CHAPTER 2. EXISTING AND FUTURE CONDITIONS

EXISTING CONDITIONS

This chapter presents a general description of existing water resources facilities and conditions in the study area, and describes how they are expected to change in the foreseeable future. It is included to provide an understanding of existing water management operations that could be affected by the development of additional water supplies in the Upper San Joaquin River Basin.

The San Joaquin Valley is approximately 250 miles long, 30 to 60 miles across, and is bounded on the north by the Sacramento-San Joaquin Delta, on the south by the Tehachapi Mountains, on the east by the Sierra Nevada foothills, and on the west by the Coast Range (Figure 2-1). Irrigated agriculture has been the mainstay of the San Joaquin Valley economy since the first water diversions for irrigation began in the 1860s. Since that time, agriculture has developed to become a major economic contribution to both the State of California and the Nation. Three of the counties in the study area – Fresno, Kern, and Tulare – consistently rank among the Nation's top four counties in agricultural revenue. Exports of cotton, citrus, and produce also contribute substantially to the international market.

Hydrology

The San Joaquin River originates in the Sierra Nevada at an elevation over 10,000 feet and enters the San Joaquin Valley near Friant. Below Friant Dam, the river flows west to the center of the Valley, then turns sharply north at Mendota Pool and flows through the San Joaquin Valley to the Delta. Along the Valley floor, the San Joaquin River receives flow from the Merced, Tuolumne, and Stanislaus rivers as well as from smaller tributaries from the east and west sides of the Valley.

The California Data Exchange Center (CDEC) has estimates of unimpaired flow at four locations in the Upper San Joaquin River Basin. Since 1980, estimates of unimpaired flow are only provided at San Joaquin River below Friant Dam, where the annual average unimpaired runoff is about 1,800 TAF. As indicated on Table 2-1, annual runoff from the Upper San Joaquin River Basin (at Friant Dam) varies widely, ranging from a recorded low of about 362 TAF in 1977 to a recorded high of 4,642 TAF in 1983.

TABLE 2-1
SUMMARY OF RUNOFF IN THE UPPER SAN JOAQUIN RIVER BASIN

Station (CDEC ID)	Record Period	Annual Runoff (acre-feet)		
		Maximum	Average	Minimum
Big Creek below Huntington Lake (BHN)	2/1905 – 9/1980	297,800	110,640	14,363
San Joaquin South Fork near Florence (SFR)	10/1900 – 9/1980	248,864	652,500	71,306
San Joaquin River at Mammoth Pool (SJM)	10/1905 – 9/1980	2,964,120	1,323,776	307,870
San Joaquin River below Friant Dam (SJF)	10/1900 – present	4,641,880	1,830,331	361,550
Source: California Data Exchange Center (CDEC)				

FIGURE 2-1. STUDY AREA EMPHASIS

Surface Water Resources in the Study Area

The east side of the San Joaquin Valley includes numerous streams and rivers that drain the western slope of the Sierra Nevada Mountains into the Central Valley. During the past 50 years, water resources on all major rivers have been developed through the construction of dams and reservoirs for water supply, flood control, and hydropower generation purposes. Table 2-2 provides a summary of major reservoirs in the eastern San Joaquin Valley. With the exception of the San Joaquin River, the table lists only the largest water supply and flood control reservoir on each river.

The largest reservoir on the San Joaquin River is Millerton Lake, formed by Friant Dam. These facilities are part of the Friant Division of the Central Valley Project (CVP), and their operation significantly affect the flow in the San Joaquin River. Inflow to Millerton lake is influenced by the operation of several upstream hydopower generation projects. Dams and reservoir upstream of Millerton Lake are identified on Table 2-2 and shown in Figure 2-2.

Friant Division of the CVP

The Friant Division of the CVP provides water to over one million acres of irrigable land on the east side of the southern San Joaquin Valley, from near the Chowchilla River in the north to the Tehachapi Mountains in the south. The principal features of the Friant Division were completed in the 1940s, including Friant Dam and Millerton Lake located northeast of Fresno on the San Joaquin River; and the Madera and Friant-Kern canals, which convey water north and south to agricultural and urban water contractors. Figure 2-3 shows locations of water districts in the San Joaquin Valley.

Millerton Lake, the largest reservoir in the Upper San Joaquin River Basin has a storage capacity of 520,500 acre-feet and is operated to provide water supply to agricultural and urban areas in the eastern San Joaqun Valley and for flood control on the San Joaquin River. Minimum storage for canal diversion is about 130,000 acre-feet, resulting in active conservation storage of about 390,500 acre-feet.

During the flood season of October through March, up to 170,000 acre-feet of available storage space must be maintained for control of rain floods. Under present operating rules, up to 85,000 acre-feet of flood control requirement in Millerton Lake may be provided by an equal amount of space in Mammoth Pool (Figure 2-4).

The limited active conservation storage and the requirement for flood space reservation result in very little opportunity for carryover storage operations. Thus, Millerton Lake is operated as an annual reservoir with no specific provision for carryover storage. Annual water allocations and release schedules are developed with the intention of lowering reservoir storage to minimum levels by the end of September. In cases where demands are lower or inflow is greater than typical, end of year storage may be above minimum levels resulting in incidental carry over storage.

TABLE 2-2
RESERVOIRS ON THE EAST SIDE OF THE SAN JOAQUIN VALLEY

Reservoir Name	River or Creek	Owner	Storage (acre-feet)	Year	Operational Objectives				
					FC	WS	HP	RF	WQ
Reservoirs in the San Joaquin River Watershed									
Millerton Lake	San Joaquin River	USBR	520,500	1942	X	X			
Kerckhoff	San Joaquin River	PG&E	4,200	1920			X	X	
Redinger	San Joaquin River	SCE	35,000	1951			X	X	
Florence Lake	San Joaquin River South Fork	SCE	64,404	1926			X	X	
Huntington	Big Creek	SCE	88,834	1917			X	X	
Shaver	Stevenson Creek	SCE	135,283	1927			X	X	
Thomas Edison	Mono Creek	SCE	125,000	1954			X	X	
Mammoth Pool	San Joaquin River	SCE	123,000	1960			X	X	
Reservoirs in the Other San Joaquin Valley Watersheds									
New Melones	Stanislaus River	USBR	2,420,000	1978	X	X	X	X	X
Don Pedro	Toulumne River	MID/TID	2,030,000	1970	X	X	X	X	
Lake McClure	Merced River	MID	1,025,000	1967	X	X	X	X	
Eastman Lake	Chowchilla River	USACE	150,000	1975	X	X			
Hensley Lake	Fresno River	USACE	90,000	1975	X	X			
Pine Flat	Kings River	USACE	1,000,000	1954	X	X			
Kaweah[1]	Kaweah River	USACE	143,000	1962	X	X			
Success[1]	Tule River	USACE	82,300	1961	X	X			
Isabella	Kern River	USACE	568,000	1953	X	X			

[1] Enlargement of Kaweah and Success lakes has been authorized. Table reflects existing capacity

Owners

USBR	U.S. Bureau of Reclamation
USACE	U.S. Army Corps of Engineers
SCE	Southern California Edison
PG&E	Pacific Gas and Electric
MID/TID	Modesto Irrigation District and Turlock Irrigation District
MID	Merced Irrigation District

Operational Objectives

FC	Flood control – these reservoirs have dedicated flood control storage space
WS	Water supply for irrigation, domestic, municipal, and industrial uses
HP	Hydropower generation
RF	Downstream river instream flow requirements
WQ	Delta water quality

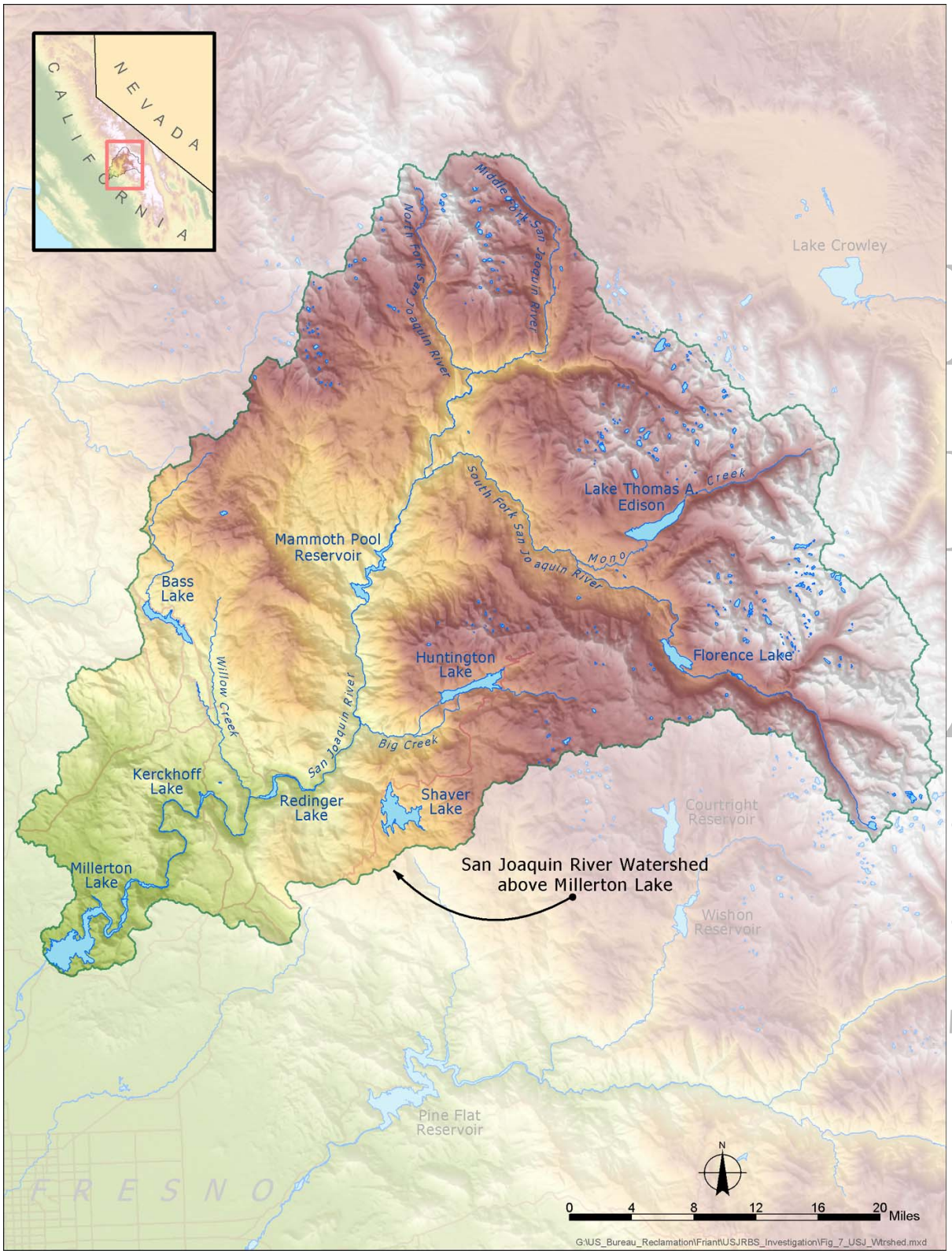

FIGURE 2-2. FACILITES UPSTREAM OF MILLERTON LAKE

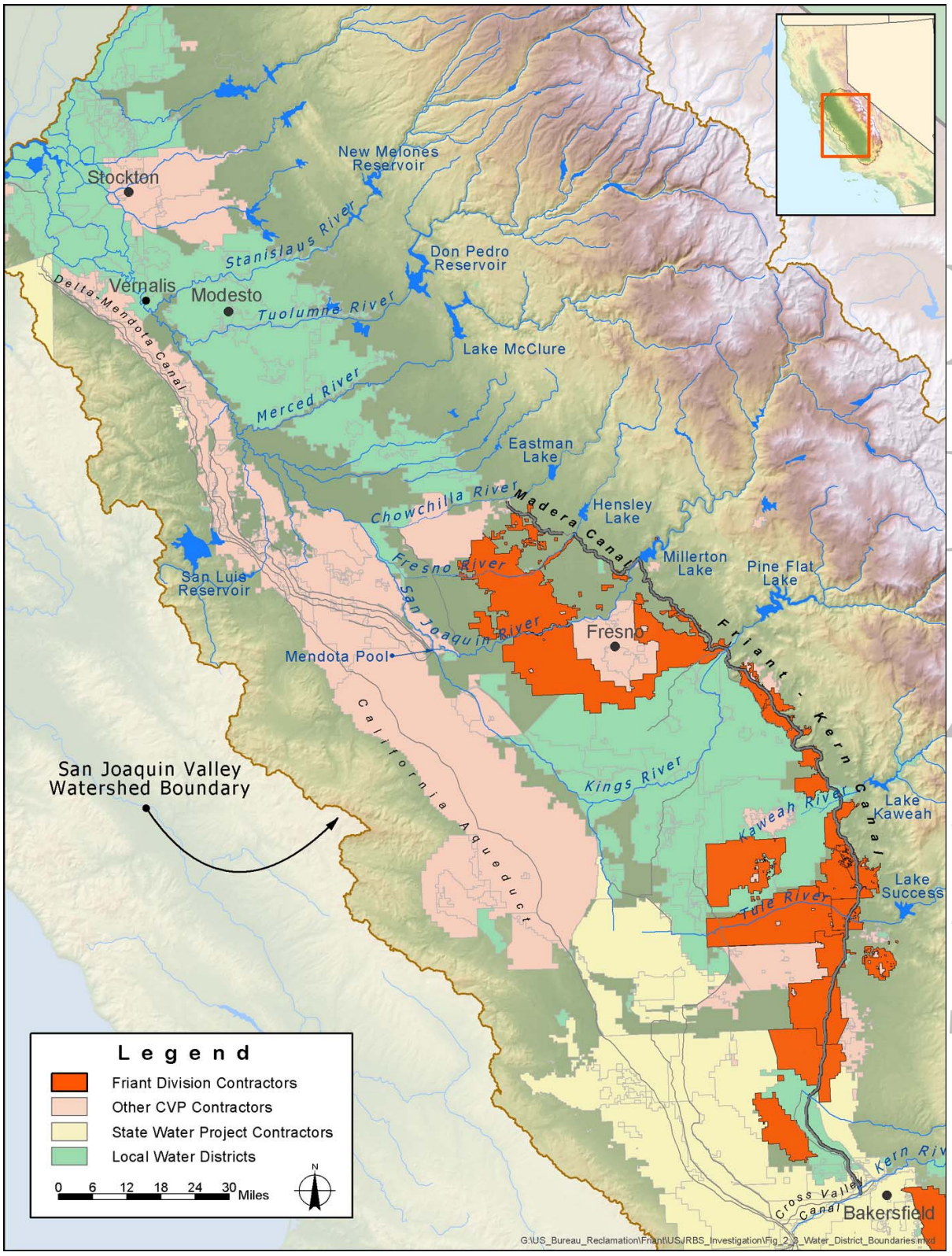

FIGURE 2-3. WATER DISTRICTS IN THE SAN JOAQUIN VALLEY

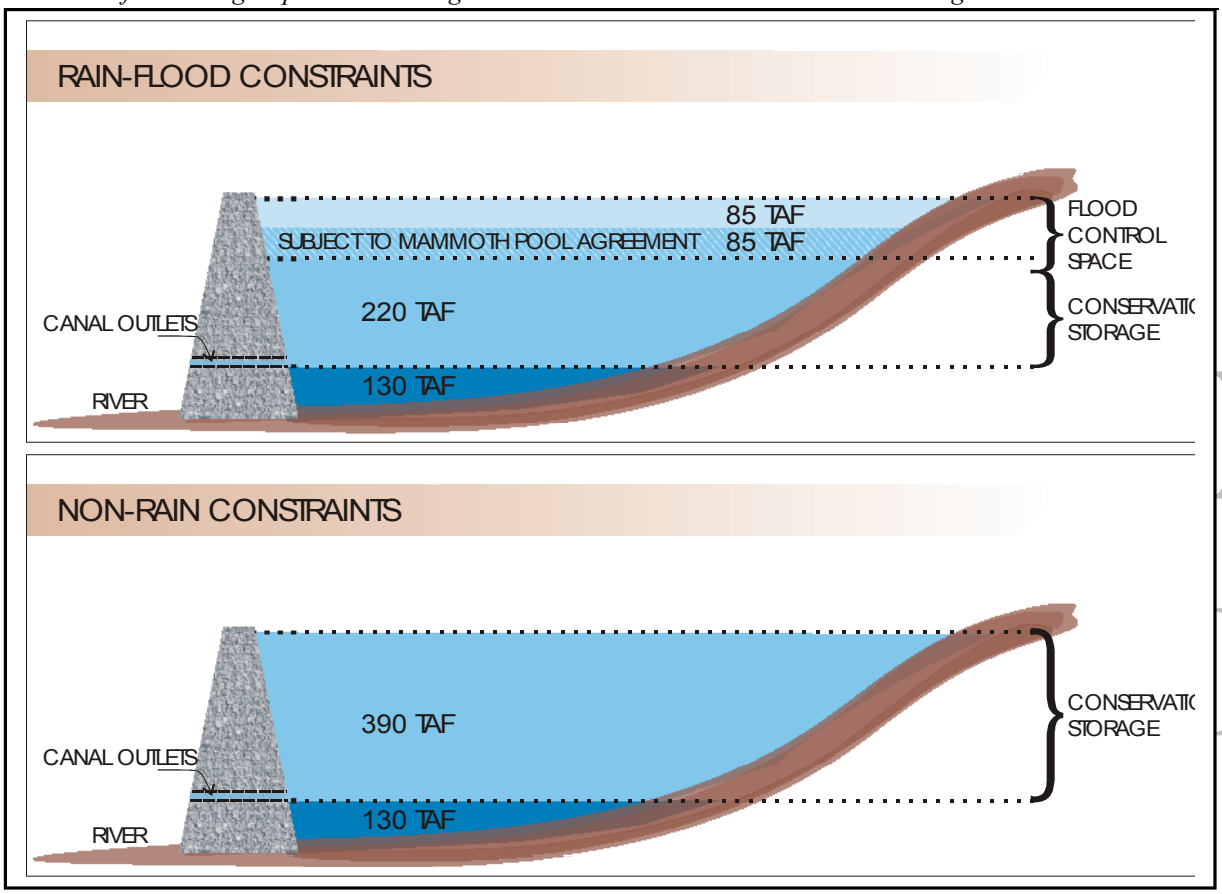

FIGURE 2-4. SCHEMATIC OF RESERVOIR STORAGE REQUIREMENTS

Reclamation obtained the majority of the water rights to the San Joaquin River allowing for the diversion of water at Friant Dam through purchase and exchange agreements with individuals and entities that held those rights at the time the project was developed. The largest of these agreements requires annual delivery of approximately 800,000 acre-feet of water to the Mendota Pool to serve water rights holders along the San Joaquin River. This obligation is met with water exported from the Delta via the Delta-Mendota Canal in accordance with in the San Joaquin River Exchange Contracts. If Delta water is not available to meet these commitments, Reclamation would be required to release water from Friant Dam to meet San Joaquin River water rights obligations. With the exception of flood control operations, water released from Friant Dam to the San Joaquin River is limited to that necessary to satisfy seepage losses and riparian water rights along the San Joaquin River between Friant Dam and the Gravelly Ford.

Friant Division Contract Types and Water Deliveries

The Friant Division was designed and is operated to support conjunctive water management in an area that was subject to groundwater overdraft prior to construction of Friant Dam and remains in a state of overdraft today. Reclamation employs a two-class system of water allocation to take advantage of water during wetter years. Friant Division contract amounts for each contractor are listed in Table 2-3.

Class 1 contracts, which are based on a firm water supply, are generally assigned to municipal and industrial (M&I) and agricultural water users that have limited access to good quality groundwater. These lands primarily include upslope areas planted in citrus or deciduous fruit. During project operations, the first 800,000 acre-feet of annual water supply is delivered under Class 1 contracts.

Class 2 water is used as a supplemental supply and is delivered directly for agricultural use or for groundwater recharge, generally in areas that experience groundwater overdraft. Class 2 contractors typically have access to good quality groundwater supplies and can continue to operate with recurrent deficiencies by using groundwater. Many Class 2 contractors are in areas with high groundwater recharge capability and operate dedicated groundwater recharge facilities. The location of water districts in the San Joaquin Valley, including Friant Division contractors, is shown in Figure 2-3.

In addition to Class 1 and Class 2 water deliveries, Reclamation is authorized to deliver water that would otherwise be released for flood control purposes. Section 215 of the Reclamation Reform Act of 1982 authorizes the delivery of unstorable irrigation water that would be released due to flood control criteria or unmanaged flood flows. The delivery of Section 215 water has enabled groundwater replenishment at levels higher than Class 1 and Class 2 contract deliveries would support in the southern San Joaquin Valley.

TABLE 2-3
HISTORICAL FRIANT ALLOCATIONS

Year	Class 1 Contract	Class 2 Contract
1957	100%	0%
1958	100%	0%
1959	100%	0%
1960	100%	0%
1961	75%	0%
1962	100%	62%
1963	100%	80%
1964	100%	12%
1965	100%	99%
1966	100%	23%
1967	100%	99%
1968	54%	0%
1969	100%	99%
1970	100%	29%
1971	100%	35%
1972	100%	40%
1973	100%	76%
1974	100%	81%
1975	100%	59%
1976	75%	0%
1977	25%	0%
1978	100%	99%
1979	100%	62%
1980	100%	98%
1981	100%	22%
1982	100%	98%
1983	100%	98%
1984	100%	49%
1985	100%	14%
1986	100%	93%
1987	91%	0%
1988	78%	0%
1989	98%	0%
1990	68%	0%
1991	100%	0%
1992	83%	0%
1993	100%	90%
1994	80%	0%
1995	75%	100%
1996	100%	55%
1997	100%	30%
1998	91%	10%
1999	100%	20%
2000	100%	17%
2001	100%	5%
2002	100%	8%

Source: Friant Water Users Authority

Historically, the Friant Division has delivered an average of about 1.3 million acre-feet of water annually. Releases from Friant Dam to the San Joaquin River for downstream riparian right holders and flood control purposes average about 530,000 acre-feet per year, however, this average annual amount is strongly influenced by large flood releases in a few years. The median annual release to the San Joaquin River from Friant Dam since 1949 has been about 129,000 acre-feet, which is slightly higher than approximately 117,000 acre-feet that required to meet downstream water right diversions above Gravelly Ford and account for seepage. The historical allocation of water to Friant Division contractors, expressed as a percentage of total amounts of Class 1 and Class 2 contracts (Table 2-4) varies widely in response to hydrologic conditions.

During the period from 1957 through 2001, annual allocations of Class 1 water typically have been at or above 75 percent of contract amount, except in three extremely dry years. In this same period, full allocation of Class 2 water supplies occurred in about one fourth of the years.

During the extended drought from 1987 through 1992, no Class 2 water was available and Class 1 allocations were below full contract amounts, except in one year. During this and other historical drought periods, water contractors relied heavily on groundwater to meet water demands.

In addition to the Class 1, Class 2, and conjunctive management aspects of the Friant Division operations, a very productive program of transfers between districts takes place annually. This program provides opportunities to improve water management within the Friant service area. In wet years, water that is surplus to one district's need can be transferred to other districts that have the ability to recharge groundwater. Conversely, in dry years, water is returned to those districts that have little or no groundwater supply, thereby providing an ongoing informal groundwater banking program within the Friant Division.

The Cross-Valley Canal, a locally-financed facility completed in 1975, enables delivery of water from the California Aqueduct to the east side of the southern San Joaquin Valley near the City of Bakersfield. A complex series of water purchase, transport, and exchange agreements allow for the exchange of equivalent amounts of water between Arvin-Edison Water Storage District (a long-term Friant contractor) and eight entities that hold CVP contracts for CVP water exported from the Delta.

When conditions permit, water can be is delivered to Arvin Edison from the California Aqueduct in exchange for water that would have been delivered from Millerton Lake. Through the exchange agreements, up to 128,300 acre-feet annually can be delivered to other Friant Division contractors.

TABLE 2-4
FRIANT DIVISION LONG-TERM CONTRACTS

CONTRACT TYPE/CONTRACTOR	Class 1	Class 2	Cross Valley Exchange
Friant-Kern Canal Agricultural			
Arvin-Edison WSD	40,000	311,675	
Delano-Earlimart	108,800	74,500	
Exeter ID	11,500	19,000	
Fresno ID		75,000	
Garfield WD	3,500		
International WD	1,200		
Ivanhoe ID	7,700	7,900	
Lewis Creek WD	1,450		
Lindmore ID	33,000	22,000	
Lindsay-Strathmore ID	27,500		
Lower Tule River ID	61,200	238,000	
Orange Cove ID	39,200		
Porterville ID	16,000	30,000	
Saucelito ID	21,200	32,800	
Shafter-Wasco ID	50,000	39,600	
Southern San Joaquin MUD	97,000	50,000	
Stone Corral ID	10,000		
Tea Pot Dome WD	7,500		
Terra Bella ID	29,000		
Tulare ID	30,000	141,000	
Sub-Total Friant-Kern Canal Agricultural	**595,750**	**1,041,475**	
Madera Canal Agricultural			
Chowchilla WD	55,000	160,000	
Madera ID	85,000	186,000	
Sub-Total Madera Canal Agricultural	**140,000**	**346,000**	
San Joaquin River Agricultural			
Gravelly Ford WD		14,000	
Total Friant Division Agricultural	**735,750**	**1,401,475**	
Friant Division M&I			
City of Fresno	60,000		
City of Orange Cove	1,400		
City of Lindsay	2,500		
Fresno County Water Works District No. 18	150		
Madera County	200		
Total Friant Division M&I	**64,250**		
Total Friant Division Contracts	**800,000**	**1,401,475**	
Cross Valley Canal Exchange Contracts			
Fresno County			3,000
Tulare County			5,308
Hills Valley I.D.			3,346
Kern-Tulare W.D.			40,000
Lower Tule River I.D.			31,102
Pixley I.D.			31,102
Rag Gulch W.D.			13,300
Tri-Valley W.D			1,142
Total Cross Valley Canal Exchange			**128,300**

Source: Friant Water Users Authority Informational Report

Facilities Upstream of Millerton Lake

Upstream of Millerton Lake, Pacific Gas & Electric (PG&E) and Southern California Edison (SCE) own and operate several dams and reservoirs for the primary purpose of hydropower generation. The operation of these facilities affects the flow of water into Millerton Lake and consequently affects the quantity and timing of available water for the Friant Division. The east side of the southern San Joaquin Valley also includes numerous other surface water reservoirs that were developed for flood control and water conservation and that deliver significant water supplies to the same general area as the Friant Division.

Groundwater Resources

The San Joaquin Valley Groundwater Basin is a structural trough up to 200 miles long and 70 miles filled with up to 32,000 feet of marine and continental sediments deposited during periodic inundation by the Pacific Ocean and erosion of surrounding mountains. Continental deposits form an alluvial wedge that thickens from the valley margins toward the axis of the structural trough, which is generally oriented along a north-south alignment.

Groundwater is a major source of agricultural and urban water supplies in the study area. The locations of groundwater basins underlying the San Joaquin Valley within the study area are shown in Figure 2-5. Typical groundwater production conditions for each sub-basin are listed in Table 2-5, based on information from DWR Bulletin 160-98. At a 1995 level of development, annual average groundwater overdraft is estimated at about 240,000 acre-feet per year in the San Joaquin River hydrologic region and at about 820,000 acre-feet per year in the Tulare Lake hydrologic region (Bulletin 160-98).

TABLE 2-5
PRODUCTION CONDITIONS IN SAN JOAQUIN VALLEY GROUNDWATER SUB-BASINS

Basin Number[1]	Basin Name	Extraction (TAF/year)	Well Yields (gpm)	Pumping Lifts (feet)
San Joaquin River Basin				
765	Modesto	230	1,000 – 2,000	90
776	Delta-Mendota	510	800 – 2,000	35 – 150
778	Turlock	450	1,000 – 2,000	90
784	Merced	560	1,500 – 1,900	110
795	Madera	570	750 – 2,000	160
796	Chowchilla	260	1,500 – 1,900	110
Tulare Lake Basin				
821	Kings	1,790	500 – 1,500	150
831	Westside	210	800 – 1,500	200 - 800
849	Kaweah	760	1,000 – 2,000	125 - 250
861	Tulare Lake	670	300 – 1,000	270
898	Tule	660	N/A	150 - 200
891	Pleasant Valley	100	N/A	350
1058	Kern	1,400	1,500 – 2,500	200 - 250

Source: California Department of Water Resources Bulletin 160-98.
Note: 1) Groundwater basin number as shown on Figure 2-5.

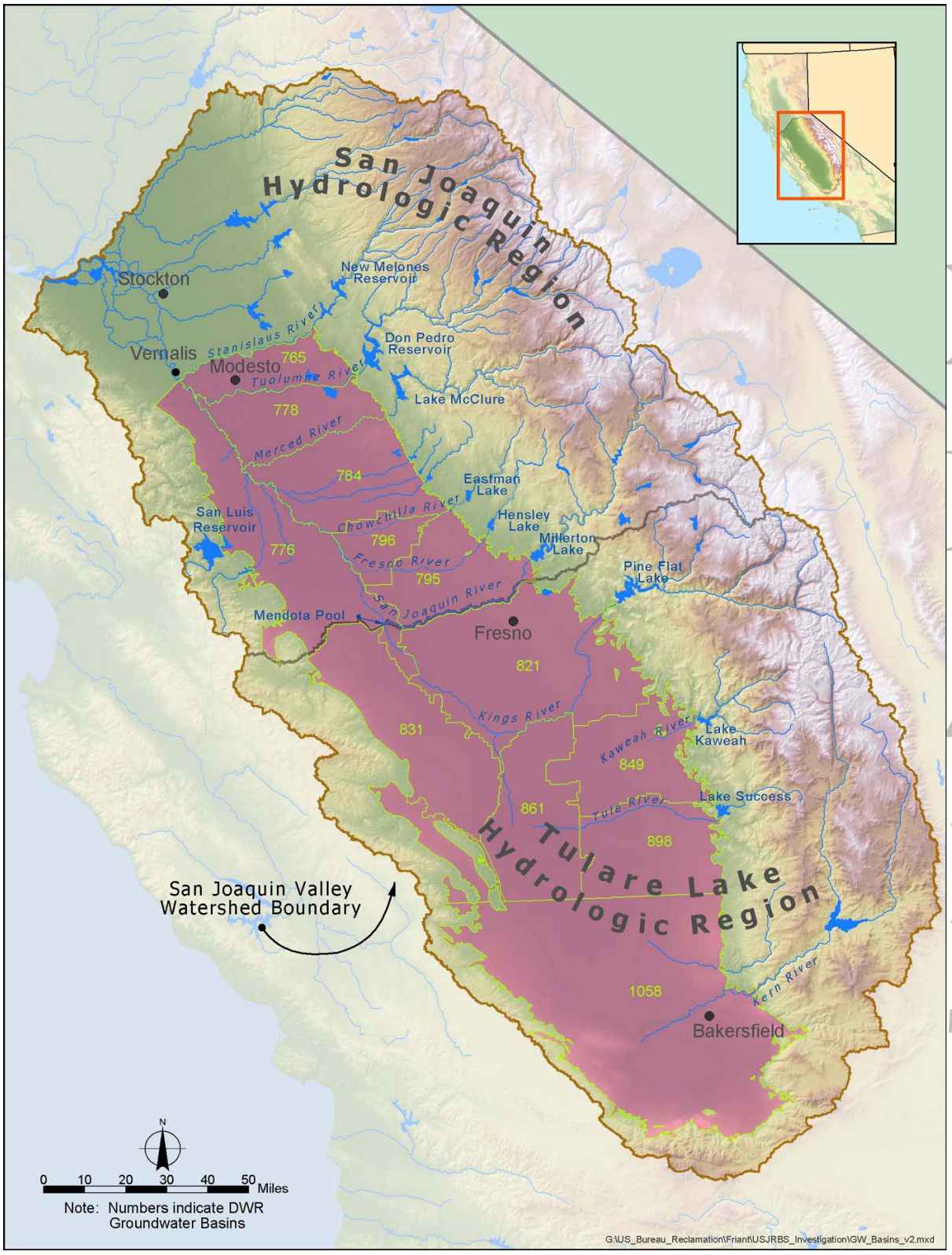

FIGURE 2-5. SAN JOAQUIN VALLEY GROUNDWATER SUB-BASINS IN THE STUDY AREA

FUTURE WITHOUT-PROJECT CONDITIONS

Water resources in the study area are not sufficient to meet the demands of current water uses. Local water users, CALFED, and numerous other entities have been considering potential projects and actions that would help meet current water needs, provide water for other purposes such as restoration of the San Joaquin River, and improve flood protection along the San Joaquin River. At this time, most of these initiatives are still under investigation and projects have not been sufficiently permitted, authorized, or funded to assure their completion and provide a basis for future planning.

The CALFED Program is developing a consistent set of assumptions regarding the definition of future without project conditions throughout the CALFED solution area. Those actions or projects that are foreseeable and certain during the planning time frame will be included in the future without-project condition. Assumptions regarding actions or projects that are foreseeable but not certain to be implemented during the planning time frame or the details of the implementation are not fully known at this time may also be considered for comparison purposes. Assumptions regarding such actions and projects may be included in an alternative alternate baseline for comparison or may be incorporated to project alternatives.

During the remainder of Phase 1, and during Phase 2 of the Investigation, assumptions regarding water demands, ecosystem needs, and other CALFED actions and projects will be further refined by CALFED agencies and project study teams. The following sections describe the approach that is under way in defining the future without project conditions for programs that could affect the availability and use of water in the Upper San Joaquin River Basin, including conjunctive management, demand management, and exchanges and transfers.

Conjunctive Management

The CALFED Program is preparing an inventory of potential locally-initiated conjunctive management projects based on information provided through grant and loan applications during the past few years. The inventory will identify those projects that would be developed independent of new surface storage. During Phase 2, the conceptual development of conjunctive management projects in the future without project condition will need to consider water sources, changes to existing project operations, conveyance needs, and effects on regional groundwater conditions.

Demand Management

The CALFED Program has made preliminary assumptions regarding actions that would be taken at the local level to reduce water demands or increase the use of existing supplies. Water conservation and recycling projects undertaken at the local would be developed to help reduce local water resources problems, such as water quality or groundwater overdraft, but would not result in a reduction in surface water demand. This assumption recognizes that surface water supplies are not adequate to meet current and future demands without an over-reliance on groundwater. Thus, demand management actions implemented consistent with the CALFED ROD would likely result in reduced groundwater pumping, but would not reduce demands for surface water from Friant Dam.

Exchanges and Transfers

Similar to the approach in developing assumptions regarding future conjunctive management, the CALFED Program will compile a list of potential exchanges and water transfers that could be implemented independent of new storage projects. This work is in the formative stage and as of this date, a list has not yet been developed. Criteria for determining which exchanges and transfers would be included in a future without-project condition have not been fully defined.