7.1 SURFACE WATER HYDROLOGY, WATER QUALITY, AND WATER SUPPLY

7.1 SURFACE WATER HYDROLOGY, WATER QUALITY, AND WATER SUPPLY

7.1.1 INTRODUCTION

7.1.1.1 Content

This section describes the potential effects of the proposed project on surface water hydrology, water quality and water supply. The proposed project could potentially affect natural surface waterways including the Feather, Sacramento, American and San Joaquin rivers, the Sacramento-San Joaquin Delta and small streams in Plumas and Kern County. It could potentially affect man-made surface waterways and reservoirs including the North Bay Aqueduct, California Aqueduct, South Bay Aqueduct, Coastal Aqueduct, Lake Oroville, San Luis Reservoir, Castaic Lake, Lake Perris and Lake Davis, all components of the SWP. The proposed project could also affect the water supplies of agencies other than the Department and the SWP contractors.

Chapter 6 describes the changes in SWP and SWP contractor operations that are attributable to the Monterey Amendment and the Settlement Agreement. Some of the operational changes attributable to the proposed project could have effects on surface water hydrology, water quality and the water supplies of agencies other than the Department and the SWP contractors. The potential effects of Monterey Amendment and Settlement Agreement-induced operational changes on surface water hydrology, water quality, and the water supply of entities other than the SWP and the SWP contractors, are the focus of this section.

A provision of the Monterey Amendment allowed the transfer of ownership of property in Kern County from the SWP to local water agencies. Subsequent development of a water bank on the property involved construction activities.

A provision of the Settlement Agreement provides SWP funding for watershed improvement projects in Plumas County that could include construction activities. Both of these provisions could have short-term effects on hydrology and water quality in the vicinity of the construction sites. The effects of the provisions are described in this section. Elements of the proposed project that could potentially affect surface water hydrology, water quality and water supply are listed in Table 7.1-1.

7.1.1.2 Analytical Method

Three methods were used to examine the effects of the proposed project on surface water hydrology, water quality and the water supply of entities other than the SWP and its contractors: CALSIM II simulations and post-processing of CALSIM simulations, analysis of historical data and extrapolation from historical data. The CALSIM II model directly simulates the effects of the Table A transfers and retirements and a post-processing spreadsheet analysis of CALSIM II output enables determination of the effects of the altered water allocation procedures. CALSIM II does not simulate the water supply management practices. CALSIM II was also used to assist in the analysis of the impact on CVP use of JPOD.

TABLE 7.1-1

IMPACTS OF THE PROPOSED PROJECT ELEMENTS ON HYDROLOGY AND WATER QUALITY

Proposed Project Element	Potentially Affected Environmental Resources	Impact Number
Monterey Amendment		
Altered water allocation procedures	Flow and water quality in rivers and Delta, water levels in reservoirs, availability and quality of water for other water users	7.1-1, 7.1-2, 7.1-3, 7.1-4, 7.1-5, 7.1-6, 7.1-7, and 7.1-8.
Permanent Table A transfers and retirements	Flow and water quality in rivers and Delta, water levels in reservoirs, availability and quality of water for other water users	7.1-1, 7.1-2, 7.1-3, 7.1-4, 7.1-5, 7.1-6, 7.1-7, and 7.1-8.
Transfer of Kern Fan Element lands	NA	NA
Water supply management practices	Flow in Delta, water levels in reservoirs, groundwater levels, availability and quality of water for other water users	7.1-1, 7.1-2, 7.1-3, 7.1-4, 7.1-5, 7.1-6, 7.1-7, and 7.1-8.
Restructured financial arrangements	NA	NA
Settlement Agreement		
Substitute Table A for entitlement	NA	NA
Disclosure of SWP delivery capabilities	NA	NA
Guidelines on permanent transfers	NA	NA
Guidelines on public participation	NA	NA
Restrictions on Kern Fan Element lands	NA	NA
Watershed forum and restoration in Plumas County	Water Quality in Plumas County streams	7.1-9
Amendment of Plumas SWP contract water shortage provision	NA	NA
Funding for plaintiffs	NA	NA

Note:
NA – Not Applicable.

The assumptions made in the CALSIM II studies are discussed in Chapter 5 and described in detail in Appendix F. The CALSIM II model uses historical hydrological data from a 73-year period of record and other data to simulate operations of the SWP and CVP and river flows in the Sacramento and San Joaquin Valleys. It is an analytical planning tool that uses and predicts monthly data and does not forecast actual day-to-day operations of the SWP or CVP. Actual day-to-day operations of the SWP and CVP depend on continuous collection of, and response to, real-time data. Actual daily operations are more complex than can be simulated by CALSIM II or any other similar model.

CALSIM II was used to estimate the amount of water available for allocation to the SWP contractors in different hydrologic year types. The total amount of water available each year was then allocated to the contractors in accordance with pre-Monterey Amendment allocation procedures (baseline scenario) and post-Monterey Amendment allocation procedures (proposed project). Using an Excel spreadsheet, Monterey Amendment-induced changes in deliveries to individual contractors have the potential to alter flow in the Feather and Sacramento rivers and outflow from the Delta. The effects of the Table A transfers and retirements and the altered water allocation procedures on river flow and Delta outflow were determined by simple calculation using a spreadsheet analysis that incorporated CALSIM II-generated river flow and Delta inflow data.

None of the Monterey Amendment water supply management practices has the potential to affect flow in the Feather and Sacramento rivers. The effects of the water supply management practices on the Delta in the period 1996 to 2003 were determined by analysis of historical data. The effects of the water supply management practices between 2003 and 2020 were estimated by extrapolation based on the known effects of the practices between 1996 and the present.

Some of the effects of the proposed project on water quality were estimated based on flow/water quality and groundwater level/water quality relationships. Others were estimated based on known effects of construction activities on water quality.

7.1.1.3 Standards of Significance

An impact would be judged to be potentially significant if it:

- reduces stream flow in any natural water body sufficiently to substantially impair designated beneficial uses or violate water quality objectives;
- reduces reservoir levels or storage sufficiently to substantially impair designated beneficial uses or violate water quality objectives;
- reduces the quality of an agency's SWP water supply or another agency's Delta water supply such that it is more difficult to treat to meet applicable federal or state drinking water standards for finished water or to maintain existing finished water quality, or
- reduces substantially the availability of water to water supply agencies other than the Department and the SWP contractors.

7.1.2 ENVIRONMENTAL SETTING

The environmental setting section is divided into four subsections. The first subsection describes the physical setting in 1995, the year before the Monterey Amendment was implemented. The second subsection describes the changes in the physical setting that occurred between 1996 and 2003. The third subsection describes the regulatory setting in 1995. The fourth subsection describes changes in the regulatory setting that occurred between 1996 and 2003.

7.1.2.1 Physical Setting in 1995

This section describes those water bodies that could potentially be affected by the proposed project. Flows and water quality in the Feather, Sacramento, American and San Joaquin rivers, the Sacramento-San Joaquin Delta and San Francisco Bay could be affected by the proposed project. Water levels and water quality in Lake Davis, Lake Oroville, San Luis Reservoir, Castaic Lake, and Lake Perris could be affected by the proposed project. Water quality in Plumas and Kern County streams could be affected by proposed project-induced construction activities in those counties.

The primary elements of the proposed project do not involve the discharge of pollutants into water bodies and hence have a limited potential to affect water quality. Some elements of the proposed project would result in the construction of new facilities, for example, percolation basins in Kern County and watershed restoration projects in Plumas County. These projects could result in some discharge of pollutants, primarily suspended solids, to surface water bodies during the construction period. Standard construction mitigation measures usually make the impacts on surface water quality negligible.

Proposed project-related changes in water quality stem mainly from changes in flow in streams and changes in water levels in reservoirs. Accordingly, the water quality data presented in this chapter is limited to those water quality characteristics that could be altered by the proposed project or that are needed to provide a general understanding of potentially affected water bodies.

Surface Waters

The following section contains descriptions of surface waters that may have been affected by the proposed project between 1996 and 2003 and could be affected by it in the future.

Feather River, Lake Davis and Lake Oroville

The Feather River in north-central California is the largest tributary of the Sacramento River below Shasta Dam. It drains an area of about 6,000 square miles. Three small reservoirs in Plumas County, Lake Davis, Frenchman Lake and Antelope Lake, are located on Feather River tributaries and are the northernmost SWP facilities. These reservoirs are used primarily for recreation but they also provide water supply to local agencies. Plumas County FC&WCD, a SWP contractor, obtains its water supplies from Lake Davis. Lake Davis is located about six miles northwest of the city of Portola. It has a maximum capacity of 84,400 AF, a surface area of approximately 6.25 square miles, and a 32-mile long shoreline at capacity.[1]

Flow in the lower Feather River is controlled mainly by releases from the SWP's Lake Oroville, the second largest reservoir in the Sacramento River watershed. Oroville Dam, which impounds Lake Oroville, was completed in 1968. Lake Oroville has a maximum capacity of 3,537,600 AF, a surface area of about 25 square miles, and a 167-mile long shoreline at capacity.[2]

Discharge in the lower Feather River at Nicolaus between 1956 and 1982 averaged 8,428 cubic feet per second (cfs) (6.1 million AFY).[3] Nicolaus is about ten miles upstream of the Feather River's confluence with the Sacramento River.

Mean monthly stream flows at Nicolaus for the period 1956 through 1982 are shown in Table 7.1-2. Stream flow is at its seasonal maximum in the winter and early spring and at its minimum in the summer and fall. The largest mean monthly flow of 15,957 cfs occurred in February. The smallest mean monthly flow of 3,220 cfs occurred in July. Lake Oroville reduces winter and early spring flows in the lower Feather River below estimated unimpaired flows, and increases its late spring, summer and fall flows above estimated unimpaired flows. Unimpaired flow is the flow that would occur in a stream with current land use in the watershed and the current stream channel configuration if there were no reservoirs or diversions.

Lake Oroville and Lake Davis impound high quality water that originates as runoff and snowmelt from primarily rural watersheds. Water quality characteristics for Lake Oroville are shown in Table 7.1-3. Water quality in the lower Feather River is also good. Water quality data for the Feather River at Nicolaus are shown in Table 7.1-4. Dissolved oxygen content is generally high and total organic carbon and electrical conductivity levels are low.

Sacramento River

The Sacramento River is the largest river in California. It drains a basin with an area of about 27,000 square miles and discharges to the Sacramento-San Joaquin Delta. Lake Shasta, a part

TABLE 7.1-2

MEAN MONTHLY STREAM FLOWS AT SELECTED LOCATIONS ON WATERWAYS POTENTIALLY AFFECTED BY PROPOSED PROJECT (CUBIC FEET PER SECOND)

Location	Feather River at Nicolaus[a]	Sacramento River at Knights Landing	Sacramento River at Freeport	American River at Fair Oaks	San Joaquin River at Vernalis	Delta Freshwater Outflow[d]
Period	1/1956-12/1982[b]	1/1956-12/1980[c]	1/1956-12/1995	1/1956-12/1995	1/1956-12/1995	1/1956-12/1995
January	15,453	16,280	33,331	5,006	5,451	52,371
February	15,957	18,920	38,718	5,227	6,400	60,899
March	12,887	16,358	37,028	5,200	7,017	54,812
April	13,328	12,147	28,552	4,224	6,892	37,371
May	9,167	10,412	22,999	4,158	6,444	25,563
June	5,255	8,175	17,329	3,727	5,046	15,398
July	3,220	7,907	15,102	3,692	2,472	7,984
August	3,414	8,330	14,884	2,787	1,560	6,568
September	3,700	8,918	15,409	2,270	2,047	10,337
October	4,032	7,939	13,005	1,918	2,605	10,957
November	5,097	9,796	16,750	2,445	2,458	17,028
December	9,634	13,106	25,318	3,502	3,381	30,905

Notes:
a. Data for all sites except Delta Outflow downloaded from USGS (http://waterdata.usgs.gov/nwis/sw).
b. Feather River at Nicolaus gage (11425000) removed from service in Sep. 1983.
c. Sacramento River at Knights Landing gage (11391000) removed from service in Mar. 1981.
d. Delta freshwater outflow calculated from Dayflow data downloaded from Interagency Ecological Program (http://www.iep.ca.gov/dayflow/output/index.html).
Source: US Geological Survey and California Department of Water Resources.

TABLE 7.1-3

WATER QUALITY CHARACTERISTICS – STATE WATER PROJECT RESERVOIRS POTENTIALLY AFFECTED BY PROPOSED PROJECT

Characteristic		Lake Oroville	San Luis Reservoir	Castaic Lake	Lake Perris
pH (standard units)	Mean	-	7.7	8.3	8.2
	Range	6.8 – 7.4	7.2 – 8.6	7.4 – 9.1	7.4 – 8.9
Turbidity (NTU)	Mean	-	3	2	1
	Range	0.58 – 25	1 – 12	<1 – 3	<1 – 8
Total Organic Carbon (mg/L)	Mean		2.7	4.0	-
	Range		2.0 – 4.1	2.5 – 7.7	3.0 – 1.8
Total Dissolved Solids (mg/L)	Mean		248	285	310
	Range		194 – 295	223 – 381	260 – 775
Electrical Conductivity (μS/cm)	Mean	-	448	535	591
	Range	31 – 85	363 – 501	479 – 627	483 – 712
Chloride (mg/L)	Mean		-	46	89
	Range		-	41 – 54	65 – 121
Dissolved Oxygen (mg/L)	Mean	-	-	-	-
	Range	7.8 – 12	-	-	-

Notes:
Sampling periods vary. Lake Perris and Castaic Lake, February 1996 through January 2007; Lake Oroville, January 1992 through May 1997; San Luis Reservoir, January 1996 through December 1999.
Source: California Department of Water Resources and US Bureau of Reclamation, Draft Environmental Water Account EIR/EIS, 2003.

TABLE 7.1-4

WATER QUALITY CHARACTERISTICS – RIVERS AND STREAMS POTENTIALLY AFFECTED BY PROPOSED PROJECT

Characteristic		Sacramento River at Red Bluff	Sacramento River at Freeport	Feather River near Nicolaus	Lower American River	San Joaquin River near Vernalis
pH (standard units)	Mean	7.8	7.7	7.7	7.4	8.2
	Range	7.4 – 8.1	7.0 – 8.1	7.4 – 8.4	7.0 – 7.7	7.0 – 9.0
Turbidity (NTU)	Mean	39	54	36.5	13.9	77
	Range	3 – 355	12 – 368	8 – 123	2 – 116	45 – 180
Total Organic Carbon (mg/L)	Mean	1.55	1.7	1.7	1.7	10.1
	Range	0.9 – 3.2	0.3 – 3.7	1.2 – 3.2	1.1 – 6.4	7.0 – 17
Dissolved Oxygen (mg/L)	Mean	10.7	9.7	10.1	-	9.6
	Range	8.2 – 12.1	6.5 – 12.2	9.0 – 15.7	8.2 – 12.8	7.3 – 12.9
Electrical Conductivity (µS/cm)	Mean	117	124	85	-	320
	Range	104 – 145	51 – 166	56 – 122	-	-

Source: California Department of Water Resources and US Bureau of Reclamation, Draft Water Account EIR/EIS, 2003.

of the CVP, is the largest reservoir in the Sacramento River basin. Located just north of the city of Redding, it is impounded by Shasta Dam, which was completed in 1946. Lake Shasta, Lake Oroville and reservoirs on other Sacramento River tributaries are used to regulate flows. Flow in the Sacramento River at Knight's Landing between 1956 and 1980 averaged 11,524 cfs (8.1 million AFY).[4] Knight's Landing is located upstream of the Sacramento River's confluence with the Feather River. Flow in the Sacramento River at Freeport between 1956 and 1995 averaged 23,202 cfs (16.8 million AFY).[5] Freeport is located about eight miles south of Sacramento.

Mean monthly stream flows at Knight's Landing and Freeport are shown in Table 7.1-2. Sacramento River discharge is typically at its seasonal minimum in the fall and early winter. Discharge increases as the rainy season begins and usually reaches its seasonal maximum in the late winter or early spring. The largest mean monthly flow of 38,718 cfs at Freeport occurred in February. The smallest mean monthly flow of 13,005 cfs at that location occurred in October. The river's many upstream reservoirs reduce its late winter and early spring flows below estimated unimpaired flows and increase its late spring, summer and fall flows above estimated unimpaired flows.

Water quality data for the Sacramento River at Bend Bridge, near Red Bluff, and at Freeport are shown in Table 7.1-4. Dissolved oxygen content is generally high, close to saturation, and total organic carbon and electrical conductivity levels are low at both locations. There is a deterioration in water quality in a downstream direction primarily as a result of runoff and irrigation return flows from agricultural lands and runoff and wastewater treatment plant discharges from urban and suburban areas.

<u>American River</u>

The American River drains a basin with an area of about 2,000 square miles and discharges to the Sacramento River at Sacramento. Flow in the river is controlled by releases from Folsom Lake, a part of the CVP. Flow in the American River at the Fair Oaks gauge between 1956 and 1995 averaged 3,679 cfs (2.7 million AFY).[6] The Fair Oaks gauge is about 22 miles upstream of the confluence of the American River with the Sacramento River. Mean monthly stream flows at Fair Oaks are shown in Table 7.1-2. The highest flows occurred in January though March and the lowest in September through November. The largest mean monthly flow of 5,227 cfs occurred in February. The smallest mean monthly flow of 1,918 cfs occurred in October.

Water quality data for the lower American River are shown in Table 7.1-4. Dissolved oxygen content is generally high, close to saturation, and total organic carbon and electrical conductivity levels are low.

San Joaquin River

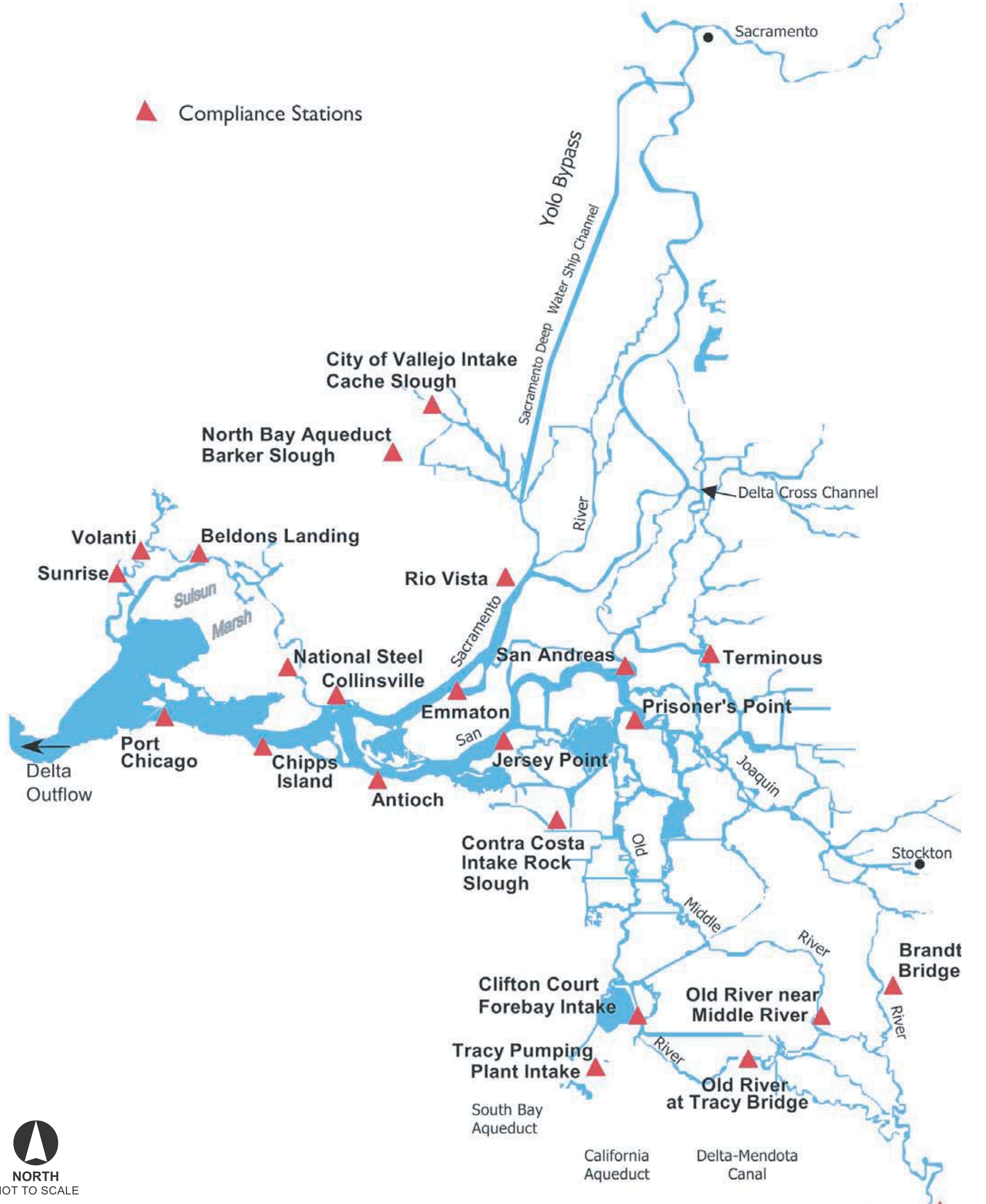
The San Joaquin River drains a basin with an area of about 13,500 square miles and discharges to the Sacramento-San Joaquin Delta. Flow in the river is controlled by releases from Millerton Lake on the main stem of the river and from New Don Pedro, New Melones, and other reservoirs on the San Joaquin's tributaries. Millerton Lake is impounded by Friant Dam which was completed in 1942. Flow in the San Joaquin River at Vernalis between 1956 and 1995 averaged 4,314 cfs (3.1 million AFY).[7] Mean monthly stream flows at Vernalis are shown in Table 7.1-2. The highest flows occur in February though May and the lowest in August and September. The largest mean monthly flow of 7,017 cfs occurred in March. The smallest mean monthly flow of 1,560 cfs occurred in August. There are no minimum flow requirements below Friant Dam and the San Joaquin River is essentially dry between Gravelly Ford and the Mendota Pool, except when flood releases are being made.

Water quality data for the San Joaquin River at Vernalis are shown in Table 7.1-4. Total dissolved solids and total organic carbon content are high for natural waters and considerably higher than for water entering the Delta from the Sacramento River. The primary causes of degraded water quality in the San Joaquin River are flow depletion as a result of upstream diversions on the mainstem of the river and its tributaries, the unsolved agricultural drainage problems in the San Joaquin Valley and municipal wastewater discharges. Water pumped from the Delta and exported to the San Joaquin Valley for crop irrigation contains dissolved mineral salts. Most of the water applied to crops is used by the crops or evaporates, but almost all of the salts remain in the valley. They either accumulate in the soil and groundwater or are discharged to the San Joaquin River in agricultural drainage or return water. Because the San Joaquin River discharges to the Delta some of the salts return to the vicinity of the pumps, are exported back to the valley and return again to the San Joaquin River. Until a solution is found to the San Joaquin Valley's agricultural drainage problem, salt will continue to recycle in the valley with adverse consequences for San Joaquin River water quality.

Sacramento-San Joaquin Delta

The Sacramento-San Joaquin Delta, shown in Figure 7.1-1, is a 600 square mile area of channels and islands at the confluence of the Sacramento and San Joaquin rivers. Freshwater, draining from a 41,300 square-mile watershed, enters the Delta from the Sacramento and San Joaquin rivers and several smaller streams.

About 21 million AF of water reach the Delta annually, but actual inflow varies widely from year to year and within the year. In 1977, a year of extraordinary drought, Delta inflow totaled 5.9 million AF. In 1983, an exceptionally wet year, Delta inflow was about 70 million AF. On a seasonal basis, average monthly flow into the Delta varies by more than a factor of 10 between the highest month in the winter or spring and the lowest month in the fall.[8] The Sacramento River contributes an average of 77 percent of the inflow to the Delta, the San Joaquin River contributes about 15 percent of the inflow, and Mokelumne, Consumnes, and Calaveras rivers contribute the remainder.[9]



Source: Department of Water Resources, October 2004.

FIGURE **7.1-1**

Sacramento-San Joaquin Delta

Most of the Delta islands are used to grow crops. Delta farmers divert water directly from the Delta channels to irrigate their land. A portion of the diverted water is returned to the Delta channels as agricultural drainage or return water. The average annual net diversion of water for irrigation within the Delta is estimated to be 960,000 AF.[10]

California's two largest water systems, the CVP and SWP, also divert water from the Delta. The CVP diverts water from Old River in the south Delta at the Tracy Pumping Plant and delivers it to CVP contractors via the Delta-Mendota Canal. CVP diversions at the Tracy Pumping Plant average about 1.7 million AFY. In addition, Contra Costa WD, a CVP contractor, diverts its water from Old River and Rock Slough in the south Delta and Mallard Slough in the west Delta. On average, Contra Costa WD diverts 190,000 AFY from the Delta.[11]

The SWP diverts water from Old River at the Banks Pumping Plant and delivers it to SWP contractors via the California Aqueduct and the South Bay Aqueduct. The SWP diverts smaller amounts of water from Barker Slough in the north Delta to serve two SWP contractors, Napa County FC&WCD and Solano County WA. Between 1980 and 1994, the SWP diverted an average of about two million AFY from the Delta.

The Delta is a tidal region. Every 12.4 hours, the tides cause water to move in and out of the Delta. Most of the time, tides cause a five- to eight-mile back and forth movement of water in the western part of the Delta. The average tidal flow into the Delta on the flood tide and out of the Delta on the ebb tide is about 170,000 cfs.[12] The movement of freshwater through the Delta is superimposed on the tidal flows. Typical freshwater flows are much smaller than tidal flows. The average Delta freshwater outflow for the period 1956 to 1995 was only about 27,500 cfs.[13] Thus, total flow into the Delta from Suisun Bay on the flood tide was 142,500 cfs when Delta outflow was at its average value. Similarly, net flow out of the Delta to Suisun Bay on the ebb tide was 197,500 cfs when Delta outflow was at its average value.

Delta freshwater outflow, commonly referred to simply as Delta outflow, is roughly equal to Delta inflow less diversions for export and net in-Delta water diversions. Like Delta inflow, Delta outflow varies widely from month to month and from year to year. Between 1956 and 1995, Delta outflow averaged 19.9 million AF. The greatest annual Delta outflow in the period was 35.7 million AF in 1983. The smallest Delta outflow in the period was 2.6 million AF in 1977.[14] Average monthly Delta outflow for the same period is shown in Table 7.1-2. The greatest Delta outflow typically occurs in January, February and March, when surface runoff is high and demand for irrigation water is low. The smallest Delta outflow typically occurs in the period July through October. The largest mean monthly Delta outflow of 60,899 cfs occurred in February. The smallest mean monthly Delta outflow of 6,568 cfs occurred in August.

In general, the SWP and CVP pump as much water as they can from the Delta. Their ability to pump water is limited by three factors, the capacity of their facilities (pumping plants, aqueducts and storage reservoirs), the need to maintain compliance with environmental standards, and the availability of water. In the winter and spring, fisheries-related environmental standards usually limit pumping. In summer and early fall, water quality-related environmental standards usually limit pumping. Typically, the CVP and SWP can pump larger amounts of water from the Delta in high flow winter and spring months than they can in low flow summer and fall months.

The proportion of Delta inflow that is diverted by the CVP and SWP varies from year to year. Before 1960, no more than 10 percent of annual Delta inflow was diverted from the Delta. The proportion of annual Delta inflow that was diverted increased in the 1960s, 1970s, and 1980s as SWP operations began and SWP contractors' water demands increased. The maximum proportions of annual Delta inflow diverted in the 1960s, 1970s and 1980s were 16 percent, 39 percent and 51 percent, respectively. Proportional diversions of annual Delta inflow reached a maximum value of 54 percent in the drought year of 1990.[15] The flow objectives contained in the 1995 Bay-Delta Water Quality Control Plan (WQCP) limit diversion by the SWP and CVP to 35 percent of total Delta inflow between February and June and to 65 percent of total Delta inflow between July and January.[16]

Diversion of water by the SWP, CVP and others in the south Delta, and upstream depletion of San Joaquin River flows, affects the pattern of flow in the Delta channels. Historically, net flow in the Delta channels was toward Suisun Bay. Now, because freshwater inflow to the south Delta from the San Joaquin River is small compared to the diversions at the Banks and Tracy Pumping Plants, net flow in many south Delta channels reverses during summer and fall. Flow in the lower San Joaquin River and the south Delta channels is directed upstream toward the pumping plants rather than downstream toward Suisun Bay.[17]

Water quality in the Delta is governed by the Delta's complex hydrodynamics. Freshwater enters the Delta from its tributary rivers. Saline water enters the Delta from Suisun Bay, the northern reach of the San Francisco Bay estuary, with the tides. When freshwater flow through the Delta is great, saline water is repelled and the waters of the Delta exhibit little salinity. When freshwater flow is small, tidal flow enables saline water to penetrate into the Delta. Under these circumstances, water quality in some parts of the Delta becomes brackish and unsuitable or less suitable for use as a source of potable and irrigation water.

The development of the water resources of the Sacramento and San Joaquin River watersheds has altered the magnitude and timing of Delta inflow, which in turn affects water quality in the Delta. Construction of reservoirs on rivers tributary to the Delta has led to the capture of winter and spring runoff. Some of the runoff is diverted for municipal and agricultural purposes and never reaches the Delta. The rest of the runoff is released from reservoirs for electric power generation and diversion within the Delta. Diversion and storage of water reduces peak wintertime Delta inflow and increases Delta inflow in the summer and early fall compared to conditions in the 1920s and 1930s. As a result, Delta waters can be less saline in the summer months than they were before construction of the reservoirs.

The reversal of flow in the lower San Joaquin River and many south Delta channels as a result of water diversions by the SWP and CVP also affects water quality. Flow reversal has both beneficial and adverse effects on water quality in the South Delta. Flow reversal causes high quality Sacramento River water to penetrate into the South Delta and dilute lower quality water from the San Joaquin River but it also enables saline water from Suisun Bay to move upriver. Flow reversal also slows the movement of San Joaquin River water toward Suisun Bay, which can reduce the dissolved oxygen content of river water during the warmer summer months. Dissolved oxygen levels in this reach of the river are already low in the summer months as a result of higher water temperature and the oxygen-depleting effects of municipal, industrial and agricultural wastewater discharges.

Water quality in the Delta has also been affected by land use changes in the watersheds of rivers tributary to the Delta. Use of the land for agricultural and urban purposes has increased the discharge of water pollutants to rivers upstream of the Delta. Discharges and runoff from agricultural and urban areas contain dissolved minerals and organic compounds, suspended solids, plant nutrients and low concentrations of toxic substances, including metals and pesticides. Although all municipal wastewaters are treated before discharge some metals and synthetic organic compounds are not removed in conventional wastewater treatment plants.

Table 7.1-5 shows water quality characteristics at selected locations in the Delta. In general, water quality in the Delta declines in a southerly and westerly direction. This is illustrated by the pattern of chloride concentrations. The chloride content of Sacramento River water, entering the Delta from the north, is low. Chloride, a constituent of seawater, enters the Delta from the west. Chloride concentration at the Banks Pumping Plant is higher than in the Sacramento River because low-chloride Sacramento River water has mixed with saline water entering from Suisun Bay.

TABLE 7.1-5

WATER QUALITY CHARACTERISTICS AT SELECTED STATIONS WITHIN THE DELTA

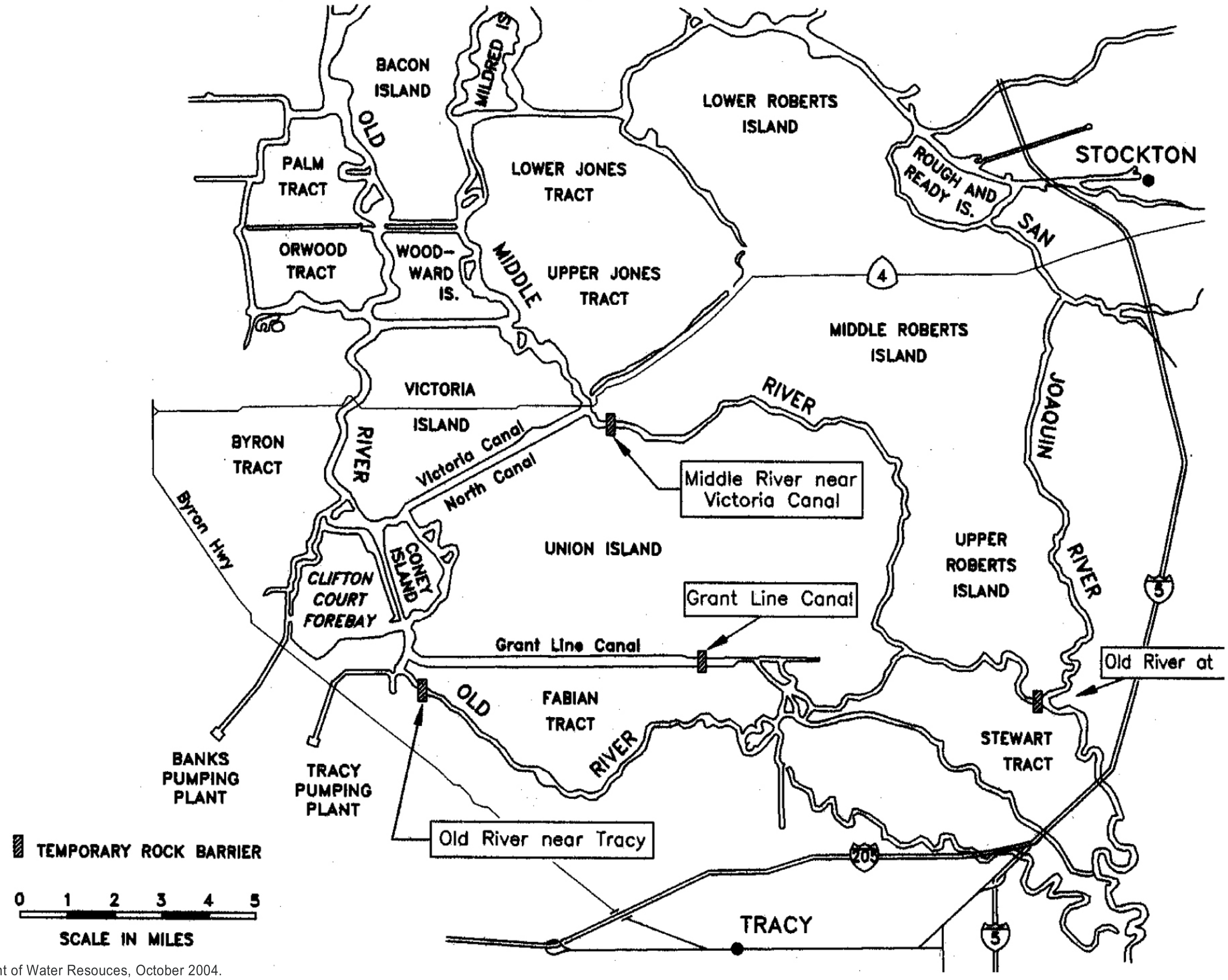
Location	Sacramento River at Green's Landing	North Bay Aqueduct at Barker Slough	Banks Pumping Plant	Contra Costa Intake at Rock Slough	San Joaquin River at Vernalis
Mean TDS (mg/L)	100	192	258	305	459
Mean Electrical Conductivity (µS/cm)	160	332	482	553	749
Mean Bromide, Dissolved (mg/L)	0.018	0.015	0.269	0.455	0.313
Mean DOC (mg/L)	2.5	5.3	3.7	3.4	3.9
Mean Chloride, Dissolved (mg/L)	6.8	26	81	109	102

Notes:
mg/L = milligram per liter.
µS/cm = microsiemen per centimeter.
Sampling period varies, depending on location and constituent, but generally is between 1990 and 1998.
Source: CALFED 2000a.

Water quality constituents in Delta waters that are of greatest concern to municipal water supply agencies are total dissolved solids (salinity), bromide and total organic carbon content. Elevated salinity levels in municipal water supplies may make it unpalatable to users, injurious to piping and plumbing fixtures and unsuitable for groundwater recharge and some industrial purposes. It may also prevent or make wastewater reclamation and reuse more difficult. Farmers are also concerned about salinity because elevated salinity levels may make water unsuitable for irrigating certain salt-sensitive crops and may accelerate the build up of salts in soil.

Organic carbon compounds are present in water in the form of microscopic plants and animals and the products of bacterial degradation of plant and animal material. Total organic carbon levels rise in the Delta in the winter and spring primarily as a result of surface runoff. Organic carbon reacts with agents used to disinfect drinking water to form a group of chemicals called disinfection byproducts. Disinfection byproducts are known to cause cancer and are regulated under the Safe Drinking Water Act (SDWA). Bromide also reacts with organic matter and disinfection agents to form disinfection byproducts. Saline water from San Francisco Bay is the main source of bromide in the Delta.

Since 1990, the Department has installed temporary barriers in the Grant Line Canal, Middle River and Old River to improve water quality and conditions for migrating salmon. The Department installs the barriers in the spring and removes them in the fall. The Department is planning to replace the temporary barriers with permanent gates. The locations of the temporary barriers are shown in Figure 7.1-2. The temporary barriers on the Grant Line Canal, Middle River near the Victoria Canal and Old River near Tracy maintain water levels for irrigation in the south Delta channels. The barrier on Old River at Stewart Tract improves the



Source: Department of Water Resouces, October 2004.

FIGURE **7.1-2**
South Delta Temporary Barriers Locations

dissolved oxygen content of San Joaquin River waters and conditions for downstream migrating juvenile Chinook salmon (smolts) in the spring and upstream migrating adults in the fall.[18]

San Francisco Bay Estuary

The Delta discharges to Suisun Bay. From Suisun Bay, water flows through Carquinez Strait into San Pablo Bay, south into San Francisco Bay and through the Golden Gate to the Pacific Ocean.

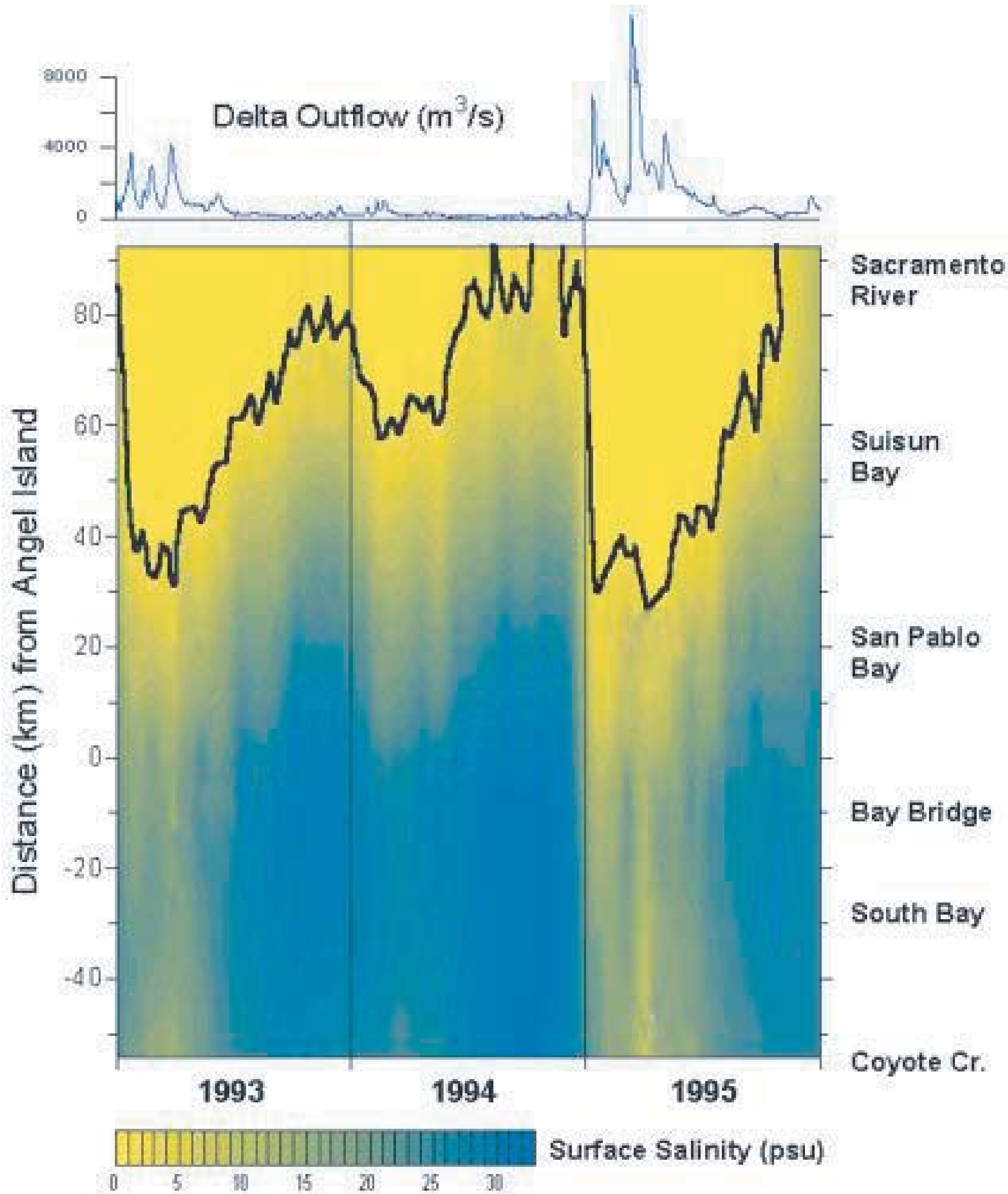
Construction of reservoirs and diversion of water for agricultural and municipal use in the Sacramento and San Joaquin watersheds and land use changes in the Central Valley have altered the volume and timing of freshwater flow into the San Francisco Bay Estuary. It has been estimated that upstream diversion has reduced Delta inflow by about nine million AFY. Additional water is diverted in the Delta for use there and for export. Diversion for export has increased gradually from less than 10 percent of Delta inflow in the 1950s to as high as 54 percent in the drought year of 1990.[19]

Although there is disagreement among experts on the extent of the historical changes in freshwater flow into the San Francisco Bay Estuary, the prevalent view among water planners and the scientific community is that because diversions have increased over the last 80 years, the volume of Delta outflow has decreased. Some scientists have put forward the view that the average annual volume of freshwater flowing to the San Francisco Bay Estuary has remained fairly constant since the 1920s because hydrologic and land use changes that have occurred have offset the increased diversions. Increasing diversion of water from rivers in the Central Valley and the Delta for agricultural and municipal purposes has decreased Delta outflow. But the draining of the extensive historical Central Valley wetlands and the confinement of rivers in channels probably has increased surface runoff, as has an apparent increase in precipitation. Although there is disagreement over whether the increases and decreases offset each other there is agreement that the timing of freshwater flow to the estuary has changed.[20]

Freshwater inflow is the primary determinant of water quality in the San Francisco Bay Estuary. Without freshwater flow into the San Francisco Bay Estuary its waters would be saline and similar in quality to the near-shore Pacific Ocean. The primary source of freshwater flow into the bay is outflow from the Delta, but local runoff and municipal wastewater treatment plants also contribute low-salinity water.

The U.S. Geological Survey (USGS) has studied the effects of different Delta freshwater outflow rates on salinity in the San Francisco Bay Estuary. Figure 7.1-3 shows salinity along a transect drawn through the San Francisco Bay Estuary from the Sacramento River in the north to Coyote Creek in the south for 1993, 1994 and 1995.[21] Salinity varies from about 100 mg/L at the Sacramento River to 33,000 mg/L in central and southern portions of San Francisco Bay. The thick solid line shows the changing location of the 2,000 mg/L surface isohaline. An isohaline is a line drawn on a map connecting places with an equal water salinity. The location of the 2,000 mg/L-isohaline, often referred to as "X2", has been shown to be important for some fish species (see Section 7.3 for a complete discussion of this topic).

In the spring of 1993, when Delta outflow was high, X2 was located at the western end of Suisun Bay in Carquinez Strait. As Delta outflow declined in the summer and fall, X2 moved upstream into the Delta. Because 1994 was a dry year, X2 remained in the Delta for most of the year. In the spring of 1995, a wet year, X2 was pushed out of the Delta and into eastern San Pablo Bay.



Source: http://sfbay.wr.usgs.gov/access/wqdata/yearsdata/charts/sal9395nojava.html.

FIGURE **7.1-3**

Salinity in San Francisco Bay

While water quality in the northern portion of the San Francisco Bay estuary, north of the San Francisco-Oakland Bay Bridge, is clearly and strongly influenced by Delta outflow the effect of Delta outflow on water quality in the estuary south of the Bay Bridge is more muted. Incursions of low-salinity water into the bay south of the Bay Bridge are relatively rare and it is difficult to distinguish the effect of large Delta outflows from those of local runoff because they often occur simultaneously. However, modeling by the USGS has shown that Delta outflow is the most important influence on salinity in the estuary as far south as the San Mateo Bridge.[22]

California Aqueduct and San Luis Reservoir

Water is pumped into the California Aqueduct at the Banks Pumping Plant in the south Delta. Water quality in the aqueduct reflects that of the Delta and varies seasonally. The mean total dissolved solids content of samples taken at the Banks Pumping Plant between 1996 and 1999 was 195 mg/L. The maximum and minimum values recorded in that period were 388 mg/L and 116 mg/L, respectively. The lowest values occur between January and July and the highest between August and December.[23]

San Luis Reservoir is the SWP's primary water storage facility south of the Delta. The Department and the U.S. Bureau of Reclamation (Reclamation) share storage capacity in the reservoir roughly equally. Water from the Delta is delivered to San Luis Reservoir via the California Aqueduct and the Delta-Mendota Canal. A negligible amount of runoff is captured in San Luis Reservoir and so water quality in the reservoir reflects that of the Delta.

Water quality data for San Luis Reservoir are shown in Table 7.1-3. Water quality in the reservoir reflects the quality of Delta waters at the time it is diverted from the Delta and conveyed to the reservoir. Total dissolved solids and total organic carbon concentrations are considerably higher in San Luis Reservoir than in Lake Oroville. Currently, water quality problems constrain the usability of San Luis Reservoir when the reservoir storage is less than 300,000 AF of water. In late summer, when water levels in San Luis Reservoir drop below about 369 feet above sea level, which corresponds with storage of 300,000 AF of water, excessive growth of algae degrades water quality. Algae can be drawn into the intake for the San Felipe Division of the CVP, which serves Santa Clara Valley WD and several smaller CVP contractors.[24] Algae in raw water makes it difficult for municipal water supply agencies to treat water and avoid taste and odor problems. Irrigation districts may be adversely affected because algae can block the emitters in drip irrigation systems. The quality problems that occur when storage in San Luis Reservoir is less than 300,000 AF of water do not affect the SWP or its contractors, other than Santa Clara Valley WD.[25]

The Department and Reclamation cooperate to try to maintain the low point above 300,000 AF, but maintaining that level decreases operational flexibility and may not be possible as water demand increases and limitations on pumping from the Delta become more restrictive. The Department, Reclamation, and Santa Clara Valley WD are currently exploring alternatives that would allow the SWP and CVP to drawdown San Luis Reservoir without adversely affecting the San Felipe Division and its contractors.

Castaic Lake and Lake Perris

Castaic Lake and Lake Perris are located respectively at the termini of the West and East branches of the California Aqueduct. Castaic Lake was completed in 1972 and is located about 45 miles northwest of Los Angeles and about two miles north of the community of Castaic. The lake has a maximum capacity of 323,700 AF at a water surface elevation of 1,515 feet above sea level. It has a surface area of 3.5 square-miles and 29 miles of shoreline at capacity.[26] Water levels typically reach a high point in March and a low point in October. Table 7.1-6 shows historical average monthly water surface elevations for Castaic Lake for the period 1974 though 1995.

TABLE 7.1-6

AVERAGE MONTHLY SURFACE ELEVATIONS – CASTAIC LAKE AND LAKE PERRIS (FEET ABOVE MEAN SEA LEVEL)

Month	Castaic Lake		Lake Perris	
	1974-1994	1995-2003	1974-1994	1995-2003
January	1475.0	1487.7	1582.3	1583.1
February	1483.9	1487.5	1584.6	1582.5
March	1490.5	1493.7	1585.0	1583.8
April	1489.6	1503.3	1584.3	1584.3
May	1484.7	1505.9	1582.9	1584.6
June	1478.0	1506.7	1580.3	1585.0
July	1473.0	1503.7	1577.4	1585.0
August	1465.7	1500.7	1575.4	1585.0
September	1463.4	1499.2	1575.4	1584.4
October	1457.9	1495.5	1575.8	1584.4
November	1460.9	1492.9	1577.7	1584.3
December	1469.5	1495.4	1580.2	1583.6

Source: California Department of Water Resources.

Lake Perris is located adjacent to the City of Moreno Valley. It has a maximum capacity of 131,500 AF at a water surface elevation of 1,588 feet above sea level. It has a surface area of 3.6 square miles and a ten-mile long shoreline at capacity.[27] Water surface elevations typically reach a high point in March and a low point in August or September. Table 7.1-6 shows historical average monthly water surface elevations for Lake Perris for the period 1974 though 1995.

Castaic Lake and Lake Perris are filled with water from the California Aqueduct but the former also receives some runoff from its local watershed. Water quality data for the two reservoirs are shown in Table 7.1-3. Water quality in the two reservoirs primarily reflects the quality of Delta waters, but it is also influenced by local factors. Although most organic compounds are at concentrations below detection limits in both reservoirs, a few synthetic compounds such as methyl tertiary-butyl ether (MTBE) are detected occasionally in Castaic Lake probably as a result of local runoff. Water quality in Lake Perris deteriorates at times because it remains in storage for relatively long periods of time allowing degradation by evaporation and high recreational use.

Kern County Streams

The Kern River is the primary surface water feature in Kern County. It rises in the southern Sierra Nevada and flows westward into the San Joaquin Valley. The valley is arid, typically receiving five inches of rainfall over the valley floor and nine to thirteen inches in the foothills.[28] Because of low rainfall, permeable surface soils and little topographic relief, little surface runoff occurs on the valley floor and there is a limited network of natural surface drainage channels. The few natural streams are ephemeral. The most prominent surface water features are man-made irrigation canals.

Water Supplies

Water supply agencies, other than the Department and the SWP contractors, which could be affected by the proposed project, include the Feather River water rights contractors and CVP contractors.

Feather River Water Rights Contractors

The Feather River water rights contractors are agricultural water agencies with water rights to Feather River water that predate the Department's water rights. The Department negotiated settlement agreements with these water agencies to address the effects of constructing Oroville Dam upstream of their historical points of diversion from the Feather River. The Department provides releases from Oroville Dam to satisfy the terms of the settlement agreements.

Central Valley Project and its Contractors

The CVP is California's largest water project. The CVP is a system of reservoirs, power plants, pumping plants, and canals operated by Reclamation. On average, the CVP delivers 5.6 million acre feet of water for agricultural and municipal use, about twice as much as the SWP.

North of the Delta, the CVP operates reservoirs on the Trinity, Sacramento and American rivers. Water from the Trinity River, which flows to the Klamath River and to the Pacific Ocean near the California/Oregon border, is diverted into Shasta Lake, the largest CVP reservoir on the Sacramento River with a capacity of 4.5 million AF. Water from Shasta Lake and Folsom Lake on the American River is released to the Sacramento River and flows downstream to the Delta. Water is diverted from the south Delta at the CVP's Tracy Pumping Plant and conveyed southward to the CVP's contractors on the western side of the San Joaquin Valley via the Delta-Mendota Canal. The CVP's diversions at the Tracy Pumping Plant average about 1.7 million AFY. Smaller amounts of CVP water, an average of about 150,000 AF, are diverted at the SWP's Banks Pumping Plant and conveyed southward in the California Aqueduct to the O'Neill Forebay (see Chapter 6 for a discussion of shared use of Delta pumping plants by the SWP and CVP). From the O'Neill Forebay, water continues southward to CVP contractors or is pumped into San Luis Reservoir, a joint use facility of the CVP and SWP.

Reclamation supplies water to CVP contractors on the eastern side of the San Joaquin Valley from Millerton Reservoir on the San Joaquin River and several other reservoirs on tributaries of the San Joaquin. Contra Costa County Water District, a CVP contractor, diverts its CVP water directly from the Delta. It diverts an annual average of about 190,000 AF of water from the Delta.

7.1.2.2 Changes in Physical Setting between 1996 and 2003

No major storage facilities with the potential to alter flows in rivers or the Delta were added to the SWP between 1996 and 2003. Some improvements and additions were made to the SWP conveyance system including completion of the Coastal Branch of the California Aqueduct in 1997. Some SWP contractors made improvements to their water systems between 1996 and 2003 to take better advantage of their SWP supplies including the completion of Diamond Valley Reservoir, a pre-Monterey Amendment project of MWDSC. The improvements may have affected flow in rivers and Delta outflow.

No major storage facilities with the potential to alter flows in rivers or the Delta were added to the CVP between 1996 and 2003. Contra Costa WD, a CVP contractor, completed Los Vaqueros Reservoir and the Old River Intake and Pipeline in 1998. The reservoir has a capacity of 100,000 AF. It is filled with water from the Delta when water quality is good. Water from the reservoir is blended with water diverted directly from the Delta during dry periods when water quality deteriorates. The reservoir also serves as emergency storage.[29] The reservoir altered the timing of Contra Costa WD's diversions from the Delta, increasing diversions in wet periods and reducing them in dry periods.

Flows in the Delta and San Joaquin River between 1996 and 2003 were affected by a number of regulatory actions under existing laws, changes in regulations and the responses of water users to the regulatory actions and changes. The regulatory changes that affected flows are described in Section 7.1.2.4. They were also affected by growing water demand in the SWP service area and a consequent increase in water diversion by the SWP.

At certain times of the year, diversion of water from the Delta by the SWP and CVP could harm fish species listed as threatened and endangered under the federal Endangered Species Act. The federal agencies responsible for administering the act, U.S. Fish and Wildlife Service (USFWS) and the National Oceanic and Atmospheric Administration's National Marine Fisheries Service (NMFS), ordered pumping curtailments at times in May and June of 1996, 1997, 1999 and 2000 to reduce harm to the listed fish species. The effect was to increase Delta outflow at times in May and June when threatened and endangered species were present near the pumps.

Beginning in late 2000, the Environmental Water Account (EWA) became operational as a consequence of the CALFED Bay-Delta Program. The purpose of the EWA is to enable the diversion of water by the SWP and CVP from the Delta to be reduced at times when at-risk fish species may be harmed or killed while preventing the uncompensated loss of water to SWP and CVP contractors. The EWA then acquires water from willing sellers by transfers of water from reservoirs, surface water made available by groundwater substitution, or purchase of previously banked groundwater to repay the pumping curtailments. The EWA also obtains water by use of certain operational assets (including shared use of Banks Pumping Plant during the July to September period). The EWA can also acquire water by agreements with water agencies wherein farmers temporarily remove land from agricultural production but this technique has not yet been used. The replacement water is then delivered to the O'Neill Forebay of San Luis Reservoir to ensure that no SWP or CVP users suffer any reduced deliveries as a result of fisheries-related restrictions on Delta pumping by the SWP and CVP.

The operation of the EWA may have resulted in higher Delta outflow at times of the year when water that was acquired from agencies north of the Delta was released for diversion at the SWP and CVP pumps.[30] Because the characteristics of the Delta prevent efficient delivery of water from north of the Delta to the SWP and CVP pumps, extra water, referred to as carriage water, sometimes has to be released to maintain compliance with Delta water quality and flow standards. The amount of carriage water needed to transfer water across the Delta to the pumps depends on conditions in the Delta at the time of the transfer. It typically represents about 20 percent of the amount transferred; that is, to deliver 10,000 AF of water to the pumps, 12,500 AF must be released north of the Delta. The extra 2,500 AF is carriage water and contributes to Delta outflow.

Increases in Delta outflow occurred during fisheries-related pumping curtailments that occurred from December through June between 2000 and 2003. They also occurred between July and

October when water acquired for the EWA was transferred across the Delta. The primary increases in Delta outflow occurred during the pumping curtailments.

Plumas County streams could be affected by the Settlement Agreement, which was executed in 2003. Almost all streams in Plumas County drain to the Feather River. Although the North, Middle and South Forks of the Feather River have been developed for hydropower and water supply, most of the smaller streams in the county are undeveloped. Any stream in Plumas County could potentially be affected by the watershed restoration elements of the Settlement Agreement. Restoration projects are planned for Jordan, Last Chance and Hosselkus Creeks, all of which are tributary to the North Fork Feather River.

7.1.2.3 Regulatory Setting in 1995

Many federal and state laws and regulations have been promulgated to protect California's lakes, rivers, groundwater aquifers, estuaries and coastal waters. The most relevant to the Monterey Plus EIR are summarized briefly below.

Clean Water Act

Growing public awareness and concern for controlling water pollution led to enactment of the Federal Water Pollution Control Act Amendments of 1972. As amended in 1977, this law became known as the Clean Water Act (CWA). The CWA established the basic structure for regulating discharges of pollutants into the waters of the U.S. It gave the U.S Environmental Protection Agency (EPA) the authority to set ambient water quality standards for surface waters and set standards for municipal and industrial wastewater discharges. The CWA made it unlawful for any person to discharge any pollutant from a point source into navigable waters, unless a permit was obtained.

Section 303(d) of the CWA requires states, territories and authorized tribes to develop a list of water quality-impaired segments of waterways. The list includes waters that do not meet water quality standards for the beneficial uses of that waterway, even after point sources of pollution have installed the minimum required levels of pollution control technology. The law requires that these jurisdictions establish priority rankings for water segments on the lists and develop action plans, called Total Maximum Daily Loads (TMDLs), to improve water quality. Many water bodies in the Monterey Plus EIR area of analysis are listed as water quality limited (impaired) for one or more of the constituents of concern. The lists of impaired water bodies are prepared every two years.

Safe Drinking Water Act

The federal Safe Drinking Water Act (SDWA), enacted in 1974, and significantly amended in 1986, was established to protect the public health and quality of drinking water in the United States. The law addresses all waters actually or potentially designated for drinking use, whether from above ground or underground sources. The SDWA directed the EPA to set national standards for drinking water quality. It required the EPA to set maximum contaminant levels (MCLs) for a wide variety of potential drinking water pollutants. The owners or operators of public water systems are required to comply with primary (health-related) MCLs and encouraged to comply with secondary (nuisance- or aesthetics-related) MCLs. The 1986 amendments to the SDWA directed the EPA to expand its list of MCLs.

SDWA drinking water standards apply to treated water as it is served to consumers. All surface waters require some form of treatment in order to meet drinking water standards. The degree of treatment needed depends on the quality of the raw water. The highest quality raw surface waters need only to be disinfected before being served to consumers. More typically, raw water is treated in a conventional water treatment plant that includes sedimentation, filtration and disinfection processes. Although it is technically possible to treat virtually any raw water so that it will meet drinking water standards, it is usually not practical to do so. Municipal water suppliers prefer raw water sources of high quality because their use minimizes risk to public health and the cost and complexity of treatment needed to meet SDWA drinking water standards.

Almost all SWP water is diverted from the Delta. Some constituents of Delta water are of particular concern to municipal contractors because they are either not removed or only partially removed by commonly used water treatment processes. They include total dissolved solids, chlorides, bromides, and organic compounds. These substances can be removed from raw water by advanced water treatment processes but to do so substantially increases the cost of water treatment.

Elevated total dissolved solids or chloride concentrations in drinking water can adversely affect its taste. Secondary MCLs for total dissolved solids and chloride are 500 mg/L and 250 mg/L respectively.[31] Bromide and total organic carbon concentrations are of concern because bromides and organic compounds react with disinfecting agents to form various chemical compounds that can harm human health at low concentrations. These compounds are referred to as disinfection byproducts and include trihalomethanes (chloroform, bromodichloromethane, dibromochloromethane, and bromoform), haloacetic acids (mono-, di-, and trichloroacetic acid, mono- and dibromoacetic acid), chlorite and bromate. The primary MCLs for total trihalomethanes, total haloacetic acids, chlorite and bromate are 0.08, 0.06, 1 and 0.01 mg/L, respectively.[32] Elevated total organic carbon concentrations can also affect the taste and odor of treated water.

Porter-Cologne Act

Responding to public concern in California, state legislators enacted a law designed to curb water pollution several years before passage of the Federal Water Pollution Control Act Amendments. The Porter-Cologne Act of 1969 established regional water quality control boards and gave them defined responsibilities for water quality management.

The Porter-Cologne Act requires the regional water quality control boards to prepare regional WQCPs, often referred to as basin plans. The WQCPs must identify present and future beneficial uses of California's waters and establish water quality objectives that will protect those uses. California's beneficial use designations and water quality objectives are the functional equivalent of the federal ambient water quality standards. After passage of the Federal Water Pollution Control Act Amendments, California's water quality objectives served as federal water quality standards, upon review and approval by the EPA.

The State Water Resources Control Board (SWRCB) prepares and adopts the Bay-Delta WQCP. WQCPs for other parts of the state are adopted and amended by the regional water quality control boards but do not become effective until adopted by the SWRCB. All WQCPs are subject to CEQA review. Adoption or revision of surface water objective/standards is subject to the approval of the EPA. The regional WQCPs complement statewide WQCPs adopted by the SWRCB, such as the WQCP for Temperature Control and the WQCP for Ocean Waters.

Several WQCPs govern management of surface and ground waters that could be affected by the proposed project. The Central Valley WQCP covers the Sacramento and San Joaquin River basins, including an area bounded on the east by the crests of the Sierra Nevada and Cascade Range and on the west by the Coast Range and Klamath Mountains. The Tulare Lake WQCP covers the watershed in the southern San Joaquin Valley that drains to the Tulare Lake bed, including the Kings, Kaweah, Tule and Kern rivers. The San Francisco Bay/Delta WQCP covers those portions of Alameda, Contra Costa, Marin, Napa, San Mateo, San Francisco, Santa Clara, Solano and Sonoma counties that drain to the San Francisco Bay estuary, including the Delta. The Los Angeles and Santa Ana River WQCPs cover coastal southern California.

Each WQCP identifies existing and potential beneficial uses of surface waters and establishes water quality objectives within its part of California. Existing and potential beneficial uses of surface waters that could be affected by the proposed project are shown in Table 7.1-7. Surface waters in the WQCP areas are in compliance with objectives except for those waters on the SWRCB's list of impaired water bodies, the CWA Section 303(d) list, and shown in Table 7.1-8.

Delta Standards

The San Francisco Bay/Sacramento-San Joaquin Delta Estuary is one of the most important aquatic ecosystems in the United States, providing habitat for hundreds of plant, animal and fish species. It also provides drinking water for two-thirds of California's people and irrigation water for over seven million acres of farmland.

The San Francisco Region WQCP, published in the early 1970s, designated beneficial uses and water quality objectives for both San Francisco Bay and the Delta. In 1978, a WQCP for the Sacramento-San Joaquin Delta and Suisun Marsh was published. In 1991, a WQCP for salinity in the San Francisco Bay/Sacramento-San Joaquin Delta Estuary was published. When the Monterey Agreement was signed in December 1994, the beneficial uses and water quality objectives contained in the 1978 and 1991 WQCPs were in effect. In May 1995, prior to implementation of the Monterey Amendment, the SWRCB adopted a new WQCP for San Francisco Bay and the Delta that superseded both the 1978 and 1991 plans.[33]

<u>Water Quality and Flow Objectives</u>

The Bay/Delta WQCP contained beneficial use designations and new water quality and flow objectives for the Delta and the lower Sacramento and San Joaquin rivers. Existing and potential beneficial uses are shown in Table 7.1-7. Separate objectives were established for municipal and industrial water use, agricultural water use, and protection of fish and wildlife. Objectives for the Delta include both numerical objectives and narrative objectives. Numerical objectives specify that the concentration of a certain constituent must not exceed or be less than a certain numerical value. For example, chloride content of Delta waters at the Banks Pumping Plant must not exceed 250 mg/L year round and Delta outflow must not be less than a specified value in individual months of different hydrologic year types. Narrative objectives state a desired outcome, for example, protection of migratory fish. These objectives must be met at the locations shown in Figure 7.1-1.

TABLE 7.1-7

DESIGNATED EXISTING AND POTENTIAL BENEFICIAL USES FOR POTENTIALLY AFFECTED SURFACE WATERS

Beneficial Use Designation	Lake Davis	Lower Sacramento River	Lake Oroville	Lower Feather River	Sacramento – San Joaquin Delta	San Francisco Bay	Lower San Joaquin River	California Aqueduct	San Luis Reservoir	Castaic Lake	Lake Perris
Municipal and Domestic Supply		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Agricultural Supply		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Stock Watering		✓					✓	✓	✓		
Industrial Process					✓	✓	✓	✓		✓	✓
Industrial Service Supply					✓	✓		✓	✓	✓	✓
Groundwater Recharge					✓	✓				✓	✓
Power Generation			✓				✓	✓	✓	✓	
Water Contact Recreation	✓	✓	✓	✓	✓	✓	✓		✓	✓	✓
Non-contact Water Recreation	✓	✓	✓	✓	✓	✓	✓		✓	✓	✓
Warm Freshwater Habitat	✓	✓	✓	✓	✓	✓	✓		✓	✓	✓
Cold Freshwater Habitat	✓	✓	✓	✓	✓	✓				✓	✓
Fish Migration		✓		✓	✓	✓	✓				
Fish Spawning Habitat	✓	✓	✓	✓	✓	✓	✓			✓	
Navigation		✓			✓	✓					
Wildlife Habitat	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Estuarine Habitat					✓	✓					
Preservation of Rare and Endangered Species					✓	✓				✓	
Shellfish Harvesting					✓	✓					
Commercial and Sport Fishing					✓	✓					

Sources: Lake Davis, Lower Sacramento River, Lake Oroville, Lower Feather River, Lower San Joaquin River, California Aqueduct and San Luis Reservoir; Water Quality Control Plan for Sacramento River and San Joaquin River Basins, September 1998.
Sacramento-San Joaquin Delta and San Francisco Bay; Water Quality Control Plan for San Francisco Bay/Sacramento-San Joaquin Delta Estuary, May 1995.
Lake Perris; Water Quality Control Plan for Santa Ana River Basin, January 1995.

TABLE 7.1-8

IMPAIRED SURFACE WATER BODIES

Location	Impairment
Delta waterways, eastern portion	Pesticides
Delta waterways, Stockton Ship Canal	Organic/Enrichment/Low dissolved oxygen, pesticides
Delta waterways, western portion	Electrical/conductivity, pesticides
Middle River	Low dissolved oxygen
Old River	Low dissolved oxygen
Salt Slough	Electrical/conductivity, pesticides, unknown toxicity
San Joaquin River	Electrical, conductivity, boron, pesticides, unknown toxicity
Feather River, Lake Oroville to Sacramento River	Pesticides
Sacramento River, Keswick Dam to Knights Landing	Unknown toxicity, pesticides
Sacramento River, Knights Landing to Delta	Pesticides, unknown toxicity
Suisun Bay, San Francisco Bay, San Pablo Bay	Pesticides

Source: www.waterbodies.ca.gov/tmdl/303_dlists.html, accessed September 18, 2005.

Table 7.1-9 shows the numerical objectives for municipal and industrial beneficial uses. The numerical municipal and industrial objectives are expressed in terms of chloride content. Chloride is abundant in seawater, typically found at a concentration of about 19,000 mg/L. The chloride content of waters in the upper reaches of rivers is typically less than 10 mg/L. Chloride content is important to municipal and industrial water users because it provides a measure of

salinity or total dissolved solids content. Water with high chloride content also has high total dissolved solids content. Water with high total dissolved solids content is unpalatable as drinking water and can damage plumbing fixtures. It may also be unsuitable for some industrial purposes, groundwater recharge programs and wastewater reclamation and reuse programs. Removal of total dissolved solids from raw water is difficult and expensive.

The municipal and industrial objectives require that chloride content at all municipal water supply intakes not exceed 250 mg/L at any time. The objectives also specify the number of days each year that the chloride content must not exceed 150 mg/L at either of two municipal water supply intakes in the western Delta. The number of days each year that the 150 mg/L chloride standard in the western Delta must be met depends on the hydrologic year type; compliance is required for fewer days in dry years than in wet years.

Table 7.1-10 shows the numerical objectives for agricultural beneficial uses. The numerical agricultural objectives are expressed in terms of electrical conductivity. Electrical conductivity provides an indicator of salinity or total dissolved solids content. Salinity is important to farmers because irrigation water with a high total dissolved solids content is unsuitable for growing many crops and can lead to salt buildup in soils. The objectives require that the electrical conductivity of waters at various locations in the Delta not exceed certain values during certain periods of time. The objectives for electrical conductivity at western and interior Delta locations vary depending on hydrologic year type.

Table 7.1-11 shows the numerical objectives for fish and wildlife beneficial uses. The numerical fish and wildlife water quality objectives are expressed in terms of dissolved oxygen content, electrical conductivity, the location of X2, the 2,000 mg/L isohaline, and flows in the Delta and the Sacramento and San Joaquin rivers. The dissolved oxygen objective of 6.0 mg/L for September, October and November in the lower San Joaquin River between Stockton and Turner Cut was set to protect fall-run Chinook salmon. In addition, the Central Valley WQCP

TABLE 7.1-9

SACRAMENTO-SAN JOAQUIN DELTA -WATER QUALITY OBJECTIVES FOR MUNICIPAL AND INDUSTRIAL BENEFICIAL USES

Compliance Location	Interagency Station Number (RKI[1])	Parameter	Description (Unit)	Water Year Type[2]	Time Period	Value
Contra Costa Canal at Pumping Plant #1 -or- San Joaquin River at Antioch Water Works Intake	C-5 (CHCCC06) D-12 (near) (RSAN007)	Chloride (Cl)	Maximum mean daily 150 mg/l Cl for at least the number of days shown during the Calendar Year. Must be provided in intervals of not less than two weeks duration. (Percentage of Calendar Year shown in parenthesis)	W AN BN D C		No. of days each Calendar Year ≤150 mg/l Cl 240 (66%) 190 (52%) 175 (48%) 165 (45%) 155 (42%)
Contra Costa Canal at Pumping Plant #1 -and-	C-5 (CHCCC06)	Chloride (Cl)	Maximum mean daily (mg/l)	All	Oct-Sep	250
West Canal at mouth of Clifton Court Forebay -and-	C-9 (CHWSTO)					
Delta-Mendota Canal at Tracy Pumping Plant -and-	DMC-1 (CHDMC004)					
Barker Slough at North Bay Aqueduct Intake -and-	--- (SLSAR3)					
Cache Slough at City of Vallejo Intake[3]	C-19 (SLCCH16)					

Notes:
1. River Kilometer Index station number.
2. The Sacramento Valley 40-30-30 water year hydrologic classification index applies for determinations of water year type. W=wet, AN=above normal, BN=below normal, D=dry, and C=critically dry.
3. The Cache Slough objective to be effective only when water is being diverted from this location.

Source: State Water Resources Control Board, *Water Quality Control Plan for San Francisco Bay/Sacramento-San Joaquin Delta Estuary*, 1995.

TABLE 7.1-10

SACRAMENTO-SAN JOAQUIN DELTA–WATER QUALITY OBJECTIVES FOR AGRICULTURAL BENEFICIAL USES

Compliance Location	Interagency Station Number (RKI[1])	Parameter	Description (Unit)[2]	Water Year Type[3]	Time Period	Value
WESTERN DELTA						
Sacramento River at Emmaton	D-22 (RSAC092)	Electrical Conductivity (EC)	Maximum 14-day running average of mean daily EC (mmhos/cm)	W AN BN D C	0.45 EC April 1 to date shown Aug 15 Jul 1 Jun 20 Jun 15 ---	EC from date shown to Aug 15[4] 0.63 1.14 1.67 2.78
San Joaquin River at Jersey Point	D-15 (RSAN018)	Electrical Conductivity (EC)	Maximum 14-day running average of mean daily EC (mmhos/cm)	W AN BN D C	0.45 EC April 1 to date shown Aug 15 Aug 15 Jun 20 Jun 15 ---	EC from date shown to Aug 15[4] 0.74 1.35 2.20
INTERIOR DELTA						
South Fork Mokelumne River at Terminous	C-13 (RSMKL08)	Electrical Conductivity (EC)	Maximum 14-day running average of mean daily EC (mmhos/cm)	W AN BN D C	0.45 EC April 1 to date shown Aug 15 Aug 15 Aug 15 Aug 15 ---	EC from date shown to Aug 15[4] 0.54
San Joaquin River at San Andreas Landing	C-4 (RSAN032)	Electrical Conductivity (EC)	Maximum 14-day running average of mean daily EC (mmhos/cm)	W AN BN D C	0.45 EC April 1 to date shown Aug 15 Aug 15 Aug 15 Jun 25 ---	EC from date shown to Aug 15[4] 0.58 0.87
SOUTHERN DELTA						
San Joaquin River at Airport Way Bridge, Vernalis -and-	C-10 (RSAN112)	Electrical Conductivity (EC)	Maximum 30-day running average of mean daily EC (mmhos/cm)	All	Apr-Aug Sep-Mar	0.7 1.0
San Joaquin River at Brandt Bridge site[5] -and-	C-6 (RSAN073)					
Old River near Middle River[5] -and-	C-8 (ROLD69)					
Old River at Tracy Road Bridge[5]	P-12 (ROLD59)					
Export Area						
West Canal at mouth of Clifton Court Forebay -and-	C-9 (CHWSTO)	Electrical Conductivity (EC)	Maximum monthly average of mean daily EC (mmhos/cm)	All	Oct-Sep	1.0

TABLE 7.1-10

SACRAMENTO-SAN JOAQUIN DELTA–WATER QUALITY OBJECTIVES FOR AGRICULTURAL BENEFICIAL USES

Compliance Location	Interagency Station Number (RKI[1])	Parameter	Description (Unit)[2]	Water Year Type[3]	Time Period	Value
Delta-Mendota Canal at Tracy Pumping Plant	DMC-1 (CHDMC004)					

Notes:
1. River Kilometer Index station number.
2. Determination of compliance with an objective expressed as a running average begins on the last day of the averaging period. The averaging period commences with the first day of the time period for the applicable objective. If the objective is not met on the last day of the averaging period, all days in the averaging period are considered out of compliance.
3. The Sacramento Valley 40-30-30 water year hydrologic classification index applies for determination of water year type.
4. When no date is shown, EC limit continues from April 1.
5. The 0.7 EC objective becomes effective on April 1, 2005. The California Department of Water Resources and the USBR shall meet 1.0 EC at these stations year round until April 1, 2005. The 0.7 EC objective is replaced by the 1.0 EC objective from April through August after April 1, 2005 if permanent barriers are constructed, or equivalent measures are implemented, in the southern Delta and an operations plan that reasonably protects southern Delta agriculture is prepared by the California Department of Water Resources and the USBR and approved by the Executive Director of the SWRCB. The SWRCB will review the salinity objectives for the southern Delta in the next review of the Bay-Delta objectives following construction of the barriers.

Source: State Water Resources Control Board, *Water Quality Control Plan for San Francisco Bay/Sacramento-San Joaquin Delta Estuary*, 1995.

TABLE 7.1-11

SACRAMENTO-SAN JOAQUIN DELTA-WATER QUALITY OBJECTIVES FOR FISH AND WILDLIFE BENEFICIAL USES

Compliance Location	Interagency Station Number (RKI[1])	Parameter	Description (Unit)[2]	Water Year Type[3]	Time Period	Value
San Joaquin River Salinity						
San Joaquin River at and between Jersey Point and Prisoners Point [4]	D-15 (RSAN018) and D-29 (RSAN038)	Electrical Conductivity (EC)	Maximum 14-day running average of mean daily EC (mmhos/cm)	W,AN,BN,D	Apr -May	0.44 [6]
Eastern Suisun Marsh Salinity						
Sacramento River at Collinsville -and- Montezuma Slough at National Steel -and- Montezuma Slough near Beldon Landing	C-2 (RSAC081) S-64 (SLMZU25) S-49 (SLMZU11)	Electrical Conductivity (EC)	Maximum monthly average of both daily high tide EC values (mmhos/cm), or demonstrate that equivalent or better protection will be provided at the location	All	Oct Nov-Dec Jan Feb-Mar Apr-May	19.0 15.5 12.5 8.0 11.0
Western Suisun Marsh Salinity						
Chadbourne Slough at Sunrise Duck Club -and- Suisun Slough, 300 feet south of Volanti Slough -and- Cordella Slough at Ibis Club -and- Goodyear Slough at Morrow Island -and- Water supply intakes for waterfowl management areas on Van Sickle and Chipps islands	S-21[7] (SLCBN1) S-42 [8] (SLSUS12) S-97 [8] (SLCRD06) S-35 [8] SLGYR09) No locations specified	Electrical Conductivity (EC)	Maximum monthly average of both daily high tide EC values (mmhos/cm), or demonstrate that equivalent or better protection will be provided at the location	All but deficiency period Deficiency period [9]	Oct Nov Dec Jan Feb-Mar Apr-May Oct Nov Dec-Mar Apr May	19.0 16.5 15.5 12.5 8.0 11.0 19.0 16.5 15.6 14.0 12.5

TABLE 7.1-11

SACRAMENTO-SAN JOAQUIN DELTA-WATER QUALITY OBJECTIVES FOR FISH AND WILDLIFE BENEFICIAL USES

Compliance Location	Interagency Station Number (RKI[1])	Parameter	Description (Unit)[2]	Water Year Type[3]	Time Period	Value
Delta Outflow						
		Net Delta outflow index (NDOI) [11]	Minimum monthly average [12] NDOI (cfs)	All All W,AN BN D C W,AN,BN D C All W,AN,BN,D C W,AN,BN,D C	Jan Feb-Jun Jul Aug Sep Oct Nov-Dec	4,500 [13] [14] 8,000 6,500 5,000 4,000 4,000 3,500 3,000 3,000 4,000 3,000 4,500 3,500
River Flows						
Sacramento River at Rio Vista	D-24 (RSAC101)	Flow rate	Minimum monthly average [15] flow rate (cfs)	All W,AN,BN,D C W,AN,BN,D C	Sep Oct Nov-Dec	3,000 4,000 3,000 4,500 3,500
San Joaquin River at Airport Way Bridge, Vernalis	C-10 (RSAN112)	Flow rate	Minimum monthly average [16] flow rate (cfs) [17]	W,AN BN,D C W AN BN D C All	Feb-Apr 14 and May 16-Jun Apr 15-May 15 [18] Oct	2,130 or 3,420 1,420 or 2,280 710 or 1,140 7,330 or 8,620 5,730 or 7,020 4,620 or 5,480 4,020 or 4,880 3,110 or 3,540 1,000 [19]
Export Limits						
		Combined export rate [20]	Maximum 3-day running average (cfs) Maximum percent of Delta inflow diverted [23] [24]	All All All	Apr 15-May 15 [17] Feb-Jun July-Jan	[22] 35% Delta inflow [25] 65% Delta inflow
Delta Cross Channel Gates Closure						
Delta Cross Channel at Walnut Grove	----	Closure of gates	Closed gates	All	Nov-Jan Feb-May 20 May 21-Jun 15	[26] --- [27]
Dissolved Oxygen						
San Joaquin River between Turner Cut and Stockton	(RSAN050-RSAN061)	Dissolved Oxygen (DO)	Minimum DO (mg/l)	All	Sep-Nov	6.0 [4]

TABLE 7.1-11

SACRAMENTO-SAN JOAQUIN DELTA-WATER QUALITY OBJECTIVES FOR FISH AND WILDLIFE BENEFICIAL USES

Compliance Location	Interagency Station Number (RKI[1])	Parameter	Description (Unit)[2]	Water Year Type[3]	Time Period	Value
SALMON PROTECTION						
----	----	----	Narrative	Water quality conditions shall be maintained together with other measures in the watershed, sufficient to achieve a doubling of natural production of Chinook salmon from the average production of 1967-1991, consistent with the provisions of State and federal law.		

Source: State Water Resources Control Board, *Water Quality Control Plan for San Francisco Bay/Sacramento-San Joaquin Delta Estuary*, 1995. Please see this document for notes in this table shown in brackets.

includes the requirement that dissolved oxygen concentrations anywhere in the Delta must not be less than 5.0 mg/L.[34]

Salinity in the Delta and the location of the freshwater/brackish water interface referred to as X2 affect the abundance and health of some fish species and other aquatic life. In addition to the numerical electrical conductivity objectives for fish and wildlife for the lower San Joaquin River and for Suisun Marsh, there is also an estuarine habitat protection objective that X2 be maintained at the water surface at Collinsville, Chipps Island or Port Chicago. The location of X2 depends primarily on tidal action and Delta outflow and is influenced by upstream reservoir operations and pumping from the Delta. The objective for X2 applies from the beginning of February to the end of June.

The fish and wildlife objectives include flow objectives designed to protect fish and wildlife. They require minimum Delta outflows, minimum flows in the San Joaquin and Sacramento rivers, limits on exports by the SWP and CVP and requirements with respect to closure of the gates in the Delta Cross Channel.

Water Rights Decisions

The SWRCB is responsible for issuing and administering water rights permits in California. In 1978, the SWRCB adopted Water Rights Decision 1485 (D-1485) which established minimum flows in the Delta and limited exports of water by the SWP and CVP. The purpose of D-1485 was to ensure compliance with then current water quality objectives. D-1485 superseded all earlier water rights decisions for SWP and CVP operations in the Delta. Various interests filed lawsuits challenging D-1485. In 1986, the appeal court affirmed the SWRCB's broad authority and obligation to establish water quality objectives and set water rights permit terms that provide reasonable protection to the beneficial uses of Delta waters (Racanelli Decision).[35] In 1987, the SWRCB began hearings to adopt new Delta objectives and a new water rights decision. The SWRCB adopted new water quality and flow objectives in 1995 as part of the 1995 Bay-Delta WQCP but a new water rights decision (D-1641) implementing the 1995 WQCP was not issued until 2000. In the absence of the new water rights decision, the SWP and CVP were voluntarily operated to meet the new objectives, beginning in December 1995.

Water Quality Objectives for Surface Waters Other than the Delta

Because the primary elements of the proposed project do not involve discharge of pollutants the only proposed project-related changes in lake or river water quality are those associated with changes in flow in surface streams or changes in water levels in lakes and reservoirs. Water quality characteristics that are flow-related and could be affected by the proposed project include water temperature, salinity and turbidity.

Two beneficial uses relate to water temperature, cold freshwater habitat (COLD) and warm freshwater habitat (WARM). All the natural water bodies that could be affected by the proposed project are designated for both COLD and WARM beneficial uses. The Central Valley WQCP contains the following objective for COLD and WARM: at no time or place shall the temperature of COLD or WARM intrastate waters be increased more than 5 degrees F. above natural receiving water temperature. The WQCP contains a specific temperature objective for the Sacramento River. Water temperatures between Shasta Dam and Hamilton City must not exceed 56 degrees F. and water temperatures between Hamilton City and the I Street Bridge in Sacramento must not exceed 68 degrees F. during periods when temperature increases will be detrimental to the fishery.[36]

Minimum Stream Flow Requirements

Minimum flow requirements have been established for some river reaches. Some minimum flow requirements are permit conditions imposed on hydropower facilities by the Federal Energy Regulatory Commission (FERC). Minimum flows below Lake Oroville on the Feather River were established by FERC based on an agreement made in 1983 between the Department and the California Department of Fish and Game. Flows in the Feather River are governed by releases from Thermalito Afterbay, which is part of the Department's Oroville facilities. Minimum flow requirements in the Feather River below the outlet from Thermalito Afterbay in non-critically dry years are 1,700 cfs from October through March and 1,000 cfs for the rest of the year. Minimum flow requirements in critically dry years are 1,200 cfs from October through February and 1,000 cfs for the rest of the year.[37]

Hydropower facilities at the federally owned Shasta Dam on the Sacramento River are not regulated by FERC. Minimum flows in the river below Keswick Dam are established in a memorandum of agreement between the Reclamation and the California Department of Fish and Game executed in 1960 and SWRCB Order 90-50. Keswick Dam forms the afterbay for Shasta Lake. Minimum flow requirements in critically dry years are 2,000 cfs from December through February, 2,300 cfs in March through August and 2,800 cfs in September through November. In other year types, the requirements are 3,250 cfs from September through February and 2,300 cfs from March through August.[38]

Minimum flow requirements for the American River below the CVP's Folsom Dam are established in the SWRCB's Water Rights Decision 893 (D-893). D-893 states that releases below Nimbus Dam should not fall below 250 cfs between January and September or below 500 cfs at other times. Nimbus Dam forms the afterbay of Folsom Reservoir. However, D-893 requirements are rarely the controlling factor for the CVP's releases at Nimbus Dam. Other factors cause the CVP to release more water than is required by D-893 most of the time.[39]

No minimum releases for environmental purposes have been formally established for Friant Dam on the San Joaquin River. Reclamation releases 35 to 230 cfs to support riparian water rights between the dam and Gravelly Ford. A minimum flow of five cfs is required at Gravelly

Ford in the irrigation season to support water rights holders between Gravelly Ford and the Mendota Pool.[40]

SWP Contract Water Quality Objectives

Article 19 of the long-term water supply contracts includes quality objectives for SWP water. The article states that the Department shall take all reasonable measures to make available at all delivery points water that does not contain constituents in concentrations greater than those shown in Table 7.1-12.

TABLE 7.1-12

WATER QUALITY OBJECTIVES[a] FOR THE METROPOLITAN WATER DISTRICT OF SOUTHERN CALIFORNIA

Constituent	Unit	Monthly Average	Average for any 10-year Period	Maximum
Total dissolved solids	ppm	440	220	-
Total hardness	ppm	180	110	-
Chlorides	ppm	110	55	-
Sulfates	ppm	110	20	-
Sodium percentage	%	50	40	-
Fluoride	ppm	-	-	1.5
Lead	ppm	-	-	0.1
Selenium	ppm	-	-	0.05
Hexavalent Chromium	ppm	-	-	0.05
Arsenic	ppm	-	-	0.05
Iron and Manganese together	ppm	-	-	0.3
Magnesium	ppm	-	-	125
Copper	ppm	-	-	3
Zinc	ppm	-	-	15
Phenol	ppm	-	-	0.001

Note:
a. Water quality objectives from long-term water supply contract between the department and MWDSC. Water quality objectives are the same for all contractors.

Non-Project Water Acceptance Criteria

If SWP capacity is available, non-SWP water, referred to as “non-project” water, may be introduced into SWP conveyance facilities and conveyed to SWP contractors or others provided it does not adversely effect SWP operations, deliveries or facilities. The quality of the non-SWP water must also be acceptable to the Department. The Department delivered non-SWP water to contractors prior to the Monterey Amendment in accordance with Water Code Section 1810. Article 55 of the Monterey Amendment clarifies some of the administrative arrangements for conveyance of non-SWP water including the costs of conveyance and scheduling of deliveries.

Non-SWP water may be delivered to the Delta and diverted at the Banks Pumping Plant or it may be introduced into the California Aqueduct from a ground or surface water source. Non-SWP water available at the Delta has the same quality characteristics as SWP water. Water introduced into the aqueduct from another source may differ in quality to SWP water in the aqueduct. The Department has developed acceptance criteria for the quality of non-SWP water that may be introduced into the California Aqueduct. The purpose of the criteria is to protect SWP water quality. In considering requests to convey non-SWP water in SWP facilities the

Department takes account of potential impacts on SWP water quality, the SWP contractors' water treatment processes and overall benefits to the SWP.

7.1.2.4 Changes in Regulatory Setting between 1996 and 2003

Clean Water Act

As noted above, Section 303(d) of the CWA requires states to prepare lists of impaired surface water bodies every two years. The most recent list for California was published in 2002. Many surface water bodies in the area potentially affected by the proposed project are listed as impaired with respect to various characteristics. However, many water bodies are listed for characteristics that would not be affected by the proposed project. For example, the Sacramento River and many of its tributaries are listed for mercury and other heavy metals. These contaminants are associated with past mineral extraction and would not be affected by the proposed project. Table 7.1-8 shows surface water bodies listed as impaired for substances that could be affected by the proposed project. Most rivers and streams in the lowland portions of the Sacramento and San Joaquin Valleys are listed as impaired by pesticides, as are Suisun Bay, San Pablo Bay and San Francisco Bay. The San Joaquin River and southern and western portions of the Delta are also listed for electrical conductivity and in some cases for dissolved oxygen.

Porter-Cologne Act

Several WQCPs were updated between 1996 and 2003. In most cases, the designated beneficial uses changed very little. The beneficial uses shown in Table 7.1-7 were current in 2003.

Delta Standards

<u>Water Quality and Flow Objectives</u>

The WQCP for San Francisco Bay and the Delta published in 1995 included water quality and flow objectives for the Delta. A draft EIR on the WQCP was published in 1997.[41] In the draft EIR on the WQCP, the SWRCB acknowledged that the flow objectives can only be achieved by limiting diversions of water in the Sacramento and San Joaquin watersheds and within the Delta itself. The draft EIR noted that the SWRCB intended to implement the objectives, to the extent feasible, through amendments to the water rights permits of water rights holders in the Central Valley. However, the draft EIR also noted that some of the objectives cannot reasonably be achieved through changes to water rights permits exclusively. Water quality and the health of aquatic resources in the Delta and San Francisco Bay are dependent on many factors outside the regulatory authority of the SWRCB. Other factors outside the control of the SWRCB that could affect water quality and the health of aquatic resources of the Delta and San Francisco Bay include salt build up in the San Joaquin Valley, the introduction of non-native aquatic species, legal and illegal commercial and sport fishing and degradation of upstream spawning habitat for fish that migrate through the Bay and Delta.

In the years following publication of the WQCP, most of the objectives of the WQCP were implemented through biological opinions issued by the USFWS and the NMFS pursuant to the Endangered Species Act and through D-1485 and SWRCB Orders WR 95-6 and WR 98-9. Under the biological opinions, D-1485, WR 95-6 and WR 98-9, responsibility for meeting most of the objectives was assigned to the SWP and the CVP.[42]

In 1997, the SWRCB began examining long-term alternatives that would enable compliance with the flow objectives. Water rights proceedings to determine responsibility for meeting the objectives in the 1995 WQCP began in 1998. The water rights proceedings were to be conducted in eight phases. The SWRCB's policy in the water rights proceedings was to encourage water agencies to resolve among themselves the responsibilities for meeting the objectives in the 1995 WQCP and to bring their proposals to the SWRCB for approval. In 1999, the SWRCB published a final EIR on the WQCP, which presented the environmental effects of a range of alternatives but did not identify a preferred alternative.[43]

Water Rights Decisions

Phase 1 through 7 of Bay-Delta water rights proceedings resulted in the SWRCB issuing Water Rights Decision D-1641 in late 1999. The SWRCB revised D-1641 in early 2000 by issuance of Order WR 2000-02, and again in 2001 by issuance of Order WR 2001-05. D-1641 and Order WR 2001-05 contain the water rights requirements to implement the flow objectives for the Delta. D-1641 includes both long-term and temporary requirements.[44]

In D-1641 and in Order WR 2001-05, the SWRCB assigned responsibilities, for specified periods, to water rights holders including Reclamation and the Department in certain watersheds tributary to the Delta. The SWRCB accepted with modifications the proposals made by some water agencies and groups of water agencies with respect to their responsibilities for meeting flow objectives in the Delta. The responsibilities of various parties, including water users in the Sacramento, San Joaquin, Mokelumne, Calaveras and Cosumnes River watersheds were defined in D-1641. These responsibilities require that the water users in these watersheds will contribute specified amounts of water to protect water quality, and that the Department and/or Reclamation will ensure that the objectives are met in the Delta.[45]

Phase 8 of the water rights proceedings would have ultimately determined the responsibilities of the Sacramento Valley water rights holders for meeting the objectives in the 1995 WQCP. The SWRCB's Order WR 2001-05 stayed Phase 8 of the water rights proceedings and required Reclamation and the Department to continue to meet certain objectives in the 1995 WQCP until adoption of another decision assigning responsibility for meeting the objectives. During 2002, Reclamation, the Department, Sacramento Valley upstream water users and certain downstream users negotiated a settlement in lieu of continuing Phase 8 of the water rights proceedings. Beginning in December 2002, the parties to the negotiations executed the Sacramento Valley Water Management Agreement or Short-Term Settlement Agreement. The agreement establishes a planning process for actions that would help meet objectives in the Delta.

Vernalis Adaptive Management Plan

Shortly after the Bay-Delta WQCP was published, an association of users of San Joaquin River water filed suit against the SWRCB, challenging the flow objectives in the WQCP. The association claimed that the flow objectives were based on an inadequate understanding of the relationship between flow and salmon survival. In an effort to settle the issue out of court, the San Joaquin River interests collaborated with other water users, environmental groups and government agencies to develop an alternative, which would provide an equivalent level of fisheries protection to that provided by the Bay-Delta WQCP. The result was the San Joaquin River Agreement, of which the Vernalis Adaptive Management Program (VAMP) was a key component.[46]

The VAMP is an experimental/management program designed to protect juvenile Chinook salmon migrating from the San Joaquin River through the Delta. The San Joaquin River Agreement, including the VAMP, was submitted to the SWRCB as a proposal. It was accepted by the SWRCB and made a part of D-1641.

The VAMP provides for a 31-day pulse flow in the San Joaquin River at Vernalis together with a reduction in SWP and CVP exports from the south Delta.[47] The pulse usually occurs from mid-April to mid-May but its timing may be adjusted based on hydrology and fisheries conditions. The effects of different flow rates in the lower San Joaquin River and different SWP and CVP export rates on juvenile and smolt Chinook salmon survival are being studied as part of the VAMP.

CALFED Bay-Delta Program and the Environmental Water Account

In 1994, the CALFED Bay-Delta Program was initiated to address long-standing and unresolved conflicts over water use in the Sacramento-San Joaquin Delta. It is a collaborative program of 23 federal and State agencies. Its goal is to restore the ecological health of the Delta while ensuring an adequate supply for Delta water users including the SWP and CVP.

During Phase I of the CALFED Program, a range of alternatives for achieving long-term solutions to the problems of the Delta was developed. In Phase II, a programmatic EIS/EIR was prepared on the CALFED Program. The preferred alternative, identified in the CALFED Record of Decision, which was published in 2000, is being implemented in Phase III of the CALFED Program.[48] One of the project-level actions being implemented as part of the CALFED Program is the EWA.

The purpose of the EWA is to enable diversion of water by the SWP and CVP to be reduced at times when at-risk fish species may be harmed while preventing the uncompensated loss of water to SWP and CVP contractors. The EWA then replaces any water loss due to curtailment of pumping by purchase of surface or groundwater supplies from willing sellers and by taking advantage of regulatory flexibility and certain SWP operational assets. The Delta export/inflow ratio may be increased at times when fish abundance in the vicinity of the Delta pumping plants is low and temporary use can be made of available storage in SWP and CVP reservoirs. Also, the Banks Pumping Plant can pump an additional 500 cfs between July and September and the EWA can capture certain upstream environmental releases in the Delta. Five agencies administer the EWA. They are the Department, and Reclamation, the agencies that operate the SWP and the CVP, and the USFWS, the NMFS and the California Department of Fish and Game, the agencies responsible for protecting and managing the Delta's natural resources. The Department and Reclamation are called the Project Agencies; the others are called the Management Agencies. The EWA began operation in late 2000.[49] A more detailed description of the EWA is contained in Chapter 6.

7.1.3 IMPACTS AND MITIGATION MEASURES

7.1-1 The proposed project could potentially change stream flow in the Feather, Sacramento, American and San Joaquin rivers and could potentially change outflow from the Delta to San Francisco Bay.

1996 — 2003

This section describes the impacts of the proposed project in relation to the baseline scenario. Under the baseline scenario, water demand would increase in the contractors' service areas but none of the provisions of the Monterey Amendment or the Settlement Agreement would be implemented (see Chapter 5 for a full description of the baseline scenario).

Several provisions of the Monterey Amendment have the potential to affect stream flow in natural waterways under 2003 conditions. The provisions that altered water allocation procedures and provided for the retirement and transfer of Table A amounts could affect flow in the Feather and Sacramento rivers, Delta inflow and Delta diversions. The provisions that enable the use of the water supply management practices could affect Delta diversions. Because Delta outflow is dependent on both Delta inflow and Delta diversions it can be affected by all of these provisions.

<u>Analysis of Effects of Table A Transfers and Retirements and Altered Water Allocation Procedures using CALSIM II Simulations</u>

The SWP makes deliveries to its contractors, other than those in Plumas and Butte counties, by diverting water from the Feather and Sacramento rivers and the Delta, and when flow is insufficient, by releasing water from Lake Oroville. Plumas County FC&WCD obtains its SWP water from Lake Davis, an SWP reservoir on a Feather River tributary upstream of Lake Oroville. The county of Butte obtains its SWP water directly from Lake Oroville. Water released from Lake Oroville flows down the Feather River to Yuba City's diversion point and down the Feather and Sacramento rivers to diversion points at the North Bay Aqueduct and at the Banks Pumping Plant. Solano County WA and Napa County FC&WCD obtain their SWP water from the North Bay Aqueduct.

Changes to flow in the Feather and Sacramento rivers and the Delta would occur if the retirements and transfers of Table A amounts and altered water allocation procedures changed the total amount of water delivered or the proportion of SWP deliveries made north and south of the Delta. The CALSIM II model was used to estimate the effects of the Table A transfers and retirements and the altered water allocation procedures on SWP deliveries to individual contractors under 2003 conditions as described in Chapter 6. Under the baseline scenario, an estimated annual average of 43,600 AF, or 1.4 percent of total average annual SWP deliveries (3,104,800 AF), would be delivered to contractors north of the Delta. With the proposed project, an estimated annual average of 45,400 AF or 1.48 percent of total average annual SWP deliveries (3,070,600 AF), would be delivered north of the Delta. The small increase in the amount and proportion of SWP water delivered north of the Delta would be expected to result in small changes in flow in the Feather and Sacramento rivers and in Delta inflow but no change in flow in the San Joaquin and American rivers.

The Department developed quantitative estimates of changes in annual and monthly flow in the Feather and Sacramento rivers attributable to the retirements and transfers of Table A amounts and altered water allocation procedures under 2003 conditions by post-processing CALSIM II output on baseline river flows in a spreadsheet (Study No. 5 in Appendix H). Estimates were made of average annual flows in wet, above normal, below normal, dry and critically dry years for the baseline scenario and the proposed project. Average annual flows under the two scenarios were very similar. Differences in average annual flows between the proposed project and the baseline scenario were less than 0.15 percent of annual flows under the baseline scenario, an amount that is essentially immeasurable.

The Department also made estimates of average monthly flows in the Feather and Sacramento rivers in different hydrologic year types for the proposed project and the baseline scenario. This was done by estimating monthly deliveries to contractors based on typical seasonal delivery patterns and then estimating the effects of the monthly deliveries on river flows. Average monthly flows under the two scenarios were very similar. Differences in average monthly flows between the proposed project and the baseline scenario were less than 0.15 percent of monthly flows under the baseline scenario, an amount that is essentially immeasurable.

As indicated above, the Table A transfers and retirements and the altered allocation procedures would result in an estimated 1,800 AF increase in annual average deliveries north of the Delta with the proposed project compared to the baseline scenario under 2003 conditions. The small increase in deliveries north of the Delta attributable to the proposed project would reduce Delta inflow and could occasionally reduce the need for carriage water, which could result in a slight reduction in Delta outflow at times when Delta outflow exceeds that required by D-1641.

<u>Analysis of Effects of Most Provisions of the Monterey Amendment using Historical Data</u>

The Monterey Amendment contains several provisions, other than the altered water allocation procedures and the transfers and retirement of Table A amounts, that have the potential to affect flows in the Feather, Sacramento, American and San Joaquin rivers and the Delta. They include Article 52, and Articles 54 and 56, that provide for the water supply management practices. Article 52 transfers ownership of lands in the Kern Fan Element from the state to KCWA, which enabled local development of the Kern Water Bank. Article 54 of the Monterey Amendment allows certain contractors to borrow water from Castaic Lake and Lake Perris up to specified maximum amounts provided they replace the water within five years. Article 56 of the Monterey Amendment allows contractors to store SWP water outside their service areas for later use within their service areas. This could include storage in groundwater banks or storage in surface water reservoirs owned by the SWP or others. Another provision of Article 56 establishes an annual turnback pool.

Because the Article 52, 54 and 56 provisions apply to SWP operations south of the Delta they would not affect flow in the Feather, Sacramento, American and San Joaquin rivers. But they could affect Delta outflow.

CALSIM II does not model Articles 52, 54 and 56, and so the analysis described in the previous section, which uses CALSIM II, does not fully characterize the effects of all the provisions of the Monterey Amendment in combination. This does not affect the analysis of the effects of the proposed project on flow in the Sacramento and Feather rivers because, as noted above, Articles 52, 54 and 56 only affect SWP operations south of the Delta. But they could affect Delta outflow and so an additional analysis using data from 1996 through 2004, was necessary to examine the effects of the Article 52, 54 and 56 provisions on Delta outflow. The Department's historical operations analysis examined the combined effects of the Article 52 provisions, the water supply management practices (Articles 54 and 56) and the Table A retirements on SWP deliveries, Delta diversions at the Banks Pumping Plant, and Delta outflow (Study No. 2). The historical operations analysis is described in more detail in Chapter 6 and is contained in its entirety in Appendix K.

The Monterey Amendment would only have an effect on Delta outflow if the SWP water delivered, stored or transferred pursuant to its provisions would otherwise flow out of the Delta. Water would otherwise have flowed out of the Delta only when the availability of water in the

Delta exceeds total demand for SWP water. As discussed in Chapter 6, the Department diverts water at the Banks Pumping Plant at the maximum rate it can while maintaining compliance with Delta water quality objectives and other environmental standards. The diversion rate is only reduced below the maximum rate consistent with compliance with environmental standards when water availability in the Delta exceeds the total demand for SWP water. Under this condition, the contractors have all the SWP water they can use or store, San Luis Reservoir and all other SWP reservoirs south of the Delta are full, and all EWA debt has been repaid.

The Department determined that the Article 52, 54 and 56 provisions in combination with the Table A retirements enabled increased pumping in a few months between 1996 and 2004.[50] Increased pumping was infrequent because between 1996 and 2004 there were only a few months when the contractors had all the SWP water they could use or store, all SWP reservoirs south of the Delta were full, and all EWA debt was repaid. The Department estimates that between 1996 and 2004, the Articles 52, 54 and 56 provisions and the Table A retirements enabled the SWP to pump about 44,000 AF more water at the Banks Pumping Plant than it would have under the baseline scenario. Thus, between 1996 and 2004, the Article 52, 54 and 56 provisions and the Table A retirements reduced Delta outflow by 44,000 AF.

The reductions in Delta outflow occurred four times; January 13, 1998, February 24 through March 31 of 1999, February 22 through March 31 of 2000, and March 23 though March 30 of 2004. Table 7.1-13 shows the reductions in each month and the percentage of Delta outflow that they represented. The reductions typically occurred when monthly Delta outflow was in excess of 1,000,000 AF and the percentage reductions in monthly flows attributable to the proposed project ranged up to 0.8 percent. Additional information on daily reductions in Delta outflow are provided in Section 7.3, Fisheries Resources.

TABLE 7.1-13

ESTIMATED EFFECTS OF MONTEREY AMENDMENT ON DELTA OUTFLOW

Year	Month	Change in Pumping at Banks AF	Delta Outflow		
			Baseline AF	Proposed Project AF	% Difference
1998	January	1,000	4,400,140	4,399,140	0.02
1999	February	1,000	5,488,283	5,487,283	0.02
1999	March	2,000	4,251,137	4,249,137	0.05
2000	February	10,000	5,422,226	5,412,226	0.18
2000	March	4,000	5,404,323	5,400,323	0.07
2004	March	26,000	3,475,039	3,459,039	0.80

Under the baseline scenario, more spare capacity would have been available at the Banks Pumping Plant than it was with the Article 52, 54 and 56 provisions and the table A retirements in effect. The operations of the SWP and the CVP in the Delta are coordinated and at times the CVP uses spare capacity at the Banks Pumping Plant to divert water from the Delta and deliver it to storage or to CVP contractors. However, the Department has determined that it is unlikely that the CVP would have used the capacity at the Banks Pumping Plant that would have been available to the CVP under the baseline scenario to divert water from the Delta between 1996 and 2004 (see Impact 7.1-7). Thus, 44,000 AF more water would have been pumped from the Delta between 1996 and 2004 with the proposed project than under the baseline scenario.

Summary of Effects of Proposed Project on Stream Flow and Delta Outflow

The retirements and transfers of Table A amounts and the altered allocation procedures that are part of the Monterey Amendment would have very little effect on average or monthly flows in the Feather and Sacramento rivers or Delta outflow compared to the baseline scenario under 2003 conditions.

There are minimum in-stream flow requirements for the Sacramento River below Shasta Dam and for the Feather River below Oroville Dam. The proposed project does not effect the dam operator's obligations with respect to minimum flows. Minimum flow requirements would be the same with the proposed project and under the baseline scenario.

Some of the water supply management practices that are a part of the proposed project affected Delta outflow between 1996 and 2004. Several of the water supply management practices in combination with the Table A retirements resulted in an estimated reduction in Delta outflow of 44,000 AF between 1996 and 2004. The estimated reduction represents about 0.03 percent of total outflow in that period.

Most of the time, the SWP diverts water from the Delta at the Banks Pumping Plant at the maximum possible rate consistent with compliance with Delta water quality standards. From time-to-time, in the wetter months of wet years, water is available in the Delta in amounts in excess of that needed to meet Delta environmental standards and the needs of the SWP and its contractors. That is, all the SWP reservoirs south of Delta are full, all contractors' water needs have been met and EWA debt in San Luis Reservoir has been repaid. It is only at such times, that the water supply management practices of the Monterey Amendment could enable pumping of water that would have contributed to Delta outflow under the baseline scenario. Between 1996 and 2004, these conditions occurred in January 1998, February and March 1999, February and March 2000, and March 2004. Because the late 1990s and 2000 were a series of wet and above normal years the effects of the water supply management practices were felt more frequently than they would have been in a more typical sequence of hydrologic years.

No significance findings were made with respect to the impacts of the proposed project on river flow or Delta outflow. Significance findings are made later in this EIR with respect to the impacts on water quality and biological resources produced by changes in river flow and Delta outflow that are a consequence of the proposed project.

Future Impacts

This section describes the impacts of the proposed project in relation to the baseline scenario. The baseline scenario represents a scenario that might have developed between 2003 and 2020 if the Monterey Amendment had not been implemented. Under the baseline scenario, water demand would increase in the contractors' service areas but none of the provisions of the Monterey Amendment or the Settlement Agreement would be implemented (see Chapter 5 for a full description of the baseline scenario).

Analysis of Effects of Table A Transfers and Retirements and Altered Water Allocation Procedures using CALSIM II Simulations

The retirements and transfers of Table A amounts and altered water allocation procedures that are a part of the proposed project would change the quantities of SWP water delivered to individual contractors in 2020 as described in Chapter 6. The changes in deliveries could affect flows in the Feather and Sacramento rivers and Delta outflow.

Changes to flow in the Feather and Sacramento rivers and the Delta would occur if the retirements and transfers of Table A amounts and altered water allocation procedures changed the proportion of SWP deliveries made north and south of the Delta. The CALSIM II model was used to estimate the effects of the Table A transfers and retirements and the altered water allocation procedures on average annual SWP deliveries to individual contractors under 2020 conditions as described in Chapter 6. Under the baseline scenario, an estimated annual average of 71.4 TAF, or 2.2 percent of total average annual SWP deliveries (3,251.7 TAF), would be delivered to contractors north of the Delta. With the proposed project, an estimated annual average of 78.8 TAF or 2.37 percent of total average annual SWP deliveries (3,325.3 TAF), would be delivered north of the Delta. The small increase in the proportions of SWP water delivered north of the Delta would be expected to result in small changes in flow in the Feather and Sacramento rivers and in Delta outflow but no change in flow in the San Joaquin and American rivers.

The Department developed quantitative estimates of changes in flow in the Feather and Sacramento rivers attributable to the retirements and transfers of Table A amounts and altered water allocation procedures under 2020 conditions as described in Appendix H. Estimates were made of average annual flows in wet, above normal, below normal, dry and critically dry years for the baseline scenario and the proposed project. Average flows under the two scenarios were very similar. Differences between the proposed project and the baseline scenario were less than 0.15 percent of flows under the baseline scenario, an amount that is essentially immeasurable.

The Department also made estimates of average monthly flows in the Feather and Sacramento rivers in different hydrologic year types for the proposed project and the baseline scenario. Average monthly flows under the two scenarios were very similar. Differences between the proposed project and the baseline scenario were less than 0.15 percent of monthly flows under the baseline scenario, an amount that is essentially immeasurable.

Total deliveries to the SWP contractors with the proposed project and under the baseline scenario under 2020 conditions would be very similar. Consequently, the effects of slightly altered proportional deliveries north and south of the Delta on Delta outflow would be minimal. The small increase in deliveries north of the Delta attributable to the proposed project could reduce the need for carriage water, which could result in slight reduction in Delta outflow at times when Delta outflow exceeds that required by D-1641.

<u>Analysis of Effects of Water Supply Management Practices Using Historical Data</u>

Contractors took advantage of the water supply management practices that are part of the Monterey Amendment to increase their deliveries of SWP water between 1996 and 2003 with a consequent effect on Delta pumping and Delta outflow. They would be expected to continue to employ all or most of them in the future.

As noted earlier, groundwater storage outside contractors' service areas, extended carryover storage and the turnback pool could have an effect on Delta outflow if the SWP water stored or transferred using these water supply management practices would otherwise flow out of the Delta. The effect on Delta outflow would only occur when the availability of water in the Delta exceeds total demand for SWP water; that is, when contractors have all the SWP water they can use or store, San Luis Reservoir and all other SWP reservoirs south of the Delta are full, and all EWA debt has been repaid.

The Department analyzed the historical record to determine whether storage outside contractors' service areas, extended carryover storage, the turnback pool and flexible storage in Castaic Lake and Lake Perris would be likely to enable increased pumping at the Banks Pumping Plant in the future compared to the baseline scenario (Study No. 3). Historical information from the period 1996 through 2004 was used in Study No. 3 but different assumptions were made with respect to the groundwater storage (See Chapter 6 for more information). The Department determined that the Article 54 and 56 provisions would enable the SWP to pump about 449,000 AF more water at the Banks Pumping Plant in the future with the proposed project than it would have under the baseline scenario. Thus, from 1996 through 2004, a nine year period the water supply management practices reduced Delta outflow by 449,000 AF, or an average of 50,000 AF per year. Reductions would occur 11 times in the nine year period and typically occur when monthly Delta outflow is in excess of 1,000,000 AF. Additional information on daily reductions in Delta outflow are provided in Section 7.3, Fisheries Resources.

The estimate of a future average annual 50,000 AF reduction in Delta outflow as a result of the proposed project is a conservative one because in the future the conditions that allowed increased pumping at Banks Pumping Plant as a result of water supply management practices are likely to become even more infrequent than they were between 1996 and 2004. However, as demand increases the advantages provided by the water supply management practices would increase their attractiveness to contractors so it was assumed that future Delta outflow reductions would be the same as those that would have occurred in the past with the groundwater storage assumptions in Study No. 3.

<u>Summary of Effects of Proposed Project on Stream Flow and Delta Outflow</u>

The retirements and transfers of Table A amounts and the altered allocation procedures that are part of the Monterey Amendment would have very little effect on average or monthly flows in the Feather and Sacramento rivers or Delta outflow compared to the baseline scenario under 2020 conditions.

There are minimum in-stream flow requirements for the Sacramento River below Shasta Dam and for the Feather River below Oroville Dam. The proposed project does not affect the dam operator's obligations with respect to minimum flows. Minimum flow requirements would be the same with the proposed project and under the baseline scenario.

Some of the water supply management practices that are a part of the proposed project affected Delta outflow between 1996 and 2004. The same water supply management practices are expected to reduce Delta outflow in the future by about 50,000 AF per year. The reduction would represent about 0.35 percent of average annual Delta outflow.

The Bay-Delta WQCP contains minimum requirements for Delta outflow. The proposed project does not effect the obligations of those that divert water from the Delta with respect to the minimum requirements established in D-1641. Delta outflow requirements would be the same with the proposed project and under the baseline scenario.

No significance findings were made with respect to the impacts of the proposed project on river flow or Delta outflow under 2020 conditions. Significance findings are made later in this EIR with respect to the impacts on water quality and biological resources produced by changes in river flow and Delta that are a consequence of the proposed project.

7.1-2 The proposed project could potentially change ambient water quality in the Feather, Sacramento, American and San Joaquin rivers.

1996 — 2003

Water quality in the rivers varies seasonally and is dependent on discharge. If the proposed project substantially altered discharge in the Feather, Sacramento, American and San Joaquin rivers it could also affect water quality. Stream flow changes would not be expected to affect the concentration of particulate matter, dissolved minerals or dissolved organic substances in river water. Precipitation contains small amounts of dissolved minerals. Concentrations of dissolved substances in river water increase in a downstream direction as surface runoff, infiltrating groundwater and municipal and agricultural wastewater discharges add dissolved minerals and organic substances. Because the proposed project does not involve any change in mass emission of dissolved substances to the Feather, Sacramento, American and San Joaquin rivers it would not change ambient concentrations of these substances. Concentrations of particulate matter in river water, measured as turbidity, increase in storms as precipitation washes soil from the land surface and flood flows erode the beds and banks of rivers. Flow changes in the range attributable to the proposed project would have a negligible effect on turbidity.

The only water quality characteristic of importance that could be affected by flow changes attributable to the proposed project is water temperature. Water temperature in flowing streams depends on flow, the source of the water, air temperature and solar radiation. In managed streams such as the Feather, Sacramento, American and San Joaquin, water temperature is often strongly influenced by the release of cool water from reservoirs.

As described above under Impact 7.1-1, the Table A transfers and retirements and the altered water allocation procedures that are part of the proposed project would have no effect on flow in the American and San Joaquin rivers. These elements of the proposed project would alter flow in the Feather and Sacramento rivers by less than 0.15 percent compared to the baseline scenario. Studies undertaken as part of the EWA EIS/EIR examined the effects of flow changes on water temperature in the Feather and Sacramento River. The studies indicate that flow changes of 0.15 percent or less are insufficient to have an effect on water temperature. As a result, it was concluded that the Table A transfers and retirements and the altered water allocation procedures that are a part of the proposed project would have no effect on water temperature in the Feather and Sacramento rivers.

As described under Impact 7.1-1, several of the water supply management practices that are a part of the proposed project affected Delta outflow in some months between 1996 and 2004 but none affected flow in the Sacramento, Feather, American or San Joaquin rivers. Therefore, none of the water supply management practices affected water quality in the rivers. The proposed project had a ***less-than-significant impact*** on water quality in the Feather, Sacramento, American and San Joaquin rivers between 1996 and 2003.

Mitigation Measures

None required.

Future Impacts

For reasons noted above, the only water quality characteristic of importance that could be affected by flow changes attributable to the proposed project is water temperature. The proposed project would have no measurable effect on flow in the Feather, Sacramento, American and San Joaquin rivers in 2020 relative to the baseline scenario. Therefore, it would have a ***less-than-significant impact*** on water quality including water temperature in 2020 compared to the baseline scenario.

Mitigation Measures

None required.

7.1-3 The proposed project could potentially change water quality in the Delta and the San Francisco Bay Estuary.

1996 — 2003

Water quality in the Delta varies seasonally and is primarily dependent on Delta inflow and the rate of water diversions from the Delta. Water quality in the San Francisco Bay Estuary depends on Delta outflow. If the proposed project substantially altered Delta inflow or the rate of diversion from the Delta it could also affect Delta water quality. If the proposed project substantially altered Delta outflow it could affect water quality in the San Francisco Bay Estuary.

As described above under Impact 7.1-1, the Table A transfers and retirements and the altered water allocation procedures that are a part of the proposed project would have a negligible effect on inflow to the Delta under 2003 conditions. The Table A transfers and retirements and altered allocation methods would result in a less than 0.15 percent change in annual and monthly flow into the Delta from the Feather and Sacramento rivers and no change in flow from the San Joaquin and American rivers. Total deliveries to the SWP contractors with the proposed project and under the baseline scenario under 2003 conditions would be very similar. Consequently, the effects of slightly altered proportional deliveries north and south of the Delta on diversions from the Delta and Delta outflow would be minimal.

The CALSIM II model was used to examine the effects of Table A transfers and retirements and the altered allocation on the average annual value of various Delta parameters under 2003 conditions. The results of the analysis are shown in Table 7.1-14. The estimates include the effects of the Table A transfers and retirements and the altered water allocation procedures but not the water supply management practices. An important parameter with respect to water quality is the average position of X2, the 2,000 mg/L isohaline. The position of X2 is measured as the distance in kilometers from the Golden Gate. As shown in Table 7.1-14, the Table A transfers and retirements and the altered water allocation procedures that are a part of the proposed project would have no effect on the average location of X2 in most hydrologic year types compared to the baseline scenario. In wet years, it would shift the position of X2 by 0.1 kilometers toward the Golden Gate.

The Monterey Amendment enables the use of certain water supply management practices that would not occur under the baseline scenario. Some of the water supply management practices resulted in an increase in the amount of water diverted from the Delta by the SWP between 1996 and 2004 under certain conditions as described under Impact 7.1-1. These conditions can occur when all SWP storage south of the Delta is full, all contractors' SWP water needs have

TABLE 7.1-14

AVERAGE ANNUAL DELTA PARAMETERS UNDER 2003 CONDITIONS ESTIMATED USING CALSIM II[a]

	Delta Outflow (TAF/yr)	Minimum Required Delta Outflow (TAF/yr)	SWP Banks Pumping (TAF/yr)	CVP Banks Pumping (TAF/yr)	Average X2 Position (km)	Average E/I Ratio
1995						
All Years	14,435.0	5,551.4	2,945.0	87.3	75.8	0.36
Wet Years	27,790.3	6,801.7	3,628.8	96.7	68.9	0.31
Above Normal Years	16,903.8	6,609.0	3,364.8	144.1	73.6	0.37
Below Normal Years	9,858.7	5,466.6	3,104.2	85.9	76.9	0.40
Dry Years	6,653.3	4,593.3	2,673.2	81.0	79.9	0.42
Critical Years	4,720.6	3,858.4	1,575.3	33.2	82.6	0.34
2003 Baseline						
All Years	14,656.6	5,609.0	3,000.2	147.7	75.6	0.35
Wet Years	28,007.7	6,821.2	3,592.9	186.0	68.9	0.30
Above Normal Years	17,153.2	6,778.5	3,436.5	181.6	73.5	0.36
Below Normal Years	9,687.8	5,441.9	3,240.0	179.7	77.0	0.40
Dry Years	6,375.0	4,577.5	2,712.8	123.6	79.9	0.40
Critical Years	4,751.7	3,958.3	1,647.7	43.3	82.5	0.32
2003 Proposed Project						
All Years	14,699.0	5,603.6	2,959.5	142.3	75.6	0.35
Wet Years	28,068.5	6,819.1	3,542.9	178.4	68.8	0.30
Above Normal Years	17,186.4	6,769.4	3,389.3	177.0	73.5	0.35
Below Normal Years	9,742.0	5,425.2	3,188.2	172.7	77.0	0.40
Dry Years	6,413.0	4,578.0	2,675.4	120.3	79.9	0.40
Critical Years	4,759.9	3,956.1	1,638.5	40.1	82.5	0.32

Note:
a. Includes effects of Table A transfers and retirements and altered water allocation procedures. Does not include effects of water supply management practices.

been met, EWA debt in San Luis Reservoir has been paid and unused pumping capacity is available at Banks Pumping Plant.

The Monterey Amendment enables the use of certain water supply management practices that would not occur under the baseline scenario. Some of the water supply management practices resulted in an increase in the amount of water diverted from the Delta by the SWP between 1996 and 2004 under certain conditions as described under Impact 7.1-1. These conditions can occur when all SWP storage south of the Delta is full, all contractors' SWP water needs have been met, EWA debt in San Luis Reservoir has been paid and unused pumping capacity is available at Banks Pumping Plant.

Under the proposed project, an estimated 44,000 additional AF of water was pumped from the Delta between 1996 and 2004 than under the baseline scenario. Most of the increased pumping under the proposed project occurred in the wet months of wet years. Increased pumping as a result of the water supply management practices would be expected to shift the position of X2 upstream by a small but undetermined amount in the wet winter months when the extra pumping occurred. The average monthly position of X2 varies seasonally and is at its most downstream location in the late fall and winter when any effects of increased pumping would be felt. The position of X2 in the wet months of wet years is typically between the Benicia Bridge and the eastern end of San Pablo Bay.

Although the proposed project would shift the position of X2 slightly, it would not alter the SWP's and CVP's obligations to meet standards for the location of X2 within the Delta at certain seasons and under different hydrologic conditions. Movement of X2 as a result of the proposed project could alter water salinity at some locations in Suisun Bay and the Delta slightly compared to the baseline scenario but the changes would be too small to be measurable or to affect beneficial uses.

Freshwater inflow from the Delta is the primary determinant of water quality in the San Francisco Bay Estuary. The small differences between Delta outflow under the proposed project and the baseline scenario that result from the retirements and transfers of Table A amounts and the altered water allocation procedures would have little effect on water quality in the estuary. The decrease in Delta outflow in the wet winter months when the water supply management practices enabled extra pumping would prevent X2 from moving as far into the San Francisco Bay Estuary as it would have under the baseline scenario. As noted above, any change, in location of X2 attributable to this increased pumping would occur when monthly average X2 is at its seasonally most downstream location.

The proposed project had a ***less-than-significant impact*** on water quality in the Sacramento-San Joaquin Delta and the San Francisco Bay Estuary between 1996 and 2003.

<u>Mitigation Measures</u>

None required.

Future Impacts

Water quality in the Delta varies seasonally and is primarily dependent on Delta inflow and the rate of water diversions from the Delta. Water quality in the San Francisco Bay Estuary depends on Delta outflow. If the proposed project substantially altered Delta inflow or the rate of diversion from the Delta it could also affect Delta water quality. If the proposed project substantially altered Delta outflow it could affect water quality in the San Francisco Bay Estuary.

As described above under Impact 7.1-1, the Table A transfers and retirements and the altered water allocation procedures that are a part of the proposed project would have a negligible effect on inflow to the Delta under 2020 conditions. Diversion of water from the Delta could be affected by the Table A transfers and retirements, the altered water allocation procedures and by the water supply management practices.

The CALSIM II model was used to estimate the value of various Delta parameters under 2020 conditions. The estimates are shown in Table 7.1-15. The estimates account for the Table A transfers and retirements and the altered water allocation procedures but not the new water supply management practices. An important parameter with respect to water quality is the average position of X2, the 2,000 mg/L isohaline. As shown in Table 7.1-15, the Table A transfers and retirements and the altered water allocation procedures that are a part of the proposed project would have no effect on the average location of X2 in most hydrologic year types compared to the baseline scenario. In dry years, it would shift the position of X2 by 0.1 kilometers toward the Golden Gate.

TABLE 7.1-15

AVERAGE ANNUAL DELIVERIES TO FEATHER RIVER WATER RIGHTS CONTRACTORS ESTIMATED USING CALSIM II (TAF/Year)

Scenario	Demand	Delivery					
		All Years	Wet Years	Above Normal Years	Below Normal Years	Dry Years	Critical Years
1995 Baseline	796.0	762.1	787.3	792.4	788.5	794.0	619.7
2003 Baseline	796.0	762.1	787.2	792.3	788.5	793.9	619.7
2003 Proposed Project	796.0	762.1	787.2	792.3	788.5	793.9	619.7
2020 Baseline	796.0	760.0	783.9	789.5	786.8	793.0	618.7
2020 Proposed Project	796.0	760.0	783.9	789.5	786.8	793.0	618.7

The Monterey Amendment enables the use of certain water supply management practices that would not occur under the baseline scenario. As described under Impact 7.1-1, the water supply management practices could reduce Delta outflow by an average of 50,000 AF per year in the future. The reductions in outflow would occur in some wet months of wet years at the time when Delta outflow is at its seasonal maximum. The changes in flow would be small and would have a ***less-than-significant impact*** on water quality in the Delta or the San Francisco Bay Estuary in 2020, relative to the baseline scenario.

Mitigation Measures

None required.

7.1-4 The proposed project could potentially change water levels and water quality in Lake Oroville, San Luis Reservoir, Castaic Lake and Lake Perris.

1996 — 2003

Lake Oroville

The proposed project would not change the Department's operating objectives for Lake Oroville but water storage and water surface elevations in Lake Oroville would be affected by the Table A transfers and retirements and the altered water allocation procedures. Water storage and water surface elevations in Oroville Reservoir would not be affected by the water supply management practices.

The CALSIM II model was used to estimate the effects of the Table A transfers and retirements and the altered water allocation procedures on storage in Lake Oroville under 2003 conditions. Average annual storage in Lake Oroville with the Table A transfers and retirements and the altered water allocation procedures under 2003 conditions would be about 34,000 AF greater than under the baseline scenario (an increase of about 1.5 percent). An average annual increase in storage of this amount would not raise the water surface elevation by more than a foot or two.

The primary influences on water quality in Lake Oroville are conditions in the watershed from which it originates. Some minor changes in water quality, for example total dissolved solids, plant nutrient and total organic carbon content, typically occur as a result of physical, chemical and biological processes in the reservoir. Water temperature typically increases in the upper 75 feet of the water column in reservoirs in the Sierra Nevada in the summer. The changes in storage and water level attributable to the proposed project that occurred between 1996 and 2003 were too small to affect these processes. Water quality in Lake Oroville with the proposed project was probably the same as under the baseline scenario. The proposed project had no affect on the reservoir's ability to support its designated beneficial uses.

San Luis Reservoir

The proposed project would not change the Department's operating objectives with respect to San Luis Reservoir but it could affect water storage and water surface elevations in the reservoir. Water storage in the reservoir could be affected by the Table A transfers and retirements, the altered water allocation procedures and the water supply management practices.

The CALSIM II model was used to estimate the effects of the Table A transfers and retirements and the altered water allocation procedures on storage in San Luis Reservoir under 2003 conditions. Average annual storage in the SWP's share of San Luis Reservoir with the Table A transfers and retirements and the altered water allocation procedures under 2003 conditions would be about 46,000 AF greater than under the baseline scenario (an increase of about 8 percent). An annual average increase in storage of this amount could raise the water surface elevation by ten or twenty feet.

Between 1996 and 2004, the Department's historical operations analysis (Study No.2) showed that the proposed project resulted in a net increase in deliveries of SWP water. These increased deliveries delayed the Department's filling of its storage space in San Luis Reservoir in some years, usually by a matter of days, and in some months lowered SWP storage in San Luis Reservoir by several tens of thousands of AF. As a result, the proposed project lowered water surface elevations in San Luis Reservoir by five feet or less compared to the baseline scenario at times.

Delayed filling of San Luis Reservoir could affect water quality in several ways. The total dissolved solids content of water pumped into the reservoir may change because the total dissolved solids content of Delta water varies seasonally. Reduced storage could result in increased water temperature and reduced water surface area and evaporation. Reduced evaporation could have a minor beneficial effect on total dissolved solids content. Any changes in total dissolved solids content and water temperature attributable to the proposed project would not be expected to affect beneficial uses of the reservoir. Any change in total dissolved solids content would be insufficient to affect the reservoir's beneficial use designation for water supply. Any change in water temperature would be insufficient to affect the reservoir's designation as a warm-water fishery.

When water storage in San Luis Reservoir is less than 300,000 AF, excessive growth of algae degrades water quality. Although the proposed project may have reduced storage in San Luis Reservoir at times between 1996 and 2003 relative to the baseline condition, total storage in the reservoir by the SWP and the CVP did not fall below 300,000 AF. (See Impact 7.1-5 for a description of the effects of the proposed project on the quality of contractors' water supplies.)

Castaic Lake

The Department typically draws down storage in Castaic Lake in the summer and early fall to meet peak water demands. It refills the reservoir in the winter and spring with water from the Delta and local runoff. Figure 7.1-4 shows storage in Castaic Lake between 1975 and the present. The reservoir was cycled annually and on occasion drawn down substantially. Between 1975 and 1995, the average water surface elevation was 1474.3 feet above mean sea level.

Article 54 of the Monterey Amendment, provides that the three contractors that can obtain water from Castaic Lake and Lake Perris may borrow water from the reservoirs provided the borrowing contractor replaces it within five years. Article 54 is referred to as the flexible storage provision. The effects of the flexible storage provision on SWP operations are described in Chapter 6.

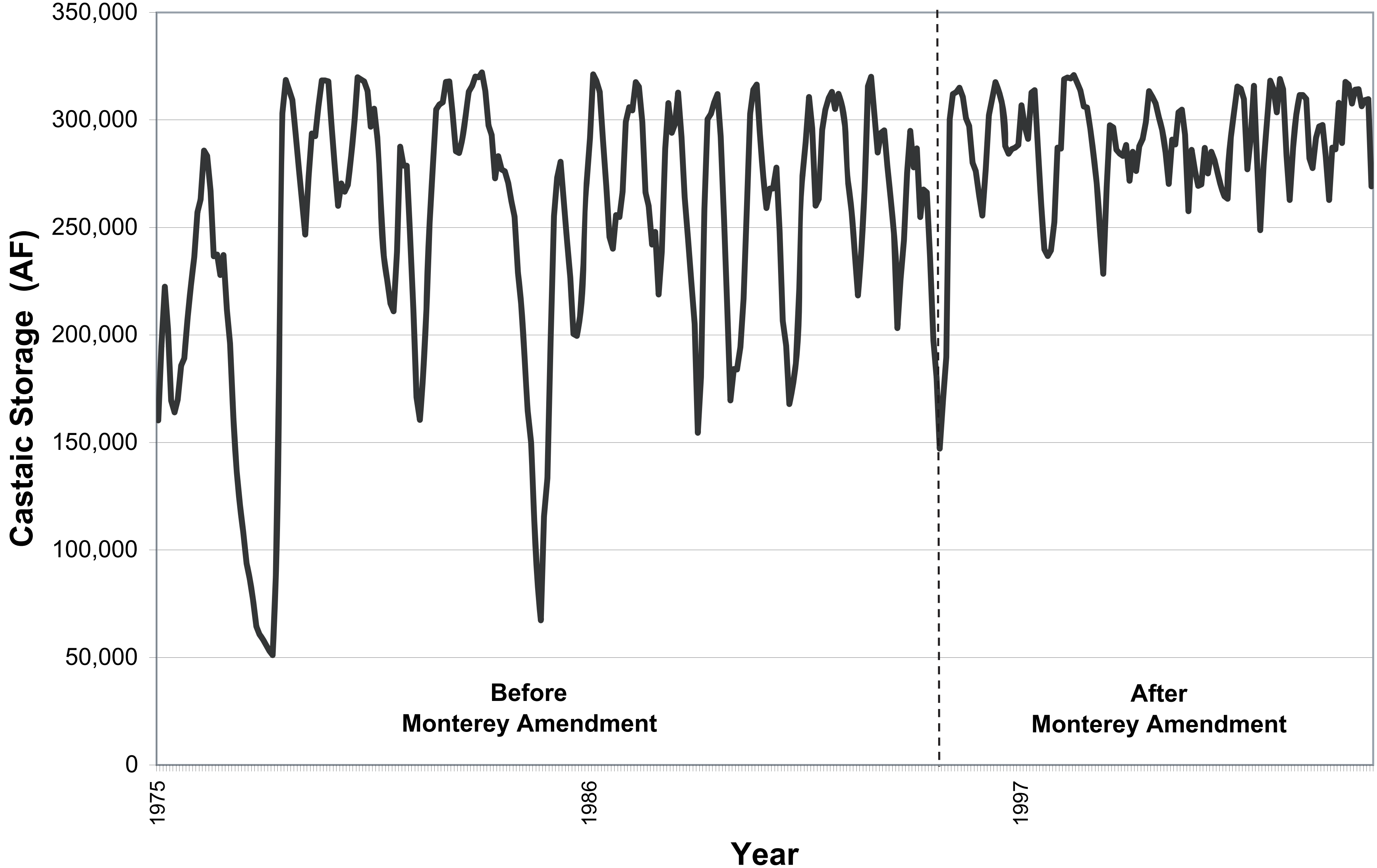
Between 1996 and 2003, two of the three eligible contractors, MWDSC and Castaic Lake WA, used the flexible storage provision and borrowed water from Castaic Lake. Information on the use of flexible storage in Castaic Lake between 1996 and 2003 including dates of withdrawals and replacements is provided in Table 6-26. MWDSC withdrew water from Castaic Lake on three occasions. Withdrawals ranged from 14,300 to 77,804 AF. The longest period between withdrawal and replacement by MWDSC was eighteen months. Castaic Lake WA also withdrew water from Castaic Lake on three occasions. Withdrawals ranged from 395 to 2,598 AF. The longest period between withdrawal and replacement by Castaic Lake WA was 37 months.

As indicated in Figure 7.1-4, after execution of the Monterey Amendment, Castaic Lake continued to be cycled annually but the cycles were smaller in amplitude than in the period from 1975 to 1995 despite the periodic borrowing by contractors described above. In that period, the difference between the highest and lowest water surface elevations averaged about 12 feet as compared to 33 feet in the period 1975 to 1995. Also, the average water surface elevation between 1996 and 2003 was 1497.7 feet above mean sea level, about 23 feet higher than between 1975 and 1995.

Several factors contributed to the reduced cycling and increased water surface elevations in Castaic Lake after 1995. Although borrowing by contractors reduced storage and water surface elevations in the reservoir at times, several other factors tended to increase storage and water surface elevations. They included reduced storage of local runoff due to additional fish release requirements and a series of wet years in the late 1990s. In addition, the Department was able to accommodate borrowing of water from Castaic Lake by reducing its annual summer drawdown of the reservoir compared to pre-Monterey Amendment conditions.

Under the baseline scenario, it was assumed that contractors would not have been able to borrow water from Castaic Lake. Furthermore, the Department would not have altered its operation of the reservoir to accommodate borrowing and, between 1996 and 2003, Castaic Lake would have been operated in the same way as it was between 1975 and 1995.

Changes in water storage and water levels in Castaic Lake may have affected water quality. Increased and more frequent refilling of the reservoir from the Delta could affect water quality because the total dissolved solids content of Delta water varies seasonally. Total dissolved solids content of Castaic Lake waters could increase or decrease depending on the timing of the refilling. Reduced storage could result in increased water temperature and reduced



Source: MWDSC, 2006.

FIGURE **7.1-4**

Castaic Lake Storage Levels Before and After Monterey Amendments

D50680.00

evaporation, which could have a minor effect on total dissolved solids content. The fluctuations in storage in Castaic Lake after implementation of the Monterey Amendment were generally less than in the period before the Monterey Amendment. Accordingly, seasonal changes in water quality in Castaic Lake, attributable to post-Monterey Amendment reservoir operations, were probably less than the changes that occurred before 1995. Any change in water quality that occurred was too small to affect the reservoir's ability to support its designated beneficial uses between 1996 and 2003.

Lake Perris

The Department typically draws down storage in Lake Perris in the summer and early fall to meet peak water demands. It refills the reservoir in the winter and spring with water from the Delta. Figure 7.1-5 shows storage in Lake Perris between 1975 and the present. The reservoir was cycled annually and on occasion drawn down substantially. Between 1975 and 1995, the average water surface elevation was 1580 feet above mean sea level.

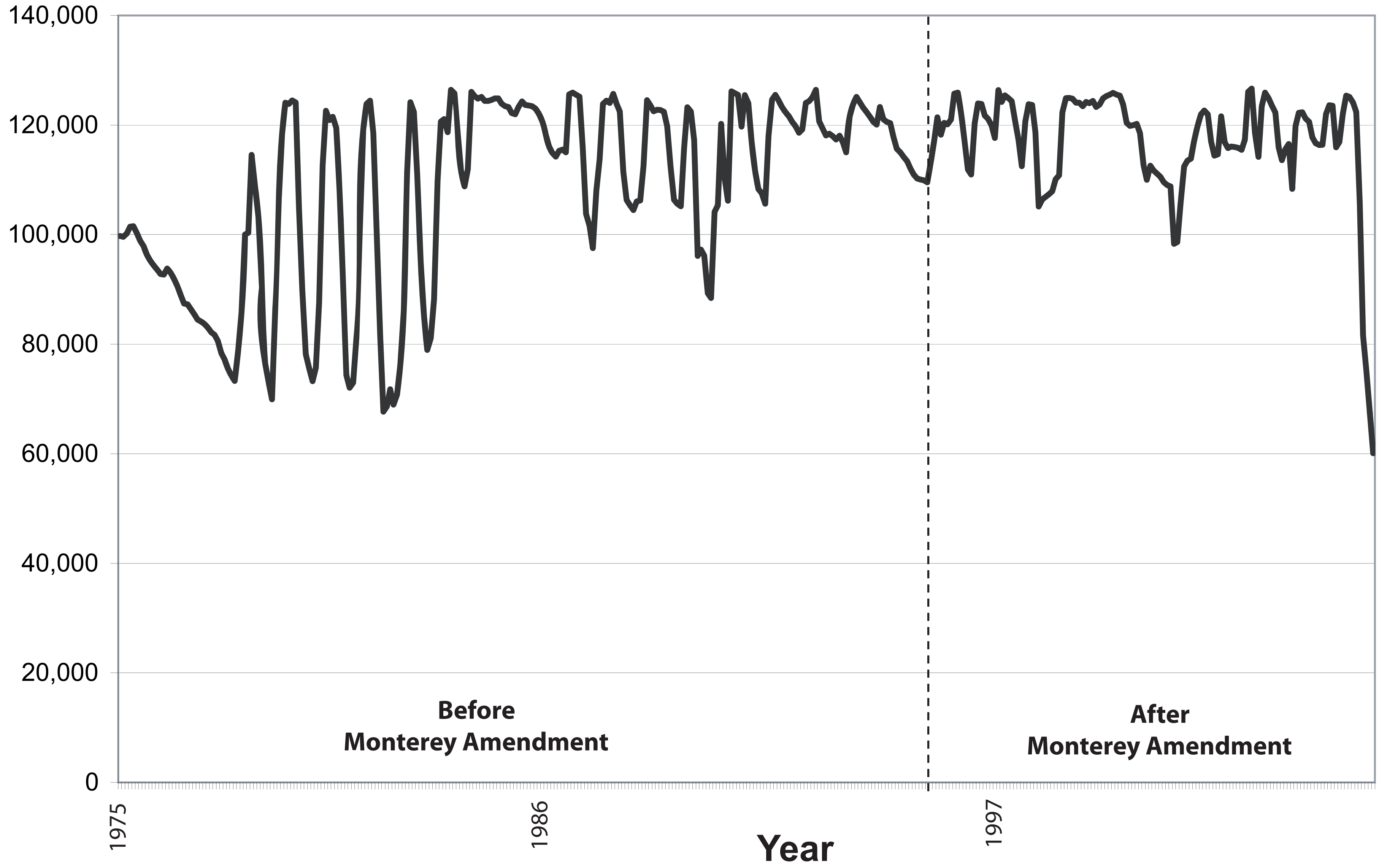
Article 54 of the Monterey Amendment, provides that the three contractors that can obtain water from Castaic Lake and Lake Perris may borrow water from the reservoirs provided the borrowing contractor replaces it within five years. By agreement, MWDSC is the only contractor that may withdraw water from Lake Perris under Article 54. Article 54 is referred to as the flexible storage provision. The effects of the flexible storage provision on SWP operations are described in Chapter 6.

MWDSC borrowed water from Lake Perris on three occasions between 1996 and 2003. Withdrawals ranged from 8,181 to 17,993 AF. The longest period between withdrawal and payback was twelve months.

As indicated in Figure 7.1-5, after execution of the Monterey Amendment, Lake Perris continued to be cycled annually but the cycles were smaller in amplitude than in the period 1974 to 1995 despite the periodic borrowing by MWDSC described above. In that period, the difference between the highest and lowest water surface elevations averaged about 4 feet as compared to10 feet in the period 1975 to 1995. Also, the average water surface elevation between 1996 and 2003 was 1584.1 feet above mean sea level, about 4 feet higher than between 1975 and 1995.

Although borrowing by MWDSC after 1995 reduced storage and water surface elevations in the Lake Perris at times, two other factors tended to increase storage and water surface elevations. One factor was a series of wet years in the late 1990s. In addition, the Department was able to accommodate borrowing of water from Lake Perris by reducing its annual summer drawdown of the reservoir compared to pre-Monterey Amendment conditions.

Changes in water storage and water levels in Lake Perris could affect water quality in the same way as was described above for Castaic Lake. Increased and more frequent filling of Lake Perris could improve water quality because currently reduced filling allows water quality to deteriorate. The fluctuations in storage in Lake Perris after implementation of the Monterey Amendment were generally less than in the period before the Monterey Amendment so this may have caused some deterioration of water quality. However, any changes were too small to affect the reservoir's ability to support most of its designated beneficial uses between 1996 and 2003.



Source: MWDSC, 2006.

FIGURE 7.1-5
Lake Perris Storage Levels Before and After Monterey Amendments

D50680.00

<u>Summary of Effects on Reservoirs</u>

The proposed project affected water levels in Lake Oroville, San Luis Reservoir, Castaic Lake and Lake Perris between 1996 and 2003. As a result of the change in water levels, some minor changes in water quality probably occurred. Any changes in water quality that occurred were not of sufficient magnitude to affect the water bodies' ability to support their designated beneficial uses. The proposed project had a ***less-than-significant impact*** on water quality in Lake Oroville, San Luis Reservoir, Castaic Lake and Lake Perris.

<u>Mitigation Measures</u>

None required.

Future Impacts

<u>Lake Oroville</u>

The proposed project would not change how the Department operates Lake Oroville but water storage and water surface elevations in Lake Oroville would be affected by the Table A transfers and retirements and the altered water allocation procedures. Storage and water surface elevations in Lake Oroville would not be affected by the water supply management practices.

The CALSIM II model was used to estimate the effects of the Table A transfers and retirements and the altered water allocation procedures on storage in Lake Oroville. Average annual storage in Lake Oroville with the Table A transfers and retirements and the altered water allocation procedures under 2020 conditions would be about 7,000 AF greater than under the baseline scenario (an increase of about 0.3 percent). The increase in storage would not raise the water surface elevation by more than a fraction of a foot and would have no measurable effect on water quality.

<u>San Luis Reservoir</u>

The proposed project would not change the Department's operating objectives with respect to San Luis Reservoir but it could affect water storage and water surface elevations in the reservoir. Water storage in the reservoir could be affected by the Table A transfers and retirements, the altered water allocation procedures and the water supply management practices.

The CALSIM II model was used to estimate the effects of the Table A transfers and retirements and the altered water allocation procedures on storage in San Luis Reservoir under 2020 conditions. Average annual storage in the SWP's share of San Luis Reservoir with the Table A transfers and retirements and the altered water allocation procedures under 2020 conditions would be about 60,000 AF greater than under the baseline scenario (an increase of about 13 percent). An annual average increase in storage of this amount could raise the water surface elevation by ten or twenty feet.

Using historical data from the period 1996 through 2004, the Department determined that in the future the water supply management practices would increase average annual deliveries of SWP water by about 50,000 AF per year, which would delayed the filling of San Luis Reservoir by several months on occasion (Study No. 3). Thus, the water supply management practices would lower storage and water levels in San Luis Reservoir at times.

It is expected that the effects of the water supply management practices on SWP deliveries would the filling of San Luis Reservoir would decline in the future. This is because opportunities for groundwater storage of SWP water outside contractors' service areas would be less frequent in the future than between 1996 and 2004 and use of the turnback pool declines. The water supply management practices would continue to cause delayed filling of San Luis Reservoir in the future but the delays would probably become smaller and smaller as demand for SWP water increases and opportunities to store SWP water in excess of a contractor's current year's needs decline.

Delayed filling of San Luis Reservoir could affect water quality in several ways as described above for the period 1996 through 2003. Most changes in water quality of reservoir waters, attributable to the proposed project, would be expected to be small and insufficient to affect beneficial uses.

<u>Castaic Lake and Lake Perris</u>

The effects of borrowing of water on water surface elevations in Castaic Lake and Lake Perris in the future will depend on the extent to which the contractors that can borrow water from the reservoirs make use of Article 54 and on future hydrologic conditions. Table 6-28 shows MWDSC's expected future use of flexible storage in Castaic Lake and Lake Perris. It is quite possible that future borrowing would draw down the reservoirs to a greater extent than occurred between 1996 and 2003, a relatively wet period.

If the contractors borrowed the maximum amounts of water provided for under Article 54 160,000 AF would be borrowed from Castaic Lake, about half its maximum capacity of 323,700 AF, and 65,000 AF would be borrowed from Lake Perris, about half its maximum capacity of 131,500 AF. The reservoirs could remain drawn down for five years. Although the worst-case condition could occur, it would be unlikely.

Changes in water storage and water levels in the two terminal reservoirs could affect water quality. Increased and more frequent refilling of the reservoirs from the Delta could affect water quality because the total dissolved solids content of Delta water varies seasonally. The total dissolved solids content of reservoir water could increase or decrease depending on the timing of the refilling. Reduced storage could result in increased water temperature and reduced evaporation. Reduced evaporation could affect total dissolved solids content. However, it is expected that any changes in overall water quality in the reservoirs would be small because the primary water source would remain the same, the Delta. Depending on how far the reservoirs were drawn down, water temperature could rise considerably. Increased and more frequent refilling of Lake Perris would likely improve water quality because limited cycling of water in the reservoir currently causes water quality to deteriorate as a result of evaporation and recreational use.

<u>Summary of Effects on Reservoirs</u>

The proposed project would affect water levels and water quality in San Luis Reservoir, Castaic Lake and Lake Perris in the future. The changes in water quality would not be of a magnitude that could affect the water bodies' ability to support their designated beneficial uses. The proposed project would have a ***less-than-significant impact*** on water quality in Lake Oroville, San Luis Reservoir, Castaic Lake and Lake Perris.

Mitigation Measures

None required.

7.1-5 The proposed project could potentially change the quality of water supplies for SWP contractors and the water agencies they serve.

1996 — 2003

Almost all the water supplied to contractors by the SWP is diverted from the Sacramento-San Joaquin Delta. The quality of Delta water varies annually and seasonally, as does the quality of water diverted by the SWP. The quality of water diverted by the SWP also depends on the location of the diversion point.

Some additional SWP water was diverted into the North Bay Aqueduct as a result of the proposed project between 1996 and 2003 as compared to the baseline scenario. This was primarily the result of the transfer of Table A amounts from KCWA to Napa County FC&WCD and Solano County WA. Water was diverted into the North Bay Aqueduct at Barker Slough near the northern extremity of the Delta. Water quality in the northern parts of the Delta is similar to water quality in the lower reaches of the Sacramento River. As noted previously (see Impacts 7.1-1 and 7.1-2), the proposed project had little or no effect on flow or water quality in the Sacramento River between 1996 and 2003. Therefore, it would have had little or no effect on water quality delivered to users of the North Bay Aqueduct.

Most of the time between 1996 and 2004 the proposed project had no effect on the rate of diversion of water from the Delta by the SWP or water quality in the Delta at the Banks Pumping Plant. Some additional SWP water (44,000 AF) was diverted at the Banks Pumping Plant during wet months of wet or above normal years as a result of the proposed project. The additional diversions occurred in January 1998, February and March 1999, February and March in 2000, and March 2004. They occurred during periods of high Delta outflow and did not affect compliance with Delta standards established by D-1641. As discussed above in Impact 7.1-3, the additional diversions, attributable to the water supply management practices, may have shifted X2 slightly eastward compared to the baseline condition. However, any increase in salinity in Suisun Bay or the western Delta would be unlikely to have much effect on water quality at the SWP diversion point in the southern Delta. During the wet months of wet and above normal years the salinity of water at the Banks Pumping Plant is usually below its annual average of 258 mg/L. Even if the increased diversion had some effect on the salinity at the SWP diversion point, the effect would be small and would not threaten compliance with secondary drinking water standards.

Because the proposed project had little effect on water quality at the SWP diversion point between 1996 and 2003, it had little effect on water quality in the California Aqueduct and San Luis Reservoir or the quality of water supplied to Castaic Lake and Lake Perris from the aqueduct. The borrowing of water from Castaic Lake and Lake Perris between 1996 and 2003 could have had some effect on water quality in the reservoirs but if it did any effects would have been minor (see Impact 7.1-4). Because the proposed project had no effect or little effect on water quality in SWP facilities south of the Delta, it did not increase the need for water treatment or make compliance with SDWA standards more difficult.

Between 1996 and 2004, the contractors placed more than one million AF of SWP water in storage in groundwater basins outside their service areas in Kern County. Approximately, 686,357 AF more SWP water was placed in groundwater storage outside the contractors' service areas with the Monterey Amendment than under the baseline scenario. When contractors wish to withdraw water from storage it is pumped from the groundwater basin and delivered to the California Aqueduct or obtained through an in-lieu exchange with a storage partner with direct access to the groundwater basin. In an in-lieu exchange, a contractor that has placed SWP water in groundwater storage allows its storage partner to pump the stored groundwater for use in the partner's' service area. In return, the contractor takes delivery of some of the storage partner's allocated SWP water from the California Aqueduct that would otherwise have been delivered to the partner.

SWP water that has been placed in groundwater storage and then pumped out of the ground and into the California Aqueduct would have different characteristics than water flowing in the aqueduct. The addition of groundwater could affect the quality of water in the aqueduct. Stored water returned by an in-lieu exchange would have no effect on water quality in the California Aqueduct.

Between 1996 and 2003, only a small portion of the water placed in groundwater storage outside contractors' service areas was recovered, most of it by in-lieu exchanges, and so the potential for changes in water quality in the California Aqueduct were limited. Also, any water introduced into the aqueduct would have to meet the Department's acceptance criteria for non-SWP water. Because of this, groundwater storage and reintroduction of water to the California Aqueduct between 1996 and 2003 did not make compliance with SDWA standards more difficult. In fact, because groundwater generally has a lower TOC content than Delta water, the introduction of groundwater into the aqueduct may have made it slightly easier to treat.

The proposed project had a ***less-than-significant impact*** on the quality of the SWP contractors' SWP water supplies.

<u>Mitigation Measures</u>

None required.

Future Impacts

The expected future effects of the proposed project on water quality in the Sacramento River, the Delta and the SWP reservoirs are described in Impacts 7.1-2, 7.1-3 and 7.1-4, respectively. None of the water quality changes would be sufficient to increase the need for water treatment to maintain current levels of drinking water quality or make compliance with the SDWA more difficult. The proposed project would have a ***less-than-significant impact*** on the quality of the contractors' SWP water supplies.

<u>Mitigation Measures</u>

None required.

7.1-6 The proposed project could potentially alter the availability and quality of water supplies for the Feather River water rights contractors.

1996 — 2003

The CALSIM II model was used to simulate the effects of the transfers and retirements of Table A amount and the altered water allocation procedures that are a part of the Monterey Amendment on the Feather River water rights contractors under 2003 conditions. The results of the simulation for the baseline scenario and the proposed project under 2003 conditions and under different hydrologic year types are shown in Table 7.1-15. There is no difference between the deliveries to the Feather River water rights contractors under the two scenarios. Consequently, the transfers and retirements of Table A amounts and the altered water allocation procedures would have no effect on deliveries to the Feather River water rights contractors. The water supply management practices would have little or no effect on deliveries to the Feather River water rights contractors.

The Table A transfers and retirements and the altered water allocation procedures affected average annual and average monthly flow in the Feather River by no more than 0.15 percent relative to the baseline scenario between 1996 and 2003. Flow changes of this magnitude were too small to have any effect on water quality at the diversion points of the Feather River water rights contractors.

The proposed project had a ***less-than-significant impact*** on the availability of water to the Feather River water rights contractors and the quality of their supplies between 1995 and 2003.

<u>Mitigation Measures</u>

None required.

Future Impacts

The CALSIM II model was used to simulate the effects of the transfers and retirements of Table A amount and the altered water allocation procedures that are a part of the Monterey Amendment on the Feather River water rights contractors under 2020 conditions. The results of the simulation for the baseline scenario and the proposed project under 2020 conditions and under different hydrologic year types are shown in Table 7.1-15. There is no difference between the deliveries to the Feather River water rights contractors under the two scenarios. The water supply management practices would have little or no effect on deliveries to the Feather River water rights contractors in the future.

The proposed project would have a ***less-than-significant impact*** on the availability of water to the Feather River water rights contractors and the quality of their supplies in the future.

<u>Mitigation Measures</u>

None required.

7.1-7 The proposed project could potentially alter the availability and quality of water to the CVP and its contractors.

1996 — 2003

The proposed project could affect the availability of water to the CVP and the quality of water at its contractors' diversion points. CVP contractors north of the Delta could be affected by proposed project-induced changes in Sacramento River flow and Contra Costa WD could be affected by proposed project-induced changes in Delta outflow. CVP deliveries south of the Delta could be affected because at times the CVP uses the SWP's Banks Pumping Plant to divert water from the Delta. The proposed project could affect the availability of the Banks Pumping Plant for use by the CVP.

The CALSIM II model was used to simulate the effects of the transfers and retirements of Table A amount and the altered water allocation procedures that are a part of the Monterey Amendment on CVP deliveries south of the Delta (Study No. 4 in Appendix F). The results of the CALSIM II simulation for the baseline scenario and the proposed project under 2003 conditions and under different hydrologic year types are shown in Table 7.1-16. The differences between CVP deliveries under the two scenarios are less than 0.05 percent.

TABLE 7.1-16

AVERAGE ANNUAL DELIVERIES TO CENTRAL VALLEY PROJECT CONTRACTORS SOUTH OF THE DELTA ESTIMATED USING CALSIM II (TAF/Year)

Scenario	Demand	Delivery					
		All Years	Wet Years	Above Normal Years	Below Normal Years	Dry Years	Critical Years
1995 Baseline	3,460.0	1,762.5	2,224.7	2,078.4	1,859.7	1,605.8	725.9
2003 Baseline	3,460.0	1,741.9	2,238.0	2,049.5	1,858.3	1,562.3	657.0
2003 Proposed Project	3,460.0	1,740.0	2,246.0	2,053.2	1,844.0	1,552.8	656.9
2020 Baseline	3,460.0	1,737.4	2,353.1	2,070.5	1,797.0	1,542.5	682.9
2020 Proposed Project	3,460.0	1,733.9	2,356.4	2,067.3	1,801.2	1,515.8	687.6

A historical operations analysis data using from 1996 through 2004 was conducted to estimate the effects of the proposed project on SWP diversions at the Banks Pumping Plant (Study No. 2 in Appendix K). The Department estimated that the proposed project resulted in the pumping of an additional 44,000 AF of water from the Delta between 1996 and 2004. If the Banks Pumping Plant had not been used to pump this water for the SWP, the unused capacity would have been available to the CVP. The CVP makes use of available capacity in the SWP's Delta pumping facilities at times in accordance with an agreement between the Department and Reclamation to cooperatively use of the CVP's and SWP's Delta pumping facilities. The practice is referred to as Joint Point of Diversion or JPOD.

The Department analyzed the historical record and CALSIM II output to determine whether the proposed project prevented probable use of the Banks Pumping Plant by the CVP at any time between 1995 and 2005 (Study No. 6 in Appendix L). Any impacts would have been confined to those periods when the Banks Pumping Plant was operating at its full permitted capacity with the proposed project, but would have been operating at a reduced capacity under the baseline scenario. There are 12 months in the historical record when differences in pumping would have occurred.

The Department reviewed circumstances prevailing in each of the 12 months to determine whether the CVP would have been likely to use JPOD. The CVP would likely only use JPOD when it predicted that the CVP's share of San Luis Reservoir would not otherwise fill and when the energy costs associated with use of JPOD were acceptable. Between 1996 and 2005, the CVP's share of San Luis Reservoir storage filled in every year except 1997 when it fell short by a small amount, 40,000 AF. JPOD capacity was available in that year and Reclamation chose not to use it. Therefore, the Department concluded that any proposed project-induced change in the availability of capacity in the Banks Pumping Plant for the CVP between 1996 and 2005 would have no effect on the CVP's use of JPOD.

The proposed project had no effect on flows in the American and San Joaquin rivers and less than a 0.15 percent effect on flows in the Sacramento and Feather rivers and Delta outflow between 1996 and 2003 (see Impact 7.1-1). Flow changes of this magnitude are too small to have any effect on water quality at the diversion points of CVP contractors. Consequently, the proposed project would not affect water availability or quality at CVP diversion points.

The proposed project had a ***less-than-significant impact*** on water availability to the CVP and its contractors, or the water quality of water available to them, between 1996 and 2003.

Mitigation Measures

None required.

Future Impacts

The CALSIM II model was used to simulate the effects of the transfers and retirements of Table A amount and the altered water allocation procedures that are a part of the Monterey Amendment on the CVP deliveries south of the Delta under 2020 conditions. The results of the CALSIM simulation for the baseline scenario and the proposed project under 2020 conditions and under different hydrologic year types are shown in Table 7.1-17. The differences in CVP deliveries under the two scenarios are less than 1.5 percent, with slightly higher deliveries under the proposed project in most hydrologic year types.

As described in Chapter 6, the Department estimated that the water supply management practices could result in the Department pumping an average of an additional 50,000 AF per year of water in the future compared to the baseline scenario. Because the increased pumping would be partially offset by the effects of other provisions of the Monterey Amendment, primarily the Table A retirements, the actual increase in pumping would be somewhat less than 50,000 AF per year. If the Banks Pumping Plant were to be employed pumping this additional water for the SWP, the unused capacity available to the CVP would be reduced.

The Department conducted an historical analysis using the 73-year hydrologic record and CALSIM II output to determine the extent to which the future loss of availability of the Banks Pumping Plant to the CVP would affect CVP use of JPOD. The analysis was performed by reviewing CALSIM II estimates for the CVP's and SWP's storage in San Luis Reservoir for the proposed project and baseline scenarios. For various reasons, described in Appendix L, it is difficult to determine when the CVP would choose to use JPOD and so the Department decided to first determine the maximum potential future use of JPOD to fill the CVP's share of San Luis Reservoir.

The Department concluded that in six years of the 73-year hydrologic record the CVP could beneficially use JPOD. If the proposed project completely precluded the use of JPOD by the CVP the maximum effect would be a reduction in pumping availability of up to 100,000 AF in a single year and a maximum average effect of 5,000 AF per year. The reduction in pumping of

TABLE 7.1-17

AVERAGE ANNUAL DELTA PARAMETERS UNDER 2020 CONDITIONS ESTIMATED USING CALSIM II[a]

	Delta Outflow (TAF/yr)	Minimum Required Delta Outflow (TAF/yr)	SWP Banks Pumping (TAF/yr)	CVP Banks Pumping (TAF/yr)	Average X2 Position (km)	Average E/I Ratio
2020 BASELINE						
All Years	14,317.0	5,650.2	3,210.8	94.5	75.8	0.36
Wet Years	27,177.1	6,895.3	4,083.9	98.1	69.3	0.32
Above Normal Years	16,855.8	6,842.1	3,654.7	95.0	73.8	0.37
Below Normal Years	9,512.6	5,438.8	3,380.8	104.6	77.1	0.40
Dry Years	6,250.0	4,622.8	2,759.4	119.6	80.1	0.41
Critical Years	4,802.7	3,968.8	1,633.8	43.5	82.4	0.32
2020 PROPOSED PROJECT						
All Years	14,338.1	5,644.9	3,196.6	94.4	75.8	0.36
Wet Years	27,209.6	6,893.2	4,068.6	101.5	69.3	0.32
Above Normal Years	16,908.1	6,825.5	3,626.9	94.3	73.7	0.36
Below Normal Years	9,535.7	5,427.8	3,361.5	102.6	77.1	0.40
Dry Years	6,251.2	4,622.2	2,748.5	121.3	80.1	0.41
Critical Years	4,800.4	3,967.3	1,634.8	37.4	82.4	0.32

Note:
a. Includes effects of Table A transfers and retirements and altered water allocation procedures. Does not include effects of water supply management practices.

5,000 AF per year represents about 0.3 percent of the CVP's average annual pumping rate from the Delta at the Jones and Banks Pumping Plants. The actual impact of the proposed project on the CVP's use of JPOD would smaller, probably much smaller, than the maximum.

The proposed project would have a ***less-than-significant impact*** on water availability to the CVP.

<u>Mitigation Measures</u>

None required.

7.1-8 The proposed project could potentially change water quality in Plumas County streams.

The Settlement Agreement provides funds to Plumas County to improve environmental conditions in the Feather River watershed. Several projects funded between 2003 and 2005. Future projects are likely to be similar to those already funded.

Many of the projects already funded involve monitoring, environmental education, institutional capacity building and research. Projects of this type would likely ultimately benefit the environment but they would have no direct adverse environmental impacts. Some funded projects have involved or could involve construction activities that could have adverse effects on water quality. Each project type involving construction activities that are likely to be funded by the Settlement Agreement is discussed below. It is assumed in the analysis that none of the projects would have occurred under the baseline scenario.

The environmental analysis that follows is at a general or "program" level. The environmental effects of projects in Plumas County would be examined in more detail once the projects have been fully defined. If the environmental impacts of any project is determined to be potentially significant then environmental documents would be prepared pursuant to CEQA.

Most of the projects that would be built pursuant to the Settlement Agreement would have to comply with CWA requirements for stormwater disposal at construction sites. In conformance with the CWA the SWRCB adopted a State-wide general NPDES permit for stormwater discharges associated with construction activity (General Permit) in August 1999. Performance standards for obtaining and complying with the General Permit are described in NPDES General Permit No. CAS000002, Waste Discharge Requirements, Order No. 99.08 DWQ. The General Permit requires a General Construction Activity Stormwater Permit and preparation of a Stormwater Pollution Prevention Plan. Construction activities pursuant to the Settlement Agreement would be required to comply with the General Permit. The General Permit calls for the application of various best management practices (BMPs).

Examples of typical construction BMPs include: using temporary mulching, seeding, or other suitable stabilization measures to protect uncovered soils; storing materials and equipment to ensure that spills or leaks cannot enter the storm drain system or surface water; developing and implementing a spill prevention and cleanup plan; installing traps, filters, or other devices at drop inlets to prevent contaminants from entering storm drains; and using barriers, such as straw bales or plastic, to minimize the amount of uncontrolled runoff that could enter drains or surface water.

Dewatering during construction is sometimes necessary to keep trenches or excavations free of standing water when improvements or foundations/footings are installed. Clean or relatively pollutant-free wastewater that poses little or no threat to water quality may be discharged directly to surface water under certain conditions. RWQCBs have adopted a general NPDES permit for short-term discharges of small volumes of wastewater from certain construction-related activities. Permit conditions for the discharge of these types of wastewater to surface water are specified, for example, in "General Order for Dewatering and Other Low-Threat Discharges to Surface Waters" (Order No. 5-00-175, NPDES No. CAG995001). Discharges may be covered by the permit provided they are (1) either four months or less in duration, or (2) the average dry weather discharge does not exceed 0.25 million gallons per day. Construction dewatering, well development water, pump/well testing, and miscellaneous dewatering/low-threat discharges are among the types of discharges that may be covered by the permit. The permit also specifies standards for testing, monitoring, and reporting, receiving water limitations, and discharge prohibitions. Construction activities related to the proposed project could result in dewatering.

Stream Restoration

Stream restoration projects typically involve re-vegetation of denuded stream banks with native species, removal of non-native species and may include fencing to exclude livestock from the riparian zone. Some projects may also involve re-grading of stream banks, placement of gravel and woody debris in stream channels and construction of side channels and refuges for juvenile fish. Construction and planting on stream banks and particularly in-stream construction may cause the discharge of sediment into stream waters. However, because the purpose of stream restoration is long-term environmental improvement, designers and builders of restoration projects typically take steps to limit the short-term adverse effects of construction.

Restoration projects involving clearing of stream banks and planting with native species often use biodegradable coir matting to prevent bank erosion until the new vegetation becomes established. Also, projects involving substantial amounts of ground disturbance would require a grading permit from a city or Plumas County. Grading permits are likely to require soil erosion control measures appropriate to the site, which might include use of silt fences, hydro-seeding, etc. If in-water work is necessary, a Stream Alteration Agreements (1601/1603 Agreements) with the California Department of Fish and Game would have to be executed in advance of work. The agreement would likely include environmental safeguards and may limit the months in which work can be undertaken.

The mitigation measures that would likely be required for stream restoration projects would limit the discharge of sediment to streams. Any effects on water quality would be minor and transitory, limited to the construction period and its immediate aftermath.

Prevention of Down-cutting and Gullying

Down-cutting occurs when loss of vegetation increases the rate of flow in a natural stream. The increased flow carves a larger and deeper channel, which often leads to falling groundwater levels and further loss of vegetation. Down-cutting can be prevented or lessened by creating a series of ponds and drop structures. Projects of this type have been approved for Jordan, Last Chance and Hosselkus Creeks.

Some streamside and in-stream work would be necessary to install the drop structures. Required mitigation measures and impacts on water quality would be similar to those for stream restoration projects. Any effects on water quality would be minor and transitory, limited to the construction period and its immediate aftermath.

Well Construction

A well-drilling project located near the City of Portola has been approved for the Grizzly Lake Resort improvement District. The wells are of small capacity and would have little impact on groundwater hydrology in a lightly populated area.

Well drilling typically produces a solid or slurry waste consisting of material removed from the new well. The waste consists of ground up soil and rock and varying quantities of water. In undeveloped areas, well-drilling cuttings are typically discharged into an earth pit where the solids settle out and the water is recycled as drilling fluid. In more developed areas, cuttings are stored in tanks or lined debris boxes and trucked to a landfill. If well drilling occurs near a surface water body, it is likely that the contractor would employ standard construction erosion control measures to prevent cuttings from being washed into the water body. It is unlikely that well-drilling projects would have any effect on water quality.

Road Improvements

Road improvements may be needed to lessen adverse impacts on streams. A road relocation project has been approved for the Last Chance Creek watershed. It is expected that road projects built pursuant to the Settlement Agreement would be unpaved. Construction of the roads would require building and grading permits from Plumas County. Permit conditions would require proper design of roadside drainage ditches and culverts and the application of soil erosion control measures appropriate to the site during construction. Any effects on water quality would be minor and transitory, limited to the construction period and its immediate aftermath.

Summary of Effects of Watershed Improvements

The proposed project would improve water quality conditions in Plumas County streams over the long-term as stream restoration and other similar projects matured and yielded beneficial results. Some ***less-than-significant impacts*** to water quality would occur during and immediately following construction.

Mitigation Measures

None required.

7.1-9 The proposed project could potentially affect the Environmental Water Account

The purpose of the EWA is to enable diversion of water from the Delta by the SWP and CVP to be reduced at times when at-risk fish species may be harmed or killed while preventing the uncompensated loss of water to SWP and CVP contractors. A description of the EWA is contained in Chapter 6.

The proposed project could affect the EWA if proposed project-induced increased pumping at the Banks Pumping Plant was occurring at times when the agencies administering the EWA initiate pumping reductions. Thus, an impact on the EWA can only occur at those times when Delta pumping would be cut back under the baseline scenario because all of the contractors' demands are met, all SWP storage is full and EWA debt is paid. As indicated in Chapter 6, such circumstances occurred infrequently in 1996 through 2004 and would occur infrequently in the future. If an impact on the EWA occurred it would increase EWA debt compared to the baseline scenario.

The Department conducted a study using historical data from 1996 through 2004 to estimate the likely effect of the proposed project on the EWA (Study No. 7 in Appendix M). Many variables are involved in the analysis so it is unavoidably speculative.

1996 — 2003

The EWA began operation in December 2000. As indicated in Chapter 6, there were six occasions from 1996 though 2004 when the proposed project enabled increased pumping at the Banks Pumping Plant. Only one month was identified in the period between EWA commencement and the end of 2004 when both an EWA fish action and a proposed project-induced increase in pumping at the Banks Pumping Plant would have occurred. Because the fish action and proposed project-induced increased pumping occurred at different times in the month, it was concluded that the proposed project would have no impact on the EWA from 2000 to 2004.

Future

The Department estimated that in the future, the proposed project would enable an increase in pumping at the Banks Pumping Plant of 50,000 AF per year and that, using the 1996 through 2004 hydrology, increased pumping would occur in 11 months in the nine year period

(108 months). The Department estimated that the proposed project could affect the EWA in three of the nine years. The affect could increase the EWA debt by an average of 27,000 AF in the years that an increase in pumping could occur. The EWA has averaged about 250,000 AF of pumping curtailments at the Banks and Jones Pumping Plants from 2001 through 2006. Thus, the proposed project could increase EWA debt by about 10-percent in years when curtailments occurred.

If the EWA program continues in the future, the proposed project could increase its cost. However, because this is an economic and not a physical environmental impact no significance conclusions were drawn.

Mitigation Measures

None required.

ENDNOTES

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