3.2 SURFACE WATER RESOURCES

This section of the EIR/EIS focuses on the surface waters of the San Joaquin River Basin and the resulting flows from the basin into the Delta as measured at the U.S. Geological Survey (USGS) gauging station at Vernalis. Most of the information for this section was taken directly from Reclamation's Draft PEIS on the Central Valley Project Improvement Act (CVPIA) (Reclamation 1997d) with some information from the State Water Resources Control Board's (SWRCB's) Draft EIR on the 1995 Bay/Delta Water Quality Control Plan (SWRCB 1997).

The San Joaquin River Basin is contained within the southern portion of the vast Central Valley of California. The basin extends approximately 250 miles north-to-south, encompasses about 32,000 square miles, and is bounded by the Sierra Nevada mountains on the east and the Diablo Range on the west. The southern extent of the San Joaquin River Basin is formed by a relatively low hydrological divide separating it from the Tulare Lake Basin and the northern boundary is formed by the Sacramento-San Joaquin Delta. The Delta separates the San Joaquin River Basin from the Sacramento River Basin and ultimately drains all of the watersheds found within both basins.

Extensive water supply, hydroelectric, and flood control efforts during the past century have resulted in the construction of dams and reservoirs that now control the flow on nearly all major streams in the San Joaquin River Basin. Figure 3.2-1, Major features of the San Joaquin River Basin (Map) adapted from the Draft PEIS, shows major rivers and streams that drain the San Joaquin River Basin watersheds and major dams that affect stream flows.

Most of the following sections were taken directly from Reclamation's Draft PEIS for the CVPIA (1997d), with minor edits.

3.2.1 Surface Water in the San Joaquin River Basin

The San Joaquin River Basin covers approximately 32,000 square miles in the northern part of the San Joaquin Valley, roughly from Fresno to Stockton. The climate of the San Joaquin River Basin is semiarid, characterized by hot, dry summers and mild winters, except at the highest altitudes, where distinct wet and dry seasons prevail. Most of the precipitation falls from November to April, with rain at the lower elevations and snow in the higher regions. On the valley floor, precipitation decreases from north to south, ranging from 14 inches in Stockton to eight inches at Mendota.

The primary sources of surface water to the basin are rivers that drain the western slope of the Sierra Nevada Range. Each of these rivers, the San Joaquin, Merced, Tuolumne, Stanislaus, Calaveras, Mokelumne, and Cosumnes, drain large areas of high elevation watershed that supply snowmelt runoff during the late spring and early summer months. Historically, peak flows occurred in May and June and flooding occurred in most years along all of the major rivers. When flood flows reached the valley floor, they spread out over the lowlands, creating several hundred thousand acres of permanent tule marshes and more than 1.5 million acres of seasonally flooded wetlands. Construction and operation of the numerous water supply, hydroelectric, and flood control efforts during the 20th century have significantly modified the historic flows.

The three northernmost streams, the Calaveras, Mokelumne, and Cosumnes rivers, flow into the San Joaquin River (within the boundaries of the Delta) without affecting the flows at Vernalis and consequently are not considered in this document. Streams on the west side of the basin are intermittent, and their flows during high rainfall periods frequently reach the San Joaquin River. Natural runoff from westside sloughs is augmented with agricultural drainage.

3.2.2 Upper San Joaquin River and Tributaries

The San Joaquin River originates in the Sierra Nevada at an elevation over 10,000 feet and flows into the San Joaquin Valley at Friant. The river then flows to the center of the valley floor, where it turns sharply northward and flows through the San Joaquin Valley to the Delta. Along the valley floor, the San Joaquin River receives additional flow from the Merced, Tuolumne, and Stanislaus rivers. The upper San Joaquin River section, upstream of the confluence with the Merced River, was historically characterized by the runoff of the San Joaquin River.

Flows in the upper San Joaquin River are regulated by the CVP Friant Dam (Figure 3.2-1), which was completed in 1941 to store and divert water to the Madera and Friant-Kern canals for irrigation and municipal and industrial water supplies in the eastern portion of the San Joaquin Valley. In the reach between Friant Dam and the Gravelly Ford, flow is influenced by releases from Friant Dam, with minor contributions from agricultural and urban return flows. During the past 100 years, development in this area has resulted in groundwater overdraft conditions, and the river loses much of its flow through infiltration/percolation to the groundwater. Releases from Friant Dam are generally limited to those required to satisfy downstream water rights and instream flows. Millerton Lake, formed by Friant Dam, has a capacity of 520,000 acre-feet.

Above Friant Dam, the San Joaquin River drains an area of approximately 1,676 square miles and has an annual average unimpaired runoff of 1.7 million acre-feet. The median historical unimpaired runoff is 1.4 million acre-feet, with a range of 0.4 to 4.6 million acre-feet. Several reservoirs in the upper portion of the San Joaquin River watershed, including Edison, Florence, Huntington, Mammoth Pool, and Shaver Lake, are primarily used for hydroelectric power generation. The operation of these reservoirs affects the inflow to Millerton Lake.

3.2.3 Lower San Joaquin River and Tributaries

The lower San Joaquin River, from the confluence with the Merced River to the Delta, is characterized by the combination of flows from tributary streams, major rivers, groundwater accretions, and agricultural drainage water. The lower San Joaquin River is the section of river from the confluence with the Merced River (below Fremont Ford) to Vernalis, which is generally considered the southern limit of the Delta. The drainage area of the San Joaquin River above Vernalis includes approximately 13,356 square miles, of which approximately 2,100 square miles are drained by Fresno Slough (James Bypass) as well as the much longer Kings River watershed. Little water is contributed from the upper San Joaquin River, except during flood events. Flow patterns in the lower San Joaquin River are therefore primarily governed by the tributary inflows from the Merced, Tuolumne, and Stanislaus rivers.

Merced River. The Merced River originates in the Sierra Nevada, drains an area of approximately 1,273 square miles east of the San Joaquin River, and produces an average unimpaired runoff of approximately 1 million acre-feet.

Agricultural development in the Merced River watershed began in the 1850s, and significant changes have been made to the hydrologic system since that time. The enlarged New Exchequer Dam, forming Lake McClure with a capacity of 1,024,000 acre-feet, was completed in 1967 and now regulates releases to the lower Merced River. New Exchequer Dam is owned and operated by the Merced Irrigation District for power production, irrigation, and flood control. Releases from Lake McClure pass through a series of powerplants and smaller diversions and are re-regulated at McSwain Reservoir. Below McSwain Dam, water is diverted to Merced Irrigation District at the Pacific Gas and Electric Company (PG&E) Merced Falls Dam and further downstream at the Crocker Huffman Dam.

Tuolumne River. The Tuolumne River originates in the Sierra Nevada Mountains, drains a watershed of approximately 1,540 square miles, and produces an average annual unimpaired runoff of approximately 1.8 million acre-feet.

Flows in the lower portion of the Tuolumne River are controlled primarily by the operation of New Don Pedro Dam, which was constructed in 1971 jointly by TID and MID with participation by the City and County of San Francisco. The 2.03-million-acre-foot reservoir stores water for irrigation, hydroelectric generation, fish and wildlife enhancement, recreation, and flood control purposes. The districts divert water to the Modesto Main Canal and the Turlock Main Canal a short distance downstream from New Don Pedro Dam at La Grange Dam. The existing dam at La Grange was completed in 1893.

The City and County of San Francisco (CCSF) operates several water supply and hydroelectric facilities within the Tuolumne River Basin upstream of New Don Pedro Reservoir. O'Shaughnessy Dam on the main stem of the Tuolumne River, completed in 1923, impounds approximately 0.36 million acre-feet of water in Hetch Hetchy Reservoir. Water from Hetch Hetchy is used primarily to meet the municipal and industrial water needs of the CCSF and to provide instream flows in the Tuolumne River below O'Shaughnessy Dam. Two other storage facilities upstream of New Don

Pedro Reservoir, Lake Eleanor and Cherry Lake, are also operated by CCSF for hydropower and water supply purposes. The combined capacity of these two reservoirs is about 0.3 million acre-feet.

Stanislaus River. The Stanislaus River originates in the Sierra Nevada Mountains, drains a watershed of approximately 900 square miles, and produces an average unimpaired runoff of approximately 1.056 million acre-feet. Snowmelt runoff contributes the largest portion of the flows in the Stanislaus River, with the highest monthly flows in May and June.

Flow control in the lower Stanislaus River is provided by the New Melones Reservoir, which has a capacity of 2.4 million acre-feet, and is operated by Reclamation as part of the CVP. Releases from New Melones Reservoir are re-regulated downstream by Tulloch Reservoir. Prior to the construction of New Melones Dam, average monthly flows in the Stanislaus River were generally uniform between January and June, with peak flows in May. As a result of limited storage capacity of facilities on the river, average monthly flows in August and September approached zero in many years downstream of Goodwin Dam. Following construction of New Melones Dam, average monthly flows included peak flows in March, with releases in all months.

The main water diversion point on the Stanislaus River is Goodwin Dam, which provides for delivery to OID and SSJID. Goodwin Dam is also used to divert water into the Goodwin Tunnel for deliveries to Central San Joaquin Water Conservation District and the Stockton East Water District.

San Joaquin River at Vernalis. Flows in the San Joaquin River at Vernalis are affected by the operation of upstream facilities on the San Joaquin, Merced, Tuolumne, and Stanislaus rivers, as well as by deliveries to the Mendota Pool from the Delta-Mendota Canal and overflows from the Kings River in the Tulare Lake Region. Prior to the construction of major dams on the San Joaquin River and its tributaries, average monthly flows peaked during May and June in response to snowmelt runoff. Unrestricted flows have not occured since the construction of the original Exchequer and Don Pedro reservoirs in the 1920s. Between 1941 and 1978, flows were altered from natural conditions in response to the operations of Friant, New Exchequer, New Don Pedro, and New Melones dams. New Melones Dam, the most recently constructed dam in the San Joaquin River Basin, was completed in 1978. Since that time, average monthly flows in the San Joaquin River at Vernalis have been more uniform throughout the year, with maximum flows less than historical levels.

3.2.4 Surface Water Quality in the San Joaquin River Basin

Surface water quality in the San Joaquin River Basin is affected by several factors, including natural runoff, agricultural return flows, biostimulation, construction, logging, grazing, operations of flow regulating facilities, urbanization, and recreation. In addition, irrigated crops grown in the western portion of the San Joaquin Valley have accelerated the leaching of minerals from soils, altering water quality conditions in the San Joaquin River system.

Water quality in the San Joaquin River varies considerably along the stream's length. Above Millerton Lake and downstream towards Mendota Pool, water quality is generally excellent. The reach from Gravelly Ford to Mendota Pool (about 17 miles) is frequently dry except during flood control releases because all water released from Millerton Lake is diverted to satisfy contract agreements, or percolates to groundwater. During the irrigation season, most of the water released from the Mendota Pool to the San Joaquin River is imported from the Delta via the Delta-Mendota Canal, and has higher concentrations of total dissolved solids (TDS) than water in the upper reaches of the San Joaquin River. Most of the water released from the Mendota Pool to the San Joaquin River is diverted at or above Sack Dam for agricultural uses. Between Sack Dam and the confluence with Salt Slough, the San Joaquin River is often dry. From Salt Slough to Fremont Ford, most of the flow in the river is derived from irrigation returns carried by Salt and Mud sloughs. This reach typically has the poorest water quality of any reach of the river.

As the San Joaquin River progresses downstream from Fremont Ford, water quality generally improves at successive confluences, specifically at those with the Merced, Tuolumne, and Stanislaus rivers. In the relatively long reach between the Merced and Tuolumne rivers, however, mineral concentrations tend to increase due to agricultural drainage water return flows, other wastewaters, and effluent groundwater (DWR 1965 as cited in USBR 1997f). TDS in the San Joaquin River near Vernalis has historically ranged from 52 milligrams per liter (mg/l) (at high stages) to 1,220 mg/l during the 1951-1962 period (DWR 1965 as cited in USBR 1997f). While other contemporary periods (1976-1977 and 1986-1992) have had elevated mineral content (and reduced flows), the period of record from 1951-1962 is the most appropriate and inclusive of the greatest frequency of elevated TDS. During the mid to late 1960s, San Joaquin River water quality continued to decline. In 1972, the SWRCB included a provision in Decision 1422 (D-1422) that Reclamation maintain average monthly concentrations of TDS in the San Joaquin River at Vernalis of 500 mg/l as a condition of the operating permit for New Melones Reservoir on the Stanislaus River.

3.2.5 Water Facilities and Operations

3.2.5.1 CVP Facilities and Operations

The CVP is the largest surface water storage and delivery system in California, with a geographic scope covering 35 of the state's 58 counties. The project includes 20 reservoirs, with a combined storage capacity of approximately 11 million acre feet; 8 powerplants and 2 pump-generating plants, with a combined generation capacity of approximately 2 million kilowatts; 2 pumping plants; and approximately 500 miles of major canals and aqueducts. The CVP supplies water to more than 250 long-term water contractors in the Central Valley, the Santa Clara Valley, and the San Francisco Bay Area.

Historically, approximately 90 percent of the CVP water has been delivered to agricultural users, including senior water right holders. Total annual contracts exceed 9 million acre-feet, including over 1 million acre-feet of Friant Division Class II supply, which is generally available only in wet years. At present, increasing quantities of water are being provided to municipal customers, including the cities of Redding, Sacramento, Folsom, Tracy, and Fresno; most of Santa Clara County; and the northeastern portion of Contra Costa County.

CVP operations are influenced by a myriad of general operating rules, regulatory requirements, and facility-specific concerns and requirements. This section summarizes the operations of the CVP, beginning with a description of factors that influence operations decisions, descriptions of regulatory requirements, and specific operating constraints at CVP facilities. It concludes with a discussion of CVP contract types, including water rights contracts, and criteria used to determine annual water delivery levels to those contractors.

General Criteria for the Operation of CVP Facilities

In the development of operations decisions, criteria related to reservoir operations, downstream conditions, and water rights in the Delta must be considered. This section describes how these issues generally influence CVP operational decisions.

Reservoir Operating Criteria. Inflow and release requirements are the principal elements influencing reservoir storage. Operational decisions must consider not only conditions at an individual reservoir, but also downstream conditions and conditions at other project reservoirs. The possibility of using multiple water sources for some requirements adds flexibility to project operations and complexity to operations decisions. Storage space south (upstream) of the Delta that can only be filled with water exported from the Delta is a major operational consideration involving the geographic distribution of water in storage. Other factors that influence the operation of CVP reservoirs include flood control requirements, carryover storage objectives, lake recreation, power production capabilities, cold water reserves, and pumping costs.

The U.S. Army Corps of Engineers (COE) is responsible for determining flood control operational requirements at most CVP reservoirs. If CVP reservoir storage exceeds COE requirements, water must be released at rates of flow defined in the COE's flood control manuals. These manuals require lower reservoir storage levels in the fall in anticipation of inflow from winter precipitation. To avoid excess releases at the end of the summer, releases in excess of minimum flow requirements are made over the course of the summer such that reservoir storage levels are at or below maximum flood control levels in the fall.

Streamflow Criteria. Streams below CVP dams support both resident and anadromous fisheries, recreation, and water diversions. While resident fisheries are slightly affected by release fluctuations, the anadromous fisheries (e.g., salmon and steelhead) are the most sensitive and are present year-round in several CVP streams. Maintaining water conditions favorable to spawning, incubation, rearing, and outmigration of the young anadromous fish is one of the main objectives.

CVP operations are coordinated to anticipate and avoid streamflow fluctuations during spawning and incubation whenever possible.

In the management of releases prescribed by the COE for flood control, CVP operators have some latitude in controlling the magnitude and duration of the releases, based on criteria for downstream public safety and levee stability. Flood control releases are typically accomplished through a series of stepped increases defined by such factors as powerplant capability, minor flooding of adjacent lands, erosion, and channel capacity. Flood releases are established at the lowest step of the progression that will satisfy the requirements for evacuating storage, maximizing public safety, and minimizing the downstream effect of flood releases.

Regulations and Agreements that Affect CVP Operations

The operation of the CVP is, and has historically been, affected by the provisions of several regulatory requirements and agreements. Prior to the passage of CVPIA, the operation of the CVP was affected by SWRCB Decisions 1422 and 1485, and the Coordinated Operations Agreement (COA). Decisions 1422 and 1485 identify minimum water flow and water quality conditions at specified locations, which are to be maintained in part through the operation of the CVP. The COA specifies the responsibilities shared by the CVP and State Water Project (SWP) for meeting the requirements of D-1485.

Beginning in 1987, a series of actions by the SWRCB, U.S. Environmental Protection Agency (USEPA), the National Marine Fisheries Services (NMFS), and the U.S. Fish and Wildlife Service (Service) affected interim water flow and water quality standards in the Delta. However, at the time CVPIA was enacted (October, 1992), the water quality standard in the Delta remained D-1485, and the CVP and SWP were operated in accordance with the COA to maintain this requirement.

In 1993, the Service released a biological opinion and included restrictions on water management in and upstream of the Delta regarding delta smelt and associated habitat of operational actions by the CVP and SWP. This biological opinion was revised in 1994 and in 1995.

In December 1994, representatives of the state and federal governments and urban, agricultural and environmental interests agreed to the implementation of a Bay/Delta protection plan through the SWRCB, in order to provide ecosystem protection for the Bay/Delta Estuary. SWRCB WR Order 95-6 modified D-1485 and D-1422 to reflect the objectives of, and remove some inconsistencies with the Draft Bay/Delta Water Quality Plan, released May 1995. The coordinated operations of the CVP and SWP continue to be based on the COA.

Operations of CVP Divisions and Facilities South of the Delta

The facilities included in CVP divisions north of the Delta are known collectively as the Northern CVP System. Facilities in CVP divisions south of the Delta include the Delta, West San Joaquin, and San Felipe divisions and are known collectively as the Southern CVP System. Both the Eastside and the Friant divisions are operated independently of the remainder of the CVP, due to the nature of their water supplies and service areas. The Northern and Southern CVP Systems are operated as an integrated system, and demands for water and power can be met by releases from any one of several facilities. Demands in the Delta and south (upstream) of the Delta can be met by the export of excess water in the Delta, which can result from releases from northern CVP reservoirs. As a result, operational decisions are based on a number of physical and hydrological factors that tend to change depending on conditions.

West San Joaquin Division. The West San Joaquin Division of the CVP consists of the San Luis Unit, and includes federal as well as joint federal and State of California water storage and conveyance facilities to provide for delivery of surplus water to CVP contractors in the San Joaquin Valley and in the San Felipe Division. Facilities in the West San Joaquin Division are San Luis Dam and Reservoir, O'Neill Dam and Forebay, the San Luis Canal, Coalinga Canal, Los Banos and Little Panoche Detention dams and reservoirs, and the San Luis Drain.

San Luis Dam and Reservoir are located on San Luis Creek near Los Banos (Figure 3.2-1). The reservoir, with a capacity of 2.0 million acre-feet, is a pumped-storage reservoir primarily used to store water exported from the Delta. It is a joint federal and State of California facility that stores CVP and SWP water. San Luis Reservoir waters are released for delivery to CVP and SWP contractors served by the San Luis Canal, through the Pacheco Tunnel to serve the San Felipe Unit of the CVP, and to the Delta-Mendota Canal to serve CVP water service and San Joaquin River Exchange Contractors on the west side of the San Joaquin Valley.

O'Neill Dam and Forebay are located on San Luis Creek downstream of San Luis Dam along the SWP California Aqueduct. The forebay is used as a hydraulic junction point for state and federal waters. CVP water is lifted from the Delta-Mendota Canal to the O'Neill Forebay by the O'Neill Pumping-Generating Plant. The San Luis Canal, a joint federal and state (CVP/SWP) facility, conveys water southeasterly from O'Neill Forebay along the west side of the San Joaquin Valley for delivery to CVP and SWP contractors.

The CVP operation of the San Luis Unit requires coordination with the SWP, since some of the facilities are joint state and federal facilities. Like the CVP, the SWP also has water demands it must meet with limited water supplies and facilities. Coordinating the operations of the two projects avoids inefficient situations such as one entity pumping water into San Luis Reservoir at the same time the other is releasing water.

San Felipe Division. The San Felipe Division provides CVP water to Santa Clara and San Benito counties, through conveyance facilities from the San Luis Reservoir. Specific facilities include the Pacheco Tunnel and Conduit, the Hollister Conduit, San Justo Dam and Reservoir, and the Santa Clara Conduit. The Pajaro Valley, in southern Santa Cruz County, was originally authorized to receive irrigation water to reduce seawater intrusion caused by groundwater pumping. Although studies to reduce seawater intrusion and determine conveyance requirements have continued, no facilities have yet been constructed in the Pajaro Valley to receive the authorized water deliveries.

Eastside Division. The Eastside Division of the CVP includes water storage facilities on the Stanislaus River (New Melones Dam, Reservoir, and Powerplant), Chowchilla River (Buchanan Dam and Eastman Lake), and Fresno River (Hidden Dam and Hensley Lake). All of the dams and reservoirs in this division were constructed by the COE. Upon completion in 1978, the operation of New Melones was assigned to Reclamation to provide flood control, satisfy water rights obligations, provide instream flows, maintain water quality conditions in the Stanislaus River and in the San Joaquin River at Vernalis, and provide deliveries to CVP contractors.

The operating criteria for New Melones Reservoir are governed by water rights, instream fish and wildlife flow requirements, instream water quality, Delta water quality, CVP contracts, and flood control considerations. Flows in the lower Stanislaus River serve multiple purposes. These include providing water for instream water rights obligations, meeting instream fishery flow requirements, maintaining instream water conditions of dissolved oxygen, and maintaining water quality conditions in the San Joaquin River at Vernalis, in accordance with D-1422 and the SWRCB May 1995 Water Quality Plan (WQP). Water is also released from New Melones Reservoir to meet, to the extent available, the San Joaquin River flow requirements in the SWRCB May 1995 WQP. The operating criteria have been revised (May, 1997) and are currently being refined by stakeholders.

Friant Division. The Friant Division includes facilities to collect and convey water from the San Joaquin River in order to provide a supplemental water supply to areas along the east side of the southern San Joaquin River Basin and the Tulare Basin. The delivery of CVP water to this region augments groundwater and local surface water supplies in an area that has historically been subject to groundwater overdraft. The Friant Division is an integral part of the CVP, but is hydrologically independent and, therefore, operated separately from the other divisions of the CVP. The water supply to this division was made available through an agreement with San Joaquin River water right holders, who entered into an exchange contract and purchase agreement with Reclamation for delivery of water through the Delta-Mendota Canal. Major facilities of the Friant Division include Friant Dam and Millerton Lake, the Madera Canal, and the Friant-Kern Canal.

Flood control releases from Millerton Lake (Friant Dam) may be used to satisfy portions of deliveries to the Mendota Pool Contractors and the San Joaquin River Exchange Contractors on the San Joaquin River below Mendota Pool. Millerton Lake operations are coordinated with operations of the Delta-Mendota Canal in the Delta Division to use all available Millerton Lake flood control releases before additional water is delivered to Mendota Pool. During wet hydrologic periods, overflow from the Kings River may also enter the San Joaquin River Basin at the Mendota Pool through the Fresno Slough.

CVP Water Users South of the Delta

During development of the CVP, the United States entered into long-term contracts with many of the major water right holder in the Central Valley. In part, the CVP is operated to satisfy downstream water rights, meet the obligations of the water rights contracts, and deliver project water to CVP water service contractors.

Many of the CVP water rights originated from applications filed by the state in 1927 and 1938 to advance the California Water Plan. After the Federal Government authorized the construction of the CVP, those water rights were transferred to Reclamation, who made applications for the additional water rights needed for the CVP. In granting water rights, the SWRCB set certain conditions within the permits to protect prior water rights, fish and wildlife needs, and other prerequisites it deemed in the public interest.

San Joaquin River Exchange Contractors. San Joaquin River Exchange Contractors are water right holders who receive substitute CVP water from the Delta-Mendota Canal (DMC) at the Mendota Pool. Under the Exchange Contract, the parties agree to not exercise their San Joaquin River water rights in exchange for a substitute CVP water supply from the Delta. Under the water rights of the United States, these exchanges allow for water to be diverted from the San Joaquin River at Friant Dam and stored at Millerton Lake.

The purchase contract dealt with riparian and pre-1914 water rights. Under the Exchange Contract, the parties agree not to exercise their rights in exchange for a substitute water supply from the Delta. However, under the Exchange Contract, no transfer of water rights occurs, and Reclamation is responsible for delivering substitute water to these contractors in accordance with the Exchange Contract.

CVP Water Service Contractors. Before construction of the CVP, many irrigators on the west side of the Sacramento Valley, on the east and west sides of the San Joaquin Valley, and in the Santa Clara Valley relied primarily on groundwater. With the completion of CVP facilities in these areas, the irrigators signed contracts with Reclamation for the delivery of CVP water as a supplemental supply. Several cities also have similar contracts.

CVP water service contracts are between the United States and individual water users or districts and provide for an allocated supplemental supply of CVP water to be applied for beneficial use. In addition to CVP water service contracts, the Exchange Contract includes a supply of water that recognizes a previous water right. The purposes of a water service contract are to stipulate provisions under which a water supply is provided, to produce revenues sufficient to recover an appropriate share of capital investment, and to pay the annual operations and maintenance costs of the project.

In the Friant Division, a two-class system of water service contracts is employed to support the conjunctive use of surface water and groundwater that has long been a practice in the San Joaquin River and Tulare Lake Basins. Class I contracts relate to “dependable supply,” typically assigned to users with limited access to good quality groundwater. Class II contracts are generally held by water users with access to good quality groundwater that can be used during periods of surface water deficiency. Groundwater recharge and recharge/exchange agreements are frequently employed in the management of Class II water supplies.

Criteria for Water Deliveries to CVP Contractors

Decision-making criteria are similar in most units and divisions of the CVP. The criteria applicable to CVP water service contractors served by the North System (Trinity, Shasta, Sacramento River, and American River divisions) and the South System (Delta, West San Joaquin, and San Felipe divisions) are similar. The decision-making criterion is unique for the Exchange Contractors because it is based solely on forecasted inflows to Shasta only. The criteria applied to establish water delivery deficiencies in the Friant Division are somewhat different, because this division is operated to provide water supplies for conjunctive use. In addition, the criteria for operations of New Melones Reservoir and contract deliveries on the Stanislaus River are affected by conditions unique to the Stanislaus River watershed as well as the May 1997 New Melones Interim Plan of operation (which is the subject of stakeholder refinement as of the writing of this document).

Criteria for Deliveries to CVP Contractors in the North and South Systems. Except in times of water shortages, the CVP makes available the amounts of water specified in the terms of its water rights and water service contracts in the CVP North and South systems. Water availability for delivery to CVP water service contractors during periods of insufficient water supply is determined based on a combination of operational objectives, hydrologic conditions, and reservoir storage conditions. Reclamation is required to allocate shortages among water service contractors within the same service area, as individual contracts and CVP operational capabilities permit.

Criteria for Deliveries to CVP Contractors in the Friant Division. The determination of annual water supply from the Friant Division is done independently of other CVP divisions. In February, Reclamation estimates the water supply for the coming contract year based on hydrologic conditions, storage in upstream reservoirs, and assumptions based on statistical analysis of historic records.

Criteria for Deliveries to CVP Contractors in the Eastside Division. Reclamation has had difficulty meeting all of the demands on New Melones Reservoir. This difficulty became apparent during the period of 1987-1992 when New Melones Reservoir was drawn down to approximately

80,000 acre-feet by 1992. Numerous unanticipated operational factors influenced the drawdown of New Melones during this period. These include the severity of drought conditions from 1989 through 1992, the effect of return flow water quality in the San Joaquin River at Vernalis, and low flows on the Merced and Tuolumne rivers. During the drought period, many Stanislaus River stakeholder meetings were convened to coordinate management of limited water supplies. Consequently the May 1997 New Melones Interim Plan of Operation provides examples of operation under the 50 percent (most probable) and 90 percent probability of exceedance (90 percent chance of having increased flows) hydrologic conditions which include water years 1997 and 1998. This interim plan is currently the subject of stakeholder refinement as of the writing of this document.

3.2.5.2 SWP Facilities and Operations

SWP facilities consist of 22 dams and reservoirs that capture and store water on the Feather River, in order to deliver water to service areas in the Feather River Basin, the San Francisco Bay area, the San Joaquin Valley, the Tulare Basin, and Southern California. Lake Oroville, SWP's largest reservoir, with a storage capacity of approximately 3.5 million acre-feet, regulates the Feather River for release to Sacramento River and the Delta. The water is diverted by various facilities of the SWP for delivery to contractors or salinity control. In addition, Lake Oroville provides flood control, fish and wildlife habitat, irrigation water, hydroelectric generation, and recreation (Water Education Foundation 1997).

The SWP operates two diversion facilities in the Delta. The North Bay Aqueduct diverts water from the north Delta near Cache Slough for agricultural and municipal uses in Napa and Solano counties. In the southern portion of the Delta, the Banks Delta Pumping Plant lifts water into the California Aqueduct from the Clifton Court Forebay. The California Aqueduct is the state's largest and longest water conveyance system (444 miles), beginning at the Banks Pumping Plant and extending to Lake Perris south of Riverside, in Southern California. Water in the California Aqueduct flows to O'Neill Forebay, from which a portion of the flow may be lifted to the joint CVP/SWP San Luis Reservoir for storage. From O'Neill Forebay, the joint-use portion of the aqueduct, San Luis Canal, extends south to the southern end of the San Joaquin Valley. The SWP portion of the aqueduct continues over the Tehachapi Mountains to the South Coast Region. To cross the Tehachapis into southern California, water is elevated some 2,000 feet–more water pumped higher than anywhere else in the world.

SWP Water Users

About 30 percent of SWP water is used for irrigation, mostly in the San Joaquin Valley. Approximately 70 percent is used for residential, municipal, and industrial use, mainly in southern California. Currently, the SWP has contracted a total of 4.22 million acre-feet for delivery in San Joaquin River Region, the Central Coast Region, and the San Francisco and South Coast regions. Of this amount, about 2.5 million acre-feet is designated for the Southern California Transfer Area, nearly 1.36 million acre-feet to the San Joaquin Valley, and the remaining 0.37 million acre-feet to the San Francisco Bay area, the Central Coast Region, and the Feather River area.

Contracts executed in the early 1960s established the maximum annual water amount (entitlement) that each long-term contractor may request from the SWP. The annual quantities reflect each contractor's projected annual water needs at the time the contracts were signed. SWP delivers water to agricultural and municipal and industrial water contractors based on the criteria established in the 1996 Monterey Agreement, which applies equal deficiency levels to all contractors.

3.2.5.3 San Joaquin River Group Authority Willing Sellers

San Joaquin River

San Joaquin River Exchange Contractors Water Authority. The operating scheme used by the CVP to service the Exchange Contractors is fairly straight forward. Shasta Reservoir, which has a capacity of 4,552,000 acre-feet, stores winter runoff from the upper Sacramento River. Some of this water is transferred to the southern delta CVP Tracy Pumping Plant via the Sacramento River, the Delta Cross-Channel, and interior central delta channels and is lifted into the Delta-Mendota Canal. This 117-mile-long canal carries water south by gravity flow to the Mendota Pool (which is located 30 miles west of Fresno). The water is used in the San Joaquin Valley to replace the San Joaquin River water that is diverted at Friant Dam near Fresno. Thus, Sacramento River water is brought down to replace the San Joaquin River water that is captured, stored in Millerton Lake, and diverted for use farther south through the Friant-Kern Canal and for use farther north through the Madera Canal (Littleworth and Garner 1995).

The Exchange Contractors have a total allotment of 840,000 acre-feet per year under a best-case wet year scenario. They are allowed a maximum of 719,000 acre-feet in a normal year to be diverted during the April-October period. In a critical drought year, the Exchange Contractors are limited to 529,000 acre-feet of CVP water during the same period.

Stanislaus River

Oakdale Irrigation District. The OID encompasses approximately 72,345 acres in Stanislaus and San Joaquin counties. Approximately 62,000 acres (or 86 percent) of land within the district is irrigated by OID through a gravity system of canals, tunnels, and pipelines. OID maintains more than 330 miles of laterals and pipelines and 40 miles of main canals and tunnels. The Stanislaus River runs throughout the central portion of the district.

OID has an adjudicated pre-1914 water right held jointly with SSJID to divert 1,816.6 cubic feet per second (cfs) of flow from the Stanislaus River. In addition to its pre-1914 rights, OID also has licenses and permits to direct divert and divert to storage waters of the Stanislaus River above its

1,816.6 cfs pre-1914 right. Most of these rights are also held jointly with SSJID. When New Melones Reservoir was constructed, it flooded OID's and SSJID's Melones Reservoir. In settlement of that action and the Districts' protests of Reclamation's application to obtain a permit from the SWRCB, Reclamation, OID and SSJID entered into an Agreement and Stipulation in 1972. In 1988, the 1972 Agreement and Stipulation was amended. The Agreement entitles OID/SSJID to receive 600,000 acre-feet of water when the projected flow in the Stanislaus River is greater than 600,000 acre-feet. OID and SSJID have an internal agreement to equally divide the water available to them under the 1988 Agreement.

Historically, more than 95 percent of the water served by OID has been surface water diverted from the Stanislaus River at Goodwin Dam into the Joint Supply Canal and the South Main Canal. Water diversions historically have occurred from March 1 through October 30 of a calendar year. The bulk of the diversions occurred in May through August. OID still diverts the majority of its water for irrigation use in the months of May through August.

Surface water is supplemented by groundwater pumping, especially during dry periods when surface water supplies are limited, from 22 groundwater wells (approximately 200 feet deep) located throughout the district on both sides of the Stanislaus River. An approximate average of 8,130 acre-feet per year of water has been pumped from these wells directly into the surface conveyance system to balance flows for irrigation customers. OID also pumps a small quantity (average 1,358 acre-feet per year) from four shallow wells to control water table levels in certain portions of the district. Over the last fifteen years, OID has pumped an approximate average of 9,668 acre-feet per year of groundwater, or less than four percent of their total water usage (OID/SSJID 1997).

Other components of OID operations include river pumps and reclamation pumps that recover and re-distribute a portion of operational spills, operational fluctuations, and a portion of irrigation tailwater. Excess water in the surface system south of the Stanislaus River drains into the Modesto Irrigation Canal (MID), the Tuolumne River, and eventually into the Stanislaus River as surface water return flows. Surface water runoff on OID property north of the river drains into the SSJID main distribution canal and flows west into SSJID and Lone Tree Creek (not a tributary to the Stanislaus River). In addition to pumping for irrigation use, OID also owns and/or operates nine independent domestic water systems. Over the last ten years, these wells have produced an average of 1,100 acre-feet per year. An undetermined number of privately-owned agriculture and domestic wells are located within the OID but are not operated by OID. Production from these wells has been estimated at 30,000 acre-feet per year (OID/SSJID 1997).

South San Joaquin Irrigation District. The SSJID covers approximately 71,112 acres in San Joaquin County. The predominant land use in SSJID is agricultural with urban areas comprising approximately 10 percent of the total district area. Pursuant to the 1988 Agreement and Stipulation, SSJID is entitled to divert jointly with OID up to 600,000 acre-feet per year from the Stanislaus River. SSJID has rights to divert one-half of the total diversion, up to 300,000 acre-feet per year.

Diverted Stanislaus River surface water flows into the SSJID/OID Joint Main Canal at the Goodwin Dam and is channeled into Woodward Reservoir. The District releases water from Woodward Reservoir into a conveyance system of canals to provide irrigation water for agricultural customers. Unused surface water drains north to the French Camp Outlet Canal. A small portion of irrigation runoff drains south as surface water return flows to the Stanislaus River. The return flows to the Stanislaus River have been monitored for the last two years and total approximately 3,124 acre-feet and 3,906 acre-feet for the 1996 and 1997 irrigation seasons, respectively (OID/SSJID 1997).

SSJID has made significant improvements to its irrigation delivery system over the last 15 years. As a result, SSJID is able to meet existing agricultural needs using less water and devote the conserved water to other uses, including additional conjunctive use projects which recharge the groundwater basin in wetter water years. SSJID is currently designing additional changes to its delivery system in some portions of the district to better meet the needs of existing agricultural customers and to enable farmers who currently use groundwater for sprinkler and drip irrigation to use surface water. SSJID has agreed to build a domestic water treatment plant to address the needs of four cities in the area which currently rely largely on groundwater. SSJID, along with OID, has agreed to make available up to 30,000 acre-feet of water annually to Stockton East Water District and the City of Stockton to reduce groundwater pumping.

SSJID has, in recent years, sold water that is temporarily surplus to the District's needs as a result of water conservation. The District, along with OID, sold water to the Department of the Interior in 1994 and signed an agreement for a two year sale in 1997 and 1998. As part of the two year sale, SSJID sold 40,000 acre-feet in 1997 and 25,000 acre-feet in 1998 (OID/SSJID 1997).

After existing irrigation needs are met and after accounting for any sales of water, SSJID stores any additional water in the conservation account established by the 1988 Agreement and Stipulation with Reclamation. Water stored in the conservation account is reserved for SSJID's use in years of very low inflow to New Melones. SSJID is entitled to store up to 100,000 acre-feet in the conservation account, which is half of the amount available by the 1988 Agreement and Stipulation. By the terms of an agreement with OID, OID is entitled to the remaining portion of the conservation account. Water stored in the conservation account is lost to the extent of flood control releases by Reclamation.

Tuolumne River

Modesto Irrigation District and Turlock Irrigation District. Tuolumne River water has been used for irrigation in the Central Valley since the late 1890s, when MID/TID (the Districts) constructed storage and conveyance facilities. The water resources of the upper basin were developed for water supply by the City and County of San Francisco during the early decades of the 20th century. This and later development modified the natural flow regime of the Tuolumne River; on average, more than 60 percent of the annual flow has been diverted for agricultural or municipal and industrial use. The three reservoirs in the Hetch Hetchy System (not including storage in CCSF's Don Pedro Water Bank) can store up to 35 percent of the mean annual unimpaired flow of the river as measured below La Grange. New Don Pedro Reservoir, along with the two smaller district-specific storage reservoirs (Modesto Reservoir and Turlock Lake), can store up to 112 percent of the mean annual flow of the river (FERC 1996).

The New Don Pedro Project (NDPP) is owned and operated by the Districts and consists of the New Don Pedro Dam, Don Pedro Reservoir (New Don Pedro Lake), and the New Don Pedro Powerhouse. Diversions from the NDPP system as well as from La Grange Dam, the TID and MID diversion facilities at the La Grange Dam, the TID canal system, TID's Turlock Lake, the MID canal system, and MID's Modesto Reservoir currently supply water to agricultural users. TID has considered using diversion from the NDPP system to supply the city of Turlock for municipal and industrial supply purposes; MID recently began supplying Tuolumne River water to the city of Modesto in 1995. NDPP also provides flood control, hydropower production, reservoir-based recreation, and fish and wildlife conservation.

The New Don Pedro Dam is an earth and rockfill structure located at Tuolumne river mile 54.5. It has a crest length of 2,300 feet and a maximum height of 585 feet above the streambed. The dam was constructed in 1971 to replace the original Don Pedro Dam, which was located approximately 2 miles upstream. The New Don Pedro Reservoir has a gross capacity of 2,030,000 acre-feet and a net usable capacity for irrigation, flood control, and hydropower generation of 1,721,000 acre-feet (FERC 1996).

La Grange Dam is a diversion facility also owned and operated by the Districts and is located 2.3 miles downstream of New Don Pedro Dam. The dam is a 130-foot-high overflow structure built in 1893 and impounds approximately 500 acre-feet of water. The Turlock Main Canal and the Modesto Main Canal divert water from just above La Grange Dam into an extensive network of irrigation canals on both sides of the Tuolumne River, with TID's canals on the south and MID's on the north. Both irrigation districts have an intermediate storage reservoir at the upper end of their canal network to help regulate flows. Turlock Lake, on the south side of the Tuolumne River, has a capacity of 48,000 acre-feet. Modesto Reservoir, on the north side of the river, has a capacity of 28,000 acre-feet (FERC 1996).

The Hetch Hetchy System is owned and operated by City and County of San Francisco and is not part of the FERC licensed NDPP facilities. CCSF regulates the upper portion of the Tuolumne basin through the operation of its Hetch Hetchy System for municipal and industrial water supply and hydropower generation. Hetch Hetchy facilities include O'Shaughnessy Dam at the Hetch Hetchy Reservoir; the Hetch Hetchy Aqueduct; the Canyon Power Tunnel; the Kirkwood Powerhouse; the Early Intake Diversion Dam; and the Cherry Creek Power Development. Although CCSF has no authority over the operation of Don Pedro Reservoir, a portion of the storage in Don Pedro is allocated to CCSF through a water bank arrangement (FERC 1996). CCSF is not a willing seller under the proposed project.

Merced River

Merced Irrigation District. Flows in the Merced River are regulated primarily by four major facilities: New Exchequer Dam (Lake McClure), McSwain Reservoir and Powerplant, Merced Falls Dam and Crocker-Huffman Dam. The largest reservoir, Lake McClure, has a capacity of 1,024,000 acre-feet and is created by New Exchequer Dam. Merced ID owns and operates the reservoir for power, irrigation, recreation and flood control purposes. Water released from Lake McClure passes through a series of powerplants and smaller diversions before reaching the main diversion point. McSwain Reservoir, a part of Merced ID's Merced River Development Project, serves as an afterbay to New Exchequer Dam and Powerplant, re-regulating power generation releases to the Merced River. The capacity of McSwain Reservoir is 9,200 acre-feet (Merced ID 1977). Merced Falls Dam, from which diversions are made to Merced ID's Northside Canal, is owned and operated by PG&E. Downstream of Merced Falls Dam is the Crocker-Huffman Dam, from which diversions are made to Merced ID's Main Canal. On average, just over 50 percent of the annual streamflow in the Merced River below Merced Falls Dam is diverted to Merced ID's Main Canal (500,900 acre-feet per year between 1955 and 1980) (Merced ID 1997).