CHAPTER 5
SURFACE WATER SUPPLY AND MANAGEMENT

YCWA delivers surface water supplies from the Yuba Project to its Member Units in Yuba County, and also transfers water through additional storage releases or conjunctive use agreements for uses outside the county. Therefore, surface water supply and management actions associated with the alternatives considered in this EIR/EIS could affect local water supply reliability, revenues for local flood control and water supply projects, and water supply management and reliability for state and federal water contractors. This chapter focuses on the surface water supplies of the Yuba Project and use of these supplies within the project study area.

5.1 ENVIRONMENTAL SETTING/AFFECTED ENVIRONMENT

This section describes aspects of the environmental setting and affected environment relating to the supply and management of surface water that may be affected if the Proposed Project/Action or alternatives are implemented. The description of the potentially affected environment is divided into four regions: the Yuba Region, the CVP/SWP Upstream of the Delta Region, the Delta Region, and the Export Service Area.

5.1.1 YUBA REGION

The Yuba Region, which is one of the four regions that make up the project study area, is shown on Figure 2-2. It encompasses storage and hydropower facilities of the Yuba Project, the Yuba River downstream from New Bullards Bar Reservoir, the lower Yuba River downstream from Englebright Reservoir to the confluence with the Feather River, the YCWA Member Unit service areas, the local groundwater basins, and lands overlying the groundwater basins. The principle streams and facilities located in the Yuba Region are shown on **Figure 5-1.**

The Yuba Region is part of the larger Yuba River Basin that drains approximately 1,339 square miles (USGS 2004) of the western slope of the Sierra Nevada Mountains, including portions of Sierra, Placer, Yuba, and Nevada counties. The Yuba River is a tributary of the Feather River, which in turn is a tributary of the Sacramento River. The basin rises from an elevation of about 88 feet to about 8,590 feet above mean sea level (msl). The annual unimpaired flow at the Smartville Gage on the lower Yuba River has ranged from a high of 4.93 MAF in 1982 to a low of 0.37 MAF in 1977, with an average of about 2.37 MAF per year (1901 to 2005).[1] In general, runoff is nearly equally divided between runoff from rainfall during October through March and runoff from snowmelt during April through September.

The upper basins of the Middle Yuba and South Yuba rivers have been extensively developed for hydroelectric power generation and consumptive uses by Nevada Irrigation District (NID) and PG&E. Total storage capacity of about 307 TAF on the Middle Yuba and South Yuba rivers and associated diversion facilities enable both NID and PG&E to export an average of approximately 410 TAF per year from the Yuba River Basin to the Bear River and American River basins. In addition, the South Feather Water and Power Agency exports an average of

[1] The forecasted seasonal unimpaired flow at Smartville is estimated each year by DWR and reported monthly in Bulletin 120, *Water Conditions in California*. The unimpaired flow at Smartville controls YCWA contractual delivery obligations to senior water right holders on the lower Yuba River, and is used to calculate the Yuba River Index (YRI), defined in RD-1644, and the North Yuba Index (NYI), defined in the Yuba Accord Alternative.

about 70 TAF per year from Slate Creek (a tributary to the North Yuba River) to the Feather River Basin. While these upper basins lie outside of the project study area, the described operations can significantly reduce the water supply available to the lower Yuba River, particularly during dry and critical water years.

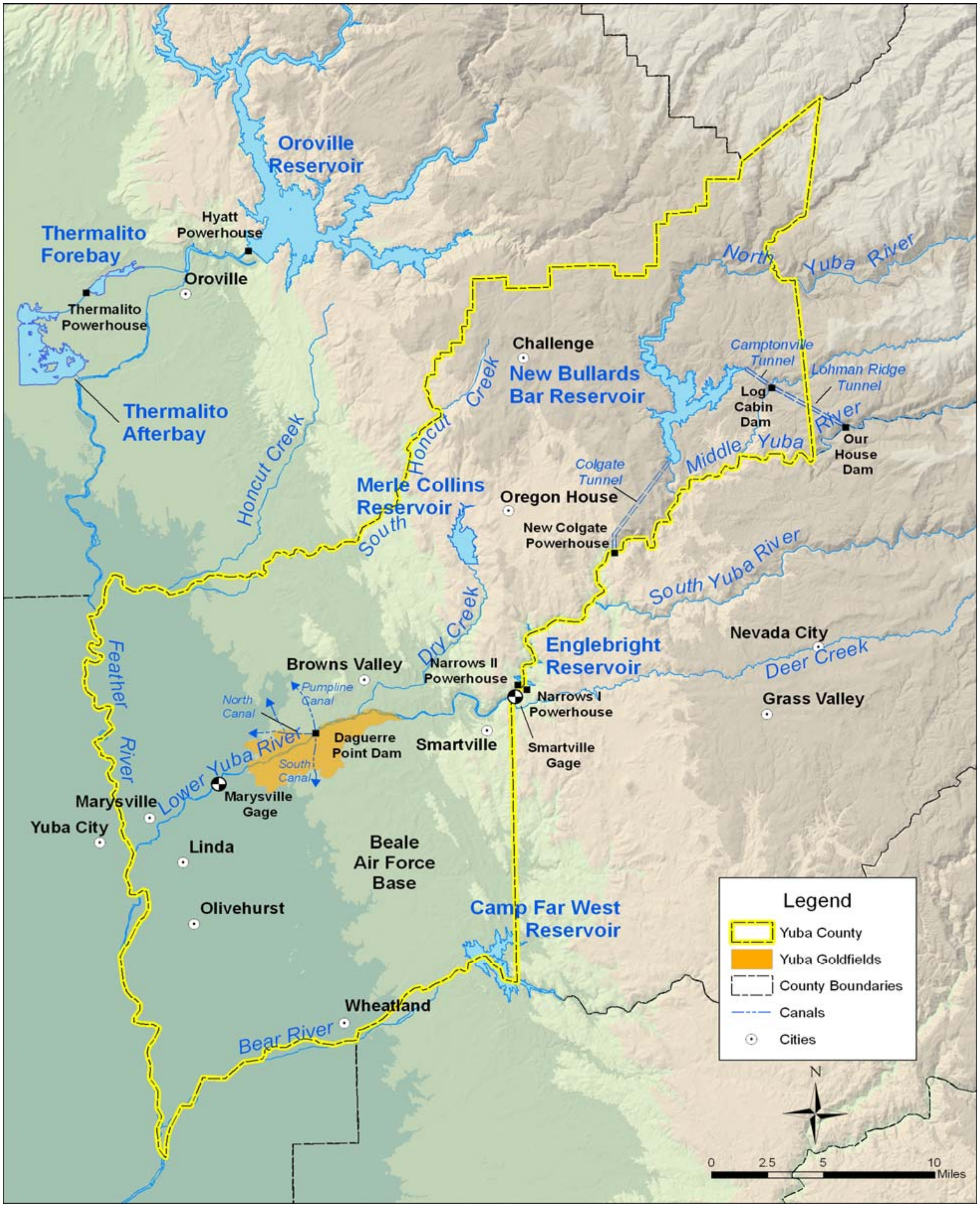

Figure 5-1. Yuba River Basin in Yuba County

The Corps and YCWA own storage facilities in the Yuba Region. Englebright Dam and Daguerre Point Dam were originally constructed by the California Debris Commission, a unit of the Corps, for debris control and now are operated and maintained by the Corps. The Yuba Project, constructed and operated by YCWA, is a multiple-use project that provides flood control, power generation, irrigation, recreation, and protection and enhancement of fish and wildlife. It includes New Bullards Bar Reservoir, New Colgate Powerhouse, and Narrows II Powerhouse. Englebright Dam and Reservoir and Daguerre Point Dam are not parts of the Yuba Project. However, Englebright Dam and Reservoir are used to regulate power peaking releases from the New Colgate Powerhouse, and Daguerre Point Dam is used by YCWA to divert water to its Member Units. The elements of the Yuba Project are described in more detail in the following subsections.

5.1.1.1 NEW BULLARDS BAR RESERVOIR

New Bullards Bar Reservoir, located on the North Yuba River, is the principal storage facility of the Yuba Project. The reservoir has a total storage capacity of 966 TAF with a minimum pool of 234 TAF (as required by YCWA's FERC license), thus leaving 732 TAF of capacity that can be regulated. A portion of this regulated capacity, 170 TAF, normally must be held empty from September through April for flood control.

The North Yuba River inflow to New Bullards Bar Reservoir is augmented by diversions from the Middle Yuba River to Oregon Creek through the Lohmann Ridge Tunnel, and by diversions from Oregon Creek into the reservoir through the Camptonville Tunnel. The average total inflow to New Bullards Bar Reservoir from the North Yuba River and diversions from the Middle Yuba River and Oregon Creek is about 1.2 MAF per year.[2] Releases from New Bullards Bar Reservoir are made through the New Colgate Powerhouse, which has a capacity of 3,700 cfs, or through the dam's bottom outlet, or gated spillway.

Operations of New Bullards Bar Reservoir can be described in terms of(1) water management operations (i.e., baseflow operations), (2) storm runoff operations, and (3) flood control operations.

Baseflow operations describe normal reservoir operations when system flows are controlled through storage regulation. These operations occur outside periods of flood control operations, spilling, bypassing uncontrolled flows into Englebright Reservoir, or outside periods of high unregulated inflows from tributary streams downstream from Englebright Dam.

Storm runoff operations occur during the storm season, typically between October and May. Storm runoff operations target Englebright Reservoir operations, because it is the downstream control point for releasing water into the lower Yuba River. Storm runoff operations guidelines for Englebright Reservoir specify target storage levels and release rates.

During flood control operations, the seasonal flood pool specified in the Corps flood operation manual for New Bullards Bar Reservoir is kept evacuated for flood protection, and to avoid unnecessary flood control releases. Reservoir releases may be required to maintain flood control space between September 15 and June 1.

[2] Based on model simulations of current facilities for the 1922 to 1994 period, and estimated historical inflows for the 1995 to 2005 period.

5.1.1.2 ENGLEBRIGHT RESERVOIR

Englebright Dam and Reservoir were constructed in 1941 to capture sediment produced by upstream hydraulic mining activities. The reservoir is situated downstream of New Bullards Bar Dam, at the confluence of the Middle and South Yuba rivers. The average annual inflow to Englebright Reservoir, excluding releases from New Bullards Bar Reservoir, is approximately 400 TAF. Englebright Reservoir has a total storage capacity of approximately 70 TAF, but provides limited conservation storage because the reservoir is used to attenuate power peaking releases from New Colgate Powerhouse.[3] Englebright Reservoir is used extensively for recreation.

Englebright Dam has no low-level outlet. Water from Englebright Reservoir is released for power generation at the Narrows I and Narrows II powerhouses, or spilled over the top of the dam. Narrows I Powerhouse, owned by PG&E, is a 12 MW facility, with a discharge capacity of approximately 730 cfs and a bypass flow capacity (when the generator is not operating) of 540 cfs. Narrows II, which is part of the Yuba Project, is a 50 MW facility, with a discharge capacity of approximately 3,400 cfs and a bypass flow capacity of 3,000 cfs. YCWA and PG&E coordinate the operations of Narrows I and II for hydropower efficiency and to maintain relatively constant flows in the lower Yuba River. The Narrows I Powerhouse typically is used for low-flow reservoir releases (less than 730 cfs), or to supplement the Narrows II Powerhouse capacity during high flow reservoir releases.

Annual maintenance requires the Narrows II Powerhouse to be shut down for a two- to three-week period, or longer if major maintenance is performed. Maintenance is typically scheduled for the beginning of September, or during the winter months. The recently completed Narrows II Bypass Project provides a 3,000 cfs bypass to Narrows II that can be used during maintenance and emergency shutdowns.

Under existing water rights and agreements, PG&E may release up to 45 TAF from Englebright Reservoir storage, although only about 10 TAF of storage normally are used. Fluctuations in Englebright Reservoir storage principally occur for daily or weekly regulation of winter inflows and New Colgate Powerhouse releases. Because of the recreational and power generation needs, the storage level within the reservoir seldom drops below 50 TAF.

5.1.1.3 LOWER YUBA RIVER

The lower Yuba River refers to the 24-mile section of the river between Englebright Dam and the confluence with the Feather River southwest of Marysville (Figure 5-1). Instream flow requirements are specified for the lower Yuba River at the Smartville Gage (RM 23.6), located approximately 2,000 feet downstream from Englebright Dam, and at the Marysville Gage (RM 6.2). Below the Smartville Gage, accretions, local inflow, and runoff contribute, on average, approximately 200 TAF per year to the lower Yuba River. Deer Creek flows into the Yuba River at approximately RM 22.7. Dry Creek flows into the Yuba River at RM 13.6, approximately two miles upstream of Daguerre Point Dam. The flow in Dry Creek is regulated by BVID's operation of Merle Collins Reservoir, located on Dry Creek about 8 miles upstream from its confluence with the Yuba River. In recent years, irrigation diversions from the lower Yuba River at Daguerre Point Dam and upstream at BVID's Pumpline diversion facility have totaled approximately 300 TAF per year.

[3] Bathymetric surveys performed by USGS in 2001 indicate a reduced storage of 52 TAF due to sedimentation.

5.1.1.4 YUBA COUNTY WATER AGENCY

YCWA was created by the Yuba County Water Agency Act (California Water Code Appendix, Sections 84-1 to 84-28). This act authorizes YCWA to develop and promote the beneficial use and regulation of the Yuba River water resources. The act provides for development of water conservation facilities, flood control, hydroelectric power generation, water supply, fisheries protection and enhancement, and related recreation.

YCWA releases water for power generation at the New Colgate Powerhouse and at the Narrows I and II powerhouses. Hydroelectric power is generated at these locations under YCWA's FERC license and eight water right licenses issued by the SWRCB.

YCWA is a major water right holder on the Yuba River. YCWA diverts water for consumptive uses under Permits 15026, 15027, and 15030. YCWA's permits authorize direct diversion up to a total rate of 1,593 cfs from the lower Yuba River from September 1 to June 30 for irrigation and other uses, and diversion of up to 1,250,000 AF from October 1 to June 30 to storage in New Bullards Bar Reservoir.

Various water districts, irrigation districts, and mutual water companies have contracts with YCWA for delivery of water. Some of the parties that receive water from YCWA also have their own appropriative rights for diversion of water from the Yuba River. Other agencies and districts providing surface water for irrigation in Yuba County include the North Yuba Water District, Camp Far West Irrigation District,[4] and Plumas Mutual Water Company.[5]

5.1.1.5 YUBA COUNTY WATER AGENCY MEMBER UNITS

Water diverted under YCWA's water right permits is delivered to BWD, BVID, CID, DCMWC, HIC, RWD, and SYWD. BVID receives water at the Pumpline Diversion Facility, located one mile upstream from Daguerre Point Dam. CID, HIC, and RWD receive water through the Hallwood-Cordua Canal (North Canal), located on the north abutment of Daguerre Point Dam. BWD, SYWD, and DCMWC receive water through the South Yuba Canal (South Canal), located on the south side of the Yuba River slightly upstream of the south abutment of Daguerre Point Dam. YCWA also delivers surface water to the City of Marysville for use at Lake Ellis. When the Wheatland Project is completed, YCWA will provide water to WWD in southern Yuba County through the South Canal. Contract allocations for each of the Member Units are summarized in **Table 5-1**.

BVID, CID, and HIC have water rights on the lower Yuba River. Under YCWA water right settlement contracts, CID and HIC receive surface water supplies as part of Yuba Project operations. However, dry year deficiency criteria under these contracts are different than the deficiency criteria in YCWA contracts with other Member Units. Provisions in YCWA water right settlement contracts preclude deficiencies in water-right settlement deliveries unless the DWR April forecast of unimpaired runoff (measured at the Smartville Gage) is less than 40 percent of average. No deficiencies in such deliveries may be imposed on BVID. Contract shortage provisions are presented in **Table 5-2**.

[4] Camp Far West Irrigation District diverts water from the Bear River below Camp Far West Reservoir.

[5] Plumas Mutual Water Company diverts water from the Feather River downstream of the confluence of the Yuba and Feather rivers.

Table 5-1. Yuba County Water Agency Annual Contract Amounts

Water Diversion Point and Member Units	Base Contract (AF)	Supplemental Contract (AF)	Total Contract (AF)	District Water Rights (AF)	Total Contract and Water Rights (AF)
Brown's Valley Irrigation District Pumpline Diversion Facility					
Browns Valley Irrigation District	9,500	-	9,500	24,462[b]	33,962
South Canal					
Brophy Water District	43,470	32,177	75,647	-	75,647
South Yuba Water District	25,487	18,843	44,330	-	44,330
Dry Creek Mutual Water Company	13,682	3,061	16,743	-	16,743
Wheatland Water District [a]	23,092	17,138	40,230	-	40,230
North Canal					
Cordua Irrigation District	12,000	-	12,000	60,000	72,000
Hallwood Irrigation Company	-	-		78,000	78,000
Ramirez Water District	14,790	10,311	25,101	-	25,101
Other					
City of Marysville	-	2,500	2,500	-	2,500
Total	**142,021**	**84,030**	**226,051**	**162,462**	**388,513**

[a] Includes both Phase 1 and Phase 2 of the Wheatland Project.
[b] As specified in RD-1664

YCWA contract allocations are based on the gross acreage served by each Member Unit. The maximum "Base Project Water" allocation is computed by multiplying 90 percent of the gross acreage by 2.87 AF per acre. The maximum "Supplemental Water Supply" is computed by multiplying 90 percent of the gross acreage by 2.13 AF per acre. For Member Units that have water rights senior to YCWA, their contract allocations are based on their water right amounts.

Table 5-2. Yuba County Water Agency Water Supply Contract Deficiency Provisions

Category	Unimpaired Runoff Forecast (f) [a]	Percentage of Settlement/ Contract Allocation Available
Pre-1914 Rights Settlements		
Cordua Irrigation District, Hallwood Irrigation Company	$f \geq 40\%$	100%
	$f < 40\%$	80%
Browns Valley Irrigation District	All	100%
YCWA Supply Contracts		
Base Project Water	$f > 85\%$	100%
	$50\% < f \leq 85\%$	85%
	$40\% \leq f \leq 50\%$	70%
	$f < 40\%$	50%
Supplemental Water	All forecasts	Determined annually by YCWA in its reasonable discretion considering forecasted runoff and operational conditions.

[a] April 1 DWR forecast of unimpaired Yuba River runoff near Smartville, in percentage of 50-year average.

BROPHY WATER DISTRICT

Since 1985, all water from the lower Yuba River used by BWD has been delivered through the South Canal under contract with YCWA. BWD's contract with YCWA provides for a Base Project Water allocation of 43,470 AF and a Supplemental Water allocation of 32,177 AF.

BROWNS VALLEY IRRIGATION DISTRICT

BVID holds a pre-1914 appropriative water right to divert up to 47.2 cfs of water year-round from the Yuba River for agricultural use. In addition, BVID holds post-1914 appropriative water rights on Dry Creek. These post-1914 appropriative rights allow for direct diversion and storage of water in Merle Collins Reservoir. BVID also has a contract with YCWA authorizing diversions of 9.5 TAF per year at its Pumpline diversion facility on the lower Yuba River to supplement BVID's diversions under its pre-1914 appropriative right when North Yuba River flows decrease below 47.2 cfs.

CORDUA IRRIGATION DISTRICT

CID holds a pre-1914 appropriative right to divert up to 75 cfs from the Yuba River for agricultural use, and 1940 and 1948 appropriative rights to divert an additional 90 cfs. CID also has a contract with YCWA for 12 TAF of Base Project Water. CID diverts all of its Yuba River water from Daguerre Point Dam through the North Canal.

DRY CREEK MUTUAL WATER COMPANY

DCMWC receives all surface water deliveries from the South Canal under contract with YCWA. DCMWC began receiving water from YCWA in 1998; prior to 1998, the only water available to DCMWC was groundwater. DCMWC's contract with YCWA provides for a Base Project Water allocation of 13,682 AF and a Supplemental Water allocation of 3,061 AF.

HALLWOOD IRRIGATION COMPANY

HIC has a pre-1914 appropriative right to divert 150 cfs from the Yuba River, and a 1940 appropriative right to divert 100 cfs from the Yuba River. In a settlement agreement with YCWA regarding its water right, HIC agreed to receive a Base Project water allocation of 78 TAF per year from YCWA from the North Canal at Daguerre Point Dam.

RAMIREZ WATER DISTRICT

RWD received water from CID from 1978 to 1992. Since 1992, RWD has received contract water from YCWA. RWD's contract with YCWA provides for a Base Project Water allocation of 14,790 AF and a Supplemental Water allocation of 10,311 AF. RWD receives water from the North Canal at Daguerre Point Dam.

SOUTH YUBA WATER DISTRICT

Areas of SYWD began receiving surface water from the South Canal in 1985 with an original contract amount of 33.9 TAF per year. Since 1992, SYWD has received all of its surface water deliveries from the South Canal under contract with YCWA. Since 1996, SYWD's contract with YCWA provides for a Base Project Water allocation of 25,487 AF and a Supplemental Water allocation of 18,843 AF.

WHEATLAND WATER DISTRICT

WWD currently relies on groundwater for irrigation water. However, the Wheatland Project will provide for the conveyance of water, diverted by YCWA at Daguerre Point Dam, to WWD through the existing South Canal. The project will be constructed in two phases. Phase 1, which is expected to begin construction in 2007, will provide for delivery of surface water to WWD and the immediate irrigation of approximately 7,750 acres of the approximately 9,200 acres to be served upon completion of both phases. Under Phase 1, WWD's contract with YCWA will provide for a total allocation (base and supplemental) of 23,092 AF per year. The completion of Phase 2 will provide WWD with a total of 40,230 AF per year.

5.1.1.6 SURFACE WATER DEMANDS

Agricultural diversion requirements for the YCWA service area have been estimated for current and future projected level of development conditions in Yuba County (YCWA 2000). The 12-month schedules of diversion requirements are based on crop acreages and applied crop water rates within the service area (as limited by contract allocations). The diversion requirements also account for fall flooding of rice fields for waterfowl habitat and rice straw decomposition. The current level of demands presented in **Table 5-3** is for water purveyors that have existing contracts with YCWA and developed distribution systems to convey Yuba River water to the purveyor's service area. The table also includes 400 AF per month for seepage losses from the lower Yuba River upstream of the Marysville Gage. The estimated post-2007 demands that include WWD are presented in **Table 5-4**.

Table 5-3. Irrigation Demand at Daguerre Point Dam, Current Level of Development (2006 through 2007)

Water Year Type (YRI)	Irrigation Demand (AF)												
	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Total
Wet	18,692	10,441	5,210	400	400	1,226	13,055	59,187	54,170	63,869	53,743	17,705	298,098
Above Normal	18,692	10,441	5,210	400	400	1,226	13,055	59,187	54,170	63,869	53,743	17,705	298,098
Below Normal	18,692	10,441	5,210	400	400	2,753	17,311	59,187	54,170	63,869	53,743	17,705	303,881
Dry	18,692	10,441	5,210	400	400	2,753	17,311	59,187	54,170	63,869	53,743	17,705	303,881
Critical	18,692	10,441	5,210	400	400	2,753	17,311	59,187	54,170	63,869	53,743	17,705	303,881
YRI – Yuba River Index													

Table 5-4. Irrigation Demand at Daguerre Point Dam, Projected Level of Full Development (2008 through 2025)

Water Year Type (YRI)	Irrigation Demand (AF)												
	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Total
Wet	20,543	10,717	5,338	400	400	2,191	17,625	65,600	62,174	72,780	60,519	20,201	338,488
Above Normal	20,543	10,717	5,338	400	400	2,191	17,625	65,600	62,174	72,780	60,519	20,201	338,488
Below Normal	20,543	10,717	5,338	400	400	3,835	22,230	65,600	62,174	72,780	60,519	20,201	344,736
Dry	20,543	10,717	5,338	400	400	3,835	22,230	65,600	62,174	72,780	60,519	20,201	344,736
Critical	20,543	10,717	5,338	400	400	3,835	22,230	65,600	62,174	72,780	60,519	20,201	344,736

The estimated demands have been refined to adjust for water year type classifications based on the Yuba River Index (YRI). This refinement reflects an estimated reduction of demand in wet and above normal years resulting from higher than normal soil moisture at the start of the irrigation season and reduced pre-irrigation water requirements. Water demands for grains, pastures, and orchards are reduced by 0.4 feet during March and April in these water year types.

Historical deliveries provided by YCWA to its Member Units since 1971 are presented in **Figure 5-2**. The current level of development demands also shown in Figure 5-2 do not include estimated demands for riparian diverters within the Dantoni Area, or demands for the City of

Marysville. Preliminary demand analyses indicate that opportunities for further water use efficiencies or water conservation measures within Yuba County currently are limited.[6] Water users in Yuba County already are implementing state-of-the-art water conservation practices, including drip-irrigation systems, laser leveling of fields, and water-reuse and recirculation systems. However, additional opportunities for conservation may improve over time as new technologies evolve.

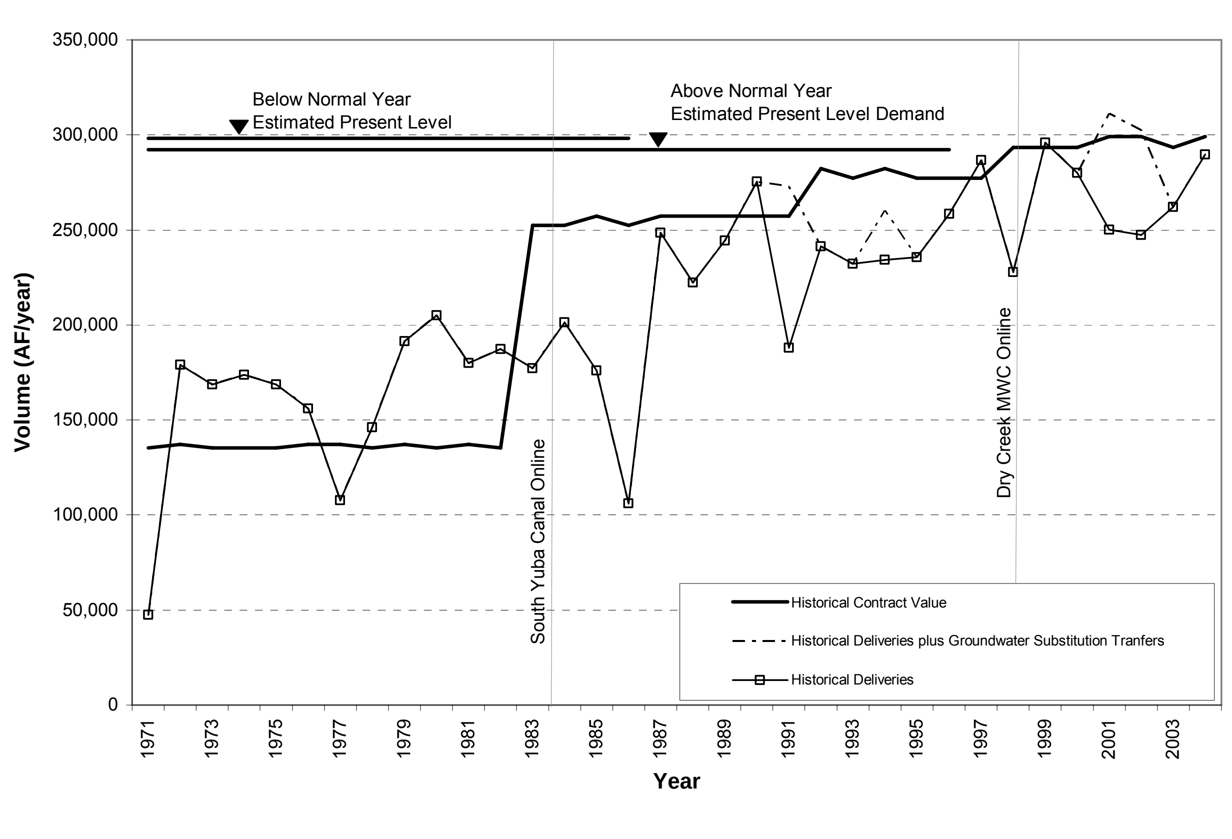

Figure 5-2. Historical Deliveries to YCWA Member Units

5.1.1.7 YUBA COUNTY WATER AGENCY WATER TRANSFERS

Water transfers are an important component of Yuba Project operations. In the 18 years between 1987 and 2004, YCWA transferred water in 12 years, averaging about 120 TAF in each transfer year. Details of individual transfers are presented in **Table 5-5**. Stored water transfers were made by YCWA from storage releases from New Bullards Bar Reservoir. Groundwater substitution transfers were made by YCWA in coordination with its Member Units.

STORED WATER TRANSFERS

Typically, individual one-year stored water transfers may occur when the projected end-of-September storage in New Bullards Bar Reservoir is sufficient for YCWA to ensure 100 percent deliveries to Member Units in the following year under a drought event with a 1-in-100-year

[6] Consideration of increased water conservation was included in development of the alternatives considered in this EIR/EIS; the Yuba Accord Alternative includes implementation of water use efficiency measures as an integrated element of the Conjunctive Use Agreements.

return period. In addition, for cross-Delta water transfers to service areas south of the Delta, the Delta must be in balanced water conditions[7] and available conveyance capacity must exist at Banks or Jones pumping plants. Stored water transfers have typically occurred from July through September.

Table 5-5. Yuba County Water Agency Historical Sales 1987 to 2004

Year	Water Year Type Sacramento Valley 40-30-30 Index	Buyer	Stored Water Transfer (AF)	Groundwater Substitution Transfer (AF)
1987	Dry	California Department of Water Resources	83,100	
1988	Critical	California Department of Water Resources	135,000	
1989	Dry	California Department of Water Resources	90,000	
		California Department of Water Resources for California Department of Fish and Game	110,000	
		City of Napa	7,000	
		East Bay Municipal Utility District	60,000[a]	
1990	Critical	City of Napa	6,700	
		California Department of Water Resources	109,000	
		Tudor Mutual Water Company/Feather Water District	2,951	
1991	Critical	State Water Bank	99,200[b]	84,840
		State Water Bank - California Department of Fish and Game	28,000	
		City of Napa	7,500	
1992	Critical	State Water Bank	30,000[c]	
1994	Critical	California Department of Water Resources		26,033
1997	Wet	Bureau of Reclamation for Refuge Water	25,000[d]	
		Sacramento Area Flood Control Agency for American River Fishery	48,857	
2001	Dry	Environmental Water Account	50,000[e]	
		California Department of Water Resources	52,912	61,140
2002	Dry	Environmental Water Account	79,742	55,248
		California Department of Water Resources	22,050	
		Contra Costa Water District	5,000	
2003	Above Normal	Environmental Water Account	65,000[f]	
		Contra Costa Water District	5,000	
2004	Below Normal	Environmental Water Account	100,000[g]	
		California Department of Water Resources	487	
2005	Above Normal	Environmental Water Account	6,086	
Total			**1,228,585**	**227,261**

[a] Sold but not delivered.
[b] In 1991, BVID transferred an additional 5.5 TAF to the State Water Bank through conservation.
[c] In 1992, BVID transferred an additional 5.5 TAF to the State Water Bank through conservation.
[d] In 1997, the transfer included 5 TAF from BVID.
[e] In 2001, BVID transferred an additional 4.5 TAF to DWR (stored water transfer) and 3.5 TAF to the EWA (groundwater substitution pumping).
[f] In 2003, BVID transferred an additional 3.1 TAF to SCVWD through conservation.
[g] In 2004, BVID transferred an additional 3.1 TAF to SCVWD through conservation.

GROUNDWATER SUBSTITUTION TRANSFERS

Groundwater substitution transfers are implemented through agreements between YCWA and its Member Units. Member Units forego parts of their surface water deliveries at Daguerre Point Dam; irrigation needs are met through additional groundwater pumping. Water not

[7] Balanced water conditions are periods when it is agreed that releases from upstream reservoirs plus unregulated flows approximately equal the water supply needed to meet Sacramento Valley in-basin uses plus required Delta outflows and exports (Reclamation and DWR 1986).

delivered at Daguerre Point Dam is temporarily stored in New Bullards Bar Reservoir, and subsequently released to meet transfer demand. Transfer water may also be pre-delivered from New Bullards Bar Reservoir, and replaced by groundwater substitution pumping later in the year.

The monthly pattern of recent historical groundwater substitution pumping, as measured at transfer wells, is presented in **Table 5-6**.

Table 5-6. Yuba County Water Agency Historical Groundwater Substitution Pumping

Member Unit	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
2001 Pumping Volumes (AF)										
Brophy Water District	-	-	-	-	-	-	-	-	-	-
Browns Valley Irrigation District	-	-	-	-	-	-	-	-	-	-
Cordua Irrigation District	-	1,606	2,887	2,935	2,965	1,293	2,314	-	-	14,000
Dry Creek Mutual Water	104	1,131	2,364	2,006	2,888	668	-	-	-	9,161
Hallwood Irrigation Company	492	1,879	2,075	2,618	2,056	900	1,999	-	-	12,020
Ramirez Water District	712	2,228	2,627	2,229	2,057	1,373	2,149	2,102	1,532	17,009
South Yuba Water District	91	2,758	2,955	3,196	-	996	-	-	-	9,996
Subtotal	*1,398*	*9,602*	*12,909*	*12,983*	*9,967*	*5,229*	*6,463*	*2,102*	*1,532*	*62,184*
2002 Pumping Volumes [a] (AF)										
Brophy Water District		187	1,350	4,965	2,938	411	1,440	-	-	11,292
Browns Valley Irrigation District	-	349	307	739	832	810	868	992	-	4,897
Cordua Irrigation District	-	957	1,927	3,912	-	2,325	938	-	-	10,059
Dry Creek Mutual Water	-	747	562	1,971	1,632	964	-	-	-	5,876
Hallwood Irrigation Company	-	728	947	2,884	2,029	794	-	-	-	7,382
Ramirez Water District	-	615	1,345	2,926	1,257	717	1,952	-	-	8,812
South Yuba Water District	-	434	-	5,919	1,676	-	739	-	-	8,767
Subtotal	-	*4,017*	*6,438*	*23,316*	*10,364*	*6,021*	*5,937*	*992*	-	*57,084*
2001 Pumping Volumes + 2002 Pumping Volumes										
Monthly Volume (AF)	1,398	13,619	19,347	36,299	20,330	11,250	12,400	3,094	1,532	119,268
Monthly Distribution (%)	1%	11%	16%	30%	17%	9%	10%	3%	1%	100%

[a] Includes 1,826 AF of excess groundwater pumping.

The start of groundwater substitution pumping is dictated by New Bullards Bar Reservoir operations. Water can be backed up in storage under base flow operations when releases from New Bullards Bar Dam are not controlled by minimum flow requirements at the Smartville Gage. Groundwater substitution pumping ceases once the transfer volume has been achieved, or at the onset of flood control operations for New Bullards Bar Reservoir or storm runoff operations.

The total groundwater substitution transfer capacity of YCWA Member Units is the groundwater volume that can be pumped to substitute for surface water deliveries forgone by willing participants using existing wells. A 2005 survey (YCWA and MWH unpublished data) estimated available pumping capacity for YCWA Member Units, not including WWD, at approximately 98 TAF. Of that volume, 77.5 TAF is from electric-powered wells, and 21.5 TAF from diesel-powered wells. About 60 percent of the groundwater pumping capacity is available from Member Units north of the lower Yuba River, while the remaining 40 percent is from Member Units south of the lower Yuba River.

RELEASED TRANSFER WATER

The historical monthly pattern of released transfer water for the 2001, 2002, and 2003 transfers is summarized in **Table 5-7**. Because of Delta export limitations, the preferred transfer period is from July 1 to September 30[8]. As part of a water transfer program, YCWA may make available supplemental fisheries flows, typically in May and June, for flow stability.

Table 5-7. Monthly Pattern of Historical Water Transfers

Year	Transfer Volume (AF)						
	May	Jun	Jul	Aug	Sep	Oct	Total
2001	-	-	77,623	71,690	19,239	-	168,552 [a]
2002	-	23,872	72,452	58,864	6,910	-	162,098
2003	-	-	20,886	34,384	14,937	-	70,207
Total (AF)	-	23,872	170,961	164,938	41,086	-	400,857
Total (%)	-	6%	43%	41%	10%	-	100%

[a] Includes a 4.5 TAF BVID transfer to DWR.

5.1.2 CVP/SWP Upstream of the Delta Region

The area of analysis for the surface water resources impact assessment includes streams, water bodies, and facilities that could be affected by changes in Yuba River outflow to the Feather River, and the transfer of Yuba River water across the Delta for export at Banks and Jones pumping plants. Water bodies and facilities identified as part of the CVP/SWP Upstream of the Delta Region that are addressed in the surface water supply impact assessment include: (1) the SWP Oroville-Thermalito Complex and the Feather River downstream of Oroville Reservoir; and (2) the Sacramento River downstream of its confluence with the Feather River.

The Oroville-Thermalito Complex is included in the CVP/SWP Upstream of the Delta Region because Oroville Dam and Reservoir could be used to reregulate released transfer water from the lower Yuba River. Releases from Oroville Dam also may need to be adjusted to maintain minimum flows in the lower Feather River and water supplies to Feather River water right holders.

CVP divisions upstream of the Delta include the Shasta, Sacramento River, and American River divisions. The CVP Shasta Division includes Shasta Dam, Reservoir and Power Plant, and Keswick Dam, Reservoir and Power Plant. The CVP American River Division includes Folsom Dam, Reservoir, and Power Plant; Nimbus Dam; Lake Natoma; Nimbus Power Plant; and the Folsom South Canal. As described in Chapter 4, Reclamation does not anticipate modifying Shasta Reservoir, Shasta Dam, or upper Sacramento River operations as a result of the Proposed Project/Action and alternatives. Similarly, Reclamation does not anticipate modifying Folsom Reservoir, Folsom Dam, or lower American River operations as a result of the Proposed Project/Action and alternatives. Therefore, Shasta Reservoir and the Upper Sacramento River, Folsom Reservoir, and the lower American River are not included in the study area.

CVP and SWP facilities and operations span three of the four study regions: the Upstream of the Delta Region, the Delta Region, and the Export Service Area. The CVP and SWP are described in the sections below.

5.1.2.1 Central Valley Project

The CVP, constructed by the federal government and managed by Reclamation, is the largest surface water storage and delivery system in California, with a geographic scope covering 35 of

[8] For the months of July, August, and September, the EWA Program has historically had 500 cfs of dedicated diversion capacity at the Banks Pumping Plant. EWA Program actions and CVPIA (b)(2) actions restrict pumping at Banks and Jones pumping plants in April, May, and June. During these months, the maximum allowable E/I ratio is 0.35. Pumping capacity under the JPOD may be limited in October due to water quality concerns in the Delta.

the state's 58 counties. The CVP initially received federal authorization through the Rivers and Harbors Act of 1935, and construction began in the late 1930s. Since then, several reauthorizations have directed Reclamation to operate the CVP to meet various goals (Reclamation and DWR 2005). For example, the amended Rivers and Harbors Act of 1937 provided that dams and reservoirs of the CVP "…*shall be used, first, for river regulation, improvement of navigation, and flood control; second, for irrigation and domestic uses; and, third, for power*." In 1992, CVPIA Section 3406(b)(2) reauthorized the 1937 Act and amended CVP authorizations (Section 3406(a)) to include fish and wildlife mitigation, protection, and restoration as purposes equal in priority to irrigation and domestic uses, and fish and wildlife enhancement as a purpose equal in priority to power generation.

The CVP includes 20 dams and reservoirs, with a combined storage capacity of approximately 11 MAF; 11 power plants, of which two are pump-generating plants; and approximately 500 miles of major canals and aqueducts. The CVP has nine divisions; only the Delta Division and West San Joaquin Division are located within the study area. There are no CVP facilities in the Upstream of the Delta Region.

Reclamation supplies CVP water to more than 250 long-term water contractors in the Central Valley, Santa Clara Valley, and San Francisco Bay area (Reclamation 2004). Collectively, the maximum total annual amounts of these contracts exceed 9 MAF. Contract allocations vary from year to year depending on hydrologic conditions. The maximum annual CVP contract amounts, excluding the Friant Division, which is not part of the study area, are summarized in **Table 5-8**.

Table 5-8. Summary of Central Valley Project Maximum Annual Contract Amounts

	Maximum Contract Amount (MAF)	
	Upstream of the Delta	**Export Service Area**
Settlement/Exchange Contractors		
	2.3	0.9
Water Service Contracts		
Agriculture	0.4	2.0
Municipal and Industrial	0.5	0.2
Refuges (Level 2)	0.2	0.3
Total CVP Contract Amounts	**3.4**	**3.5**

Historically, approximately 90 percent of CVP water has been delivered to agricultural users, including senior water right holders. However, increasing quantities of water are being provided to municipal customers, including the cities of Redding, Sacramento, Tracy, Folsom, and Fresno; parts of Santa Clara County; and the northeastern portion of Contra Costa County.

5.1.2.2 State Water Project

The SWP, operated by DWR, is the largest state-built, multipurpose water project in the country. The SWP delivers water for municipal and agricultural purposes, provides flood control, generates power, provides recreational opportunities, and is operated to enhance habitats for fish and wildlife. SWP facilities include 28 dams and reservoirs, 26 pumping and hydroelectric power plants, and approximately 660 miles of aqueducts. The SWP provides water to 29 long-term contractors in Northern California, the San Joaquin Valley, the San Francisco Bay area, the Central Coast, and Southern California. In these areas, the SWP provides water to an estimated population of more than 23 million people and approximately 755,000 acres of irrigated farmland (DWR Website 2006).

Within the SWP, there are five divisions: (1) Oroville; (2) Delta; (3) San Luis; (4) San Joaquin; and (5) Southern Field. Each division contains water control facilities that may include dams, pumping plants, canals, power plants, lakes, and reservoirs. For the purposes of this EIR/EIS, the SWP facilities of primary focus are the Oroville-Thermalito complex on the Feather River, the Harvey O. Banks Pumping Plant in the south Delta, the California Aqueduct, and the San Luis Reservoir, which is a joint federal-state facility.

In the Feather River Basin, SWP water is provided to three water agencies with service areas in Plumas, Butte, and Sutter counties. In addition to meeting in-basin demands, water released from Oroville Reservoir contributes, in part, to maintaining Delta water quality and meeting SWP export demands. The SWP exports water from the Delta at the Banks and North Bay Aqueduct pumping plants. Water pumped through the North Bay Aqueduct at Barker Slough is delivered to two SWP contractors serving portions of Solano and Napa counties. Water diverted into Clifton Court Forebay is pumped into the California Aqueduct at Banks Pumping Plant and flows to Bethany Reservoir, 1.5 miles downstream. At Bethany Reservoir, the South Bay Pumping Station lifts some of the water into the South Bay Aqueduct for delivery to three SWP contractors in Alameda and Santa Clara counties. The remainder of the water flows south in the California Aqueduct to service areas in Kings, Kern, Tulare, San Bernardino, Riverside, Los Angeles, Ventura, Orange, San Diego, and Imperial counties. Water also is delivered to service areas in San Luis Obispo and Santa Barbara counties through the Coastal Branch of the California Aqueduct.

OROVILLE DAM AND RESERVOIR

Oroville Dam and Reservoir was completed in 1968 and is the largest SWP storage facility with a capacity of approximately 3.5 MAF. Associated facilities include the Feather River Fish Hatchery ladder, raceway, and barrier; the Thermalito Forebay and Afterbay; and the Thermalito and Hyatt powerhouses, which allow power generation and pumped-storage operations between the Afterbay and Forebay, and the Forebay and Oroville Reservoir, respectively. The average annual inflow to Oroville Reservoir is about 4 MAF. Releases from Oroville Dam flow into the Thermalito Reservoir Complex, which provides storage for pumped-storage operations at the Hyatt Power Plant and diversions to meet water rights held by Feather River water districts. A release of 600 cfs is made to the Feather River in all months to provide spawning and attracting flows for the Feather River hatchery.

FEATHER RIVER SERVICE AREA

Construction of SWP facilities on the Feather River altered the amount and timing of downstream flows. DWR has signed water right settlement agreements with water right holders who hold riparian or senior appropriative rights to the Feather River. The SWP currently delivers water to 10 non-project agencies (known as the Feather River Service Area) that have water rights to the Feather River. These agencies are Last Chance Creek Water District; Thermalito Irrigation District; South Feather Water and Power Agency (formerly Oroville-Wyandotte Irrigation District); Western Canal Water District; Joint Water Districts Board (including Biggs-West Gridley Water District; Butte Water District; Richvale Irrigation District; and Sutter Extension Water District); Oswald Water District; Tudor Mutual Water Company; Garden Highway Mutual Water Company; Plumas Mutual Water Company; and the Dana Brothers. In addition, the SWP delivers water to the Feather Water District, which is a CVP contractor.

5.1.3 DELTA REGION

The Delta and Suisun Marsh are located where California's two major river systems, the Sacramento and the San Joaquin rivers, converge to flow westward through Suisun, San Pablo, and San Francisco bays. The Delta was formally defined in the Delta Protection Act of 1959 (California Water Code Section 12220). The legal Delta encompasses an area of approximately 851,000 acres (of which approximately 135,000 acres consist of waterway, marshland, or other water surfaces) bordered by the cities of Sacramento, Stockton, Tracy, and Pittsburg.

The Delta has been reclaimed into more than 60 islands and tracts, interlaced with about 700 miles of waterways. About 520,000 acres are devoted to farming. An approximate 1,100-mile network of levees protects the reclaimed land, most of which lies near or below sea level, from flooding. Some of the island interiors are as much as 25 feet below sea level (SWRCB 1999). Water flowing into the Delta is used for urban and agricultural use, recreation, navigation, and wildlife and fisheries. The Delta provides drinking water for about 23 million Californians.

5.1.3.1 DELTA HYDRAULICS

Water movement in the Delta responds to four primary forcing mechanisms: (1) freshwater inflows, (2) Delta exports and diversions, (3) operation of water control facilities such as flow barriers, and (4) tidal movement of brackish water into and out of the Delta. Other meteorological factors, such as wind and barometric pressure, may at times, also affect Delta water levels. In addition, tidal and salinity behavior within the Delta generate a number of secondary currents, which while of low velocity, are of considerable significance with respect to transporting contaminants and mixing different sources of water.

DELTA INFLOW

On average, about 21 MAF of freshwater flows into the Delta annually. The Sacramento River, combined with flood flows in the Yolo Bypass, accounts for about 80 percent of this freshwater inflow. Inflow from the San Joaquin River accounts for 15 percent, with the balance of 5 percent flowing from the eastside tributaries, namely the Mokelumne, Calaveras, and Cosumnes rivers (Delta Protection Commission 2000). Freshwater inflow varies widely from year to year and within each year. For example, in 1977, Delta inflow totaled only 5.9 MAF, while inflow in 1983, an exceptionally wet year, was about 70 MAF. On a seasonal basis, average natural flow to the Delta varies by a factor of more than 10 between the highest flows in the winter or spring and the lowest flows in the fall.

DELTA DIVERSIONS AND EXPORTS

The combined export of water by the CVP and SWP at Clifton Court Forebay, the Jones Pumping Plant, and the North Bay Aqueduct, on average, represents about 30 percent of the Delta inflow. Local agencies, such as CCWD, private entities, and agricultural users divert an additional 10 percent of the Delta inflow. There are an estimated 1,800 agricultural diversions in the Delta. Delta farmers divert water directly from Delta channels for both irrigation and leaching. During the summer, when irrigation of Delta farmland is at a peak, net diversions for Delta farms may exceed 4,000 cfs. This is similar in magnitude to CVP exports from the Delta in summer. Additional major diversion facilities within the legal boundary of the Delta are proposed by CCWD (the Alternative Intake Project), by the City of Stockton (Stockton Delta Water Supply Project), and by the FRWA (Freeport Regional Water Project).

Delta diversions and exports reduce Delta outflow and can impact Delta water quality and water levels in the south Delta. When the CVP and SWP exports are high, water levels in local channels are sometimes drawn down, causing problems for landowners that divert from these channels. Sediment build-up in the channels also presents problems for water diversions. DWR provides portable pumps to resolve diversion issues in areas not helped by the barriers, and contracts dredging at times to improve circulation in these channels.

DELTA BARRIERS

DWR first began installing temporary rock barriers in south Delta channels in 1987. The South Delta Temporary Barriers Project now consists of four rock barriers: a barrier at the Head of Old River to keep migrating fish in the San Joaquin River, and three agricultural barriers that are installed between April and September each year. The three agricultural barriers, located at Old River near Tracy, in Middle River, and in Grant Line Canal, are intended to increase water levels, circulation patterns, and water quality in the south Delta area for local irrigation diversions.

DWR has been studying installation of permanent operational or operable gates since the 1980s. A permanent operable gate at the Head of Old River would be open most of the year and closed to keep young salmon in the San Joaquin River as they outmigrate to the ocean in the spring. The permanent operational gates would also be closed in the fall to keep adult salmon in the San Joaquin River as they migrate upstream. Three permanent agricultural gates would be operated year-round to meet water level, water quality, and water supply needs. The Draft EIS/EIR for the SDIP, which includes operation of the four proposed permanent gates, was released in October 2005, and the Final EIS/EIR was released in December 2006.

DELTA OUTFLOW

Delta outflow is the primary factor controlling water quality in the Delta. Freshwater flows provide a barrier against seawater intrusion, and can be strategically managed through SWP and CVP facility operations. When Delta outflow is low, brackish water can intrude further into the Delta, impacting salinity and bromide concentrations at drinking water intakes. Average winter (December through March) outflow is about 36,000 cfs, while average summer (June through September) outflow is about 7,000 cfs. During above normal water years, average winter outflow is about 46,000 cfs, while average summer outflow is about 7,000 cfs. During below normal water years, average winter outflow is about 25,000 cfs, while average summer outflow is about 6,000 cfs. During dry and critical water years, average winter outflow ranges from about 9,000 to 17,000 cfs, while average summer outflow ranges from about 4,000 to 5,000 cfs. About 20 percent of the Delta inflow is required for salinity control, and an additional 40 percent of inflow flows out to San Francisco Bay in excess of the minimum requirements specified in the 1995 WQCP (CALFED 2000).

5.1.3.2 CVP FACILITIES AND OPERATIONS

The CVP Delta Division facilities include the Delta Cross Channel, the Contra Costa Canal, the Jones Pumping Plant and associated fish collection facility, and the Delta-Mendota Canal.

The Delta Cross Channel is a gated diversion channel off the Sacramento River near Walnut Grove. When the gates are open, water flows from the Sacramento River through the Delta Cross Channel to the lower Mokelumne River and San Joaquin River. The Delta Cross Channel is operated to improve water quality in the interior and southern Delta and to improve the transfer of water from the Sacramento River to the CVP and SWP export facilities in the south Delta.

The Jones Pumping Plant, located in the south Delta about 5 miles from the City of Tracy, is used to lift water from the Delta into the Delta-Mendota Canal. The pumping plant is located at the end of a 2.5-mile intake channel. At the head of the intake channel, louver screens intercept fish, which are collected and transported by tanker to release sites away from the pumps. Jones Pumping Plant consists of six pumps with a maximum rated capacity of about 5,100 cfs, although the permitted capacity is 4,600 cfs. When irrigation demands in the upper reaches of the Delta-Mendota Canal are low, pumping is constrained by the capacity of the Delta-Mendota Canal (Reaches 11 to 13) to 4,200 cfs.

Water exported at the Jones pumps is conveyed via the Delta-Mendota Canal and via the joint reach of the California Aqueduct (San Luis Canal) to M&I and agricultural contractors in the San Joaquin Valley. Water from the Delta-Mendota Canal also is pumped into San Luis Reservoir, where the water commingles with SWP water exported at Banks Pumping Plant. CVP water in San Luis Reservoir is subsequently either diverted to M&I and agricultural water users in Santa Clara and San Benito counties or released back into the Delta-Mendota Canal or the San Luis Canal.

CVP demands typically exceed Jones pumping capacity in the spring and summer months. During this period, the CVP depends on releases from San Luis Reservoir to augment pumping at Jones. In wet and above normal years, and years of high allocations, there is limited or no spare capacity at Jones. When the water supply is available and exports are not limited by standards, the Jones Pumping Plant is operated continuously at the Delta-Mendota Canal capacity limits. However, Jones exports are typically reduced during the spring to meet endangered fish requirements. For example, VAMP[9] operations, typically from April 15 through May 15, require Jones exports to be reduced to 750 cfs. Every year the CVP depends on wheeling capacity at Banks Pumping Plant to deliver federal water.

5.1.3.3 SWP Facilities and Operations

SWP facilities in the southern Delta include Clifton Court Forebay, John E. Skinner Delta Fish Protective Facility (Skinner Fish Facility), and the Banks Pumping Plant. Clifton Court Forebay is a 31,000 AF reservoir located in the southwestern edge of the Delta, about 10 miles northwest of the City of Tracy. Clifton Court Forebay provides storage for off-peak pumping, moderates the effect of the pumps on the fluctuation of flow and stage in adjacent Delta channels, and collects sediment before it enters the California Aqueduct. Diversions from Old River into Clifton Court Forebay are regulated by five radial gates.

The Skinner Fish Facility is located west of the Forebay, two miles upstream of the Banks Pumping Plant. The Skinner Fish Facility screens fish away from the pumps that lift water into the California Aqueduct. Large fish and debris are directed away from the facility by a 388-foot-long trash boom. Smaller fish are diverted from the intake channel into bypasses by a series of metal louvers, while the main flow of water continues through the louvers and toward the pumps. These fish pass through a secondary system of screens and pipes into seven

[9] VAMP is a 12-year experiment to examine the fishery benefits of increased pulse flows in the lower San Joaquin River combined with CVP/SWP export restrictions. VAMP flow and export requirements are incorporated in D-1641.

holding tanks, where they are later counted and recorded. The salvaged fish are then returned to the Delta in oxygenated tank trucks.

The Banks Pumping Plant is in the south Delta, about 8 miles northwest of Tracy, and marks the beginning of the California Aqueduct. By means of 11 pumps, including two rated at 375 cfs capacity, five at 1,130 cfs capacity, and four at 1,067 cfs capacity, the plant provides the initial lift of water 244 feet into the aqueduct. The Banks Pumping Plant has an installed capacity of 10,300 cfs, and supplies water for the South Bay Aqueduct and the California Aqueduct. Under current operational constraints, inflow to Clifton Court is generally limited to a maximum 3-day average of 6,680 cfs, except between December 15 and March 15, when exports can be increased by 33 percent of the San Joaquin River inflow, if greater than 1,000 cfs. The SWP also pumps water from Barker Slough into the North Bay Aqueduct for use in the North Bay Region. Combined water deliveries from these two facilities have ranged from 1.4 MAF in dry years to nearly 4.0 MAF in wet years.

5.1.3.4 ENVIRONMENTAL WATER ACCOUNT

The EWA Program is a cooperative management program designed to provide protection to the at-risk native fish species of the Bay–Delta estuary through environmentally beneficial changes in the operations of the CVP and SWP, and to provide water supply reliability to CVP and SWP water users. The EWA Program is discussed in Section 3.2.1.6. Unless renewed, the EWA will expire on December 31, 2007. Beneficial changes in CVP and SWP operations include changing the timing of flow releases from storage, and the timing of water exports from the Delta to better protect Delta fisheries. The EWA Program acquires water to replace any regular water supply interrupted by the environmentally beneficial changes to CVP and SWP operations.

The EWA Program obtains its water by acquisition from willing sellers (fixed assets), through operational flexibility of Delta facilities (operational assets formally known as variable assets), and through other water management tools and agreements. Fixed assets are those water supplies that are purchased by Reclamation and DWR for the EWA. Operational assets are water supplies made available through operational changes to CVP and SWP facilities. Examples include the flexing of the export-to-inflow ratio, and the capture of ERPP water resulting from increased upstream releases. Water management tools provide the ability to convey, store, and manage EWA water. Examples include 500 cfs dedicated pumping capacity at Banks Pumping Plant from July to September, borrowing, banking, and entering into exchange agreements with water contractors.

EWA water purchases from 2001 to 2005 are summarized in **Table 5-9**. Annual purchases upstream of the Delta have varied from about 70 TAF to 119 TAF per year. Water sold by YCWA to the EWA is typically transferred across the Delta from July to September. Transferred water replaces water that would have been delivered to export service area contractors but for EWA fishery actions taken in the previous winter and spring months.

5.1.3.5 CROSS-DELTA WATER TRANSFERS

California's water market developed as a result of the last major drought in California (1987 to 1992) and has been facilitated by changes in federal and state legislation pertaining to water rights and entitlements. The California Legislature passed several laws in the 1980s and 1990s making it easier to transfer water beyond the boundaries of historical water service areas. These laws developed an expedited process for the SWRCB to temporarily change the water rights (i.e., point of diversion and place of use) of those conducting a short-term (i.e., one-year) water transfer. Passage of the CVPIA in 1992 changed operating rules of the CVP to allow water transfers among CVP contractors in prescribed situations. In 1994, DWR and 27 of its 29 contractors negotiated a series of principles to resolve issues regarding long-term water supply contracts. In 1995, the Monterey Agreement was signed by those 27 contractors, changing some aspects of water management and formalizing others, such as storage outside a contractor's service area, and facilitating a limited water market between SWP contractors. Water transfers occur both within the CVP and SWP and with external water agencies. In recent years, extensive transfers of water across the Delta have occurred. Water Code provisions grant other parties access to unused SWP conveyance capacity, although SWP contractors have priority access to capacity not used by DWR to meet SWP allocations.

Table 5-9. Summary of Historical EWA Water Purchases, 2001- 2005

	Transfer Volume (AF)					
	2001	**2002**	**2003**	**2004**	**2005**	**Total**
Water Year Type Sacramento Valley 40-30-30 Index	**Dry**	**Dry**	**Above Normal**	**Below Normal**	**Below Normal**	
Upstream from the Delta						
Butte Water District	0	0	0	0	0	0
Merced Irrigation District	25,000	0	0	0	0	25,000
South Feather Water & Power Agency	10,000	0	4,914	0	0	14,914
Placer County Water Agency	20,000	0	0	18,700	0	38,700
Sacramento Groundwater Authority	0	7,143	0	0	0	7,143
Yuba County Water Agency	50,000	135,000	65,000	100,000	6,044 [a]	356,044
Subtotal	*105,000*	*142,143*	*69,914*	*118,700*	*6,044*	*441,801*
Export Service Area (South of the Delta)						
Arvin Edison Water District	10,000	0	0	0	0	10,000
Buena Vista Water Service District, West Kern Water District, Rosedale-Rio Bravo Water District	21,218	0	0	0	0	21,218
Cawelo Water District	10,000	0	0	0	0	10,000
Kern County Water Agency	20,000	97,400	125,000	35,000	89,712	367,112
Rosedale-Rio Bravo Water Storage District	19,036	0	0	0	0	19,036
Santa Clara Valley Water District	30,000	0	20,000	0	8,804	58,804
Semitropic Water Storage District, Tulare Irrigation District	15,000	0	0	0	0	15,000
Westside Mutual Water District	15,000	0	0	0	0	15,000
Dudley Ridge Water District, Westside Mutual Water District, Tejon-Castec Water District	21,000	0	0	0	0	21,000
Subtotal	*161,254*	*97,400*	*145,000*	*35,000*	*98,516*	*537,170*
Total by Year	**266,254**	**239,543**	**214,914**	**153,700**	**104,560**	**978,971**
Source Shift						
Metropolitan Water District of Southern California	50,000	0	0	0	0	50,000
Exchanges						
Metropolitan Water District of Southern California	0	0	0	0	50,000	50,000
Grand Total	**316,254**	**239,543**	**214,914**	**153,700**	**154,560**	**1,078,971**

[a]DWR, on behalf of the EWA, entered into an agreement with YCWA for 62 TAF. Only 6,044 AF were transferred because of Delta excess conditions.

Transfers requiring exports from the Delta are done at times when conveyance and pumping capacity at the CVP or SWP export facilities is available to move water. Parties to the transfer are responsible for providing the incremental change in flows required to protect Delta water quality standards.

Table 5-10 summarizes the major historical cross-Delta water transfers, excluding EWA water acquisitions. The table is based on available information and may not include all historical transfers. Reclamation and DWR have operated water acquisition programs to provide water for environmental programs, and additional supplies to CVP contractors, SWP contractors, and other parties. The DWR programs include the 1991, 1992, and 1994 Drought Water Banks, as well as the 2001, 2002, 2003, and 2004 Dry Year Programs. Almost 800 TAF were purchased in 1991 as part of DWR's Drought Water Bank, and 1991 remains the largest water transfer year of record. Reclamation operated a forbearance program in 2001 by purchasing CVP contractors' water in the Sacramento Valley for CVPIA instream flows, and to augment water supplies for CVP contractors south of the Delta. Reclamation administers the CVPIA Water Acquisition Program for Refuge Level 4 supplies and fishery instream flows.

Table 5-10. Summary of Historical Cross-Delta Water Transfers

Year	Water Year Type	Buyer and Amount Delivered (AF) [a]						
		DWR	DWR (Dry Year)	EWA	MWD	Reclamation WAP	WWD	Total
1987		83,100						83,100
1988		135,000						135,000
1989		200,000						200,000
1990		109,000						109,000
1991	Critical	820,805 [b]						820,805
1992	Critical	121,541 [c]						121,541
1994	Critical	26,033 [d]						26,033
1995						57,809		57,809
1996	Wet							
1997						45,000		45,000
1998	Wet					11,100		11,100
1999	Wet					6,300		
2001	Dry		138,806 [e]	105,000		24,748	90,934	359,488
2002	Dry		22,050 [f]	142,143		12,515		176,708
2003	Above Normal		11,355	69,914	124,447	8,375		214,091
2004	Below Normal		487 [g]	118,700				119,187
2005	Above Normal			6,044			15,000	21,044
Total		**527,100**	**1,141,077**	**441,801**	**124,447**	**175,403**	**105,934**	**2,515,762**

[a] Values do not include water transfers originating in the San Joaquin Valley.
[b] Includes 212,040 AF sold by YCWA to State Water Bank.
[c] Includes 30 TAF sold by YCWA to State Water Bank.
[d] 26,033 AF sold by YCWA to DWR.
[e] 138,806 AF sold by YCWA to DWR.
[f] 22,050 AF sold by YCWA to DWR.
[g] 487 AF sold by YCWA to DWR.

The surplus capacity available for water transfers varies with hydrologic conditions and CVP/SWP allocations. In general, under wetter hydrologic conditions, surplus capacity is lower because the CVP and SWP more fully utilize capacity for their own supplies. The CVP has little surplus capacity except in the driest hydrologic conditions. The SWP has the most surplus capacity in critical and some dry years, less or sometimes none in a broad middle range of hydrologic conditions, and some surplus again in above-normal and wet years when demands may be lower and contractors have alternative local supplies.

Under low outflow conditions, increases in CVP and SWP exports can cause additional seawater intrusion, even if the Delta outflow is not changed (i.e., if additional releases are made from upstream reservoirs to match the increase in export pumping). The additional increment of inflow (and corresponding increase in Delta outflow) that is needed to offset the additional effect of exports on seawater intrusion, and prevent degradation of water quality at Delta drinking water intakes, is referred to as "carriage water".

5.1.4 EXPORT SERVICE AREA

In general, CVP/SWP facilities south of the Delta are not included in the project study area. However, the differences in CVP/SWP export pumping under the Yuba Accord Alternative and Modified Flow Alternative that may occur in some months due to changes in outflow from the lower Yuba River could affect storage in San Luis Reservoir. Decreases in Yuba River outflow due to operations for the Yuba River Accord will be accounted for according to refill provisions of the proposed Water Purchase Agreement. Therefore, San Luis Reservoir has been included in the study area for surface water supply and management.

5.1.4.1 SAN LUIS RESERVOIR

San Luis Reservoir is a storage facility south of the Delta, operated jointly by the CVP and SWP. Water is stored during the fall and winter months when Delta pumps can export more water than is needed for scheduled water demands. Similarly, water is released from San Luis Reservoir during spring and summer months when water demands are greater than the project's Delta export capacity. The total storage of San Luis Reservoir is 2,041 TAF, 918 TAF of which is dedicated to the CVP, and 1,123 TAF of which is dedicated to the SWP. San Luis Reservoir receives water from, and releases water to, O'Neil Forebay through the Gianelli Pumping-Generating Plant. The O'Neil Forebay, in turn, receives CVP supplies from the Delta-Mendota Canal via the federal O'Neill Pump-Generating Plant, and SWP supplies from the California Aqueduct.

5.1.4.2 CENTRAL VALLEY PROJECT

WEST SAN JOAQUIN DIVISION

San Luis Dam and Reservoir are part of the CVP West San Joaquin Division. However, these facilities were built by and are jointly operated with DWR. The San Luis Unit also includes the O'Neill Dam and forebay (joint federal-state facilities), O'Neill Pumping-Generating Plant (federal facility), Gianelli Plant (joint federal-state facilities), and the San Luis Canal.

San Luis Reservoir is used to meet demand when water demands and schedules for CVP contractors served from the Delta-Mendota Canal exceed the combined capacity of the Jones Pumping Plant and the capacity of the state facilities (i.e., Banks Pumping Plant) to wheel water for the CVP. Typically, the fill cycle for the CVP's share of San Luis Reservoir begins in August or September, and the drawdown cycle begins in March or April. As irrigation demands decrease, the Jones Pumping Plant is used to convey water to refill the CVP portion of San Luis Reservoir. The Jones Pumping Plant generally continues to operate at the maximum diversion rate until early spring, unless San Luis Reservoir is filled or the Delta water supply is not available.

The San Felipe Division of the CVP supplies water to customers in Santa Clara and San Benito counties from San Luis Reservoir. The operation of San Luis Reservoir has the potential to affect the water quality and reliability of these supplies if reservoir storage drops below 300 TAF.

CENTRAL VALLEY PROJECT CONTRACTORS

The CVP provides water to settlement contractors in the Sacramento Valley, exchange contractors in the San Joaquin Valley, and agricultural and M&I water service contractors in both the Sacramento and San Joaquin valleys. During the beginning of each year, Reclamation evaluates the hydrologic conditions throughout California and uses this information to forecast CVP operations and to estimate the amount of water to be made available to the federal water service contractors for the year (allocations to settlement and exchange contractors are fixed according to the unimpaired inflow to Lake Shasta).

The majority of the federal water service contractors (excluding contractors in the Friant Division) have service areas located south of the Delta. Most of their supplies must be conveyed through the Delta prior to delivery. Allocations vary considerably from year to year. In general, allocations to CVP water service contractors south of the Delta are lower than allocations to service contractors in the Sacramento Valley. A detailed summary of CVP annual contract amounts for service areas supplied from the Delta is presented in **Table 5-11**.

Table 5-11. Summary of Central Valley Project Contract Amounts for Service Areas South of the Delta

CVP Contractor	Contract Type	Maximum Contract Quantity (AF)
DELTA DIVISION		
Contra Costa Canal		
Contra Costa Water District	M&I	195,000
Subtotal		*195,000*
Delta-Mendota Canal		
Banta-Carbona Irrigation District	Irrigation and M&I	20,000
Byron-Bethany Irrigation District	Irrigation and M&I	20,600
Del Puerto Water District	Irrigation and M&I	140,210
Eagle Field Water District	Irrigation and M&I	4,550
Mercy Springs Water District	Irrigation and M&I	2,842
Oro Loma Water District	Irrigation and M&I	4,600
Pajaro Valley WMA, Santa Clara Valley WD and Westlands WD	Irrigation and M&I	6,260
Patterson Irrigation District	Irrigation and M&I	16,500
Tracy, City of	M&I	10,000
Tracy, City of (from Banta Carbona ID)	M&I	5,000
Tracy, City of (from Westside ID)	M&I	2,500
U.S. Department of Veteran Affairs	M&I	450
West Side Irrigation District	Irrigation and M&I	5,000
West Stanislaus Irrigation District	Irrigation	50,000
Westlands Water District Distribution District 1	Irrigation and M&I	2,990
Westlands Water District Distribution District 1	Irrigation and M&I	2,500
Westlands Water District Distribution District 2	Irrigation and M&I	4,198
Subtotal		*298,200*
Mendota Pool		
Coelho Family Trust	Irrigation and M&I	2,080
Fresno Slough Water District	Irrigation and M&I	4,000
James Irrigation District	Irrigation and M&I	35,300
Laguna Water District	Irrigation and M&I	800
Reclamation District No. 1606	Irrigation and M&I	228
Tranquility Irrigation District	Irrigation and M&I	13,800
Tranquility Public Utility District	Irrigation and M&I	70
Westlands Water District	Irrigation	50,000
Subtotal		*106,278*

CVP Contractor	Contract Type	Maximum Contract Quantity (AF)
San Luis Canal/Tracy		
Broadview Water District (annexed by Westlands WD)	Irrigation and M&I	27,000
Subtotal		*27,000*
MISCELLANEOUS		
Cross Valley Canal		
Fresno, County of	Irrigation and M&I	3,000
Hills Valley Irrigation District	Irrigation and M&I	3,346
Kern-Tulare Water District	Irrigation and M&I	40,000
Lower Tule River Irrigation District	Irrigation and M&I	31,102
Pixley Irrigation District	Irrigation and M&I	31,102
Rag Gulch Water District	Irrigation and M&I	13,300
Tri-Valley Water District	Irrigation and M&I	1,142
Tulare, County of	Irrigation and M&I	5,308
Subtotal		*128,300*
SAN FELIPE DIVISION		
San Felipe Unit		
San Benito County Water District	Irrigation and M&I	43,800
Santa Clara Valley Water District	Irrigation and M&I	152,500
Subtotal		*196,300*
Delta-Mendota Canal		
Pacheco Water District	Irrigation and M&I	9,280
Panoche Water District	Irrigation and M&I	27,000
San Luis Water District	Irrigation and M&I	45,080
Subtotal		*81,360*
WEST SAN JOAQUIN DIVISION		
San Luis Canal/Fresno		
Avenal, City of	M&I	3,500
California Department of Fish & Game	M&I	10
Coalinga, City of	M&I	10,000
Huron, City of	M&I	3,000
Westlands Water District	Irrigation and M&I	200,000
Westlands Water District	Irrigation and M&I	900,000
Subtotal		*1,116,510*
San Luis Canal/Tracy		
Pacheco Water District	Irrigation and M&I	0
Panoche Water District	Irrigation and M&I	67,000
San Luis Water District	Irrigation and M&I	80,000
Subtotal		*147,000*
San Luis Unit		
Dos Palos Joint Area Power Authority & Central California	M&I	2,500
Panoche Water District	Irrigation and M&I	0
Subtotal		*2,500*

–AF- acre-feet
ID - Irrigation District
WMA - Water Management Agency
M&I - Municipal and industrial
WD - Water District
Source: (pers. comm. T. Rust, Reclamation 2007)

5.1.4.3 State Water Project

SWP Contracts

The SWP operates under long-term contracts with public water agencies throughout California. These agencies, in turn, deliver water to wholesalers or retailers, or deliver it directly to agricultural and M&I water users (DWR 1999).

The SWP contracts between DWR and individual state water contractors define several classifications of water available for delivery under specific circumstances. All classifications are considered "project water". Table A is an exhibit to the SWP long-term water supply contracts. Table A amounts are used to define each contractor's proportion of the available water supply that DWR will allocate and deliver to that contractor. Each year, each contractor may request an amount not to exceed its Table A amount. The Table A amounts are used as a basis for allocations to contractors, but the actual annual supply to contractors is variable and depends on the amount of water that is available. Water delivery capabilities are frequently lower than Table A amounts (Reclamation and DWR 2005). Table A water is water delivered according to this apportionment methodology and is given first priority for delivery (DWR 2005). The total Table A amount has increased since inception of the SWP, and is projected to reach a maximum amount of about 4.2 MAF per year by 2021. The current Table A amount provided each year is about 4.15 MAF (DWR 2006). Maximum annual Table A amounts allocated to the 29 SWP contractors are presented in **Table 5-12.**

The Monterey Agreement, signed by 27 of the 29 SWP water contractors in 1995, restructured the SWP contracts to allocate water based on contractual Table A amounts instead of the amount of water requested for a given year. In times of shortages, the water supply to SWP agricultural and M&I contractors will be reduced equally.

Many contractors also make frequent use of additional contract water types to increase or decrease the amount of water available to them under Table A. Other contract types of water include Article 21 Water, Turnback Pool Water, and Carry-over Water.

The SWP allocation (proportion of Table A to be delivered) for any specific year is made based on a number of factors, including existing storage, current regulatory constraints, projected hydrologic conditions, and desired carry-over storage. Since 1995, annual delivery of Table A water has varied between 1.374 MAF (in 2001) and 2.965 MAF (in 2003). Article 21 deliveries have varied between approximately 20 TAF (in 1998) to 309 TAF (in 2000) (DWR 2006).

5.1.5 REGULATORY SETTING

5.1.5.1 YUBA REGION

FEDERAL REGULATORY SETTING

YCWA's activities on the lower Yuba River are regulated through a series of agreements, contracts, and laws. The primary focus of these regulations is the flow in the lower Yuba River, but reservoir and powerhouse operations are also subject to control by these various documents. Reclamation and DWR must operate the CVP/SWP system in accordance with similar regulations and laws. These regulations range from agreements with state or federal agencies to laws passed by the state or federal government.

FERC License for Yuba River Development Project

FERC originally issued a license under the Federal Power Act for the Yuba Project on May 16, 1963. On May 6, 1966, FERC issued an order amending this license. The amended license contains release and instream flow requirements similar to the 1965 YCWA/CDFG agreement. YCWA is obligated to operate in such a way as to meet minimum instream flows throughout the year below New Bullards Bar Dam, Englebright Dam, and Daguerre Point Dam, as described below.

Table 5-12 Maximum Annual State Water Project Table A Amounts

Region	SWP Contractor	Maximum Table A (AF)	Maximum Table A Percent of Total
Delivered from the Delta			
North Bay	Napa County FC&WCD	29,025	0.70
	Solano County WA	47,756	1.14
	Subtotal	*76,781*	*1.84*
South Bay	Alameda County FC&WCD, Zone 7	80,619	1.93
	Alameda County WD	42,000	1.01
	Santa Clara Valley WD	100,000	2.40
	Subtotal	*222,619*	*5.34*
San Joaquin Valley	Oak Flat WD	5,700	0.14
	County of Kings	9,305	0.22
	Dudley Ridge WD	57,343	1.37
	Empire West Side ID	3,000	0.07
	Kern County WA	998,730	23.93
	Tulare Lake Basin WSD	95,922	2.30
	Subtotal	*1,170,000*	*28.04*
Central Coast	San Luis Obispo County FC&WCD	25,000	0.60
	Santa Barbara County FC&WCD	45,486	1.09
	Subtotal	*70,486*	*1.69*
Southern California	Antelope Valley-East Kern WA	141,400	3.39
	Castaic Lake WA	95,200	2.28
	Coachella Valley WD	121,100	2.90
	Crestline-Lake Arrowhead WA	5,800	0.14
	Desert WA	50,000	1.20
	Littlerock Creek ID	2,300	0.06
	Mojave WA	75,800	1.82
	MWDSC	1,911,500	45.81
	Palmdale WD	21,300	0.51
	San Bernardino Valley MWD	102,600	2.46
	San Gabriel Valley MWD	28,800	0.69
	San Gorgonio Pass WA	17,300	0.41
	Ventura County FCD	20,000	0.48
	Subtotal	*2,593,100*	*62.14*
	Delta Total	***4,132,986***	***99.05***
Delivered from the Feather River Basin			
	County of Butte	27,500	0.66
	Plumas County FC&WCD	2,700	0.06
	City of Yuba City	9,600	0.23
	Feather River Total	***39,800***	***0.95***
	TOTAL	**4,172,786**	**100.00**

AF-acre-feet

FC&WCD - Flood Control and Water Conservation District
FCD - Flood Control District
ID - Irrigation District
MWDSC - Metropolitan Water District of Southern California
MWD - Municipal Water District
SWP – State Water Project
WA - Water Agency
WD - Water District
WSD - Water Storage District
Source: (DWR 2006)

Minimum Releases Below New Bullards Bar Dam

The minimum release to the North Yuba River from New Bullards Bar Reservoir is 5 cfs year-round. YCWA typically meets these requirements by releases from the bottom outlet of New Bullards Bar Dam.

Minimum Flow Requirements Below Englebright Dam

YCWA's 1966 FERC license specifies that, with the exception of flood control operations and release of uncontrolled inflows from tributary streams, releases from Englebright Dam are to be continuous and uniform. Scheduled releases must be within the limits prescribed below:

- 600 to 1,050 cfs, from October 16 to October 31
- 600 to 700 cfs, from November 1 to November 30
- 600 to 1,400 cfs, from December 1 to December 31
- 1,000 to 1,850 cfs, from January 1 to January 15
- 600 cfs minimum, from January 16 to March 3

Minimum Flow Requirements Below Daguerre Point Dam

Minimum flows as measured over the crest of Daguerre Point Dam and in the fish passage at that dam are as follows:

- 245 cfs, from January 1 to June 30
- 70 cfs, from July 1 to September 30
- 400 cfs, from October 1 to December 31

Water releases for fisheries resources are subject to reductions in critical water years, which are defined as those water years for which the April 1 forecast by DWR predicts that the annual unimpaired flow in the Yuba River at Smartville will be 50 percent or less of normal. Water release curtailments for critical water years are release reductions of 15, 20, and 30 percent when Yuba River unimpaired flow forecasts are, respectively, 50, 45, and 40 percent or less of normal. The critical water year provision is effective from the time of the forecast until April 1 of the following year. However, in no event may these minimum flows be reduced to less than 70 cfs.

Flow Fluctuation and Reductions (Ramping Criteria)

YCWA operates the Yuba Project to meet specific criteria for flow fluctuations as measured at the Smartville Gage. Flow fluctuation criteria are specified in the 1966 FERC License, and in RD-1644. On November 22, 2005, FERC approved an amendment to YCWA's license for the Yuba Project that contains flow fluctuation criteria similar to those specified in RD-1644. The 2005 amended license is the controlling requirement for operation of the Yuba Project. The amended license specifies that with the exception of emergencies, releases for flood control operations, bypasses of uncontrolled inflows into Englebright Reservoir, or uncontrolled spills, the Yuba Project be operated according to the following requirements:

- Project releases or bypasses that increase stream flow downstream of Englebright Dam shall not exceed a rate of change of more than 500 cfs per hour.
- Project releases or bypasses that reduce stream flow downstream of Englebright Dam shall be gradual and, over the course of any 24-hour period, shall not be reduced below 70 percent of the prior day's average flow release or bypass flow.

- Once the daily project release or bypass level is achieved, fluctuations in the stream flow level downstream of Englebright Dam due to changes in project operations shall not vary up or down by more than 15 percent of the average daily flow.
- During the period from September 15 to October 31, the licensee shall not reduce the flow downstream of Englebright Dam to less than 55 percent of the maximum five-day average release or bypass level that has occurred during that September 15 to October 31 period, or the minimum stream flow requirement that would otherwise apply, whichever is greater.
- During the period from November 1 to March 31, the licensee shall not reduce the flow downstream of Englebright Dam to less than the minimum stream flow release or bypass established under the preceding paragraph; 65 percent of the maximum five-day average flow release or bypass that has occurred during that November 1 to March 31 period; or the minimum stream flow requirement that would otherwise apply, whichever is greater.

FERC License for Narrow I Powerhouse

In 1993, FERC issued a new license to PG&E for the continued operation of the Narrows I Powerhouse, located below the left abutment of Englebright Dam. Contained within this license is a new set of instream flow requirements for fisheries resources. The order requires minimum flows measured at Smartville on the lower Yuba River to be those listed in **Table 5-13**, when (1) the total volume of water released to maintain the schedule of daily average flows during the water year, as quantified in the above table, is less than 45 TAF, and (2) the storage in Englebright Reservoir exceeds 60 TAF, or when PG&E is entitled to dispatch releases of water from New Bullards Bar Reservoir under the terms of PG&E's Power Purchase Contract with YCWA (i.e., when storage in New Bullards Bar Reservoir exceeds the Critical Line).

Table 5-13. Narrows I Federal Energy Regulatory Commission License Lower Yuba River Instream Flow Requirements at Smartville

Period	Flow (cfs)
October 1 to March 31	700
April 1 to April 30	1,000
May 1 to May 31	2,000
June 1 to June 30	1,500
July 1 to September 30	450

Flood Control Regulations

New Bullards Bar Reservoir also must be operated from September 16 to May 31 to comply with Part 208 "*Flood Control Regulations, New Bullards Bar Dam and Reservoir, North Yuba River, California*," pursuant to Section 7 of the Flood Control Act of 1944 (58 Stat. 890). Under the contract between the United States and YCWA, entered into on May 9, 1966, YCWA agreed to reserve 170 TAF of storage space for flood control in accordance with rules and regulations enumerated in Appendix A of the Report on Reservoir Regulation for Flood Control (USACE June 1972). The seasonal flood storage space allocation schedule is presented in **Table 5-14**.

Table 5-14. New Bullards Bar Reservoir Flood Storage Space Allocation

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Storage (TAF)	170	170	170	170	170	170	70	0	0	0	0	56

STATE REGULATORY SETTING

1965 YCWA and CDFG Stream Flow Release Agreement

Instream flow requirements for the Yuba Project were originally specified in the September 2, 1965 agreement between YCWA and CDFG. These requirements were incorporated into the 1966 FERC license.

SWRCB Revised Decision 1644

RD-1644, adopted July 16, 2003, specifies both long-term and interim instream flow requirements for the lower Yuba River. Minimum instream flow requirements are measured by a five-day running average of average daily stream flows. RD-1644 established long-term instream flow requirements that now are scheduled to begin April 1, 2008. The required stream flows, as measured at the USGS gages at Marysville and Smartville, are presented in **Table 5-15**. Water year types are defined by the YRI developed in 2000 for the SWRCB Lower Yuba River Hearings. This index is a measure of the unimpaired flow in the lower Yuba River at the Smartville Gage. The interim flow requirements are applicable until April 1, 2008, after which the long-term flow requirements are scheduled to go into effect (SWRCB Order WR 2007-002-DWR). The required minimum instream flows, as measured at the USGS gages at Marysville and Smartville, are presented in **Table 5-15** (Interim instream flow requirements) and **Table 5-16 (**Long-term instream flow requirements).

LOCAL REGULATORY SETTING

1966 Power Purchase Contract

YCWA executed a Power Purchase Contract with PG&E on May 13, 1966. The Power Purchase Contract, which allowed financing the construction of the Yuba Project, specifies conditions of PG&E's power purchase from YCWA and PG&E's rights to require releases of water from New Bullards Bar Reservoir for power production.

Power Purchase Contract Appendix C, Subsection C-2.A.(b), Water for Power and Irrigation, details the monthly storage criteria and monthly power quotas. The maximum end-of-month storage amount (the "Critical Line") is described in paragraph (1):

> "*When it appears that storage by the end of any month will exceed the critical amount for such month listed in Appendix D, project power plants shall be operated, unless otherwise agreed, to reduce the storage on hand by the end of such month to the amount specified in Appendix D but at rates not to exceed the amount required for full capability operation except when greater releases are needed by reason of flood control requirements …*"

Table 5-15. Revised Decision 1644 Long-term Instream Flow Requirements

Period	Wet, Above Normal, and Below Normal Years[a] (cfs)		Dry Years[a] (cfs)		Critical Years[a] (cfs)		Extreme Critical Years[a] (cfs)	
	Smartville Gage	Marysville Gage	Smartville Gage	Marysville Gage	Smartville Gage	Marysville Gage	Smartville Gage	Marysville Gage
Sep 15 through Oct 14	700	250	500	250	400	250	400	250
Oct 15 through Apr 20	700	500	600	400	600	400	600	400
Apr 21 through Apr 30	--	1,000	--	1,000	--	1,000	--	500
May 1 through May 31	--	1,500	--	1,500	--	1,100	--	500
Jun 1	--	1,050	--	1,050	--	800	--	500
Jun 2	--	800	--	800	--	800	--	500
Jun 3 through Jun 30	--	800	--	800	--	800	--	500
Jul 1	--	560	--	560	--	560	--	500
Jul 2	--	390	--	390	--	390	--	390
Jul 3	--	280	--	280	--	280	--	280
Jul 4 through Sep 14	--	250	--	250	--	250	--	250

[a] Water year classifications are defined by the YRI, which is based on DWR's forecast of unimpaired flow of the Yuba River at Smartville, published in DWR's Bulletin 120. Wet years are defined as years where the YRI > 1,230 TAF, above normal years with YRI > 990 TAF, below normal years with YRI > 790 TAF, dry years with YRI > 630 TAF, critical years with YRI < 630 TAF, extreme critical years < 540 TAF.

"-- "Indicates no flow requirement.

Table 5-16. Revised Decision 1644 Interim Instream Flow Requirements

Period	Wet and Above Normal Years [a] (cfs)		Below Normal Years [a](cfs)		Dry Years [a](cfs)		Critical Years [a](cfs)	
	Smartville Gage	Marysville Gage	Smartville Gage	Marysville Gage	Smartville Gage	Marysville Gage	Smartville Gage	Marysville Gage
Sep 15 through Sep 30							400	150
Sep 15 through Oct 14	700	250	550	250	500	250	400	150
Oct 1 through Oct 14							400	250
Oct 15 through Apr 20	700	500	700	500	600	400	600	400
Apr 21							--	280
Apr 21 through Apr 30	--	1,000	--	900	--	400		
Apr 22 through Apr 30							--	270
May 1 through May 31	--	1,500	--	1,500	--	500	--	270
June 1	--	1,050	--	1,050	--	400		
Jun 1 through Jul 2							--	[b]
Jun 2 through Jun 30	--	800	--	800	--	400		
Jul 1	--	560	--	560	--	280		
Jul 2	--	390	--	390	--	250		
Jul 3	--	280	--	280	--	250		
Jul 3 through Sep 14							--	100
Jul 4 through Sep 14	--	250	--	250	--	250		

[a] Water year classifications are based on DWR forecast of unimpaired flow of the Yuba River at Smartville, published in DWR Bulletin 120.

[b] The Interim instream flow requirements for June 1 through 30 of critical years shall be 245 cfs pursuant to provisions of the agreement between YCWA and CDFG, dated September 2, 1965, except if a lower flow is allowed pursuant to the provisions of the 1965 agreement. The minimum flow on July 1 shall be 70 percent of the flow on June 30, and the minimum flow on July 2 shall be 70 percent of the flow on July 1.

" --" Indicates no flow standard requirement.

No instream flow requirements are associated with shaded cells.

Compliance with this criterion requires releases of up to 3,400 cfs at New Colgate Powerhouse to bring the end-of-month storage at or below the amounts listed in **Table 5-17**, which is the "*critical storage at end of month in Yuba's New Bullards Bar Reservoir*" of Appendix D, Storage Criteria.

Table 5-17. Storage Criteria for New Bullards Bar Reservoir Under 1966 PG&E Power Purchase Contract

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Storage (TAF)	660	645	645	600	600	685	825	930	890	830	755	705

In addition to the storage requirements, a power production quota applies when the operation described above would result in an end-of-month storage at or below the Critical Line. This quota schedule is described in the contract as follows:

> "*When drafts of storage will result in the storage on hand at the end of any month being equal to or less than the critical amount for such month listed in Appendix D, then, unless otherwise requested by Pacific, Yuba shall release during that month only a sufficient amount of water, in accordance with schedules furnished from time to time by Pacific, to generate the following specified amount of energy at the new Colgate Power Plant*."

The minimum required power generation criteria are presented in **Table 5-18**.

Table 5-18. Minimum Required Power Production Under 1966 PG&E Power Purchase Contract

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Power (MWh)	39,300	39,500	37,800	81,700	81,700	81,500	81,700	82,000	82,100	37,700	38,200	38,900
MWh – megawatts per hour												

Additionally, the contract also provides that the Narrows II Powerhouse "… *shall be operated in a manner consistent with the foregoing water release requirements*."

5.1.5.2 CVP/SWP UPSTREAM OF THE DELTA

STATE REGULATIONS

SWRCB Decisions 1275 and 1291

Diversion and storage of water by the SWP in Oroville Reservoir, and diversion and export of water from the Delta, are authorized by the SWRCB. The SWRCB first issued permits to DWR for operation of the SWP in 1967 (D-1275 and D-1291).

1967 DWR and CDFG Agreement

Feather River instream flow requirements were established in accordance with the 1967 agreement between DWR and CDFG, "*Concerning the Operation of the Oroville Division of the State Water Project for Management of Fish & Wildlife*", as amended in 1983. The 1983 agreement specifies that DWR will release a minimum of 600 cfs into the Feather River from the Thermalito Diversion Dam for fishery purposes. This is the total flow from the diversion dam outlet, diversion dam power plant, and Feather River Fish Hatchery pipeline. **Table 5-19** identifies the minimum flow requirements downstream from the Thermalito Afterbay Outlet. These requirements apply if the surface elevation of Oroville Reservoir is greater than 733 feet above msl.

Table 5-19. Feather River Minimum Flow Schedule

Percent of Normal Runoff [a]	October Through February (cfs)	March (cfs)	April Through September (cfs)
>55	1,700	1,700	1,000
<55	1,200	1,000	1,000

[a] Defined as the mean 1911 to 1960 April to July unimpaired runoff, which is equal to 1,942,000 AF.

In addition, if the hourly flow is greater than 2,500 cfs between October 15 and November 30, the flow, less 500 cfs, must be maintained until the following March unless the high flow resulted from flood control operation or mechanical problems. This requirement is to protect any spawning that could occur in overbank areas during the higher flow rate by maintaining flow levels high enough to keep the overbank areas submerged. In practice, flows are maintained below 2,500 cfs from October 15 to November 30 to prevent spawning in overbank areas.

Feather River flows below the confluence with the Yuba River are controlled by an agreement between DWR and the Feather River Service Area agricultural diverters to provide sufficient flow to prevent the agricultural diverters' pumps in the Feather River from being dewatered.

5.1.5.3 DELTA REGION

FEDERAL REGULATORY SETTING

Central Valley Project Improvement Act

The Reclamation Projects Authorization and Adjustment Act of 1992 (Public Law (PL) 102-575), includes Title 34, the CVPIA. Among the changes mandated by the CVPIA was dedication of 800 TAF annually to fish, wildlife, and habitat restoration. The Interior's October 5, 1999, Decision on Implementation of Section 3406 (b)(2) of the CVPIA provides the basis for implementing upstream and Delta actions for fish management purposes. Implementation of Section 3406 (b)(2) includes Jones Pumping Plant export curtailment for fishery management protection, based on USFWS recommendations.

STATE REGULATORY SETTING

Coordinated Operations Agreement

The COA defines how Reclamation and DWR share their joint responsibility to meet Delta water quality standards and the water demands of senior water right holders, and how the two agencies share surplus flows (Reclamation and DWR 1986). The COA defines the Delta as being in either "balanced water conditions" or "excess water conditions." Balanced water conditions are periods when Delta inflows are just sufficient to meet water user demands within the Delta, outflow requirements for water quality and flow standards, and export demands. Under excess water conditions, Delta outflow exceeds the flow required to meet the water quality and flow standards. Typically, the Delta is in balanced water conditions from June to November, and in excess water conditions from December through May. However, depending on the volume and timing of winter runoff, excess or balanced water conditions may extend throughout the year.

SWRCB 1995 Water Quality Control Plan

The 1995 WQCP established water quality control objectives for the protection of beneficial uses in the Delta. The 1995 WQCP identified (1) beneficial uses of the Delta to be protected, (2) water quality objectives for the reasonable protection of beneficial uses, and (3) a program of implementation for achieving the water quality objectives. Because these new beneficial objectives and water quality standards were more protective than those of the previous D-1485, the new objectives were adopted in 1995 through a water rights order for the operation of the CVP and SWP. Key features of the 1995 WQCP include estuarine habitat objectives for Suisun Bay and the western Delta (consisting of a salinity measurement [i.e., X2] at several locations), E/I ratios intended to reduce entrainment of fish at the export pumps, Delta Cross Channel gate closures, and San Joaquin River electrical conductivity (EC) and flow standards. The SWRCB adopted a new Bay/Delta WQCP on December 13, 2006. However, this new WQCP made only minor changes to the 1995 WQCP.

SWRCB Water Right Decision 1641

D-1641 and Order WR 2001-05 contain the current water right requirements to implement the 1995 WQCP. D-1641 incorporates water right settlement agreements between Reclamation and DWR and certain water users in the Delta and upstream watersheds regarding contributions of flows to meet water quality objectives. The SWRCB imposed terms and conditions on the water rights held by Reclamation and DWR that require them, in some circumstances, to meet many of the water quality objectives established in the 1995 WQCP. D-1641 also authorizes the CVP and SWP to use joint points of diversion in the south Delta, and recognizes the CALFED Operations Coordination Group process for operational flexibility in applying or relaxing certain protective standards.

Delta Outflow Requirement

Delta outflow, inflow that is not exported or diverted, is the primary factor controlling water quality in the Delta. When Delta outflow is low, seawater is able to intrude further into the Delta, impacting water quality at drinking water intakes. D-1641 specifies minimum monthly Delta outflow objectives to maintain a reasonable range of salinity in the estuarine aquatic habitat based on the Net Delta Outflow Index (NDOI). The NDOI is a measure of the freshwater outflow and is determined from a water balance that considers river inflows, precipitation, agricultural consumptive demand, and project exports. The NDOI does not take into account the semidiurnal and spring-neap tidal cycles.

The monthly minimum values of the NDOI specified in D-1641 depend on the water year type. Minimum flows are specified for the months of January and July to December. The outflow objectives from February to June are determined based on the X2 objective.

Delta Salinity Objectives

Salinity standards for the Delta are stated in terms of EC (for protection of agricultural and fish and wildlife beneficial uses), and chloride (for protection of M&I uses). Compliance values vary with water year and month. The salinity objectives at Emmaton on the Sacramento River, and at Jersey Point on the San Joaquin River, often control Delta outflow requirements during the irrigation season from April through August, requiring additional releases from upstream CVP and SWP reservoirs.

X2 Objective

The location of X2, the 2 parts per thousand (ppt) salinity unit isohaline at one meter above the bottom of the Sacramento River Channel, is used as a surrogate measure of ecosystem health in the Delta. The X2 objective requires specific daily surface EC criteria, to be met for a certain numbers of days each month from February through June. Compliance can also be achieved by meeting a 14-day running average salinity or 3-day average outflow equivalent. These requirements were designed to provide improved shallow water habitat for fish species in the spring. Because of the relationship between seawater intrusion and interior Delta water quality, the X2 criteria also improved water quality at Delta drinking water intakes.

Maximum Export/Inflow Ratio

D-1641 includes a maximum E/I standard to limit the fraction of Delta inflows that are exported. This requirement was developed to protect fish species and to reduce entrainment losses. Delta exports are defined as the combined pumping of water at Banks and Jones pumping plants. Delta inflows are the gaged or estimated river inflows. The maximum authorized E/I ratio is 0.35 for February through June and 0.65 for the remainder of the year. If the January eight-river runoff index is less than 1.0 MAF, the February E/I ratio is increased to 0.45. The CVP and SWP have agreed to share the allowable exports equally if the E/I ratio is limiting exports.

Joint Point of Diversion

The JPOD refers to the CVP and SWP use of each other's pumping facilities in the south Delta to export water from the Delta. The CVP and SWP have historically coordinated use of Delta export pumping facilities to assist with deliveries and to aid each other during times of facility failures. In 1978, by agreement with DWR and with authorization from SWRCB, the CVP began using the SWP Banks Pumping Plant for replacement pumping (195 TAF per year) for pumping capacity lost at Jones Pumping Plant because of striped bass pumping restrictions in D-1485. In 1986, Reclamation and DWR formally agreed that "*either party may make use of its facilities available to the other party for pumping and conveyance of water by written agreement*" and that the SWP would pump CVP water to make up for striped bass protection measures (Reclamation and DWR 1986).

Reclamation filed a number of temporary petitions with SWRCB to use Banks Pumping Plant for purposes other than replacement pumping and CVP deliveries that contractually relied on SWP conveyance. Such uses included deliveries to Cross Valley Contractors, The Musco Olive Company, and the San Joaquin National Cemetery. In D-1641, the SWRCB conditionally approved the use of the JPOD in three separate stages:

- Stage 1 is the use of the JPOD to serve Cross Valley Canal contractors, the Musco Olive Company and the San Joaquin National Cemetery; to support a recirculation study; and to recover export reductions made to benefit fish. Authorization for Stage 1 JPOD pumping to recover export reductions prohibits the CVP and SWP from annually exporting more water than each would have exported without the use of each other's pumping facilities. Stage 1 pumping is subject to SWRCB approval of a water level response plan, and a water quality response plan.

- Stage 2 is the use of JPOD for any purpose authorized in the water rights permits up to the limitations contained in the Corps permit. In addition to the Stage 1 requirements, Stage 2 pumping is subject to SWRCB approval of an operations plan to protect aquatic resources and other legal users of water.
- Stage 3 is the use of JPOD for any purpose authorized under the water rights permits up to the physical capacity of the export pumps. Stage 3 is subject to the operation of barriers or other means to protect water levels in the southern Delta, on SWRCB-approved operations plan that adequately protects aquatic resources and other legal users of water, and certification of a project-level EIR by DWR for the SDIP.

It has been the policy of the SWRCB that all water transfers must meet similar criteria and conditions as set forth for the JPOD, and the SWRCB has mandated a "response plan" evaluation process for real-time incremental export operations to determine the effects of water transfer and JPOD operations. SWRCB approval of the 2006 and 2007 Accord Pilot Programs included the provision that rediversion of transfer water at Banks and Jones pumping plants must be in compliance with the various plans under D-1641 that are prerequisites for the use of the JPOD by DWR and Reclamation.

Reclamation and DWR have produced the following response plans:

- Water Level Response Plan to address incremental effects of additional export, at the time of the export, to water levels in the South Delta environment.
- Water Quality Response Plan (WQRP) to address incremental effect of additional export, at the time of the export, to water quality in the Delta and South Delta specifically.
- Operations Plan to protect fish and wildlife, and other legal uses of water.

5.2 ENVIRONMENTAL IMPACTS/ENVIRONMENTAL CONSEQUENCES

Reservoirs and streams that potentially would be affected by the Proposed Project/Action and alternatives include New Bullards Bar Reservoir and the lower Yuba River, Oroville Reservoir and the lower Feather River, the lower Sacramento River below its confluence with the Feather River, the Delta, and San Luis Reservoir. The Proposed Project/Action and alternatives also could affect the operation of pumping and power generation facilities of the Yuba Project and of the CVP/SWP. This section describes the impact assessment methodology, and presents the impact indicators and significance criteria used to evaluate potential water supply and management impacts.

5.2.1 IMPACT ASSESSMENT METHODOLOGY

Computer simulation models and post-processing tools were used to assess potential changes in reservoir storage, river flows, and diversions that could occur under the Proposed Project/Action and alternatives, relative to the basis of comparison. Model assumptions and results are generally more reliable for comparative purposes than for absolute predictions of conditions. All assumptions are the same for both the with-project and without-project model runs, except assumptions associated with the action itself, and the focus of the analysis is on differences in the results. Results from a single simulation may not necessarily correspond to actual system operations for a specific month or year, but are representative of general conditions. Model results are best interpreted using various statistical measures such as long-term and year-type averages, and probabilities of exceedance.

5.2.1.1 *METHODOLOGY FOR EVALUATING POTENTIAL IMPACTS TO YCWA DELIVERIES*

Reservoir simulation models have been used routinely to analyze flow and storage conditions in the Yuba River Basin. The first model of the Yuba River Basin was developed by DWR in the mid-1980s. Subsequently, that model was refined and enhanced by Bookman-Edmonston Engineering, Inc. (B-E). In 2002, MWH developed a spreadsheet model of the Yuba Project that simulates operations of New Bullards Bar and Englebright reservoirs, flows in the lower Yuba River, and diversions at Daguerre Point Dam. The spreadsheet model uses outputs from the B-E model to estimate inflows from the Upper Yuba Basin. The MWH spreadsheet model was used to conduct the analysis presented in the Water Code Environmental Analysis for the 2006 and 2007 Pilot Programs (YCWA 2005; YCWA 2006). In this Draft EIR/EIS, the spreadsheet-based model is referred to as the Yuba Project Model (YPM), and is described in detail in Attachment A of Appendix D. The YPM network schematic and a list of associated model outputs are shown on **Figure 5-3.**

New Bullards Bar
Inflow (as input)
Reservoir Storage
Reservoir Surface Area
Reservoir Evaporation
Reservoir Spill (flood release)
Colgate Release
Fishery Release (bottom outlet)
Power Generation
Englebright Reservoir
Inflow
Narrows Releases
Spill
Power Generation
Smartville Gage
Flow Requirement (as input)
Flow
Deer Creek
Inflow (as input)
Daguerre Point Dam
Diversion demand (as input)
Diversion
Diversion Shortage (TAF)
Diversion Deficiency (%)
Flow below Daguerre
Marysville Gage
Flow Requirement

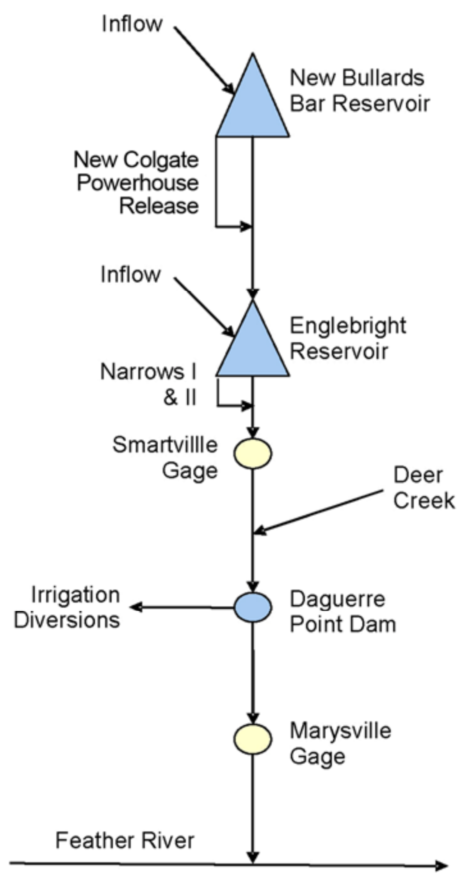

Figure 5-3 Yuba Project Model Network Schematic and Output

5.2.1.2 *METHODOLOGY FOR EVALUATING POTENTIAL IMPACTS TO CVP AND SWP AND DELTA OPERATIONS*

Potential impacts to CVP/SWP operations and water supply conditions upstream of and including the Delta, but external to the Yuba Region, were assessed using the CALSIM II operations model and using post-processing spreadsheet tools. The Delta Simulation Model, version 2 (DSM2), that simulates Delta hydrodynamics and water quality was used to assess changes in South Delta tidal levels. Detailed information about all of the modeling tools and modeling assumptions is presented in Appendix D.

CALSIM II

CALSIM II is the application of the CALSIM[10] software to the CVP/SWP. This application was jointly developed by Reclamation and DWR for planning studies relating to CVP/SWP operations. The primary purpose of CALSIM II is to evaluate the water supply reliability of the CVP and SWP at current or future levels of development (e.g., 2005, 2020), with and without various assumed future facilities, and with different modes of facility operations. Geographically, the model covers the drainage basin of the Delta, and CVP/SWP exports to the San Francisco Bay Area, San Joaquin Valley, Central Coast, and Southern California.

CALSIM II typically simulates system operations for a 72-year period using a monthly time step. The model assumes that facilities, land use, water supply contracts, and regulatory requirements are constant over this period, representing a fixed level of development (e.g., 2001 or 2020). The historical flow record of October 1921 to September 1994, adjusted for the influences of land use changes and upstream flow regulation, is used to represent the possible range of water supply conditions. Major Central Valley rivers, reservoirs, and CVP/SWP facilities are represented by a network of arcs and nodes. CALSIM II uses a mass balance approach to route water through this network. Simulated flows are mean flows for the month, reservoir storage volumes correspond to end-of month storage.

CALSIM II models a complex and extensive set of regulatory standards and operations criteria. Descriptions of both are contained in Chapter 8 of the OCAP BA (Reclamation 2004), and in the Benchmark Studies Assumptions Document (Reclamation and DWR 2002). (As discussed in Section 4.1.4, any conveyance of water provided by the Yuba Accord Alternative through the CVP/SWP system, the Delta and the Export Service Area would be consistent with all of the procedures and operating principles that are established in the new OCAP that Reclamation will adopt after completion of the new OCAP ESA consultations. Because this new OCAP has not been prepared yet, it was not possible to include its provisions in the hydrological modeling for this EIR/EIS.)

CALSIM II modeling undertaken for Reclamation's OCAP BA is used to provide the foundation for CVP/SWP system-wide baseline conditions (stream flow, storage, and diversions) for the CEQA Existing Condition (CEQA basis of comparison) and the future No Action Alternative (NEPA basis of comparison). OCAP model simulations were rerun (OCAP Study 3 and OCAP Study 5) with updated inputs for lower Yuba River outflow to the Feather River, lower Yuba River diversions at Daguerre Point Dam, and Trinity River instream flow requirements downstream of Lewiston Dam.

For this EIR/EIS, CALSIM II was used to establish baseline flow conditions in the lower Sacramento River, Feather River, and Delta, storage in Oroville Reservoir and San Luis Reservoir, and the availability of pumping capacity at Banks and Jones pumping plants. Analysis of the Proposed Project/Action and alternatives was implemented using a post-processing analysis based on changes in simulated flow in the lower Yuba River at the

[10] The CALSIM software has been renamed WRIMS to eliminate confusion between the generic engine or software and its application to the CVP/SWP system (DWR Website 2007).

Marysville Gage. Modeling accuracy for the alternatives is dependent on the accuracy of the CALSIM II baseline. While simulated operations may depart from actual operations, it is believed that the CALSIM II baseline establishes a reasonable range of likely Delta conditions.

The hydrologic analysis presented for this EIR/EIS utilized the 2004 OCAP CALSIM II models, which are the best available hydrological modeling tools, to approximate the changes in storage, flow, salinity, and reservoir system re-operation associated with the Proposed Project/Action and alternatives. Although CALSIM II is the best available tool for simulating system-wide operations, the model also contains simplifying assumptions in its representation of the real system.

A general external review of the methodology, software, and applications of CALSIM II was conducted in 2003 (Close *et al.* 2003). Recently, an external review of the San Joaquin River Valley CALSIM II model was also conducted (Ford *et al.* 2006). Several limitations of the CALSIM II models were identified in these external reviews. The main limitations of the CALSIM II models are as follows:

- Use of a monthly time step
- The accuracy of the inflow hydrology is uncertain
- The model lacks a fully explicit groundwater representation

Reclamation, DWR, and the external reviews have identified the need for a comprehensive error and uncertainty analysis for various aspects of the CALSIM II model. DWR has issued the CALSIM II Model Sensitivity Analysis Study (DWR 2005) and Reclamation is currently embarking on a similar sensitivity and uncertainty analysis for the San Joaquin River Basin. This information will improve understanding of the model results.

Despite these limitations, the monthly CALSIM II model results remain useful for comparative purposes. It is important to differentiate between "absolute or "predictive" modeling applications and "comparative" applications. In "absolute" applications, the model is run once to predict a future outcome, and errors or assumptions in formulation, system representation, data, operational criteria, etc., all contribute to total error or uncertainty in model results. In "comparative" applications, the model is run twice,: once to represent a base condition (no project) and a second time with a specific change (project) to assess the change in the outcome due to the input change. In this mode (the mode used for this EIR/EIS), the difference between the two simulations is of principal importance. Potential errors or uncertainties that exist in the "no project" simulation are also present in the "project" simulation such that their effects are reduced when assessing the change in outcomes.

POST-PROCESSING SPREADSHEET TOOLS

River flow and reservoir storage conditions under the Proposed Project/Action and alternatives were calculated using a post-processing application that routes changes in the Yuba River outflow, simulated using the YPM, through the Feather River, lower Sacramento River, and Delta. The post-processing analysis includes reoperation of Oroville Reservoir for temporary storage of transferred water from the Yuba Basin, changes in Delta operations, including Delta inflow, Delta outflow, Delta exports and X2 location, and changes in San Luis Reservoir storage due to refill impacts.

MODELING THE ENVIRONMENTAL WATER ACCOUNT

Analysis for this EIR/EIS assumes that EWA operations or a similar environmental program, as generally described in the CALFED ROD, will continue to be implemented. EWA operations are included in the CALSIM II modeling of the Proposed Project/Action and alternatives, including the future No Action Alternative. Simulated EWA operations closely follow the EWA modeling conducted by Reclamation for the 2004 OCAP BA. CALSIM II modeling generally follows EWA export actions and changes in export pumping, as anticipated by the CALFED ROD. However, EWA operations have differed from the ROD description as state and federal agencies have adapted operations to implement a successful EWA Program. This adaptive management cannot be represented in CALSIM II.

Simulated EWA actions include (1) reduction in total exports by up to 50 TAF per month from December through February, (2) VAMP SWP export restrictions from April 15 through May 15,(3) post-VAMP SWP export restrictions from May 16 through May 31 (and potentially CVP export restrictions if B2 post-VAMP action is not taken), (4) pre-VAMP SWP export restrictions from April 1 through April 14, and (5) export ramping from June 1 to June 7.

Simulated EWA purchases upstream of the Delta and in the export service area are 250 TAF per year in wet, above normal, and below normal water years, 230 TAF in dry water years, and 210 TAF in critical water years (Sacramento Valley 40-30-30 Index). Other simulated EWA assets include use of 50 percent JPOD export capacity, acquisitions of 50 percent of any CVPIA 3406(b)(2) releases pumped by the SWP, and dedicated 500 cfs pumping capacity at Banks Pumping Plant from July through September.

The Proposed Project/Action and alternatives would provide varying amounts of water to the EWA Program. CALSIM II modeling conducted for the OCAP BA does not identify the sources of water for EWA purchases upstream of the Delta. Modeling for this EIR/EIS specifically identifies volumes of water sold to the EWA by YCWA. It is assumed that this volume is part of, or all of, the EWA purchases simulated in the OCAP BA. Where simulated YCWA sales to the EWA under the Proposed Project/Action and alternatives exceed the volumes of North of Delta purchases identified in the CALSIM II modeling conducted for the OCAP BA, it is assumed that this volume offsets EWA purchases in the export service areas south of the Delta.

MODELING THE PROPOSED PROJECT/ACTION

Methodology for Evaluating Component 1 through Component 4 Water Transfers (2008 through 2015)

To evaluate potential service area impacts associated with the provision of water under the Tier 2 and Tier 3 Agreements proposed in the Yuba Accord Alternative, this EIR/EIS includes an analysis of the quantities of Component 2, 3, and 4 water likely to be provided to CVP and SWP contractors, by water year type.

As previously described for the Yuba Accord Alternative, Component 1 water is designed for EWA use and purposes currently approved by the certified EIS/EIR (Reclamation *et al.* 2004) for the EWA Program, which is anticipated to expire on December 31, 2007. It is anticipated that Component 1 water would continue to be used for similar purposes after the end of the EWA Program.

For CEQA purposes related to DWR and the SWP, a technical review of the EWA EIS/EIR was first conducted to determine the evaluated parameters (e.g., volumes of water, timing and duration), assessment methodology, impact indicators and significance criteria used to support the conclusions in the EWA EIS/EIR. The EWA water supply analysis was separated into analysis of the potential effects on agencies and their users from transferring water to the EWA, water users receiving water from the EWA, and water users not selling water to the EWA (Reclamation *et al.* 2003). To provide maximum flexibility, the EWA analysis included many potential transfers even though the EWA Project agencies would likely not need all transfers in a given year. The EWA analysis also compared the timing of transfer to the timing, of the demand. To compare potential water supply changes associated with the Proposed Project/Action and alternatives to those identified for the EWA Program, a separate analysis designed to mimic the approach used in the EWA EIS/EIR was conducted for this EIR/EIS. Because conditions associated with the EWA Program represent the basis of comparison (i.e., Existing Condition), the modeling used to characterize the CEQA Existing Condition includes operational assumptions for the EWA Program, as modeled in Reclamation's OCAP Study 3. Using OCAP Study 3 as the modeling baseline, transfer water provided to the EWA Program under the Proposed Project/Action and alternatives was post-processed to determine the amount of change expected to occur in evaluated Delta parameters (e.g., export pumping), relative to the EWA Program. The modeling results for the Proposed Project/Action and alternatives were compared to the modeled EWA EIS/EIR results to determine whether potential changes in water supply deliveries associated with transfers to the EWA Program (or functionally equivalent state program) under the Proposed Project/Action and alternatives would produce hydrologic changes similar to those occurring under the CEQA Existing Condition and thus be within the range of effects identified by the EWA Program. Following independent review and comparison of these two analyses, separate findings were made for this project and are presented in this EIR/EIS.

As part of the Tier 2 Agreement between Reclamation and DWR, the agencies normally would implement a 50-50 split in Components 2 through 4 water for delivery to CVP and SWP water contractors. Under the Tier 3 Agreements, Reclamation would allocate Components 2 through 4 water to CVP water service contractors and DWR would normally allocate Component 2 water to SWP Contractors in proportion to their Table A amounts. While DWR would normally allocate Component 3 water to SWP Contractors in proportion to their Table A amounts, individual contractor participation would be optional. The impact analysis assumes that all Yuba Accord water for the CVP would be exported to CVP service areas south of the Delta.

The analysis evaluates how annual CVP and SWP contract deliveries would change as a result of the Proposed Project/Action and alternatives, relative to the basis of comparison. Reclamation and DWR would elect to proportionally distribute the additional water supplied by the Yuba Accord Alternative to CVP and SWP contractors according to authorized federal CVP contracts and state SWP Table A amounts, respectively. The increases in annual delivery of Components 2, 3, and 4 water, by contractor and water year type, are compared to deliveries under the basis of comparison to determine the percent changes that would be expected to occur as a result of the Proposed Project/Action. Additionally, the percent increases in CVP and SWP dry and critical year deliveries provided by the Components 2, 3, and 4 water were calculated for comparative purposes. Because the Proposed Project/Action, relative to the basis of comparison, could change the distribution of CVP and SWP annual deliveries, annual deliveries are presented by water year type and over the 72-year simulation period.

Methodology for Evaluating Component 1 through Component 4 Water Transfers (2016 through 2025)

Water available for transfer under the Proposed Project/Action and alternatives may be more restricted after 2016 because of changes in Yuba Project operations (e.g., FERC relicensing constraints, see Chapter 3) and changes in CVP/SWP system-wide operations (e.g., more restrictive operational constraints associated with protecting listed species). Therefore, the analysis of the Yuba Accord Alternative during 2016 through 2025 considers a range of potential deliveries, which include a minimum of 20 TAF. The minimum delivery amount of 20 TAF is characterized as Component 1 water. Consistent with the modeling assumptions for Component 1 water deliveries before 2016, it is assumed that the 20 TAF would be pumped through the Delta primarily during the July through September period using some or all of the 500 cfs dedicated capacity available to the EWA, or capacity freed up if the EWA Program is no longer in place (post-2016).

Because of the many uncertainties associated with future changes in Yuba Project operations, the analysis of potential water supply changes expected to occur as a result of post-2016 water transfers associated with the Proposed Project/Action and alternatives, relative to the basis of comparison, is performed qualitatively.

5.2.2 WATER SUPPLY ANALYSIS

This section discusses modeling results for Delta export operations and deliveries to the CVP, SWP, and EWA under the Existing Condition, and for each of the CEQA and NEPA alternatives. The focus of this section is the water supply aspects of each alternative. Environmental impacts are discussed in Sections 5.2.4. through 5.2.10

As discussed in Chapter 4, CEQA and NEPA have different requirements and different bases of comparison. Although only one Proposed Project (the Yuba Accord Alternative) and one action alternative (the Modified Flow Alternative) are evaluated in this EIR/EIS, it is necessary to use separate modeling scenarios to correctly characterize these two alternatives under CEQA and NEPA. As a result, the scenarios compared in the impact assessment have either a "CEQA" or a "NEPA" prefix before the name of the alternative being evaluated.

5.2.2.1 WATER SUPPLY SCENARIOS

Table 5-20 summarizes the key assumptions for each alternative. A detailed discussion of the different assumptions used for the CEQA and NEPA alternatives is included in Appendix D. Two additional scenarios, Scenarios A and B, are included in Table 5-20. These scenarios represent a transitional state between the CEQA Existing Condition and the CEQA No Project Alternative. The purpose of these scenarios is to identify the separate effects of the Wheatland Project and implementation of the RD-1644 Long-term lower Yuba River instream flow requirements on CVP and SWP water supplies.

CEQA EXISTING CONDITION

The CEQA Existing Condition represents the environmental condition as it existed in 2005, when the NOP/NOI was published. It includes RD-1644 Interim instream flow requirements on the lower Yuba River, and a present level of demand for agricultural diversions at Daguerre Point Dam.

Table 5-20. Water Supply Scenarios and Alternatives

Scenario	CEQA Existing Condition	Scenario A RD-1644 Interim with Wheatland Project	Scenario B RD-1644 Long-term No Wheatland Project	CEQA No Project	CEQA Yuba Accord Alternative	CEQA Modified Flow Alternative	NEPA No Action	NEPA Yuba Accord Alternative	NEPA Modified Flow Alternative
Time Period	**2005**	**2008**	**2008**	**2008-2016**	**2008-2025**	**2008-2025**	**2016-2025**	**2008-2025**	**2008-2025**
Local Study Area Assumptions									
Lower Yuba River Instream Flow Requirements	RD-1644 Interim	RD-1644 Interim	RD-1644 Long-term	RD-1644 Long-term	Accord Flow Schedules	RD-1644 Interim + Conference Year	RD-1644 Long-term	Accord Flow Schedules	RD-1644 Interim + Conference Year
Demand at Daguerre Point Dam TAF/yr	298 - 304	338 – 344 [a]	298 - 304	338 – 344 [a]	338 – 344 [a]	338 – 344 [a]	338 – 344 [a]	338 – 344 [a]	338 – 344 [a]
CALSIM II Level of Development	Present Level Land Use	Present Level Land Use	Present Level Land Use	Present Level Land Use	Present Level Land Use	Present Level Land Use	2020 Level Land Use	2020 Level Land Use	2020 Level Land Use
YCWA Water Transfers	SW and GW Transfers	None	None	GW Transfers Only	SW and GW Transfers	SW and GW Transfers	GW Transfers Only	SW and GW Transfers	SW and GW Transfers
Other Projects and Programs Assumptions									
CVP/SWP Intertie	Not Included	Not Included	Not Included	Not Included	Not Included	Not Included	Included	Included	Included
Freeport Regional Water Project	Not Included	Not Included	Not Included	Not Included	Not Included	Not Included	Included	Included	Included
South Delta Improvements Program(Stages 1 and 2)	Not Included	Not Included	Not Included	Not Included	Not Included	Not Included	Included	Included	Included
CVP/SWP Integration	Not Included	Not Included	Not Included	Not Included	Not Included	Not Included	Included	Included	Included

[a] Increased demand at Daguerre Point Dam associated with implementation of the Wheatland Project.
SW - Surface water
GW - Groundwater

For a water supply assessment, in contrast to environmental impact determination, CVP, SWP and EWA deliveries under the Yuba Accord and Modified Flow alternatives are compared to the CEQA No Project Alternative rather than the CEQA Existing Condition. Maintaining the CEQA Existing Condition is not an alternative because in the absence of the Proposed Project or an action alternative, the Long-term instream flow requirements are scheduled to go into effect on April 1, 2008.

CEQA NO PROJECT ALTERNATIVE

The CEQA No Project Alternative represents current environmental conditions plus future operational and environmental conditions anticipated to occur in the foreseeable future in the absence of the Proposed Project or other action alternative. The CEQA No Project Alternative includes implementation of the RD-1644 Long-term instream flow requirements on the lower Yuba River. The CEQA No Project Alternative also includes increased irrigation demand at Daguerre Point Dam due to implementation of the Wheatland Project. Additional modeling analysis was conducted to estimate the separate water supply effects of the RD-1644 Long-term instream flow requirements and the Wheatland Project on CVP and SWP deliveries to the Export Service Area. The modeling scenarios, described below, are for this single purpose, and are *not* project alternatives to be considered under CEQA or NEPA.

Scenario A: RD-1644 Long-term Without Wheatland Project

RD-1644 Interim and RD-1644 Long-term specify similar flow requirements at the Marysville gage in wet, above normal, and below normal years as defined by the YRI. However, in dry and critical years, the RD-1644 Long-term instream flow requirements would be significantly higher for the period April 21 to September 14. Therefore, RD-1644 Long-term would result in greater Yuba River outflow during Delta balanced conditions, and increased water supplies to the CVP and SWP in these year types.

Section 5.2.2.2 presents modeling results summarizing the changes in Yuba River outflow and changes in CVP and SWP exports resulting from RD-1644 Long-term instream flow requirements as compared to RD-1644 Interim instream flow requirements.

Scenario B: RD-1644 Interim With Wheatland Project

After 2007, YCWA will deliver surface water from the lower Yuba River to the Wheatland Water District to meet a projected agricultural water demand of approximately 40 TAF per year. While the Wheatland Project would increase surface water deliveries, the effect on Delta exports would be significantly less in magnitude than the amounts of these deliveries.

Flows at the Marysville gage in excess of the instream flow requirements may occur when releases from New Bullards Bar Reservoir are made to meet the reservoir target operating line, or when releases from New Bullards Bar Dam are controlled by instream flow requirements at the Smartville gage. The Smartville flow requirements can control New Bullards Bar Reservoir releases from October to March. Balanced water conditions in the Delta vary from year to year, but typically run from June to November. Operating for increased demands at Daguerre Point Dam would typically result in decreased New Bullards Bar Reservoir storage, greater diversion of water released to meet the Smartville flow requirements, and potentially accompanying decreases in lower Yuba River outflows.

Section 5.2.2.2 presents modeling results summarizing the changes in lower Yuba River outflow and changes in CVP and SWP exports resulting from the increased demand at Daguerre Point Dam associated with the Wheatland Project.

NEPA NO ACTION ALTERNATIVE

The local Yuba elements of the NEPA No Action Alternative are similar to those for the CEQA No Project alternative. The primary differences between the CEQA No Project and NEPA No Action alternatives are assumptions relating to land use development in the Sacramento Valley, SWP export demands, and the implementation of reasonably foreseeable programs and actions. The NEPA No Action Alternative includes the following additional projects or actions that are not included in the CEQA No Project Alternative:

- CVP/SWP Intertie
- Freeport Regional Water Project
- South Delta Improvements Program
- CVP/SWP Integration

YUBA ACCORD ALTERNATIVE

Elements of the Yuba Accord Alternative include operating to meet the Accord flow schedules for the lower Yuba River and a lower carry-over storage target for New Bullards Bar Reservoir. Both the CEQA and NEPA Yuba Accord alternatives include full-level development demands at Daguerre Point Dam reflecting completion of the Wheatland Project.

MODIFIED FLOW ALTERNATIVE

The Modified Flow Alternative includes implementation of flows characterized by RD-1644 Interim instream flow requirements, and the conference year provisions proposed for the Yuba Accord Alternative.

5.2.2.2 BASE DELTA EXPORTS TO EXPORT SERVICE AREA

Base Delta exports, measured as exports through the Banks and Jones pumping plants, are used as an index of the water available to the SWP long-term contractors, CVP water service contractors, and wildlife refuges located in the Export Service Area. Base Delta exports include export of EWA purchases north of the Delta, but do not include water made available through other single-year water transfer or long-term water purchase agreements (e.g., the Accord Water Purchase Agreement).

CEQA EXISTING CONDITION AND NO PROJECT ALTERNATIVE

Table 5-21 compares base Delta exports for present level demands at Daguerre Point Dam under RD-1644 Interim (the CEQA Existing Condition), and RD-1644 Long-term instream flow requirements (Scenario A). The effect of implementing RD-1644 Long-term instream flow requirements on the lower Yuba River would be to increase average annual Delta exports by 9 TAF per year, compared to RD-1644 Interim. In dry and critical years, the increase in exports would be greater, averaging 11 TAF per year in dry years, and 34 TAF per year in critical years.

Table 5-21. Base Delta Exports (TAF per year) for Present Level Demands at Daguerre Point Dam

Water Year Type (SVI)	Existing Condition RD-1644 Interim No Wheatland Project	Scenario A RD-1644 Long-term No Wheatland Project	Difference
Average All Years	5,477	5,485	9
Wet	6,592	6,593	1
Above Normal	6,227	6,227	0
Below Normal	5,880	5,882	2
Dry	4,928	4,938	11
Critical	3,162	3,195	34
Note: Values in the table do not include transfers. SVI - Sacramento Valley Index			

Table 5-22 compares base Delta exports under RD-1644 Long-term instream flow requirements for present level demand (Scenario A) and full level demand (the No Project Alternative) at Daguerre Point Dam (i.e., without and with the Wheatland Project).

With the RD-1644 Long-term instream flow requirements, and with changing from present level demands to full level of development demands, the average annual Delta export would decrease by 13 TAF. In dry and critical years, the effect of the Wheatland Project would be less: exports would average 8 TAF per year less in dry years, and 3 TAF per year less in critical years.

Table 5-22. Base Delta Exports (TAF per year) for RD-1644 Long-term

Water Year Type (SVI)	Scenario A RD-1644 Long-term No Wheatland Project	CEQA No Project Alternative RD-1644 Long-term With Wheatland Project	Difference
Average All Years	5,485	5,473	-13
Wet	6,593	6,578	-15
Above Normal	6,227	6,206	-21
Below Normal	5,882	5,865	-17
Dry	4,938	4,931	-8
Critical	3,195	3,192	-3
Note: Values in the table do not include transfers. SVI - Sacramento Valley Index			

The CEQA Existing Condition includes RD-1644 Interim instream flow requirements and a present level of demand. The CEQA No Project Alternative includes RD-1644 Long-term instream flow requirements and a full development level of demand. **Table 5-23** presents the combined effect of the change in flow requirements and the change in demand on base Delta exports (equivalent to the combined effects shown in Table 5-21 and Table 5-22). The beneficial effect of the Long-term instream flow requirement on CVP and SWP exports is offset by the increase in demand at Daguerre Point Dam for the Wheatland Project. The average annual base Delta export would decrease by 4 TAF. However, the base Delta exports would average 3 TAF per year more in dry years, and 30 TAF per year more in critical years.

Table 5-23. Base Delta Exports (TAF per year) for CEQA Existing Condition and CEQA No Project Alternative

Water Year Type (SVI)	CEQA Existing Condition	CEQA No Project Alternative	Difference
Average All Years	5,477	5,473	-4
Wet	6,592	6,578	-15
Above Normal	6,227	6,206	-21
Below Normal	5,880	5,865	-14
Dry	4,928	4,931	3
Critical	3,162	3,192	30
Note: Values in the table do not include transfers. SVI - Sacramento Valley Index			

YUBA ACCORD ALTERNATIVE

Base Delta exports under the Yuba Accord Alternative correspond to exports under the accounting baseline, as defined in Exhibit 1 to the proposed Water Purchase Agreement (see Appendix B). Baseline conditions for the accounting of released transfer water include RD-1644 Interim instream flow requirements,[11] and FERC License 2246 instream flow requirements of 400 cfs at the Marysville gage for the period of October 1 to October 14. Flows above operations for RD-1644 Interim would be transferable, but are not considered part of base Delta exports (i.e., base Delta exports do not include water that would be provided under the Water Purchase Agreement). For modeling purposes, base Delta exports under the Yuba Accord Alternative are identical to Scenario B. The calculated division between base Delta exports and transfer water is approximate due to difficulties in accurately modeling the Accord accounting rules and modeling reservoir refill impacts in analytical tools that use a monthly time step. **Table 5-24** compares base Delta exports for the Yuba Accord accounting baseline to the CEQA No Project and NEPA No Action alternatives.

Table 5-24. Base Delta Exports (TAF per year) for the No Project, No Action and Yuba Accord Alternatives

Year-Type (SVI)	CEQA No Project Alternative	CEQA Yuba Accord Accounting Baseline	Difference	NEPA No Action Alternative	NEPA Yuba Accord Accounting Baseline	Difference
Average All Years	5,473	5,460	-12	5,939	5,927	-13
Wet	6,578	6,577	-1	7,258	7,257	-1
Above Normal	6,206	6,206	0	6,808	6,808	0
Below Normal	5,865	5,862	-4	6,277	6,273	-4
Dry	4,931	4,911	-20	5,225	5,204	-21
Critical	3,192	3,150	-42	3,465	3,423	-42
Note: Values in the table do not include transfers. SVI - Sacramento Valley Index						

MODIFIED FLOW ALTERNATIVE

Table 5-25 compares base Delta exports for the Modified Flow Alternative to the CEQA No Project and NEPA No Action alternatives.

Base Delta exports under the Modified Flow Alternative would be similar to base Delta exports under the Yuba Accord Alternative, except under extremely dry conditions (e.g., water year 1977), when base Delta exports would be less due to the proposed conference year provision.

Table 5-25. Base Delta Exports (TAF per year) for the No Project, No Action and Modified Flow Alternatives

Water Year Type (SVI)	CEQA No Project Alternative	CEQA Modified Flow Alternative	Difference	NEPA No Action Alternative	NEPA Modified Flow Alternative	Difference
Average All Years	5,473	5,460	-12	5,939	5,927	-12
Wet	6,578	6,577	-1	7,258	7,257	-1
Above Normal	6,206	6,206	0	6,808	6,808	0
Below Normal	5,865	5,862	-4	6,277	6,273	-4
Dry	4,931	4,911	-20	5,225	5,204	-21
Critical	3,192	3,150	-42	3,465	3,426	-39
Note: Values in the table do not include transfers.						

[11] For modeling purposes, this accounting baseline varies from the CEQA Existing Condition because of projected increased demands at Daguerre Point Dam associated with implementation of the Wheatland Project.

5.2.2.3 YCWA STORED WATER TRANSFERS

The ability of YCWA to conduct stored water transfers is considered under each of the alternatives. Modeling results for the volume of stored water transfers, including the carriage water required to implement the transfers, are shown in **Table 5-26**.

Table 5-26. YCWA Stored Water Transfer Volumes (TAF per year)

Water Year Type (SVI)	CEQA No Project Alternative	CEQA Yuba Accord Alternative	CEQA Modified Flow Alternative	NEPA No Action Alternative	NEPA Yuba Accord Alternative	NEPA Modified Flow Alternative
Average All Years	0	64	42	0	66	52
Wet	0	56	52	0	68	69
Above Normal	0	73	65	0	74	67
Below Normal	0	66	52	0	66	52
Dry	0	62	31	0	60	45
Critical	0	70	12	0	65	16

Note: Exports may be less because of Delta carriage water losses.
SVI - Sacramento Valley Index

NO PROJECT AND NO ACTION ALTERNATIVES

YCWA would not be able to undertake stored water transfers under RD-1644 Long-term instream flow requirements. Drawing down storage levels in New Bullards Bar Reservoir to affect a stored water transfer could jeopardize following year's deliveries to YCWA member units because of the higher flow requirements of RD-1644 Long-term in dry and critical years compared to the RD-1644 Interim instream flow requirements. For a more detailed discussion of these constraints on stored water transfers, see Attachment C of Appendix D.

YUBA ACCORD ALTERNATIVE

Stored water transfers would be an integral part of the Yuba Accord, and would be implemented through the Accord flow schedules. The accounting principles for transfers under the Yuba Accord Alternative are specified in the proposed Water Purchase Agreement. Transferable flow is based on the difference between flows at the Marysville gage under the Yuba Accord compared to the accounting baseline. Additional stored water transfers, over and above those afforded through the Proposed Yuba Accord flow schedules and New Bullards Bar Reservoir target operating line, would not be possible.

MODIFIED FLOW ALTERNATIVE

YCWA would be able to conduct single-year stored water transfers under the Modified Flow Alternative, depending on available water in New Bullards Bar Reservoir, Delta conditions, and available Delta export capacity.

5.2.2.4 YCWA GROUNDWATER SUBSTITUTION TRANSFERS

Groundwater substitution transfers involve the shifting of agricultural irrigation from surface water to groundwater, and allowing the surface water that would have otherwise been used for irrigation to be released at a time when it is exportable from the Delta. Limits to groundwater substitution transfer pumping, adopted for modeling purposes, are described in Chapter 6. Groundwater substitution transfers are included under each alternative. For the impact analysis, it is assumed that single-year groundwater substitution pumping would occur in only dry and critical years, and below normal years with SWP allocations less than 60 percent.

Modeling results for groundwater substitution transfers, including the carriage water required to implement the transfers, are shown in **Table 5-27**. Lower values are projected for the NEPA alternatives because of YCWA's projected SVWMP groundwater obligation.

Table 5-27. YCWA Groundwater Substitution Transfer Volumes (AF per year)

Water Year Type (SVI)	CEQA No Project Alternative	CEQA Yuba Accord Alternative	CEQA Modified Flow Alternative	NEPA No Action Alternative	NEPA Yuba Accord Alternative	NEPA Modified Flow Alternative
Average All Years	19	25	21	18	23	18
Wet	0	0	0	0	0	0
Above Normal	0	0	0	0	0	0
Below Normal	0	0	0	0	0	0
Dry	50	71	58	47	68	51
Critical	50	59	49	40	50	43

NO PROJECT AND NO ACTION ALTERNATIVES

It is assumed that single-year groundwater substitution transfers would occur under the No Project and No Action alternatives. However, the volume of transfers would be significantly less than those under the Yuba Accord Alternative because of the need to undergo the permitting process, including preparation of a Biological Evaluation, and the need for YCWA to negotiate Conjunctive Use Agreements with its Member Units each year.

YUBA ACCORD ALTERNATIVE

One of the primary components of the Proposed Yuba Accord is the proposed Conjunctive Use Agreements between YCWA and its Member Units, which would formalize the integration of surface water and groundwater supplies in Yuba County. Groundwater substitution pumping would help meet the Component 2 and Component 3 commitments in the Water Purchase Agreement. Groundwater substitution pumping would also provide Component 4 water in dry and critical years. In Schedule 6 years, groundwater substitution would include 30 TAF of pumping to increase surface water storage releases for instream flows.

MODIFIED FLOW ALTERNATIVE

Single-year groundwater substitution transfers would occur under the Modified Flow Alternative, in similar amounts to what would occur under the No Project and No Action alternatives.

5.2.2.5 TOTAL YCWA TRANSFERS

The combined stored water and groundwater substitution transfers for each alternative are presented in **Table 5-28**. Water provided under the Yuba Accord would be greater than the single-year transfer volumes expected under the No Project Alternative, the No Action Alternative, and the Modified Flow Alternative. The Yuba Accord also provides contractual assurances to buyers, and therefore would provide a more secure water supply than single-year water transfers.

Table 5-28. YCWA Combined Stored Water and Groundwater Substitution Transfer Volumes (TAF per year)

Water Year Type (SVI)	CEQA No Project Alternative	CEQA Yuba Accord Alternative	CEQA Modified Flow Alternative	NEPA No Action Alternative	NEPA Yuba Accord Alternative	NEPA Modified Flow Alternative
Average All Years	19	89	63	18	89	70
Wet	0	56	52	0	68	69
Above Normal	0	73	65	0	74	67
Below Normal	0	66	52	0	66	52
Dry	50	133	89	47	128	96
Critical	50	129	61	40	115	59

The volume of water transfers received by south-of-Delta contractors would be subject to reductions for carriage water. For the environmental impact analysis, a constant 20 percent carriage water loss[12] was assumed. **Table 5-29** presents the YCWA water transfer volumes exported through Banks and Tracy pumping plants after accounting for this assumed carriage water loss.

Table 5-29. Delta Export of YCWA Transfer Water (TAF per year)

Water Year Type (SVI)	CEQA No Project Alternative	CEQA Yuba Accord Alternative	CEQA Modified Flow Alternative	NEPA No Action Alternative	NEPA Yuba Accord Alternative	NEPA Modified Flow Alternative
Average All Years	15	71	51	14	72	56
Wet	0	45	41	0	55	56
Above Normal	0	59	52	0	59	53
Below Normal	0	53	42	0	53	42
Dry	40	106	71	37	103	77
Critical	40	103	49	32	92	47

5.2.2.6 WATER SUPPLY BENEFITS OF THE YUBA ACCORD ALTERNATIVE

The water supply benefits of the Yuba Accord Alternative are presented in **Table 5-30,** which compares Delta exports, including export of released transfer water, under the Yuba Accord Alternative to base Delta exports under the CEQA No Project Alternative and the NEPA No Action Alternative.

Table 5-30. Combined Base Delta Exports and YCWA Water Transfers: Yuba Accord Alternative (TAF per year)

Water Year Type (SVI)	CEQA No Project Alternative Base Export	CEQA Yuba Accord Alternative Base Export + YCWA Transfer	Difference	NEPA No Action Alternative Base Export	NEPA Yuba Accord Alternative Base Export + YCWA Transfer	Difference
Average All Years	5,473	5,532	59	5,939	5,998	59
Wet	6,578	6,622	44	7,258	7,312	54
Above Normal	6,206	6,265	59	6,808	6,867	59
Below Normal	5,865	5,914	49	6,277	6,325	48
Dry	4,931	5,017	87	5,225	5,307	82
Critical	3,192	3,253	61	3,465	3,515	50

[12] Expressed as a percentage of the transfer volume inflow to the Delta.

For purposes of the environmental impact analyses for this EIR/EIS, specific assumptions regarding the distribution of water transfers between different purposes have been made.

Single-year water transfers have been a component of Yuba Project operations since 1987. For environmental impact assessment, YCWA water transfers are included as part of the Existing Condition, the No Project Alternative, and the No Action Alternative. It is assumed that all transfers would be sold to Reclamation and DWR and the water would be used by CVP and SWP water service contractors, EWA, or wildlife refuges located in the Export Service Area south of the Delta.

For modeling purposes, the following allocation of transfer water was assumed:

- If the SWP end-of-May agricultural allocation, as determined in CALSIM II, is greater than 60 percent, all YCWA transfers are attributed to the EWA;
- If the SWP end-of-May agricultural allocation from CALSIM II is between 40 percent and 60 percent, YCWA transfers are split evenly between the EWA and the DWR Dry Year Program and
- If the SWP end-of-May agricultural allocation from CALSIM II is less than 40 percent, all YCWA transfers are attributed to Reclamation and DWR in equal amounts

The same allocation of transfer water was assumed for the Modified Flow Alternative to provide consistency in the comparative analysis.

Historically, YCWA has sold more water to DWR than to Reclamation. For institutional and financial reasons, CVP contractors in the Export Service Area have preferred to negotiate with CVP contractors in the Sacramento Valley for water transfers. In 2001, some CVP interests expressed a willingness to participate in the DWR Dry Year Program, but ultimately used the Forbearance Program and kept the transfers strictly between CVP contractors. The history of YCWA transfers echoes that preference, with the exception of CCWD (which is a CVP contractor but is not served by the Jones Pumping Plant). However, for the impact analysis, it is assumed that YCWA water would be used equally by the CVP and SWP.

Under the Yuba Accord Alternative, Component 1 water would be used for the EWA Program. Components 2 and 3 water would be made available to the CVP and SWP. For the environmental impact analysis, it is assumed that Component 4 water would be used by the EWA Program, or the CVP and SWP contractors in the same proportions as described above for single-year water transfers. **Table 5-31** presents the resulting breakdown of deliveries to the CVP, SWP, and the EWA for the Yuba Accord Alternative compared to base deliveries under the CEQA No Project Alternative and the NEPA No Action Alternative.

As previously mentioned, the split between CVP, SWP, and the EWA for the Yuba Accord Alternative would be determined by the water purchase agreement described in the proposed lower Yuba River Accord. **Table 5-32** shows the approximate split of transfer volumes made available by the Yuba Accord Alternative into various components, by year, according to the accounting described in the water purchase agreement. The volumes are approximate due to the inability to capture real-time operations in monthly modeling.

Table 5-31. CVP, SWP, and EWA Deliveries: Yuba Accord Alternative Compared to CEQA No Project and NEPA No Action Alternatives (TAF per year)

Water Year Type (SVI)	CEQA No Project Alternative Base Delivery	CEQA Yuba Accord Alternative Base Delivery + YCWA Transfer	Difference	NEPA No Action Alternative Base Delivery	NEPA Yuba Accord Alternative Base Delivery + YCWA Transfer	Difference
CVP South-of-Delta Water Service Contractors and Wildlife Refuges						
Average All Years	1,497	1,498	1	1,569	1,569	0
Wet	1,939	1,940	1	2,051	2,050	-1
Above Normal	1,743	1,743	0	1,864	1,864	0
Below Normal	1,574	1,573	-1	1,633	1,631	-1
Dry	1,267	1,271	4	1,322	1,327	5
Critical	732	736	4	732	733	1
SWP South of Delta Table A						
Average All Years	2,854	2,856	3	3,088	3,090	2
Wet	3,226	3,227	1	3,590	3,589	-1
Above Normal	3,236	3,236	0	3,660	3,660	0
Below Normal	3,270	3,269	-1	3,462	3,461	-1
Dry	2,676	2,682	6	2,729	2,736	7
Critical	1,635	1,644	9	1,773	1,779	6
EWA – Export of YCWA Purchases						
Average All Years	0	54	54	0	55	55
Wet	0	42	42	0	54	54
Above Normal	0	58	58	0	59	59
Below Normal	0	51	51	0	51	51
Dry	0	78	78	0	69	69
Critical	0	47	47	0	43	43

Table 5-32. Breakdown of Annual Water Transfer Components for the Yuba Accord Alternatives

Year	SVI Year Type	SWP Alloc.	CVP Alloc.	CEQA Yuba Accord Alternative						NEPA Yuba Accord Alternative					
				C1 TAF	C2 TAF	C3A TAF	C3B TAF	C4 TAF	Total TAF	C1 TAF	C2 TAF	C3A TAF	C3B TAF	C4 TAF	Total TAF
1922	AN	102%	71%	60	0	0	0	9	69	60	0	0	0	9	69
1923	BN	100%	46%	60	0	0	0	8	68	40	0	0	0	0	40
1924	C	15%	75%	60	30	40	0	21	151	60	30	40	0	22	152
1925	D	43%	80%	60	15	0	35	0	110	60	15	0	40	10	125
1926	D	75%	100%	36	15	15	0	0	66	60	15	15	0	0	90
1927	W	103%	73%	83	0	0	0	0	83	62	0	0	0	0	62
1928	AN	78%	32%	61	0	0	0	16	77	77	0	0	0	0	77
1929	C	25%	62%	60	30	40	0	20	150	60	30	40	0	26	156
1930	D	70%	67%	43	15	40	0	5	103	32	15	40	0	5	92
1931	C	24%	77%	47	13	0	0	0	60	47	13	0	0	0	60
1932	D	32%	48%	58	15	39	0	0	112	58	15	39	0	0	112
1933	C	31%	86%	60	30	40	0	25	155	60	30	40	25	0	155
1934	C	35%	68%	60	30	40	0	18	148	60	30	40	0	18	148
1935	BN	111%	100%	48	0	0	0	0	48	60	0	0	5	0	65
1936	BN	101%	80%	69	0	0	0	0	69	76	0	0	0	0	76
1937	BN	95%	100%	60	0	0	11	0	71	60	0	0	16	0	76
1938	W	100%	72%	62	0	0	0	0	62	62	0	0	0	0	62
1939	D	87%	72%	59	15	0	0	75	149	60	15	0	0	76	151
1940	AN	106%	68%	81	0	0	0	0	81	86	0	0	0	0	86
1941	W	100%	79%	48	0	0	0	0	48	61	0	0	0	3	64
1942	W	100%	81%	71	0	0	0	0	71	55	0	0	0	0	55
1943	W	94%	79%	24	0	0	0	0	24	57	0	0	0	0	57
1944	D	104%	15%	60	15	0	0	87	162	49	15	0	0	75	139
1945	BN	105%	3%	75	0	0	0	0	75	61	0	0	0	0	61
1946	BN	100%	100%	59	0	0	0	0	59	36	0	0	0	0	36
1947	D	72%	80%	60	15	0	40	88	203	60	15	0	40	85	200
1948	BN	84%	88%	77	0	0	0	0	77	103	0	0	0	8	111
1949	D	57%	75%	60	15	0	40	57	172	59	15	0	40	26	140
1950	BN	84%	100%	60	0	17	0	0	77	60	0	16	0	0	76
1951	AN	100%	100%	56	0	0	0	0	56	56	0	0	0	0	56
1952	W	100%	79%	40	0	0	0	0	40	56	0	0	0	0	56
1953	W	100%	59%	55	0	0	0	0	55	55	0	0	0	0	55
1954	AN	102%	73%	107	0	0	0	17	124	73	0	0	0	67	140
1955	D	37%	43%	60	15	40	0	37	152	48	15	0	40	35	138
1956	W	100%	10%	60	0	0	0	14	74	72	0	0	0	2	74
1957	AN	80%	42%	60	0	0	0	10	70	60	0	0	0	10	70
1958	W	101%	0%	22	0	0	0	0	22	59	0	0	0	0	59
1959	BN	83%	12%	77	0	0	0	0	77	61	0	0	0	18	79
1960	D	62%	34%	-19	15	40	0	35	71	60	15	40	40	16	171
1961	D	64%	70%	60	15	0	0	253	328	60	15	0	0	153	228

Year	SVI Year Type	SWP Alloc.	CVP Alloc.	CEQA Yuba Accord Alternative						NEPA Yuba Accord Alternative					
				C1 TAF	C2 TAF	C3A TAF	C3B TAF	C4 TAF	Total TAF	C1 TAF	C2 TAF	C3A TAF	C3B TAF	C4 TAF	Total TAF
1962	BN	89%	84%	88	0	0	0	0	88	60	0	0	0	28	88
1963	W	101%	71%	55	0	0	0	0	55	55	0	0	0	0	55
1964	D	78%	46%	-11	15	0	0	75	79	43	15	0	0	75	133
1965	W	81%	75%	104	0	0	0	0	104	82	0	0	0	63	145
1966	BN	100%	80%	42	0	0	0	0	42	30	0	0	0	0	30
1967	W	101%	100%	30	0	0	0	0	30	83	0	0	0	0	83
1968	BN	85%	73%	30	0	0	0	0	30	45	0	0	0	0	45
1969	W	101%	32%	81	0	0	0	0	81	69	0	0	0	0	69
1970	W	100%	62%	109	0	0	0	0	109	73	0	0	0	37	111
1971	W	101%	67%	77	0	0	0	0	77	60	0	0	0	17	77
1972	BN	71%	77%	72	0	0	0	0	72	60	0	0	0	25	85
1973	AN	101%	48%	83	0	0	0	0	83	60	0	0	0	9	69
1974	W	100%	86%	24	0	0	0	0	24	55	0	0	0	0	55
1975	W	100%	68%	25	0	0	0	0	25	55	0	0	0	0	55
1976	C	74%	100%	60	30	40	0	24	154	0	0	0	0	0	0
1977	C	3%	80%	13	0	0	0	0	13	60	30	29	0	0	119
1978	AN	103%	100%	57	0	0	0	0	57	56	0	0	0	0	56
1979	BN	101%	72%	55	0	0	0	0	55	55	0	0	0	0	55
1980	AN	101%	72%	56	0	0	0	0	56	56	0	0	0	0	56
1981	D	84%	68%	42	15	0	0	75	132	13	15	0	0	75	103
1982	W	100%	79%	79	0	0	0	0	79	67	0	0	0	0	67
1983	W	100%	81%	0	0	0	0	0	0	0	0	0	0	0	0
1984	W	100%	79%	16	0	0	0	0	16	27	0	0	0	0	27
1985	D	97%	15%	30	15	0	0	53	98	-29	0	0	0	0	-29
1986	W	101%	3%	99	0	0	0	0	99	125	0	0	0	0	125
1987	D	69%	100%	60	15	0	40	35	150	60	15	40	0	35	150
1988	C	12%	80%	51	30	30	0	0	111	51	30	30	0	0	111
1989	D	91%	88%	-1	15	0	15	0	29	39	15	0	0	15	69
1990	C	25%	75%	60	30	40	0	105	235	60	30	40	0	66	196
1991	C	23%	100%	60	30	40	0	7	137	60	30	40	0	8	138
1992	C	38%	100%	36	30	0	0	0	66	31	30	0	0	0	61
1993	AN	102%	79%	57	0	0	0	0	57	58	0	0	0	0	58
1994	C	79%	59%	60	30	0	0	64	154	32	30	0	0	60	122

Note: Allocations as defined by CEQA modeling
Transfer volumes as simulated using environmental impact modeling tools.

5.2.3 IMPACT INDICATORS AND SIGNIFICANCE CRITERIA

Impact indicators and significance criteria developed for the evaluation of water supply impacts are presented in **Table 5-33.** Simulated stream flow and reservoir storage data, generated as part of the surface water supply and management impact assessment, also are used in the evaluation of groundwater, hydropower, flood control, water quality, fisheries, terrestrial, recreation and cultural resources.

As also discussed in Chapter 4, while the CEQA and NEPA analyses in this EIR/EIS refer to "potentially significant," "less than significant," "no", and "beneficial" impacts, the first two comparisons (CEQA Yuba Accord Alternative compared to the CEQA No Project Alternative and CEQA Modified Flow Alternative compared to the CEQA No Project Alternative) presented below instead refer to whether or not the proposed change would "unreasonably affect" the evaluated parameter. This is because these first two comparisons are made to determine whether the action alternative would satisfy the requirement of Water Code Section 1736 that the proposed change associated with the action alternative "would not unreasonably affect fish, wildlife, or other instream beneficial uses."

5.2.3.1 YCWA ALLOCATIONS TO MEMBER UNITS

Reoperation of the Yuba Project under the Proposed Project/Action or alternatives may result in reduced surface water deliveries by YCWA to its Member Units in some years. It is assumed that, except for extremely dry conditions as experienced in 1977, surface water delivery deficiencies would be offset by increased groundwater pumping (i.e., that the reductions in surface water supplies would be less than the available capacity to pump groundwater). In reporting simulated model results, a distinction is made between YCWA allocations to Member Units and YCWA surface water deliveries. The YCWA allocations reflect water supply conditions and are used as the metric for assessing water supply impacts. YCWA surface water deliveries to Member Units are the allocations less any voluntary groundwater substitution transfers. For analytical purposes, groundwater pumping is assumed equal to the irrigation demand less the surface water delivery.

Table 5-33. Impact Indicators and Significance Criteria for Surface Water Supply and Management

Impact Indicator	Significance Criteria
Surface water allocations to YCWA Member Units	Reduction in YCWA allocations to Member Units due to decreases in annual water supply or increases in flow requirements in the lower Yuba River.
Deliveries to south-of-Delta CVP water service contractors and refuges	Reduction in combined deliveries to south-of-Delta CVP water service contractors and refuges of 5 percent or greater [a] due to decreases in the annual supply of available water to the CVP.
Deliveries to south-of-Delta SWP contractors (Table A)	Reduction in deliveries to south-of-Delta SWP contractors of 5 percent or greater [a] due to decreases in the annual supply of available water to the SWP.
X2 location	Increase in X2 that adversely affects CCWD's ability to fill Los Vaqueros Reservoir • Movement of X2 location to west of Chipps Island from February through May • Movement of X2 location to west of Collinsville during December, January, and June
Delta excess water conditions	Reduction in the duration of Delta excess conditions during the November to June period that adversely affects CCWD's ability to fill Los Vaqueros Reservoir.
Water levels in the South Delta [b]	A reduction in water surface elevation, relative to the basis of comparison, of sufficient frequency and magnitude that it adversely affects south Delta water users' abilities to divert water. • Water levels at Old River near Tracy Road Bridge and Grant Line Canal near Tracy Road Bridge less than 0.0 feet above msl. • Water levels at Middle River near the Undine Road Bridge less than 0.3 feet above msl.
San Luis Reservoir storage	Reduction in reservoir levels may adversely affect the water quality of deliveries to the San Felipe Division when water levels are below about 300 TAF. Reduction in reservoir storage may also impact allocations to SWP and CVP contractors.

[a] There appears to be no accepted standard for a significance threshold with regard to model determinations of project impacts. CALFED estimates modeling uncertainty at 10 percent and identifies all impacts below 10 percent as less than significant (CALFED 2000, Section 5.3.5). A significance criterion of 5 percent or greater is used because it is believed that this value approximates the level of quantitative error able to be detected in the CALSIM II model for a comparative analysis.

[b] Changes in south Delta water levels are estimated using the DSM2 Model. The DSM2 Model is described in Chapter 9.

5.2.3.2 CVP AND SWP DELIVERIES

Improvements in statewide water supply management, including supplemental water for the CVP and the SWP, are a project purpose. Under the Proposed Project, Reclamation and DWR would each enter into separate agreements with state and federal water contractors, respectively, regarding allocation of purchased water supply (Tier 3 Agreements).

Under the Existing Condition, and No Project, No Action, and Modified Flow alternatives, it is anticipated that CVP and SWP water supplies would be supplemented by YCWA single-year water transfers. The total water supply to CVP and SWP contractors is the combination of CVP and SWP allocations and YCWA water purchases and transfers. Historically, YCWA has sold more water to DWR than to Reclamation; for institutional and financial reasons, CVP contractors in the Export Service Area have preferred to negotiate with CVP contractors in the Sacramento Valley for water transfers.

Individual CVP and SWP contractors may opt out of all or some of the water made available under the Yuba Accord Alternative. Similarly, not all CVP and SWP contractors may benefit from single-year water transfer agreements that could take place under the project alternatives. For these reasons, the impact indicator for water supply deliveries is the base CVP and SWP allocations prior to any supplemental deliveries that would result from the Yuba Accord or single-year water transfer agreements.

5.2.3.3 X2 Location

CCWD is almost entirely dependent on the Delta for water supply. CCWD's raw water system consists of three Delta pumping plants (Mallard Slough, Rock Slough and Old River), and a 100 TAF reservoir (Los Vaqueros). The pumping plants on Rock Slough and on the Old River are the primary source. The third intake at Mallard Slough is used only when water quality conditions in the western Delta permit, usually following a prolonged period of surplus Delta outflow. Water diverted at the Old River Pumping Plant is either used directly or stored in Los Vaqueros Reservoir for later use. CCWD's current operational priority is to fill Los Vaqueros Reservoir with high quality water whenever possible.

CCWD has established a water quality delivery target of 65 mg/l chloride. An increase in salinity in the Western Delta could affect the ability of CCWD to divert water for direct delivery to its customers, or to fill Los Vaqueros Reservoir for later use in blending operations. The potential effects of increased salinity on CCWD operations are discussed in Chapter 9.

CCWD diversions to fill Los Vaqueros Reservoir are constrained by the Delta Smelt BO (NMFS 2004; USFWS 2005) as subsequently modified by agreements between CCWD, USFWS, CDFG, and SWRCB. From February through May, the BO precondition for filling the reservoir is that the X2 location is west of Chipps Island. In December, January, and June, the X2 location must be west of Collinsville. Filling of Los Vaqueros Reservoir is unconstrained in December if no delta smelt are present at the diversion location. Through agreement with CDFG and USFWS, the X2 restrictions on filling Los Vaqueros Reservoir have subsequently been modified for a temporary trial period through 2010 to conform with the X2 requirements specified in D-1641.

For the impact analysis, it is assumed that from February to June, the X2 requirement for filling Los Vaqueros Reservoir will be met by Reclamation and DWR as part of their responsibilities under D-1641[13]. Changes in simulated Delta conditions are considered to be potentially significant only for the months of December and January, and only when all of the following conditions are met:

- ❑ The Delta is in excess conditions
- ❑ Under the basis of comparison, X2 is west of Collinsville
- ❑ Under the Proposed Project/Action or alternative X2 is east of Collinsville
- ❑ CCWD is diverting under its Los Vaqueros water right, (based on simulation of Los Vaqueros Reservoir operations modeling performed for the Alternative Intake Project EIR/EIS (CCWD and Reclamation 2006).

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[13] When the Eight River Index is less than 8.1 MAF, the D-1641 X2 requirements for May and June are relaxed, potentially impacting filling of Los Vaqueros Reservoir. Model simulations show that this would occur eight times during the historical record for water years 1922 to 1994, but in these circumstances the Delta would be in balanced water conditions.

It is noted that Reclamation and DWR are not authorized to use the JPOD when the Delta is in excess conditions, and such diversions would cause the location of X2 to shift upstream so as to prevent CCWD from filling Los Vaqueros Reservoir under its water right permits.

5.2.3.4 DELTA EXCESS WATER CONDITIONS

Changes from Delta excess water conditions to balanced conditions could adversely affect CCWD's ability to fill Los Vaqueros Reservoir. Under SWRCB Water Right Decision 1629 (D-1629), filling Los Vaqueros Reservoir is restricted to the parts of the period from November 1 to June 30 when the Delta is in excess water conditions. Changes in simulated Delta conditions are considered to be potentially significant if during this period all of the following conditions are met:

- Under the basis of comparison, the Delta is in excess conditions
- Under the Proposed Project/Action or alternative, the Delta is in balanced conditions
- CCWD is diverting under its Los Vaqueros water right, (based on simulation of Los Vaqueros Reservoir operations modeling performed for the Alternative Intake Project EIR/EIS (CCWD and Reclamation 2006)

5.2.3.5 SOUTH DELTA WATER LEVELS

Water levels in the south Delta are influenced to varying degrees by natural tidal fluctuations, San Joaquin River flows, barrier operations, CVP and SWP pumping, local agricultural diversions and drainage return flows, channel capacities, siltation, and dredging. When the CVP and SWP are exporting water, water levels in local channels can be drawn down, particularly during low water years. The South Delta Water Agency (SDWA) and local farmers in the south and central Delta have interests in maintaining the water levels so that their siphons and pumps, which are installed at fixed locations in the Delta, can continue to be used for irrigation diversions. The Proposed Project/Action and alternatives could adversely affect the ability of the SDWA to divert water if changes in Delta operations cause reductions in Delta channel water levels during the irrigation season from April to October.

The South Delta Temporary Barriers Program was initiated in 1991 to improve water conditions in the South Delta and to provide design data for permanent gates. Since 1991, DWR has seasonally installed four barriers. Three barriers, located on the Middle River, Grant Line Canal, and the Old River, ensure adequate water levels and water quality for agricultural diversions. The barriers are constructed from rock fill and incorporate overflow weirs and gated culverts. These barriers are installed in the spring and removed in the fall. A fourth barrier is seasonally installed at the Head of the Old River for fish control. The Head of the Old River barrier is typically in place from April 15 to May 15 to protect out-migration of young salmon, and from September 15 to November 30 to improve dissolved oxygen concentrations in the San Joaquin River for adult return migration. The existing seasonal barriers (and proposed permanent tidal gates) significantly impact water levels in the South Delta. In October 2005, Reclamation and DWR released a Draft EIR/EIS for the SDIP. This Draft EIR/EIS discusses the proposed operation and evaluates the impacts of four proposed permanent tidal and fish control gates in the South Delta. The Final EIR/EIS for the SDIP was released in December 2006.

The methodology for determining water level impacts in the south Delta follows the methodology established by Reclamation and DWR in the "*Response Plan for Water Level*

Concerns in the South Delta Under Water Rights Decision 1641" (DWR 2004), and subsequently approved by the SWRCB on July 19, 2004. Channel tidal levels at four south Delta locations have been selected to describe the possible effects of the Proposed Project/Action and alternatives on south Delta tidal hydraulics. The four locations are as follows:

- The Old River at Tracy Boulevard Bridge (Road Bridge). This station is a tidal level and EC monitoring location and is upstream of the temporary barrier and proposed permanent barrier just east (upstream) of the Delta-Mendota Canal intake and fish facility.
- Doughty Cut above Grant Line Canal Barrier. This station is upstream of the temporary barrier on Grant Line Canal and upstream of the proposed permanent tidal gate. Doughty Cut connects the Old River and Grant Line Canal.
- Middle River near the Howard Road Bridge. This station is located just upstream of the temporary barrier near Victoria Canal and the proposed permanent tidal gate.
- East of Coney Island (DSM2 Channel 218).

For the impact assessment, DSM2 simulated tidal levels indicative of the first three of these four locations are reported[14] as the monthly means of the daily average water levels and the monthly means of the daily minimum levels. It is important to consider the minimum daily water levels because the potential for effects would be greatest at these levels.

According to the Water Level Response Plan, south Delta water levels are considered adequate if they are projected to be 0.0 feet at msl or greater at Old River near Tracy Road Bridge, and Doughty Cut above Grant Line Canal Barrier, and 0.3 feet above msl or greater at Middle River near the Howard Road Bridge.

The Water Level Response Plan recognizes that the Coney Island/Channel 218 location is downstream of the temporary barriers and may at times have water levels below that which is necessary for local diversions. A long-term solution for water levels of concern downstream of the barriers is to be developed within the SDIP. Until such a plan is implemented, Reclamation and DWR are committed to providing mitigation for effects to water levels caused by transfer operations. Such mitigation may include diversion modifications, the use of temporary pumps, or other measures (Reclamation and DWR 2005). No quantitative threshold of significance has been developed for Coney Island/Channel 218.

5.2.3.6 SAN LUIS RESERVOIR STORAGE

San Luis Reservoir typically provides little carry-over storage, and undergoes an annual drawdown and refill cycle. The CVP and SWP try to fill San Luis Reservoir by the end of March of each year. In April and May, export pumping from the Delta is limited by D-1641 San Joaquin River pulse period standards as well as B2 and EWA fishery management actions. As a result, demand in the export service area exceeds Delta exports, and San Luis Reservoir begins its drawdown cycle. In July and August, irrigation demands meet their peak, and San Luis

[14] Water levels for the Middle River at the Undine Road Bridge are reported rather than water levels for the Middle River at Howard Road Bridge. The Undine Road Bridge is located approximately 3.5 miles upstream of the Howard Road Bridge. Water levels for the Grant Line Canal near the Tracy Road Bridge are reported rather than water levels for Doughty Cut. Doughty Cut is located approximately 1.5 miles upstream of the Grant Line Canal at the Tracy Road Bridge.

Reservoir continues to be drawn down. Historically, San Luis Reservoir has typically reached its low-point in August or September.

The San Luis Reservoir low point may affect the reliability and quality of CVP water delivered to Santa Clara County and San Benito County water districts. During the summer, as the San Luis Reservoir is drawn down, a thick layer of algae can grow on the water surface. When the volume of water in the reservoir drops to below 300 TAF, this algae begins to enter the San Felipe Division intake, degrading water quality and making the water harder to treat for M&I purposes.

The Proposed Project/Action and alternatives could reduce water levels in San Luis Reservoir and thus impact the water quality and reliability of water deliveries to the San Felipe Division, if San Luis Reservoir storage drops below 300 TAF (Reclamation 2004). Reductions in San Luis Reservoir carry-over storage could also affect SWP and/or CVP allocations in the following contract year.

5.2.4 ENVIRONMENTAL IMPACTS/ENVIRONMENTAL CONSEQUENCES OF THE CEQA YUBA ACCORD ALTERNATIVE COMPARED TO THE CEQA NO PROJECT ALTERNATIVE

Impact 5.2.4-1: Surface water allocations and deliveries to YCWA Member Units

Table F1-1 presents simulated surface water allocations to YCWA Member Units. Allocations would be approximately 0.7 percent per year, or approximately 3 TAF per year, higher with the implementation of the CEQA Yuba Accord Alternative. However, surface water deliveries under the Yuba Accord Alternative would be lower, largely due to greater volumes of groundwater substitution transfers. Table F1-2 shows surface water deliveries to Member Units would be an average of approximately 4 TAF per year lower.

It is assumed that lower surface water deliveries would be offset by greater volumes of groundwater pumping, resulting in no difference in Member Unit water supply. The effects of greater groundwater pumping are discussed in Chapter 6.

Therefore, potential reductions in annual water supply or increases in lower Yuba River flows under the CEQA Yuba Accord Alternative, relative to the CEQA No Project Alternative, would not unreasonably affect surface water deliveries to YCWA Member Units.

Impact 5.2.4-2: Deliveries to south-of-Delta CVP contractors

Model results presented in Table F1-3 show that average annual deliveries to CVP south-of-Delta water service contractors and refuges, excluding additional water made available through water transfers, would be approximately 7 TAF per year, or less than 1 percent, lower under the CEQA Yuba Accord Alternative, relative to the CEQA No Project Alternative. In dry and critical years, the average annual deliveries would be approximately 11 TAF and 23 TAF per year lower, respectively. However, reductions in dry and critical years would be offset by the purchase of Component 2 and Component 3 water under the Water Purchase Agreement.

Therefore, changes under the CEQA Yuba Accord Alternative, relative to the CEQA No Project Alternative, would not unreasonably affect surface water deliveries to CVP contractors.

Impact 5.2.4-3: Deliveries to south-of-Delta SWP contractors

Simulated SWP Table A deliveries are presented in Table F1-4. Model results show that under the CEQA Yuba Accord Alternative, the average annual south-of-Delta Table A deliveries, excluding additional water made available through water transfers, would be approximately 5 TAF per year lower than under the CEQA No Project Alternative. In dry and critical years, the average annual deliveries would be approximately 9 TAF and 19 TAF per year lower, respectively. However, reductions in dry and critical years would be offset by the purchase of Component 2 and Component 3 water under the Water Purchase Agreement.

Therefore, changes under the CEQA Yuba Accord Alternative, relative to the CEQA No Project Alternative, would not unreasonably affect surface water deliveries to SWP contractors.

Impact 5.2.4-4: X2 location

The simulated monthly locations and differences in location of X2 are presented in Table F1-5 for the 72-year period of simulation. Under the CEQA No Project Alternative, the location of X2 restricts filling of Los Vaqueros Reservoir 34 times in December and 19 times in January. However, the X2 criterion for filling Los Vaqueros Reservoir in December is applicable only when delta smelt are present in the vicinity of CCWD's Old River intake. Constraints on filling Los Vaqueros Reservoir are similar under implementation of the CEQA Yuba Accord Alternative, except that the number of times filling of Los Vaqueros Reservoir would be constrained increases from 34 to 36 times in December, and from 19 to 21 times in January.

Los Vaqueros Reservoir operations modeling performed for the Alternative Intake Project EIR/EIS (CCWD and Reclamation 2006) was examined to assess the potential impacts of changes in X2 location under the CEQA Yuba Accord Alternative. Examination of simulated results for particular months and years when changes in X2 might constrain filling of Los Vaqueros Reservoir showed that in only one case would filling of the reservoir be affected. Therefore, differences in X2 location under the CEQA Yuba Accord Alternative compared to the CEQA No Project Alternative would not be expected to unreasonably affect Los Vaqueros Reservoir operations.

Impact 5.2.4-5: Delta excess water conditions

Model results show that the CEQA Yuba Accord Alternative would change the timing and amount of surplus Delta outflow compared to the CEQA No Project Alternative. Table F1-6 shows that for 4 months of the period of simulation, the reduction in Delta outflow under the CEQA Yuba Accord Alternative would be sufficient to change the Delta from excess to balanced water conditions and potentially affect filling of Los Vaqueros Reservoir under CCWD's water right.

Los Vaqueros Reservoir operations modeling performed for the Alternative Intake Project EIR/EIS (CCWD and Reclamation 2006) was examined to assess the potential impacts of changes in Delta conditions under the CEQA Yuba Accord Alternative. Examination of simulated results for particular months and years when changes in Delta conditions might affect filling of Los Vaqueros Reservoir shows that in only one case, in the month of December, would filling of the reservoir be affected. In this case, loss of filling of the reservoir in December could be offset by increased filling in subsequent months. Therefore, reductions in the period of Delta excess water conditions under the CEQA Yuba Accord Alternative, relative to the CEQA No Project Alternative, would not be expected to unreasonably affect Los Vaqueros Reservoir operations.

Impact 5.2.4-6: South Delta water levels

Tables F1-7 and F1-8 present simulated water levels in the south Delta at Old River near Tracy Road Bridge, at Grant Line Canal near Tracy Road Bridge, at Middle River near the Undine Road Bridge, and at Old River at Coney Island for the CEQA Yuba Accord Alternative as compared to the CEQA No Project Alternative. Based on model results, differences in the monthly mean of minimum daily water levels would be less than 0.01 feet in all months. Therefore, reductions in south Delta water levels under the CEQA Yuba Accord Alternative, relative to the CEQA No Project Alternative, would not unreasonably affect south Delta water users.

Impact 5.2.4-7: San Luis reservoir storage

Model results show that SWP San Luis end-of-September storage would be expected to be lower by an average of 2 TAF per year with implementation of the CEQA Yuba Accord Alternative as compared to the CEQA No Project Alternative (Appendix F4, 3 vs. 2, pg. 1376). CVP San Luis end-of-September storage would be similar under the two alternatives (Appendix F4, 3 vs. 2, pg. 1339). Therefore, reductions in San Luis Reservoir storage under the CEQA Yuba Accord Alternative, relative to the CEQA No Project Alternative, would not unreasonably affect water quality or reliability of water deliveries to CVP or SWP contractors.

5.2.5 ENVIRONMENTAL IMPACTS/ENVIRONMENTAL CONSEQUENCES OF THE CEQA MODIFIED FLOW ALTERNATIVE COMPARED TO THE CEQA NO PROJECT ALTERNATIVE

Impact 5.2.5-1: Surface water allocations and deliveries to YCWA Member Units

Table F1-9 presents simulated surface water allocations to YCWA Member Units. Allocations would be approximately 1.3 percent per year, or approximately 5 TAF per year higher with the implementation of the CEQA Modified Flow Alternative compared to the CEQA No Project Alternative. However, the higher surface water deliveries under the Modified Flow Alternative would be partially offset by greater volumes of groundwater substitution transfers. Table F1-10 shows that surface water deliveries to Member Units would be approximately 2.5 TAF per year higher.

It is assumed that higher surface water deliveries would be offset by lower levels of groundwater pumping, resulting in no changes in Member Unit water supplies. The effects of the decreased groundwater pumping are discussed in Chapter 6.

Therefore, potential reductions in annual water supply or increases in lower Yuba River flows under the CEQA Modified Flow Alternative, relative to the CEQA No Project Alternative, would not unreasonably affect surface water allocations and deliveries to YCWA Member Units.

Impact 5.2.5-2: Deliveries to south-of-Delta CVP contractors

Model results presented in Table F1-11 show average annual CVP south-of-Delta water service contractor and refuge deliveries, excluding additional water made available through water transfers, would be approximately 7 TAF per year, or less than 1 percent, lower under the CEQA Modified Flow Alternative compared to the CEQA No Project Alternative. In dry and critical years, the average annual deliveries would be approximately 11 TAF and 23 TAF per year lower respectively. Therefore, the CEQA Modified Flow Alternative, relative to the CEQA No Project Alternative, would not unreasonably affect water deliveries to south-of-Delta CVP water service contractors and refuges.

Impact 5.2.5-3: Deliveries to south-of-Delta SWP contractors

Simulated south-of-Delta SWP Table A deliveries, excluding additional water made available through water transfers, are presented in Table F1-12. Model results show that under the

CEQA Modified Flow Alternative, average annual south-of-Delta Table A deliveries would be approximately 5 TAF per year lower. In dry and critical years, the average annual deliveries would be approximately 9 TAF and 19 TAF per year lower, respectively. Therefore, the CEQA Modified Flow Alternative, relative to the CEQA No Project Alternative, would not unreasonably affect water deliveries to SWP contractors.

Impact 5.2.5-4: X2 location

The simulated monthly location and location difference of X2 are presented in Table F1-13. Under the CEQA No Project Alternative, the location of X2 would restrict filling of Los Vaqueros Reservoir 34 times in December and 19 times in January. However, the X2 criterion for filling Los Vaqueros Reservoir in December would be applicable only when delta smelt are present in the vicinity of CCWD's Old River intake. Constraints on filling Los Vaqueros Reservoir would be similar under implementation of the CEQA Modified Flow Alternative, except that the number of times filling of Los Vaqueros Reservoir would be constrained increases from 34 to 35 times in December, and from 19 to 22 times in January.

Los Vaqueros Reservoir operations modeling performed for the Alternative Intake Project EIR/EIS (CCWD and Reclamation 2006) was examined to assess the potential impacts of changes in X2 location under the CEQA Modified Flow Alternative. Examination of simulated results for particular months and years when changes in X2 might constrain filling of Los Vaqueros Reservoir showed that in no case would filling of the reservoir be affected. Therefore, differences in X2 location under the CEQA Modified Flow Alternative compared to the CEQA No Project Alternative would not be expected to unreasonably affect CCWD's Los Vaqueros Reservoir operations.

Impact 5.2.5-5: Delta excess water conditions

Model results show that the CEQA Modified Flow Alternative would change the timing and amount of surplus Delta outflow compared to the CEQA No Project Alternative. Table F1-14 shows that for 15 months of the period of simulation, the reduction in Delta outflow under the Modified Flow Alternative would be sufficient to change the Delta from excess to balanced water conditions and potentially affect filling of Los Vaqueros Reservoir under CCWD's water right.

Los Vaqueros Reservoir operations modeling performed for the Alternative Intake Project EIR/EIS (CCWD and Reclamation 2006) was examined to assess the potential impacts of changes in Delta conditions under the CEQA Yuba Accord Alternative. Examination of simulated results for particular months and years when changes in Delta conditions might affect filling of Los Vaqueros Reservoir showed that in only one case, in the month of December, would filling of the reservoir be affected. In this case, loss of filling of the reservoir in December could be offset by increased filling in subsequent months.

Therefore, reductions in the period of Delta excess water conditions under the CEQA Modified Flow Alternative, relative to the CEQA No Project Alternative, would not be expected to unreasonably affect CCWD's Los Vaqueros Reservoir operations.

Impact 5.2.5-6: South Delta water levels

Tables F1-15 and F1-16 present simulated water levels in the south Delta at Old River near Tracy Road Bridge, at Grant Line Canal near Tracy Road Bridge, at Middle River near the Undine Road Bridge, and at Old River at Coney Island for the CEQA Modified Flow Alternative as compared to the CEQA No Project Alternative. Based on model results, differences in the monthly mean of minimum daily water levels would be less than 0.01 feet in all months.

Therefore, reductions in south Delta water levels under the CEQA Modified Flow Alternative, relative to the CEQA No Project Alternative, would not unreasonably affect south Delta water users.

Impact 5.2.5-7: San Luis Reservoir storage

Model results show that SWP San Luis end-of-September storage would be expected to be the same with implementation of the CEQA Modified Flow Alternative as compared to the CEQA No Project Alternative (Appendix F4, 4 vs. 2, pg. 1376). Also, model results show CVP San Luis end-of-September storage would be similar under the two alternatives (Appendix F4, 4 vs. 2, pg. 1339). Therefore, reductions in San Luis Reservoir storage under the CEQA Modified Flow Alternative, relative to the CEQA No Project Alternative, would not unreasonably affect water quality or reliability of water deliveries to the CVP or SWP contractors.

5.2.6 Environmental Impacts/Environmental Consequences of the CEQA Yuba Accord Alternative Compared to the CEQA Existing Condition

Impact 5.2.6-1: Surface water allocations and deliveries to YCWA Member Units

There would be a difference in irrigation demand between the CEQA Existing Condition and the CEQA Yuba Accord Alternative due to the expected completion of the Wheatland Project, as described in Section 5.1.1.5, in 2007; surface water demands would be approximately 41 TAF per year higher. Table F1-17 presents the simulated surface water allocations to YCWA Member Units. Allocations under the CEQA Yuba Accord Alternative would be approximately 1.0 percent per year lower compared to the CEQA Existing Condition. However, given the greater level of demand, these allocations would be approximately 37 TAF per year higher. Table F1-18 shows surface water deliveries to Member Units would be approximately 30 TAF per year higher.

It is assumed that differences in demand and surface water deliveries would be offset by differences in groundwater pumping, resulting in no changes in Member Unit water supplies. Effects of the greater volume of groundwater pumping are discussed in Chapter 6.

Reductions in surface water allocations to YCWA Member Units under the CEQA Yuba Accord Alternative compared to the CEQA Existing Condition would result in less than significant impacts to Member Units.

Impact 5.2.6-2: Deliveries to south-of-Delta CVP contractors

Model results presented in Table F1-19 show that average annual CVP south-of-Delta water service contractor and refuge deliveries, excluding additional water made available through water transfers, would be approximately 9 TAF, or 1 percent, per year lower under the CEQA Yuba Accord Alternative compared to the CEQA Existing Condition. In dry and critical years, the average annual deliveries would be approximately 9 TAF and 7 TAF per year lower, respectively. However, reductions in dry and critical years would be offset by the purchase of Component 2 and Component 3 water under the Water Purchase Agreement.

Reductions in water deliveries to south-of-Delta CVP water service contractors and refuges under the CEQA Yuba Accord Alternative compared to the CEQA Existing Condition would result in less than significant impacts to south-of-Delta CVP water service contractors and refuges because decreases in base deliveries would be more than offset by water made available to the CVP under the proposed Water Purchase Agreement.

Impact 5.2.6-3: Deliveries to south-of-Delta SWP contractors

Simulated south-of-Delta SWP Table A deliveries, excluding additional water made available through water transfers, are presented in Table F1-20. Model results show that, under the Yuba Accord Alternative, average annual south-of-Delta Table A deliveries would be expected to be approximately 7 TAF, or less than 1 percent, per year lower. In dry and critical years, the average annual deliveries would be approximately 5 TAF and 8 TAF per year lower respectively. However, reductions in dry and critical years would be offset by the purchase of Component 2 and Component 3 water under the Water Purchase Agreement.

Reductions in water deliveries to south-of-Delta SWP contractors under the CEQA Yuba Accord Alternative compared to the CEQA Existing Condition would result in less than significant impacts to SWP contractors because decreases in base deliveries would be more than offset by water made available to the SWP under the Water Purchase Agreement.

Impact 5.2.6-4: X2 location

The simulated monthly location and change in location of X2 are presented in Table F1-21 for the 72-year period. Under the CEQA Existing Condition, the location of X2 would restrict filling of Los Vaqueros Reservoir 35 times in December and 22 times in January. However, the X2 criterion for filling Los Vaqueros Reservoir in December is applicable only when delta smelt are present in the vicinity of CCWD's Old River intake. Constraints on filling Los Vaqueros Reservoir would be similar under implementation of the CEQA Yuba Accord Alternative, except that the number of times filling of Los Vaqueros Reservoir would be constrained would go up from 35 to 36 times in December, but go down from 22 to 21 times in January.

Los Vaqueros Reservoir operations modeling performed for the Alternative Intake Project EIR/EIS (CCWD and Reclamation 2006) was examined to assess the potential impacts of changes in X2 location under the CEQA Yuba Accord Alternative. Additional constraints on filling the reservoir in December and January would be offset by increased filling in February and March. Examination of simulated results for particular months and years when changes in X2 might constrain filling of Los Vaqueros Reservoir showed that in no case would filling of the reservoir be affected. Therefore, changes in Los Vaqueros Reservoir operations due to changes in the X2 location under the CEQA Yuba Accord Alternative compared to the CEQA Existing Condition would result in less than significant impacts to CCWD's Los Vaqueros Reservoir operations.

Impact 5.2.6-5: Delta excess water conditions

Model results show that the CEQA Yuba Accord Alternative would change the timing and amount of surplus Delta outflow compared to the CEQA Existing Condition. Table F1-22 shows that the difference in Delta outflow would never be sufficient to move the Delta from excess into balanced water conditions and potentially prevent filling of Los Vaqueros Reservoir.

Changes in Los Vaqueros Reservoir operations due to changes in Delta conditions under the CEQA Yuba Accord Alternative compared to the CEQA Existing Condition would result in no impacts to CCWD's Los Vaqueros Reservoir operations.

Impact 5.2.6-6: South Delta water levels

Tables F1-23 and F1-24 present simulated water levels in the south Delta at Old River near Tracy Road Bridge, at Grant Line Canal near Tracy Road Bridge, at Middle River near the Undine Road Bridge, and at Old River at Coney Island for the CEQA Yuba Accord Alternative as compared to the CEQA Existing Condition. Based on model results, differences in the monthly mean of minimum daily water levels would be less than 0.01 feet in all months.

Reductions in south Delta water elevations under the CEQA Yuba Accord Alternative as compared to the CEQA Existing Condition would result in no impacts to south Delta water users.

Impact 5.2.6-8: San Luis reservoir storage

Model results show that SWP San Luis end-of-September storage would be expected to be lower by an average of 3 TAF per year with implementation of the CEQA Yuba Accord Alternative as compared to the CEQA Existing Condition (Appendix F4, 1 vs. 3, pg. 1376). Model results show CVP San Luis end-of-September storage would be similar under the two alternatives (Appendix F4, 1 vs. 3, pg. 1339).

Reductions in San Luis Reservoir storage under the CEQA Yuba Accord Alternative compared to the CEQA Existing Condition would result in less than significant impacts to reservoir water quality or the CVP or SWP's water supplies.

5.2.7 ENVIRONMENTAL IMPACTS/ENVIRONMENTAL CONSEQUENCES OF THE CEQA MODIFIED FLOW ALTERNATIVE COMPARED TO THE CEQA EXISTING CONDITION

Impact 5.2.7-1: Surface water allocations and deliveries to YCWA Member Units

There would be a difference in irrigation demand between the CEQA Existing Condition and the CEQA Modified Flow Alternative due to the expected completion of the Wheatland Project, as described in Section 5.1.1.5, in 2007. Surface water demands would be approximately 40 TAF per year higher. Table F1-25 presents simulated surface water allocations to YCWA Member Units. Allocations under the CEQA Modified Flow Alternative would be approximately 0.4 percent per year lower. However, given the difference in demand, these allocations would be approximately 39 TAF per year higher. Groundwater substitution transfers would increase. Table F1-26 shows surface water deliveries to Member Units would be approximately 36 TAF per year higher.

It is assumed that differences in demand and surface water deliveries would be offset by groundwater pumping, resulting in no changes in Member Unit water supplies. The effects of the groundwater pumping are discussed in Chapter 6.

Reductions in surface water allocations to YCWA Member Units under the CEQA Modified Flow Alternative compared to the CEQA Existing Condition would result in less than significant impacts to Member Units.

Impact 5.2.7-2: Deliveries to south-of-Delta CVP contractors

Model results presented in Table F1-27 show that average annual CVP south-of-Delta water service contractor and refuge deliveries, excluding additional water made available through water transfers, would be approximately 9 TAF, or 1 percent, per year lower under the CEQA Modified Flow Alternative compared to the CEQA Existing Condition. In dry and critical years, the average annual deliveries would be approximately 7 TAF and 9 TAF per year lower respectively.

Reductions in water deliveries to south-of-Delta CVP water service contractors and refuges under the CEQA Modified Flow Alternative compared to the CEQA Existing Condition would result in less than significant impacts to south-of-Delta CVP water service contractors and refuges.

Impact 5.2.7-3: Deliveries to south-of-Delta SWP contractors

Simulated south-of-Delta SWP Table A deliveries, excluding additional water made available through water transfers, are presented in Table F1-28. Model results show that under the CEQA Modified Flow Alternative, average annual south-of-Delta Table A deliveries would be approximately 7 TAF per year lower. This would be less than 1 percent of the total south-of-Delta Table A delivery. In dry and critical years, the average annual deliveries would be approximately 5 TAF and 8 TAF per year lower, respectively.

Reductions in Table A water deliveries to south-of-Delta SWP contractors under the CEQA Modified Flow Alternative compared to the CEQA Existing Condition would result in less than significant impacts to SWP contractors.

Impact 5.2.7-4: X2 location

The simulated monthly location and change in location of X2 is presented in Table F1-29 for the 72-year period. Under the CEQA Existing Condition, the location of X2 would restrict filling of Los Vaqueros Reservoir 35 times in December and 22 times in January. However, the X2 criterion for filling Los Vaqueros Reservoir in December is applicable only when delta smelt are present in the vicinity of CCWD's Old River intake. Constraints on filling Los Vaqueros Reservoir would be similar under implementation of the CEQA Modified Flow Alternative.

Changes in Los Vaqueros Reservoir operations due to changes in the X2 location under the CEQA Modified Flow Alternative compared to the CEQA Existing Condition would result in less than significant impacts to CCWD's Los Vaqueros Reservoir operations.

Impact 5.2.7-5: Delta excess water conditions

Model results show that the CEQA Modified Flow Alternative would change the timing and amount of surplus Delta outflow compared to the CEQA Existing Condition. Table F1-30 shows that for 1 month of the period of simulation, the reduction in Delta outflow under the Modified Flow Alternative would be sufficient to change the Delta from excess to balanced water conditions and potentially affect filling of Los Vaqueros Reservoir under CCWD's water right.

Los Vaqueros Reservoir operations modeling performed for the Alternative Intake Project EIR/EIS (CCWD and Reclamation 2006) was examined to assess the potential impacts of changes in Delta conditions under the CEQA Yuba Accord Alternative. Examination of simulated results for particular months and years when changes in Delta conditions might constrain filling of Los Vaqueros Reservoir showed that in only one case, in the month of December, would filling of the reservoir be affected. In this case, loss of filling of the reservoir in December could be offset by increased filling in subsequent months.

Changes in Los Vaqueros Reservoir operations due to changes in Delta conditions under the CEQA Modified Flow Alternative compared to the CEQA Existing Condition would result in less than significant impacts to CCWD's Los Vaqueros Reservoir operations.

Impact 5.2.7-6: South Delta water levels

Tables F1-31 and F1-32 present simulated water levels in the south Delta at Old River near Tracy Road Bridge, at Grant Line Canal near Tracy Road Bridge, at Middle River near the Undine Road Bridge, and at Old River at Coney Island for the CEQA Modified Flow Alternative as compared to the CEQA Existing Condition. Based on model results, differences in the monthly mean of minimum daily water levels would be less than 0.01 feet in all months.

Reductions in south Delta water elevations under the CEQA Modified Flow Alternative as compared to the CEQA Existing Condition would result in no impacts to south Delta water users.

Impact 5.2.7-8: San Luis Reservoir storage

Model results show that SWP San Luis end-of-September storage would be expected to be lower by an average of 1 TAF per year with implementation of the CEQA Modified Flow Alternative as compared to the CEQA Existing Condition (Appendix F4, 1 vs. 4, pg. 1376). Model results show CVP San Luis end-of-September storage would be similar under the two alternatives (Appendix F4, 1 vs. 4, pg. 1339).

Reductions in San Luis Reservoir storage under the CEQA Modified Flow Alternative compared to the CEQA Existing Condition would result in less than significant impacts to reservoir water quality or projects' water supply.

5.2.8 Environmental Impacts/Environmental Consequences of the CEQA No Project/NEPA No Action Alternative Compared to the CEQA Existing Condition /NEPA Affected Environment

As discussed in Chapter 3, the key elements and activities (e.g., implementation of the RD-1644 Long-term instream flow requirements) for the CEQA No Project Alternative would be the same for the NEPA No Action Alternative. The primary differences between the CEQA No Project and NEPA No Action alternatives are various hydrologic and other modeling assumptions (see Section 4.5 and Appendix D). Because of these differences between the No Project and No Action alternatives, these alternatives are distinguished as separate alternatives for CEQA and NEPA evaluation purposes.

Based on current plans and consistent with available infrastructure and community services, the CEQA No Project Alternative in this EIR/EIS is based on current environmental conditions (e.g., project operations, water demands, and level of land development) plus potential future operational conditions (e.g., implementation of the RD-1644 Long-term instream flow requirements in the lower Yuba River) that probably would occur in the foreseeable future in the absence of the Proposed Project/Action or another action alternative. The NEPA No Action Alternative also is based on conditions without the proposed project, but uses a longer-term future time frame that is not restricted by existing infrastructure or physical and regulatory environmental conditions. The differences between these modeling characterizations and assumptions for the CEQA No Project and the NEPA No Action alternatives, including the rationale for developing these two different scenarios for this EIR/EIS, are explained in Chapter 4.[15]

Although implementation of the RD-1644 Long-term instream flow requirements would occur under both the CEQA No Project and the NEPA No Action alternatives, the resultant model

[15] For modeling purposes related to CEQA analytical requirements, OCAP Study 3 (2001 level of development) is used as the foundational study upon which the modeling scenarios for the CEQA No Project Alternative and the CEQA Existing Condition were developed. For modeling purposes related to NEPA analytical requirements, OCAP Study 5 (2020 level of development) is used as the foundational study upon which the modeling scenario for the NEPA No Action Alternative was developed.

outputs for both scenarios are different because of variations in the way near-term and long-term future operations are characterized for other parameters in the CEQA and NEPA assumptions. As discussed in Chapter 4, the principal difference between the CEQA No Project Alternative and the NEPA No Action Alternative is that the NEPA No Action Alternative includes several potential future water projects in the Sacramento and San Joaquin valleys (e.g., CVP/SWP Intertie, FRWP, and SDIP, and a long-term EQA program equivalent to the EWA), while the CEQA No Project Alternative does not. Because many of the other assumed conditions for these two scenarios are similar, the longer-term analysis of the NEPA No Action Alternative compared to the NEPA Affected Environment builds upon the nearer-term analysis of the CEQA No Project Alternative compared to the CEQA Existing Condition.

Because the same foundational modeling base (OCAP Study 3) was used to characterize near-term conditions (2001 level of development) for both the CEQA No Project Alternative and the CEQA Existing Condition, it was possible to conduct a comparative analysis to quantitatively evaluate the hydrologic changes in the Yuba Region and the CVP/SWP system that would be expected to occur due to specific changes within the Yuba Region. However, because the NEPA No Action Alternative uses a foundational modeling base that has a 2020 level of development (OCAP Study 5), and includes additional water projects, it was not possible to make an entirely quantitative comparison to the NEPA Affected Environment (which uses OCAP Study 3), identifying the relative impacts due to the different elements.

The analysis of the NEPA No Action Alternative compared to the NEPA Affected Environment therefore consists of two components: (1) an analysis of near-term future without project conditions quantified through the CEQA No Project Alternative, relative to the CEQA Existing Condition; and (2) a qualitative analysis of longer-term future without project conditions (the NEPA No Action alternative).

5.2.8.1 CEQA No Project Alternative Compared to the CEQA Existing Condition

Impact 5.2.8.1-1: Surface water allocations and deliveries to YCWA Member Units

There would be a difference in irrigation demand between the CEQA Existing Condition and the CEQA No Project Alternative due to the expected completion of the Wheatland Project, as described in Section 5.1.1.5, in 2007. Surface water demands would be approximately 41 TAF per year higher. Table F1-33 presents the surface water allocations to YCWA Member Units. Allocations under the CEQA No Project Alternative would be approximately 1.7 percent per year lower. However, given the difference in demand, this would be equivalent to 35 TAF per year higher surface water deliveries. Groundwater substitution transfers would increase. Table F1-34 shows surface water deliveries to Member Units would be approximately 34 TAF per year higher.

It is assumed that differences in demand and surface water deliveries would be offset by groundwater pumping, resulting in no changes in Member Unit water supplies. The effects of the groundwater pumping are discussed in Chapter 6.

Reductions in surface water allocations to YCWA Member Units under the No Project Alternative compared to the CEQA Existing Condition would result in less than significant impacts to Member Units.

Impact 5.2.8.1-2: Deliveries to south-of-Delta CVP contractors

Model results presented in Table F1-35 show that average annual CVP south-of-Delta water service contractor and refuge deliveries, excluding additional water made available through water transfers, would be approximately 2 TAF per year lower under the CEQA No Project Alternative as compared to the CEQA Existing Condition. Compared to average annual south-of-Delta CVP deliveries of over 2,450 TAF, this would be a less than significant change in south-of-Delta CVP deliveries to water service contractors and refuges. Deliveries in dry and critical years would be expected to be 2 TAF and 17 TAF higher, respectively.

Reductions in water deliveries to south-of-Delta CVP water service contractors and refuges under the CEQA No Project Alternative compared to the CEQA Existing Condition would result in less than significant impacts to CVP water service contractors and refuges.

Impact 5.2.8.1-3: Deliveries to south-of-Delta SWP contractors

Simulated south-of-Delta SWP Table A deliveries, excluding additional water made available through water transfers, are presented in Table F1-36. Model results show that under the CEQA No Project Alternative, average annual Table A deliveries would be approximately 2 TAF per year lower. This would be less than 1 percent of the south-of-Delta Table A delivery. Deliveries in dry and critical years would be expected to be 1 TAF and 14 TAF higher, respectively.

Reductions in water deliveries to south-of-Delta SWP contractors under the CEQA No Project Alternative compared to the CEQA Existing Condition would result in less than significant impacts to SWP contractors.

Impact 5.2.8.1-4: X2 location

The simulated monthly location and change in location of X2 is presented in Table F1-37 for the 72-year period. Under the CEQA Existing Condition, the location of X2 would restrict filling of Los Vaqueros Reservoir 35 times in December and 22 times in January. However, the X2 criterion for filling Los Vaqueros Reservoir in December is applicable only when delta smelt are present in the vicinity of CCWD's Old River intake. Constraints on filling Los Vaqueros Reservoir would be similar under the CEQA No Project Alternative, except that the number of times filling of Los Vaqueros Reservoir would be constrained goes down from 35 to 34 times in December and from 22 to 19 times in January.

Changes in Los Vaqueros Reservoir operations due to changes in the X2 location under the CEQA No Project Alternative compared to the CEQA Existing Condition may be beneficial to CCWD's Los Vaqueros Reservoir operations.

Impact 5.2.8.1-5: Delta excess water conditions

Model results show that the CEQA No Project Alternative would change the timing and amount of surplus Delta outflow compared to the CEQA Existing Condition. Table F1-38 shows that for 1 month of the period of simulation, the reduction in Delta outflow under the No Project Alternative would be sufficient to change the Delta from excess to balanced water conditions during the November 1 to June 30 period, and potentially prevent filling of Los Vaqueros Reservoir under CCWD's water right.

Los Vaqueros Reservoir operations modeling performed for the Alternative Intake Project EIR/EIS (CCWD and Reclamation 2006) was examined to assess the potential impacts of changes in Delta conditions under the CEQA No Project Alternative. Simulation results show that changes in Delta conditions under the CEQA No Project Alternative compared to the

CEQA Existing Condition would result in no impacts to CCWD's Los Vaqueros Reservoir operations.

Impact 5.2.8.1-6: South Delta water levels

Tables F1-39 and F1-40 present simulated water levels in the south Delta at Old River near Tracy Road Bridge, at Grant Line Canal near Tracy Road Bridge, at Middle River near the Undine Road Bridge, and Old River at Coney Island for the CEQA No Project Alternative as compared to the CEQA Existing Condition. Based on model results, differences in the monthly mean of minimum daily water levels would be less than 0.01 feet in all months.

Reductions in south Delta water elevations under the CEQA No Project Alternative as compared to the CEQA Existing Condition would result in no impacts to south Delta water users.

Impact 5.2.8.1-8: San Luis Reservoir storage

Model results show that SWP San Luis end-of-September storage would be expected to be 1 TAF lower with implementation of the CEQA No Project Alternative as compared to the CEQA Existing Condition (Appendix F4, 1 vs. 2, pg. 1376). Model results show CVP San Luis end-of-September storage would be similar under the two alternatives (Appendix F4, 1 vs. 2, pg. 1339).

Reductions in San Luis Reservoir storage under the CEQA No Project Alternative compared to the CEQA Existing Condition would result in less than significant impacts to reservoir water quality or projects' water supply.

5.2.8.2 NEPA No Action Alternative Compared to the NEPA Affected Environment

In the Yuba Region, the primary differences between the NEPA No Action Alternative and the NEPA Affected Environment are changes in lower Yuba River flows associated with the implementation of the RD-1644 Long-term instream flow requirements, which would replace the RD-1644 Interim instream flow requirements, implementation of the Wheatland Project, which will increase surface water diversions at Daguerre Point Dam, and groundwater substitution pumping associated with the SVWMP.

In the Yuba Region, the primary differences between the CEQA No Project and the Existing Condition are implementation of RD-1644 Long-term instream flow requirements, and implementation of the Wheatland Project. Therefore, in the Yuba Region, assumptions regarding the volume of groundwater substitution pumping that may occur in the future are the only difference between the NEPA No Action and the CEQA No Project alternatives. Although groundwater substitution transfers may take place under different programs (single-year transfers versus SVWMP under the different alternatives), the total volume of groundwater substitution would be similar. Reservoir, dam and hydropower facilities operations, river flows, and water temperature model outputs for the lower Yuba River are therefore similar for the NEPA No Action Alternative compared to the NEPA Affected Environment, and for the CEQA No Project Alternative compared to the CEQA Existing Condition. Quantitative analysis for the latter is presented in Section 5.2.8.1 above. Trends in evaluation parameters previously presented for the CEQA No Project Alternative relative to the CEQA Existing Condition (Appendix F4, 2 vs. 1) are similar to the comparison of the NEPA No Action Alternative relative to the NEPA Affected Environment, and are not repeated here.

The NEPA No Action Alternative includes additional projects in the project study area that are not included in the CEQA No Project Alternative. These proposed projects would not affect water supply and management in the Yuba Region and, thus, are only discussed in the context of CVP and SWP operations upstream of the Delta, in the Delta, and in the Export Service Area.

Projects included in the NEPA No Action Alternative include conveyance projects (SDIP and CVP/SWP Intertie), water supply projects to meet increasing demand (Freeport Regional Water Project, American River diversions in accordance with the Water Forum), water transfer and acquisition programs (long-term EWA Program or a program equivalent to the EWA), and projects related to CVP/SWP system operations (CVP/SWP Integration). The NEPA No Action Alternative also considers 2020 level of development in the Sacramento Valley and increased SWP Table A demands.

The proposed projects included under the NEPA No Action Alternative would result in changes to reservoir operations, river and channel flows, river and channel diversions, and pumping and power generation facilities in the Project Study Area, but outside the Yuba Region. In general, the types of changes that may occur and that could affect water supply and management include the following:

- Change in the timing of releases from CVP/SWP reservoirs
- Increased surface water diversions from the Sacramento, Feather, and American rivers
- Decreased Delta inflow
- Reduced Delta outflow
- Increased pumping at the Jones Pumping Plant
- Increased pumping at the Banks Pumping Plant (including wheeling of CVP water)
- Increased E/I ratios in the fall and winter
- Reduced X2 in the fall and winter

5.2.9 ENVIRONMENTAL IMPACTS/ENVIRONMENTAL CONSEQUENCES OF THE NEPA YUBA ACCORD ALTERNATIVE COMPARED TO THE NEPA NO ACTION ALTERNATIVE

Impact 5.2.9-1: Surface water allocations and deliveries to YCWA Member Units

Table F1-41 presents simulated surface water allocations to YCWA Member Units. Allocations are expected to be approximately 0.7 percent, or approximately 3 TAF, per year higher with the implementation of the NEPA Yuba Accord Alternative compared to the NEPA No Action Alternative, with average annual allocations changing from 97.6 percent to 98.3 percent, and average annual shortages changing from 8.3 TAF per year to 5.8 TAF. Table F1-42 shows surface water deliveries to Member Units would be 316.5 TAF per year under the NEPA No Action Alternative, and 312.7 TAF per year under the NEPA Yuba Accord Alternative, with a reduction of approximately 4 TAF per year lower.

It is assumed that the reduction in surface water deliveries would be offset by higher groundwater pumping, resulting in no changes in Member Unit water supplies. The effects of the higher volume of groundwater pumping are discussed in Chapter 6.

Reductions in surface water allocations to YCWA Member Units under the NEPA Yuba Accord Alternative compared to the NEPA No Action Alternative would result in less than significant impacts to Member Units.

Impact 5.2.9-2: Deliveries to south-of-Delta CVP contractors

Model results presented in Table F1-43 show that average annual CVP south-of-Delta water service contractor and refuge deliveries, excluding additional water made available through water transfers, would change from 1,569 TAF per year under the NEPA No Action Alternative to 1,562 TAF per year under the NEPA Yuba Accord Alternative, with average annual deliveries approximately 7 TAF per year lower under the NEPA Yuba Accord Alternative as compared to the NEPA No Action Alternative. In dry and critical years, the average annual deliveries would be approximately 12 TAF and 23 TAF per year lower, respectively. However, reductions in dry and critical years would be offset by the purchase of Component 2 and Component 3 water under the Water Purchase Agreement.

Reductions in water deliveries to south-of-Delta CVP water service contractors and refuges under the NEPA Yuba Accord Alternative compared to the NEPA No Action Alternative would result in less than significant impacts to south-of-Delta CVP water service contractors and refuges because decreases in base deliveries would be more than offset by water made available to the CVP under the Water Purchase Agreement.

Impact 5.2.9-3: Deliveries to south-of-Delta SWP contractors

Simulated south-of-Delta SWP Table A deliveries, excluding additional water made available through water transfers, are presented in Table F1-44**.** Model results show that, under the NEPA Yuba Accord Alternative, average annual south-of-Delta Table A deliveries would change from 3,088 TAF per year under the NEPA No Action Alternative to 3,082 TAF per year under the NEPA Yuba Accord Alternative, with average annual deliveries approximately 6 TAF per year lower, which corresponds to a change of less than 1 percent. In dry and critical years, the average annual deliveries would be approximately 9 TAF and 19 TAF per year lower respectively. However, reductions in dry and critical years would be offset by the purchase of Component 2 and Component 3 water under the Water Purchase Agreement.

Reductions in water deliveries to south-of-Delta SWP contractors under the NEPA Yuba Accord Alternative compared to the NEPA No Action Alternative would result in less than significant impacts to SWP contractors because decreases in base deliveries would be more than offset by water made available to the SWP under the Water Purchase Agreement.

Impact 5.2.9-4: X2 location

The simulated monthly location and change in location of X2 is presented in Table F1-45 for the 72-year period. Under the NEPA No Action Alternative, the location of X2 would restrict filling of Los Vaqueros Reservoir 42 times in December and 20 times in January. However, the X2 criterion for filling Los Vaqueros Reservoir in December is applicable only when delta smelt are present in the vicinity of CCWD's Old River intake. Under the NEPA Yuba Accord Alternative, constraints on filling Los Vaqueros Reservoir in December would remain the same, but constraints on filling Los Vaqueros Reservoir in January would increase from 20 to 25 times.

Los Vaqueros Reservoir operations modeling performed for the Alternative Intake Project EIR/EIS (CCWD and Reclamation 2006) was examined to assess the potential impacts of changes in X2 location under the NEPA Yuba Accord Alternative. Additional constraints on filling the reservoir in December and January would be offset by increased filling in February and March. Examination of simulated results for particular months and years when changes in

X2 might constrain filling of Los Vaqueros Reservoir showed that in only one case would filling of the reservoir be affected. Therefore, changes in Los Vaqueros Reservoir operations due to differences in the X2 location under the NEPA Yuba Accord Alternative compared to the NEPA No Action Alternative would result in less than significant impacts to CCWD's Los Vaqueros Reservoir operations.

Impact 5.2.9-5: Delta excess water conditions

Model results show that the NEPA Yuba Accord Alternative would change the timing and amount of surplus Delta outflow compared to the NEPA No Action Alternative. Table F1-46 shows that under the NEPA No Action Alternative, there are 322 months of excess conditions, and there are 330 months of excess conditions under the NEPA Yuba Accord Alternative between November 1 and June 30. For 8 fewer months of the period of simulation, the reduction in Delta outflow under the Yuba Accord Alternative would be sufficient to change the Delta from excess to balanced water conditions during the November 1 to June 30 period and potentially prevent filling of Los Vaqueros Reservoir under CCWD's water right.

Los Vaqueros Reservoir operations modeling performed for the Alternative Intake Project EIR/EIS (CCWD and Reclamation 2006) was examined to assess the potential impacts of changes in Delta conditions under the NEPA Yuba Accord Alternative. Examination of simulated results for particular months and years when changes in Delta conditions might constrain filling of Los Vaqueros Reservoir showed that in only one case, in the month of December, would filling of the reservoir be affected. In this case, loss of filling of the reservoir in December could be offset by increased filling in subsequent months.

Changes in Los Vaqueros Reservoir operations due to differences in Delta conditions under the NEPA Yuba Accord Alternative compared to the NEPA No Action Alternative would result in less than significant impacts to CCWD's Los Vaqueros Reservoir operations.

Impact 5.2.9-6: South Delta water levels

Tables F1-47 and F1-48 present simulated water levels in the south Delta at Old River near Tracy Road Bridge, at Grant Line Canal near Tracy Road Bridge, at Middle River near the Undine Road Bridge, and at Old River at Coney Island for the NEPA Yuba Accord Alternative as compared to the NEPA No Action Alternative. The average annual mean daily water levels are 1.55 feet, 1.52 feet, and 2.13 feet at Old River near Tracy Road Bridge, Grant Line Canal near Tracy Road Bridge, and Middle River near the Undine Road Bridge, respectively, under both the NEPA No Action Alternative and NEPA Yuba Accord Alternative, and the average minimum daily water level at all three locations are 0.00 feet under both alternatives.

Reductions in south Delta water elevations under the NEPA Yuba Accord Alternative, as compared to the NEPA No Action Alternative, would result in no impacts to south Delta water users.

Impact 5.2.9-8: San Luis Reservoir storage

Model results show that average annual SWP San Luis end-of-September storage would be expected to be 216 TAF under the NEPA No Action Alternative, and 215 TAF under the NEPA Yuba Accord Alternative, or an average of 1 TAF per year lower with implementation of the NEPA Yuba Accord Alternative as compared to the NEPA No Action Alternative (Appendix F4, 5 vs. 6, pg. 1376). Model results show the average annual CVP San Luis end-of-September storage would be the same, 213 TAF, under the two alternatives (Appendix F4, 5 vs. 6, pg. 1339).

Reductions in San Luis Reservoir storage under the NEPA Yuba Accord Alternative compared to the NEPA No Action Alternative would result in less than significant impacts to reservoir water quality or projects' water supply.

5.2.10 ENVIRONMENTAL IMPACTS/ENVIRONMENTAL CONSEQUENCES OF THE NEPA MODIFIED FLOW ALTERNATIVE COMPARED TO THE NEPA NO ACTION ALTERNATIVE

Impact 5.2.10-1: Surface water allocations and deliveries to YCWA Member Units

Table F1-49 presents simulated surface water allocations to YCWA Member Units. Allocations are expected to be approximately 1.0 percent per year higher, changing from 97.6 percent to 98.6 percent, with the implementation of the NEPA Modified Flow Alternative compared to the NEPA No Action Alternative. Table F1-50 shows surface water deliveries to Member Units would change from 316.5 TAF per year to 318.2 TAF per year with the implementation of the NEPA Modified Flow Alternative as compared to the NEPA No Project Alternative, an increase of approximately 1.7 TAF per year.

It is assumed that the greater volume of surface water deliveries would be offset by less groundwater pumping, resulting in no changes in Member Unit water supplies. The effects of the lower level groundwater pumping are discussed in Chapter 6.

Reductions in surface water allocations to YCWA Member Units under the NEPA Modified Flow Alternative compared to the NEPA No Action Alternative would result in less than significant impacts to Member Units.

Impact 5.2.10-2: Deliveries to south-of-Delta CVP contractors

Model results presented in Table F1-51 show average annual CVP south-of-Delta water service contractor and refuge deliveries, excluding additional water made available through water transfers, would change from an average of 1,569 TAF per year under the NEPA No Action Alternative to 1,562 TAF per year under the NEPA Yuba Accord Alternative, a difference of approximately 7 TAF per year. In dry and critical years, the average annual deliveries would be approximately 12 TAF and 22 TAF per year lower respectively.

Reductions in water deliveries to south-of-Delta CVP water service contractors and refuges under the NEPA Modified Flow Alternative compared to the NEPA No Action Alternative would result in less than significant impacts to south-of-Delta CVP water service contractors and refuges.

Impact 5.2.10-3: Deliveries to south-of-Delta SWP contractors

Simulated south-of-Delta SWP Table A deliveries, excluding additional water made available through water transfers, are presented in Table F1-52. Model results show that, under the NEPA Modified Flow Alternative, average annual Table A deliveries would be approximately 5 TAF per year lower, changing from 3,088 TAF per year under the NEPA No Project Alternative to 3,082 TAF per year under the NEPA Modified Flow Alternative. In dry and critical years, the average annual deliveries would be approximately 9 TAF and 18 TAF per year lower respectively.

Reductions in water deliveries to south-of-Delta SWP contractors under the NEPA Modified Flow Alternative compared to the NEPA No Action Alternative would result in less than significant impacts to SWP contractors.

Impact 5.2.10-4: X2 location

The simulated monthly location and change in location of X2 is presented in Table F1-53 for the 72-year period. Under the NEPA No Action Alternative, the location of X2 would restrict filling of Los Vaqueros Reservoir 42 times in December and 20 times in January. However, the X2 criterion for filling Los Vaqueros Reservoir in December would be applicable only when Delta Smelt are present in the vicinity of CCWD's Old River intake. Constraints on filling Los Vaqueros Reservoir would be similar under implementation of the NEPA Modified Flow Alternative, except that the number of times filling of Los Vaqueros Reservoir would be constrained rises from 42 to 43 times in December, and 20 to 23 times in January.

Los Vaqueros Reservoir operations modeling performed for the Alternative Intake Project EIR/EIS (CCWD and Reclamation 2006) was examined to assess the potential impacts of changes in X2 location under the NEPA Yuba Accord Alternative. Examination of simulated results for particular months and years when changes in X2 might constrain filling of Los Vaqueros Reservoir showed that in only one month out of the period of records would filling of the reservoir be affected. Therefore, changes in Los Vaqueros Reservoir operations due to changes in the X2 location under the NEPA Modified Flow Alternative compared to the NEPA No Action Alternative would result in less than significant impacts to CCWD's Los Vaqueros Reservoir operations.

Impact 5.2.10-5: Delta excess water conditions

Model results show that the NEPA Modified Flow Alternative would change the timing and amount of surplus Delta outflow compared to the NEPA No Action Alternative. Table F1-54 shows that the Delta would be in excess conditions between November 1 and June 30 for 322 months under the NEPA No Action Alternative and for 308 months under the NEPA Modified Flow Alternative, indicating that there would be 15 months of the period of simulation that the reduction in Delta outflow under the NEPA Yuba Accord Alternative would be sufficient to change the Delta from excess to balanced water conditions during the November 1 to June 30 period, and potentially prevent filling of Los Vaqueros Reservoir under CCWD's water right.

Los Vaqueros Reservoir operations modeling performed for the Alternative Intake Project EIR/EIS (CCWD and Reclamation 2006) was examined to assess the potential impacts of changes in Delta conditions under the NEPA Yuba Accord Alternative. Examination of simulated results for particular months and years when changes in Delta conditions might constrain filling of Los Vaqueros Reservoir showed that in only one month out of the period of record, would filling of the reservoir be affected. In this case, loss of filling of the reservoir in December could be offset by increased filling in subsequent months.

Changes in Los Vaqueros Reservoir operations due to changes in Delta conditions under the NEPA Modified Flow Alternative compared to the NEPA No Action Alternative would result in less than significant impacts to Los Vaqueros Reservoir operations.

Impact 5.2.10-6: South Delta water levels

Tables F1-69 and F1-70 present simulated water levels in the south Delta at Old River near Tracy Road Bridge, at Grant Line Canal near Tracy Road Bridge, at Middle River near the Undine Road Bridge, and at Old River at Coney Island for the NEPA Modified Flow Alternative as compared to the NEPA No Action Alternative. Based on model results, differences in the monthly mean of minimum daily water levels would be less than 0.01 feet in all months. The average annual mean daily water levels are 1.55 feet, 1.52 feet, and 2.13 feet at Old River near Tracy Road Bridge, Grant Line Canal near Tracy Road Bridge, and Middle River near the

Undine Road Bridge, respectively, under both the NEPA No Action Alternative and NEPA Modified Flow Alternative. The average minimum daily water level at all three locations is 0.00 feet at msl under both alternatives.

Reductions in south Delta water elevations under the NEPA Modified Flow Alternative as compared to the NEPA No Action Alternative would result in no impacts to south Delta water users.

Impact 5.2.10-8: San Luis Reservoir storage

Model results show that average annual SWP San Luis end-of-September storage would be 216 TAF under the NEPA No Action Alternative, and 215 TAF under the NEPA Modified Flow Alternative, reflecting an average annual change of 1 TAF. The average annual CVP San Luis end-of-September storage would be 239 TAF under both alternatives (Appendix F4, 5 vs. 7, pg. 1376 and pg. 1339).

Differences in San Luis Reservoir storage under the NEPA Modified Flow Alternative compared to the NEPA No Action Alternative would result in less than significant impacts to reservoir water quality or projects' water supply.

5.3 CUMULATIVE IMPACTS

This section considers the cumulative effects of the Proposed Project (Yuba Accord Alternative) with other proposed projects and actions that may occur in the future. Proposed projects that have been adequately defined (e.g., in recent project-level environmental documents or CALSIM II modeling) and that have the potential to contribute to cumulative impacts are included in the quantitative assessment of the Yuba Accord's impacts. Projects that cannot be accurately characterized for hydrologic modeling purposes at this time, either due to the nature of the particular project or because specific operations details are only in the preliminary phases of development, are evaluated qualitatively.

For analytical purposes of this EIR/EIS, the projects that are considered well defined and "reasonably foreseeable" are described in Chapter 21. Additionally, the assumptions used to categorize future hydrologic conditions that are quantitatively simulated using the Yuba Project model, CALSIM II, and post-processing tools are presented in Appendix D. To the extent feasible, potential cumulative impacts on resources dependent on hydrology or water supply are analyzed quantitatively.

Only projects that could affect surface water supply and management are considered in subsequent sections of this chapter. Although most of the proposed projects described in Chapter 21 could have project-specific impacts that will be addressed in future project-specific environmental documentation, future implementation of these projects is not expected to result in cumulative impacts to regional water supply operations, or water-related and water-dependent resources that also could be affected by the Proposed Project/Action or an action alternative (see Chapter 21). For this reason, only the limited number of projects that have the potential to cumulatively impact surface water supply and management in the project study area are specifically considered qualitatively in the cumulative impacts analysis for surface water supply and management. These projects are as follows:

- Water Supply and Conveyance Projects
  - Shasta Lake Water Resources Investigation (Shasta Reservoir Enlargement)
  - Upstream of Delta Off-Stream Storage (Sites Reservoir)
  - Upper San Joaquin River Storage Project
  - In-Delta Storage Program (Delta Wetlands Project)
  - Los Vaqueros Reservoir Expansion Project
  - Folsom Dam Raise Project
- Projects Related to CVP/SWP Operations
  - Delta Cross Channel Reoperation and Through-Delta Facility
  - Delta-Mendota Canal/California Aqueduct Intertie
  - Long-Term CVP and SWP Operations Criteria and Plan
  - Central Valley Project Long-term Contract Renewals
  - CVP/SWP Integration Proposition
  - Isolated Delta Facility
  - Delta-Mendota Canal Recirculation Feasibility Study
  - Monterey Plus EIR
  - Sacramento River Water Reliability Study
  - City of Stockton Delta Water Supply Project
  - Oroville Facilities FERC Relicensing
- Water Transfers and Acquisition Programs
  - Dry Year Water Purchase Program
  - Delta Improvements Package
  - San Joaquin Valley/Southern California Exchange
  - Sacramento Valley Water Management Program
- Ecosystem Restoration and Water Quality Improvement Projects
  - North Bay Aqueduct Improvements
  - San Joaquin River Restoration Settlement Act (Friant Settlement Legislation)
- Local Projects in the Yuba Region
  - Yuba River Development Project FERC Relicensing
  - Wheatland Project

These projects and actions could affect water supply and management either through changing CVP/SWP operations, changing the available water supply for export, or changing the allocation of exported water among CVP and SWP contractors. These projects are described in Chapter 21 and qualitatively addressed below.

The FERC license for the Yuba Project will expire in 2016. Prior to the expiration of the license, YCWA will follow a relicensing process that will allow FERC, state and federal resource agencies, conservation groups, and the general public to review and discuss appropriate operations for the project. Because the renewal has a different time frame than the Accord, the FERC relicensing is not considered in the quantitative cumulative analysis. While any required changes to Yuba Project operations as part of the FERC relicensing, could impact surface water supply and management, such changes are not known at this time.

5.3.1 ENVIRONMENTAL IMPACTS/ENVIRONMENTAL CONSEQUENCES OF THE YUBA ACCORD ALTERNATIVE CUMULATIVE CONDITION COMPARED TO THE EXISTING CONDITION

For CEQA, the purpose of the cumulative analysis is to determine whether the incremental effects of the Proposed Project (Yuba Accord Alternative) would be expected to be "cumulatively considerable" when viewed in connection with the effects of past projects, other current projects, and probable future projects (PRC Section 21083, subdivision (b)(2)).[16]

For NEPA, the scope of an EIS must include "Cumulative actions, which when viewed with other proposed actions have cumulatively significant impacts and should therefore be discussed in the same impact statement" (40 CFR, §1508.25(a)(2)).

Because the CEQ regulations for implementing NEPA and the CEQA guidelines contain very similar requirements for analyzing, and definitions of, cumulative impacts, the discussions of cumulative impacts of the Yuba Accord Alternative Cumulative Condition relative to the Existing Condition will be the basis for evaluation of cumulative impacts for both CEQA and NEPA. In addition, an analysis of the Modified Flow Alternative Cumulative Condition relative to the Existing Condition is provided to fulfill NEPA requirements.

5.3.1.1 OTHER IMPACT CONSIDERATIONS RELATIVE TO CUMULATIVE SURFACE WATER SUPPLY AND MANAGEMENT

The quantitative operations-related impact considerations for the Yuba Accord Alternative, relative to the Existing Condition, are discussed in Section 5.2.5. Potential impacts identified in Section 5.2.5 provide an indication of the potential incremental contributions of the Yuba Accord Alternative to cumulative impacts. These potential impacts are summarized here:

- Impact 5.2.5-1: Reduction in surface water allocations and deliveries to YCWA Member Units – Less than Significant
- Impact 5.2.5-2: Reduction in deliveries to CVP contractors – Less than Significant
- Impact 5.2.5-3: Reduction in deliveries to SWP contractors - Less than Significant
- Impact 5.2.5-4: Westward movement of X2 – Less than Significant
- Impact 5.2.5-5: Reduction in the period of Delta excess water conditions – No Impact
- Impact 5.2.5-6: Reduction in south Delta water levels – No Impact
- Impact 5.2.5-7: Reduction in San Luis Reservoir storage – Less than Significant

Although these impacts would be less than significant, the potential exists for cumulative impacts nevertheless. Cumulative impact determinations are presented below, and are based upon consideration of the quantified Yuba Accord Alternative impacts relative to the Existing Condition, in combination with the potential impacts of other reasonably foreseeable projects. These cumulative impact determinations are made by type of project.

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[16] The "*Guide to the California Environmental Quality Act*" (Remy *et al*. 1999) states that "*…although a project may cause an "individually limited" or "individually minor" incremental impact that, by itself, is not significant, the increment may be "cumulatively considerable", and thus significant, when viewed against the backdrop of past, present, and probably future projects.*" (CEQA Guidelines, Section 15064, subd. (i)(l), 15065, subd. (c), 15355, subd. (b)).

5.3.1.2 POTENTIAL FOR CUMULATIVE SURFACE WATER SUPPLY AND MANAGEMENT IMPACTS WITHIN THE PROJECT STUDY AREA

Results from the quantitative analysis generally indicate that direct project-related impacts to surface water supply and management would be less than significant. Nevertheless, there is the potential for the Yuba Accord Alternative to incrementally contribute to cumulative surface water supply and management impacts within the project study area. The frequency and magnitude of the quantitative hydrologic changes associated with the Yuba Accord Alternative, and the other qualitative analytical considerations discussed above, were both considered during the development of the overall cumulative impact conclusions discussed below for the Yuba Accord Alternative Cumulative Condition, relative to the Existing Condition.

WATER STORAGE AND CONVEYANCE PROJECTS

The water storage and conveyance projects that have the potential to contribute to cumulative impacts would generally not be expected to have cumulative impacts as measured by the impact indicators for surface water. None of the identified projects would be expected to have impacts on water supply in the Yuba region (deliveries to Member Units). Additionally, none of the identified projects would be expected to have negative impacts on most of the other impact indicators; these projects are designed to enhance water supply to the service area, and in the Delta. No potential cumulative significant impacts are anticipated for the Yuba Accord Alternative Cumulative Condition relative to the Existing Condition.

PROJECTS RELATED TO CVP/SWP SYSTEM OPERATIONS

The water storage and conveyance projects that have the potential to contribute to cumulative impacts are generally intended to improve water supply, reliability, and flexibility for the CVP/SWP systems, and would not generally be anticipated to have any impacts on surface water allocations to the YCWA Member Units.

It is unknown how the various systems operations projects may affect other impact indicators; it therefore is assumed that projects related to CVP/SWP operations may have some minor impacts on X2, south Delta water levels, or the duration of Delta excess water conditions. Thus, the Yuba Accord Alternative Cumulative Condition has the potential for significant impacts relative to the Existing Condition with regards to projects related to future CVP/SWP system operations projects.

WATER TRANSFER AND ACQUISITION PROGRAMS

The water transfer and acquisition programs that have the potential to contribute to cumulative impacts would generally not be anticipated to affect Yuba Region deliveries, and would generally be anticipated to improve deliveries to CVP/SWP contractors. However, those water transfer and acquisition programs would likely entail additional pumping, cross-Delta transfer, or changing of timing of Delta outflow. As a result, the Yuba Accord Alternative Cumulative Condition has the potential for significant impacts relative to the Existing Condition with regards to projects related to future water transfer and acquisition programs.

ECOSYSTEM RESTORATION AND WATER QUALITY IMPROVEMENT PROJECTS

The ecosystem restoration and water quality improvement programs that have the potential to contribute to cumulative impacts would generally not be anticipated to affect Yuba Region deliveries; however, their cumulative impact on CVP/SWP deliveries is unknown. The ecosystem restoration and water quality improvement projects would generally be anticipated to improve system conditions, as measured by the other impact indicators such as X2 or the duration of Delta excess conditions. Overall, it is anticipated that the Yuba Accord Alternative Cumulative Condition will not have significant impacts relative to the Existing Condition with regards to potential future ecosystem restoration and water quality improvement projects.

LOCAL PROJECTS IN THE YUBA REGION

The local projects in the Yuba Region have the potential for impacts to local water deliveries, when considered cumulatively with the Yuba Accord Alternative. Further, changes to local water deliveries would likely affect downstream flows, and thus could potentially impact CVP/SWP deliveries, and various Delta impact indicators. As a result, the Yuba Accord Alternative Cumulative Condition has the potential for significant impacts relative to the Existing Condition with regards to future local projects in the Yuba Region.

5.3.1.3 SUMMARY OF CUMULATIVE SURFACE WATER SUPPLY AND MANAGEMENT IMPACTS WITHIN THE PROJECT STUDY AREA

The following potentially significant cumulative impacts to surface water supply and management have been identified for the project area:

Impact 5.3.1.3-1 Potential for significant cumulative surface water supply and management impacts within the Yuba Region

Potentially significant and unavoidable impacts may result from the Yuba Accord Alternative Cumulative Condition in conjunction with potential future local projects in the Yuba Region.

Impact 5.3.1.3-2 Potential for significant cumulative surface water supply and management impacts within the Delta Region

Potentially significant and unavoidable impacts may result from the Yuba Accord Alternative Cumulative Condition in conjunction with potential future CVP/SWP operations projects and water transfer and acquisition programs in the Delta Region.

Impact 5.3.1.3-3 Potential for significant cumulative surface water supply and management impacts within the Export Service Area (San Luis Reservoir)

Potentially significant and unavoidable impacts may result from the Yuba Accord Alternative Cumulative Condition in conjunction with potential future CVP/SWP operations projects and water transfer and acquisition programs in the Export Service Area.

5.3.2 ENVIRONMENTAL IMPACTS/ENVIRONMENTAL CONSEQUENCES OF THE MODIFIED FLOW ALTERNATIVE CUMULATIVE CONDITION COMPARED TO THE EXISTING CONDITION

It is anticipated that the Modified Flow Alternative Cumulative Condition would have the same potential for cumulative impacts as the Yuba Accord Alternative Cumulative Condition. Therefore, the description of the potential impacts in Section 5.3.1 also serves as the description of cumulative impacts associated with the Modified Flow Alternative. Thus, the Modified Flow Alternative Cumulative Condition would result in the following potential cumulative impacts:

- Yuba Region - Potential cumulative impacts on surface water supply and management in the Yuba Region could be potentially significant and unavoidable.
- Delta Region - Potential cumulative impacts on surface water supply and management in the Delta Region could be potentially significant and unavoidable.
- Export Service Area - Potential cumulative impacts on surface water supply and management in the Export Service Area (San Luis Reservoir) could be potentially significant and unavoidable.

5.4 POTENTIAL CONDITIONS TO SUPPORT APPROVAL OF YCWA'S WATER RIGHTS PETITION

No unreasonable adverse effects to surface water supply and management would occur under the Proposed Project/Action or an action alternative. Therefore, no impact avoidance measures or other protective conditions are identified for SWRCB consideration in determining whether or not to approve YCWA's petitions to implement the Yuba Accord.

5.5 MITIGATION MEASURES/ENVIRONMENTAL COMMITMENTS

No adverse effects would occur to surface water supply and management under the Proposed Project/Action or an action alternative and, thus, no mitigation measures are required.

5.6 POTENTIALLY SIGNIFICANT UNAVOIDABLE IMPACTS

There are no potentially significant unavoidable project-related impacts to surface water supply and management associated with the implementation of the Proposed Project/Action, or an action alternative, individually. However, the Yuba Accord Alternative, in combination with the impacts of other reasonably foreseeable future projects, could result in potentially significant unavoidable cumulative impacts on surface water supply and management in the Yuba Region, the Delta Region, and the Export Service Area (San Luis Reservoir only). Similarly, the Modified Flow Alternative, in combination with the impacts of other reasonably foreseeable future projects, could result in potentially significant unavoidable cumulative impacts on surface water supply and management in the Yuba Region, the Delta Region, and the Export Service Area (San Luis Reservoir only).

CHAPTER 6
GROUNDWATER RESOURCES

Conjunctive use of groundwater with surface water within Yuba County, when planned and managed properly, could play a key role in improving the ecosystem for fisheries in the lower Yuba River, in meeting supplemental water needs locally and regionally, and in helping water users better manage scarce water resources during drought conditions. Future water resource management operations that would be implemented under the Proposed Project/Action (Yuba Accord Alternative) and alternatives, described in Chapter 3, could affect groundwater resources in the local groundwater basin underlying the Yuba County (Yuba Basin). Therefore, future sustainability of groundwater resources in the Yuba Basin is a key management concern for the Proposed Project/Action and alternatives evaluated in this EIR/EIS.

Under the Proposed Project/Action and alternatives, integration of surface water and groundwater supplies would help YCWA meet the instream flow schedules specified in the Fisheries Agreement, and commitments of transfer water included in the Water Purchase Agreement. Under the Yuba Accord Conjunctive Use Agreements, groundwater would be managed to supplement local agricultural water supplies in drier years, and to help provide the water transfer commitments of the Water Purchase Agreements.

This chapter mainly focuses on groundwater resources within the Yuba Basin. Actions associated with the Proposed Project/Action and alternatives could potentially affect management of groundwater resources in the Export Service Area. Therefore, a discussion of groundwater resources in the Export Service Area is also included. The CVP/SWP Upstream of the Delta Region and the Delta Region are not covered in this chapter because implementation of the Proposed Project/Action and alternatives would not change management of groundwater resources in these regions.

6.1 ENVIRONMENTAL SETTING/AFFECTED ENVIRONMENT

This section describes various aspects of the environmental setting and affected environment in the Yuba Basin and the Export Service Area that may be influenced by implementation of the Proposed Project/Action and alternatives. The Yuba Basin is described in detail because potential impacts would occur mostly in the local groundwater study area.

6.1.1 YUBA BASIN

This section describes the boundaries of the local study area for groundwater resources and the environmental setting/affected environment, including the Existing Condition that may be influenced by implementation of the Proposed Project/Action and alternatives. Information specific to the Yuba Basin includes: regional geologic settings; groundwater flow, levels, and storage conditions; groundwater and surface water interactions; groundwater quality; and land subsidence. More detailed information on the environmental setting of the local study area can be found in *"Summary of Groundwater Basin Conditions, Yuba County"* (MWH 2005).

The local study area covers the groundwater basin underlying part of Yuba County. The main surface water features are the Yuba, Feather, and Bear rivers. The Yuba River runs through the study area, dividing the groundwater basin underlying the Yuba County into the North Yuba and South Yuba subbasins (see Chapter 2, Figure 2-2). DWR defines these two subbasins in Bulletin 118 as follows (DWR 2003):

> ***North Yuba Subbasin*** *(Basin Number 5-21.60) lies in the eastern central portion of the Sacramento Valley Groundwater Basin. It is bounded on the north by Honcut Creek, on the west by the Feather River, on the south by the Yuba River, and on the east by the Sierra Nevada foothills.*
>
> ***South Yuba Subbasin*** *(Basin Number 5-21.61) lies in the southern portion of the Sacramento Groundwater Basin. It is bounded on the north by the Yuba River, on the west by the Feather River, on the south by the Bear River, and on the east by the Sierra Nevada foothills.*

The boundaries of the North and South Yuba subbasins are shown in Figure 2-2. These two subbasins together encompass an area of approximately 216 square miles. The North and South Yuba subbasins form a portion of the larger Sacramento Valley Groundwater Basin (Sacramento Basin). However, the two subbasins are separated from the rest of the Sacramento Basin by the surface streams that surround the subbasins.

The North Yuba Subbasin and the South Yuba Subbasin are believed to be not hydraulically isolated from each other by the Yuba River except near the surface. Since the underlying geology of the two subbasins is similar, the description of the geologic setting below treats the North Yuba Subbasin and South Yuba Subbasin as if they were one basin. Throughout the following subsections, the local groundwater basin underlying Yuba County is referred to as the "Yuba Basin."

Groundwater has been an important source of water supply to YCWA Member Units and water purveyors located within the study area, as described below in detail in Section 6.1.1.5. The boundaries of the eight Member Units (BWD, BVID, CID, DCMWC, HIC, RWD, SYWD, and WWD) and five water purveyors (California Water Service, serving the City of Marysville, Olivehurst Public Utility District (OPUD), Linda County Water District, City of Wheatland, and Beale AFB) located within the study area are shown previously in Chapter 1 (see Figure 1-2).

6.1.1.1 GEOLOGY OF THE YUBA BASIN

This section presents information on: geology, hydrogeology, and hydrology; groundwater yield, levels, flow, and storage; land subsidence; and groundwater quality in the North and South Yuba subbasins. Information in this section was primarily taken from *"Summary of Groundwater Basin Conditions, Yuba County."* (MWH 2005).

The Yuba Basin is a portion of the Sacramento Valley Groundwater Basin that lies at the base of the Sierra Nevada Foothills, as defined in DWR Bulletin 118 (DWR 2003). Sources used to describe the geology of the Yuba Basin are the groundwater report by Bookman-Edmonston (Bookman-Edmonston Engineering, Inc. 1992); DWR's Bulletin 118 (1975 and 2003 Update) (DWR 2003); the California Department of Conservation, Division of Mines and Geology (California Division of Mines and Geology 1992); and several USGS publications (Harwood and Helley 1987) (Page 1974, 1980, 1986) and (Olmstead and Davis 1961). The geologic setting in Yuba County ranges from young alluvial deposits that store and transmit groundwater to underlying continental formations that do not store or yield a significant amount of groundwater. **Figure 6-1** shows the generalized description of the subsurface geology in the Yuba Basin. The stream channel and floodplain deposits found in the west grade into alluvial fans to the east. These geologic deposits and formations are briefly described below.

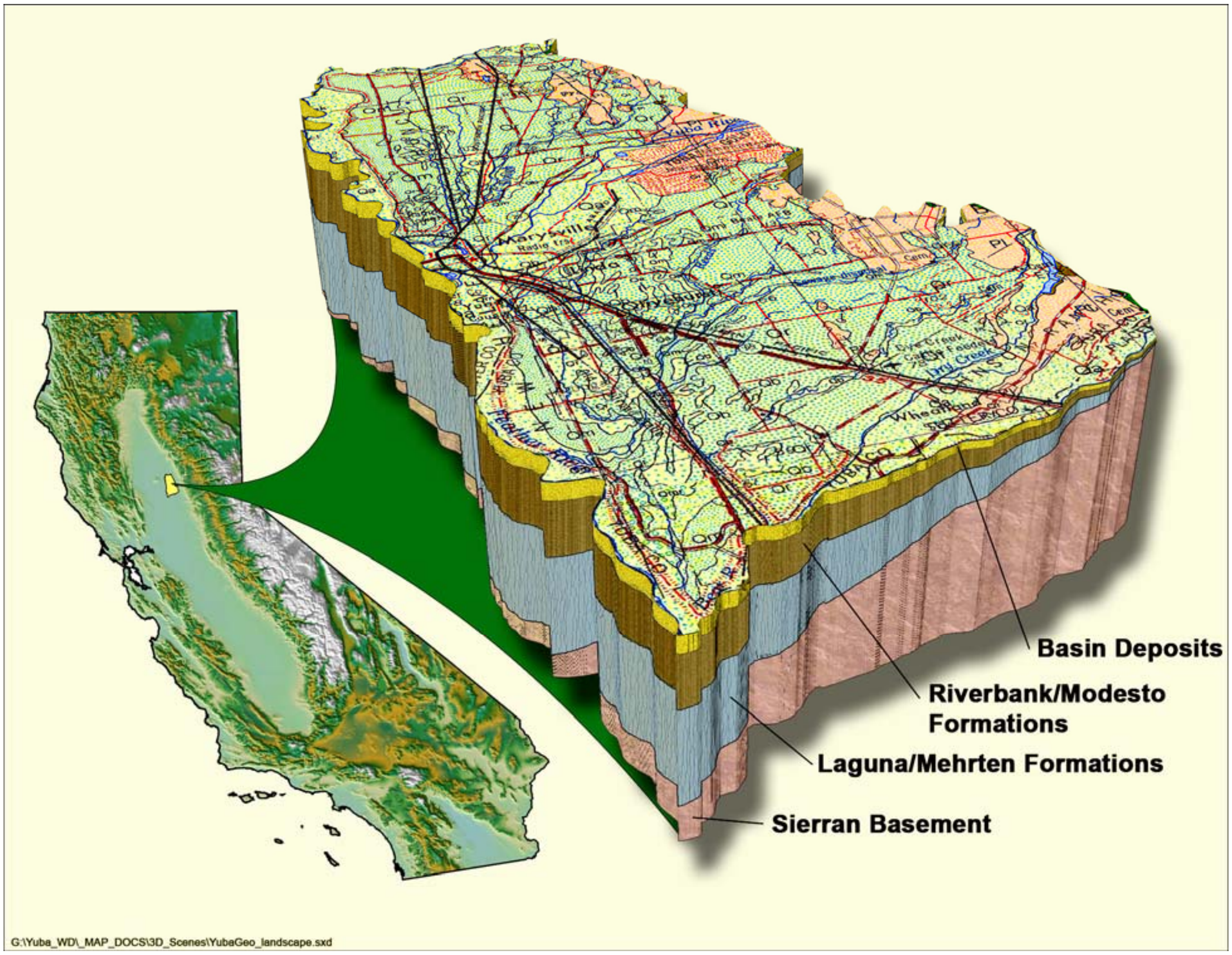

Figure 6-1.Surface Geology and Generalized Subsurface Geology in Yuba Basin
Source: Summary of Groundwater Basin Conditions, Yuba County (MWH 2005)

PRIMARY GROUNDWATER-BEARING FORMATIONS

Primary water-bearing formations include surface basin deposits, the Older Alluvium, Laguna, and Mehrten formations, which comprise the majority of the Yuba Basin volume.

Surface Basin Deposits

These deposits occur at or near the ground surface and are composed of stream channel and floodplain deposits, and dredger tailings. Surface geology for the Yuba Basin consists mainly of alluvial valley sediments that gradually increase in thickness toward the west.

Extending downstream from the Sierra Nevada Foothills along the Yuba River for 15 miles are large piles of very coarse gravels and cobbles. These piles have been dredged for gold and range in thickness between 60 feet to 80 feet in the eastern area, and 100 feet to 125 feet in the west (DWR 2003).

Riverbank/Modesto Formations

Older alluvial fan deposits were mapped as the Riverbank/Modesto Formation and consist of loosely compacted silt, sand, and gravel with lesser amounts of clay (Saucedo and Wagner 1992). Deposits are more stratified, and contain higher concentration of sands and gravel than in the underlying Laguna Formation. The gravel deposits appear to be more concentrated in the upper 150 feet of the local study area, and the formation as a whole is exposed for over 50 percent of Yuba County's surface area. Estimates of unit thickness range from 100 feet in the south to 150 feet in the Yuba River vicinity. Several wells with depths up to 150 feet below ground surface (bgs) have yielded 1,000 gpm to 1,200 gallons per minute (gpm) (Bookman-Edmonston Engineering, Inc. 1992). Higher-yielding wells in these areas are usually much deeper and draw from the underlying Laguna Formation.

Laguna Formation

Compared to the other formations located in the Yuba Basin, the Laguna Formation is the thickest and most extensive water-bearing formation (Bookman-Edmonston Engineering, Inc. 1992). This formation is exposed along the eastern study area boundary. It is also exposed in isolated hills between Beale AFB and WWD, where thin, surrounding younger sediments allow the Laguna Formation to be exposed in "windows." Farther west, the formation is found only in deep wells. This formation consists of a heterogeneous mix of generally poorly sorted clay, silt, sand, and gravel. The actual thickness of the Laguna Formation is difficult to determine in well logs because of the discontinuous contact of its upper boundary with the older alluvium. Thickness ranges up to 180 feet (Page 1980) near the eastern margin of the basin, to a reported 400 feet (DWR 2003) near the Yuba River. The overall low permeability of the Laguna Formation provides low well yields in comparison to the overlying younger deposits. In addition to the formation's fine-grained character, permeability is also reduced because much of the thin sandy and gravelly zones is cemented. Wells screened in the Laguna are capable of producing up to 2,000 gpm.

Mehrten Formation

The Mehrten Formation is an important source of fresh groundwater in the Central Valley. This sequence of volcanic rocks was deposited in the late Miocene through Pliocene ages. In the Sacramento Valley, the formation consists of two general units: (1) an overlying unit composed of unconsolidated black sands interbedded with blue-to-brown clay and (2) an underlying unit of hard, very dense tuff breccia. The Mehrten formation ranges from 400 feet to 500 feet thick (Page 1986). Surficial exposures of this unit are limited to a few square miles in the northeast corner of the Yuba Basin, dipping to the west and extending to great depths (Saucedo 1992). Generally, the Mehrten Formation yields large quantities of water to wells, although hydraulic conductivity in the Mehrten varies from place to place (Page 1986). At the time of the publication of this EIR/EIS, information on the yield of wells screened in the Mehrten formation within western Yuba County is not available. It is likely that production wells screened in the Mehrten formation are also screened within the overlying Laguna formation.

NON-GROUNDWATER-BEARING DEPOSITS/FORMATIONS

Geologic deposits and formations that do not store or produce groundwater include Eocene and Cretaceous Rocks and Sierra Nevada Basement Rocks, and are briefly described below.

Eocene and Cretaceous Rocks

Prior to the tectonic movement that created the depositional trough lying between the Coast Ranges and the eastern Sierra Nevada Foothills, the pre-existing rocks were both marine and non-marine in origin, and consisted primarily of conglomerate, sandstone, siltstone, mudstone, and shale (Page 1986). These rocks range in depth from 1,500 feet beneath the north central part of the Sacramento Valley to as much as 25,000 feet thick in the central Sacramento Valley. The marine rocks originally contained saline water but it is reported that over time, this saline water has been flushed out by freshwater percolating through the Sacramento Valley (Page 1986). The predominant formation within Yuba Basin representing this geological time frame is the Ione Formation, which is composed of sand, sandstone, and conglomerate. Where exposed, it ranges in thickness from zero to about 400 feet in the Sacramento Valley (Page 1986). The Ione Formation yields only small quantities of water, which are reported to be saline in some areas (Page 1986).

Sierra Nevada Basement Rock

Toward the east side of the valley, upper Cretaceous marine rocks (such as the Ione Formation) rest on metamorphic and plutonic crystalline rocks of the Sierra Nevada basement (Harwood and Helley 1987). These rocks are part of the Sierra Nevada batholith, an igneous mass that crystallized at great depth. Rock composition is varied and mostly consists of metamorphic and granitic types. Occurrences of the metamorphic rock types have been observed at the surface along the eastern study area, and extend westward to depths greater than 15,000 feet underneath the Central Valley (Page 1986). Additional overlying Tertiary-age volcanic rocks are considered part of the Sierra Nevada and their occurrences are rarely recorded because their volcanic nature is difficult to distinguish (Bookman-Edmonston 1992). The crystalline basement rocks of the Sierra Nevada do not store or transmit significant volumes of water. An unreliable supply is available from joints and fractures in weathered zones at the eastern boundary of the Yuba Basin where shallow domestic wells are located (Page 1986).

6.1.1.2 GROUNDWATER FLOW CONDITIONS, RECHARGE, AND DISCHARGE

Groundwater occurs generally within unconfined conditions throughout most of the Yuba Basin. Well drillers' reports for deeper wells show changes in groundwater levels with depth, suggesting that groundwater is possibly confined or semi-confined by overlying clay layers. The degree of confinement appears to increase with depth based on drillers' logs and water level data. Confined conditions probably occur at depths exceeding 300 feet to 400 feet, particularly within the Laguna Formation. Semi-confined conditions probably occur at about 300 feet bgs. Aquifer test data confirming this hypothesis are not available at this time.

Figure 6-2 shows a recent interpretation of groundwater elevations in the Yuba Basin based on groundwater elevation data collected by DWR and Beale AFB during spring 2004. This contour map was prepared as part of an extensive investigation of the Yuba Basin that is described in "*Summary of Groundwater Basin Conditions, Yuba County*" (MWH 2005).

Based on the interpreted spring 2004 groundwater elevation conditions shown in, the general flow of groundwater in the Yuba Basin is from east to the west, beginning in the mountain front recharge regions. The hydraulic gradient is steep in eastern Yuba County and gradually flattens out toward the west. As a result of agricultural pumping, particularly in the South Yuba

Subbasin, relatively low groundwater elevations occur in the southwest area of the South Yuba Subbasin, inducing groundwater to flow toward this area, as shown in the contour map on.

The interpreted spring 2004 groundwater flow conditions show that the Yuba Basin is recharged naturally along the upper reaches of the lower Yuba River, just downstream from the Sierra Nevada Foothills. Lithologic data from well drillers' logs, compiled previously during the preparation of "*Summary of Groundwater Basin Conditions, Yuba County*" (MWH 2005), show that this area, which has been dredged for gold, consists of highly permeable deposits of coarse-grained gravels and cobbles near the ground surface (MWH 2005). Appendix F2 presents six interpolated lithologic cross sections (three cross sections with west to east orientations and the other three with north to south orientations) showing the distribution of permeable materials between spring 2003 groundwater and the base of fresh water elevations (see page F2-1 through F2-7). As shown in Figure F2-2 through Figure F2-7 in Appendix F2 (see page F2-2 through F2-7), most permeable materials are present in the central Yuba Basin along the Yuba River. Lithologic data reveal that the coarse-grained beds found along the upper stream channels of the Yuba River become increasingly thinner toward the west and pinch out into impermeable clay beds intermixing with discontinuous, thin sand lenses in the central and western areas of the Yuba Basin (MWH 2005). The western portion of the Yuba River, particularly downstream from the Yuba River gage at Marysville (MRY), does not appear to act as a primary recharge zone based on the contour map. Areas along the Bear River and Honcut Creek appear to be minor recharge zones, providing limited recharge to the Yuba Basin, based on the relative volume of flows in the Bear River and Honcut Creek compared to the large volume of flows in the Yuba River, the underlying subsurface lithology in the vicinity of these areas, and the groundwater elevation contour map shown in. The subsurface lithologic data suggest the presence of less transmissive materials along the Bear River and Honcut Creek as opposed to highly transmissive materials along the upper channels of the Yuba River (see Figure F2-2 through F2-7 page F-2 through F-7 in Appendix F2). Based on the contour map, groundwater flowing from east to west appears to leave the basin across the Feather River along the western boundary of the Yuba Basin.

Along the eastern boundary of the South Yuba Subbasin near the Beale AFB, although the interpreted groundwater elevations are relatively high, as shown in, lithologic data suggest the presence of a thin aquifer zone with very low hydraulic permeability (see Figure F2-1 and cross section B-B′ in Figure F2-4 in Appendix F2). Therefore, this area should not be considered as a primary recharge zone in the Yuba Basin.

The measured high groundwater elevation of approximately 143 feet above mean sea level (msl) just downstream from the Sierra Nevada Foothills could be due to the effect of topographic highs in the vicinity of this mountainous area. The potential for direct artificial recharge in the basin is limited because areas of available storage space typically have overlying soils with very low infiltration rates that would restrict recharge potential (Bookman-Edmonston 1992). The need for direct artificial recharge is questionable given the high natural recharge rate in the upper portion of the lower Yuba River area.

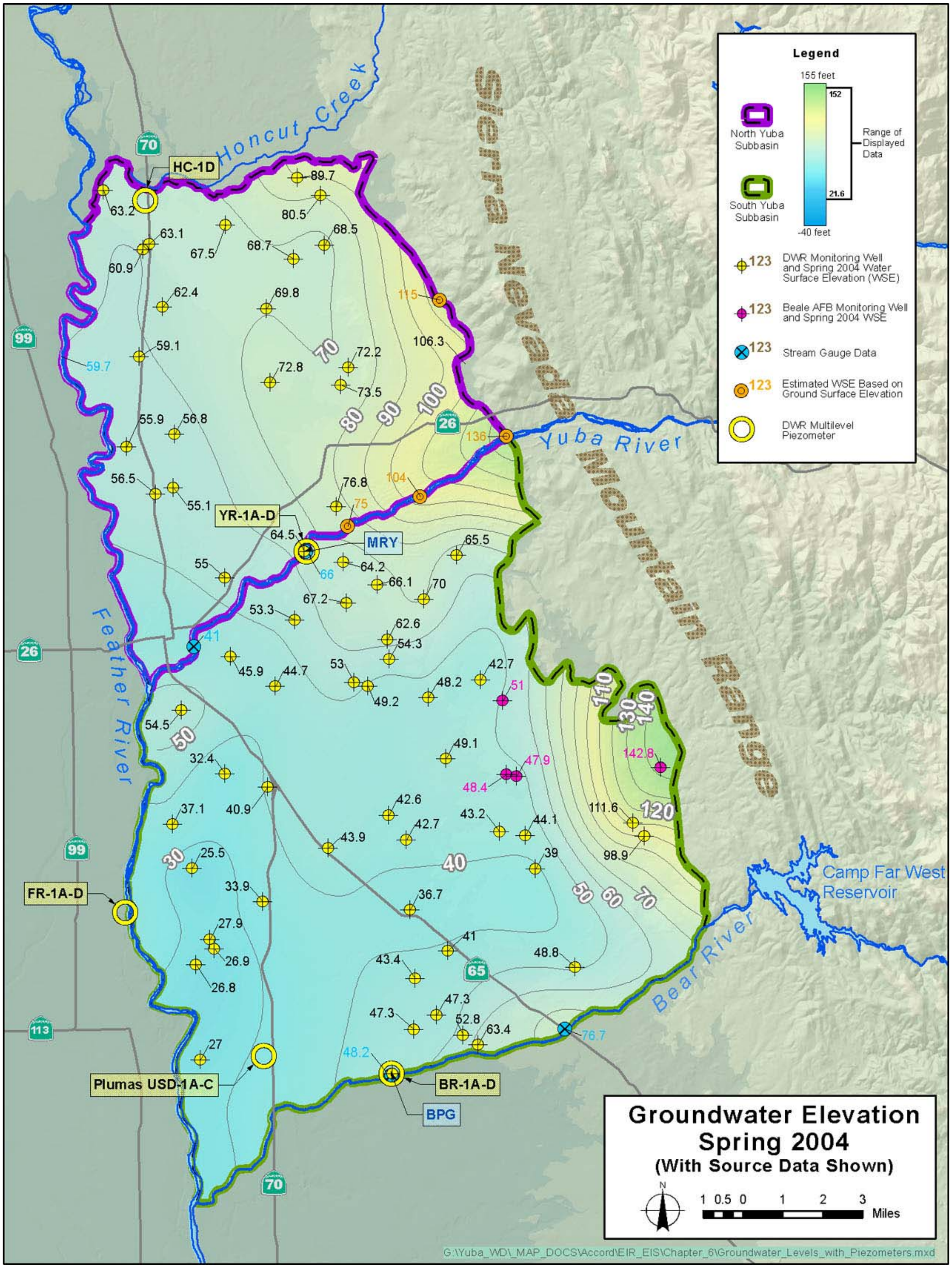

Figure 6-2. Spring 2004 Groundwater Elevations in the North and South Yuba Subbasins

6.1.1.3 GROUNDWATER STORAGE CONDITIONS

The volume of freshwater within the Yuba Basin is estimated to be 7.5 MAF (MWH 2005). This estimation is based on the storage characteristics of aquifer material occurring above the base of freshwater and below the spring 2003 groundwater surface.

The estimated volume of freshwater in the Yuba Basin should be interpreted cautiously because the volume does not represent the usable amount of groundwater. Instead, groundwater levels within the basin are managed within a safe range to avoid negative impacts such as dewatering existing productions wells, significantly increasing operational cost of groundwater extraction, and groundwater quality and quantity considerations. Detailed well construction information for 132 production wells in the Yuba Basin, as presented in Appendix F2 (see Table F2-1 in pages F2-8 through F2-11) indicates that the majority of the wells (87 wells) are screened within 200 feet bgs. A small group of wells (22 wells) are screened below 300 feet bgs. On an average, wells are screened between 135 feet bgs to 193 feet bgs. Therefore, it is unlikely that groundwater will be pumped to depths greater than 200 feet below spring 2003 conditions. The volume of freshwater 200 feet or less below the spring 2003 groundwater conditions is estimated to be approximately 2.8 MAF (MWH 2005), which is approximately 37 percent of the estimated total volume of freshwater. In addition, potential groundwater quantity and quality problems (e.g., dewatering shallow wells in the basin or drawing saline water from depth into the freshwater zone) might be induced in the Yuba Basin if groundwater levels were lowered below the range of historical groundwater level fluctuations.

The base of the freshwater contour map for the Yuba Basin recently has been revised based on geophysical logs from the California Division of Oil, Gas, and Geothermal Resources and DWR. This revised map was used to estimate the volume of freshwater in the Yuba Basin. Data from geophysical logs indicate that the base of freshwater dips from 200 feet below msl along the east side of the basin to over 800 feet below msl along the west side of the basin. A detailed explanation of the methodology for interpretation of the base of freshwater, and for estimating the volume of freshwater in the Yuba Basin, can be found in "*Summary of Groundwater Basin Conditions, Yuba County*" (MWH 2005).

6.1.1.4 GROUNDWATER WELL YIELDS

Information on groundwater well yields and production in Yuba County is based on driller reports filed with DWR. Available information on well yields and the thickness of the primary groundwater-bearing formations is discussed earlier in Section 6.1.1.1 and is summarized below:

- Surface Basin Deposits: The thickness ranges from 60 feet to 80 feet in the eastern area and 100 feet to 125 feet in the west.
- Riverbank/Modesto Formation: The thickness ranges from 100 feet in the south to 150 feet in the vicinity of the Yuba River. Well yields range from 1,000 gpm to 1,200 gpm.
- Laguna Formation: The thickness ranges up to 180 feet near the eastern margin of the Yuba Basin to 400 feet near the Yuba River. Wells screened in this formation are capable of producing up to 2,000 gpm.

- Mehrten Formation: The thickness ranges from 400 feet to 500 feet. At the time of the publication of this EIR, information on the yield of wells screened in the Mehrten formation within Western Yuba County is not available. It is likely that production wells screened in the Mehrten formation are also screened within the overlying Laguna formation.

In general, irrigation wells in the Yuba Basin commonly produce between 1,000 gpm to 2,000 gpm and range in depth from a few hundred feet to 700 feet. Wells with depths of 200 feet to 400 feet can yield 2,000 gpm to 4,000 gpm, with most of the yield derived from the upper 100 feet or more of sand and gravel. The area with the lowest yield can be found on Beale AFB property. Wells on and near Beale AFB range in depth from 264 feet to 354 feet and supply an average of 1,000 gpm per well. In a previous study, 92 driller reports were reviewed, and well yield data were reported in "*Groundwater Resources and Management in Yuba County*" (Bookman-Edmonston 1992). The average well yield ranged from 1,000 gpm to 2,300 gpm, and the average specific capacity ranged from 16 gpm to 74 gpm per foot. (Specific capacity is a relative measure of the rate at which a well produces water for each foot of drawdown.[1])

6.1.1.5 LOCAL GROUNDWATER USAGE

Use of groundwater for irrigation and municipal supplies in the Yuba Basin has developed gradually as the need for water has increased. Currently, YCWA has water service agreements to deliver surface water to its Member Units from the lower Yuba River as part of the Yuba Project. Landowners within the Member Units have existing capacity to pump groundwater to meet parts of their demands. More than 200 production wells are located within YCWA Member Units. Five municipal purveyors located within the study area, California Water Service (serving the City of Marysville), OPUD, Linda County WD, City of Wheatland, and Beale AFB, rely on groundwater to meet their M&I water demands. Currently, 33 production wells are operated by these municipal purveyors. Other water purveyors in the county use combinations of groundwater and surface water supplies to meet their demands.

Historically, irrigation demands in the North Yuba Subbasin, except in RWD, have been sufficiently supplied by the Yuba Project with diversions from the Yuba River (see Chapter 1 and Chapter 5 for details on the Yuba Project). In addition to the surface water received from the YCWA under its water rights, HIC, CID and BVID also have their own water rights on the lower Yuba River (see Chapter 5). Located in the western portion of the North Yuba Subbasin, farmers in Reclamation District 10 use groundwater as their primary source of water for irrigation. In the South Yuba Subbasin, surface water supplies were historically limited. Agricultural and urban water users in this area relied heavily on groundwater supply until 1983 when YCWA began to provide Yuba River water to BWD and SYWD as part of the Yuba Project using the South Yuba Canal. In 1998, DCMWC started receiving surface water from YCWA. BWD, SYWD, and DCMWC currently receive surface water from the Yuba River while WWD and portions of Reclamation District 784 rely on groundwater. After implementation of the Wheatland Project, local irrigation demand of approximately 40 TAF in WWD will be supplied

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[1] The specific capacity of a well is the well yield (water flow from the well in gpm that the well produces) divided by the measured drawdown in the pumping well (measured in feet as the distance from the water surface in the well from static to the pumping level).

by surface water delivery in lieu of groundwater pumping. Plumas MWC diverts water from the Feather River under a settlement agreement with DWR.

Figure 6-3 shows locations of selected DWR monitoring wells in the North and South Yuba subbasins. **Figure 6-4** and **Figure 6-5** show historical groundwater elevation data (hydrographs) for the North and South Yuba subbasins, respectively. Historical groundwater elevation data are shown for 23 wells, of which 17 are located within the Member Units; the remaining six wells are within the Yuba Basin but outside the Member Units. Wells with hydrographs were selected in areas with intensive groundwater pumping.

Historical groundwater elevation data shown in Figure 6-4 and Figure 6-5 suggest that, prior to the delivery of surface water to the Member Units, groundwater pumping resulted in declining groundwater levels throughout the South Yuba Subbasin, and in some areas, groundwater depressions were evident. Historical data for the North Yuba Subbasin show that, in general, this subbasin was not drawn down extensively because of the historical surface water supply to the Member Units in this area. In the 1960s, the North Yuba Subbasin storage was significantly lower than current levels in some areas (Figure 6-4). A decreasing trend in groundwater elevations from 1940s to the mid-to-late 1960s suggests a chronic overdraft situation in some areas (e.g., 16N04E08A01M). During a severe 2-year drought from 1976 to 1977, most wells had the lowest point of groundwater elevation (e.g., see hydrographs of 17N04E30R01M and 17N04E27F01M in Figure 6-4). Since RWD began receiving surface water in the late 1970s, increasing surface water deliveries throughout the North Yuba Subbasin have resulted in a gradual increase in groundwater levels and storage in this subbasin. Based on the data shown in these hydrographs, groundwater levels have increased between 10 feet to 20 feet in the North Yuba Subbasin, mainly due to the increased delivery of surface water to RWD and wetter conditions.

Historical groundwater elevation data for the South Yuba Subbasin show that prior to 1983 groundwater overdraft resulted in a well-developed cone of depression, which was most pronounced near the WWD service area. Since the delivery of surface water to the Member Units began in 1983, groundwater elevations have risen to historical high levels in some areas (e.g., see hydrographs of 14N05E30Q01M and 14N04E13C01M in Figure 6-5) and have exceeded historical high levels in other areas (e.g., see hydrographs of 14N04E15C05M, 14N04E24P01M, 15N04E28D01M, and 15N04E34E01M in Figure 6-5). Surface water deliveries appear to have a significant effect on groundwater levels. Since the early 1980s, groundwater levels have increased by approximately 100 feet in some areas particularly in DCMWC and BWD.

6.1.1.6 HISTORICAL GROUNDWATER SUBSTITUTION TRANSFERS

YCWA participated in four groundwater substitution transfer programs during 1991, 1994, 2001, and 2002. **Figure 6-6** shows the volumes of groundwater pumped within the North Yuba and South Yuba subbasins during each transfer year. **Figure 6-7** and **Figure 6-8** show the total volume of substitution water pumped during each of these four years within each Member Unit in the North and South Yuba subbasins, respectively.

Figure 6-3. Locations of Selected DWR Groundwater Monitoring Wells in the North and South Yuba Subbasins

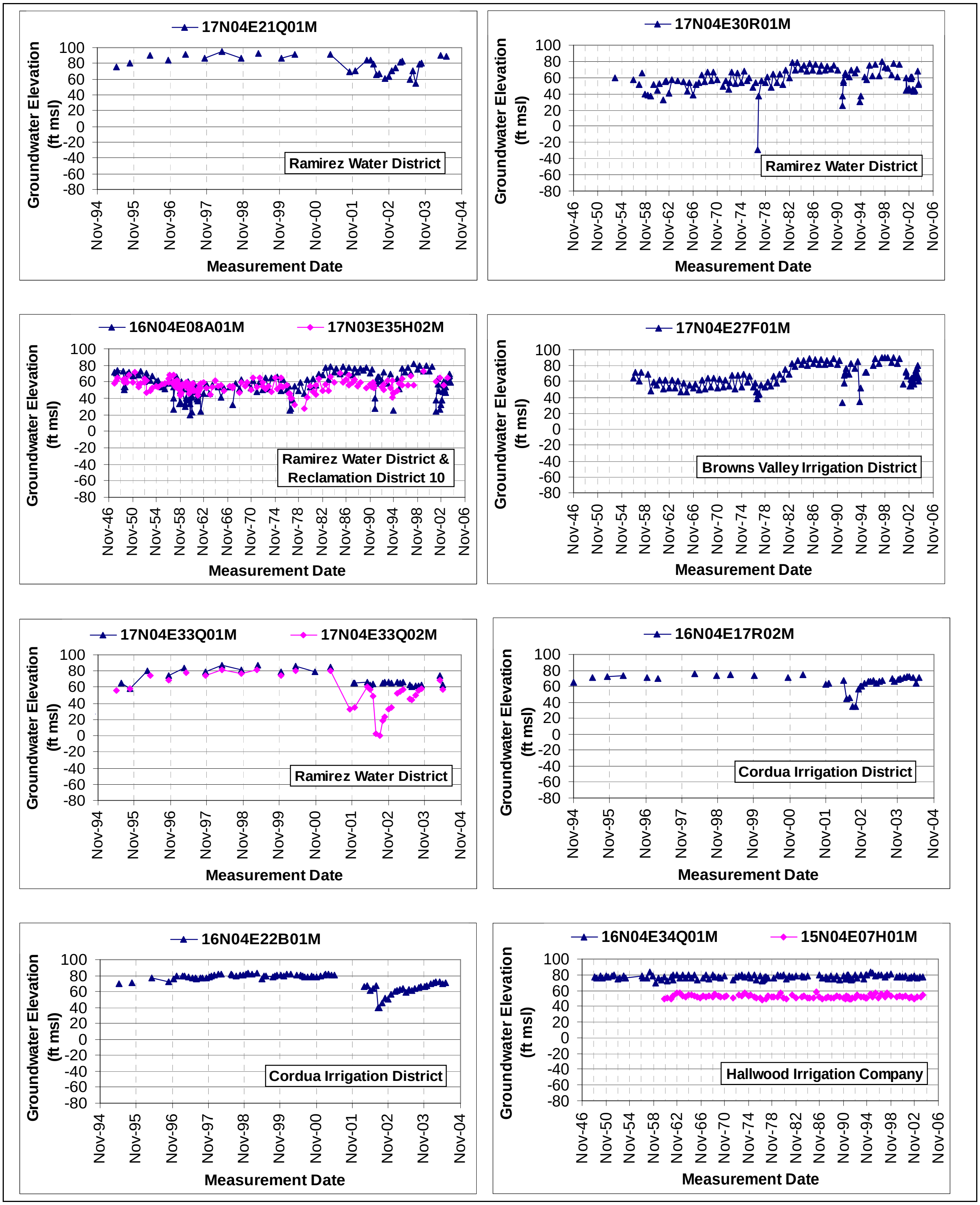


Figure 6-4. Historical Groundwater Elevations for Selected DWR Monitoring Wells in the North Yuba Subbasin

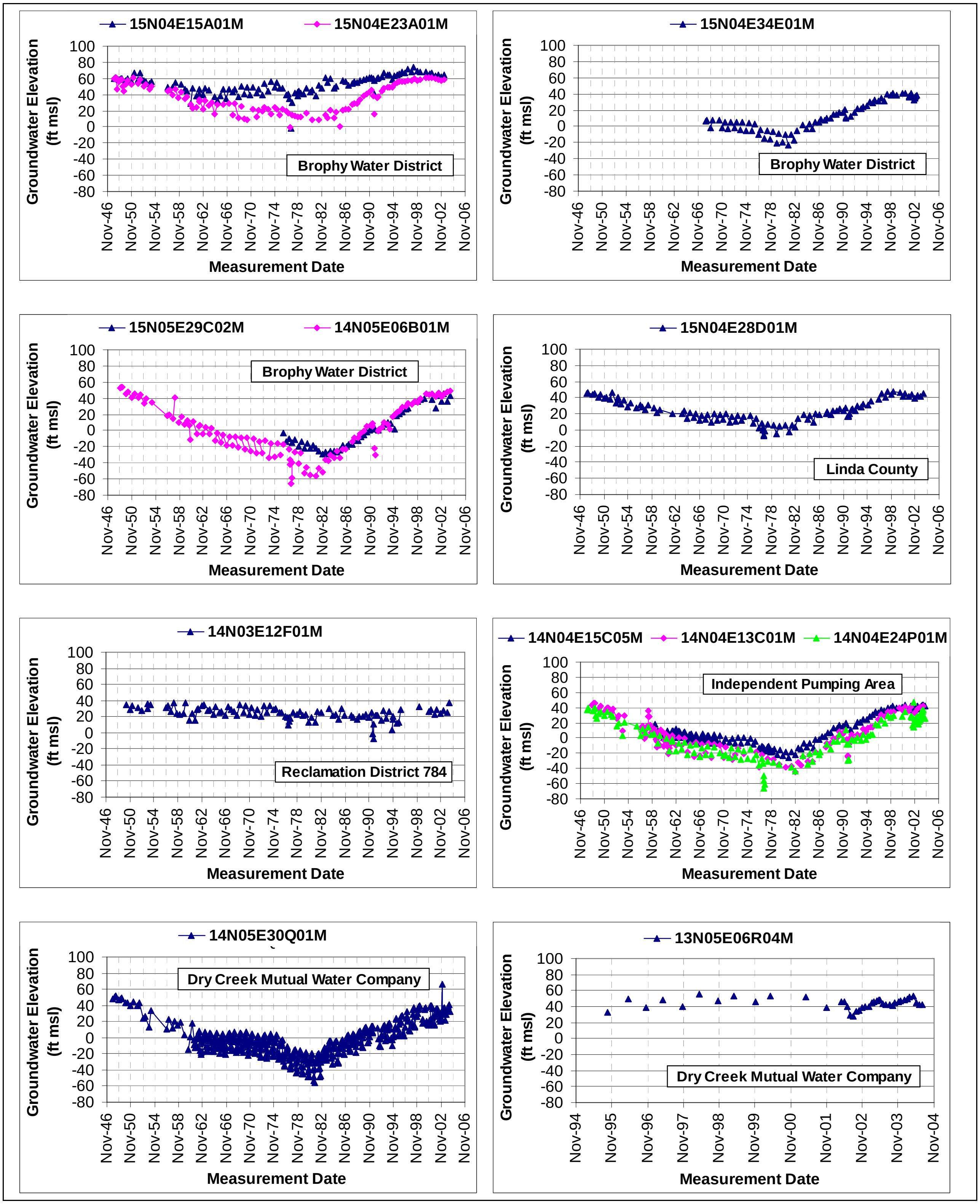


Figure 6-5. Historical Groundwater Elevations for Selected DWR Monitoring Wells in the South Yuba Subbasin

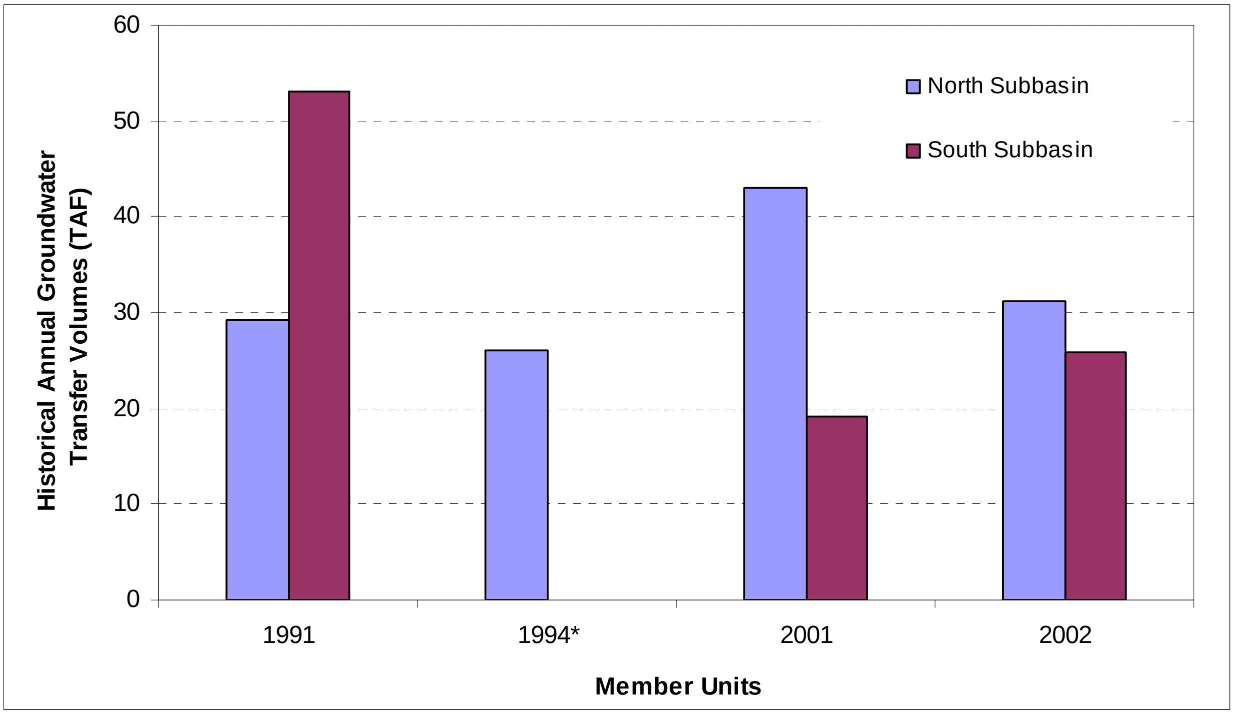


Figure 6-6. Volume of Groundwater Substitution Transfers from the North and South Yuba Subbasins

(The split of pumping between the two subbasins for the 1994 transfer is unknown)*

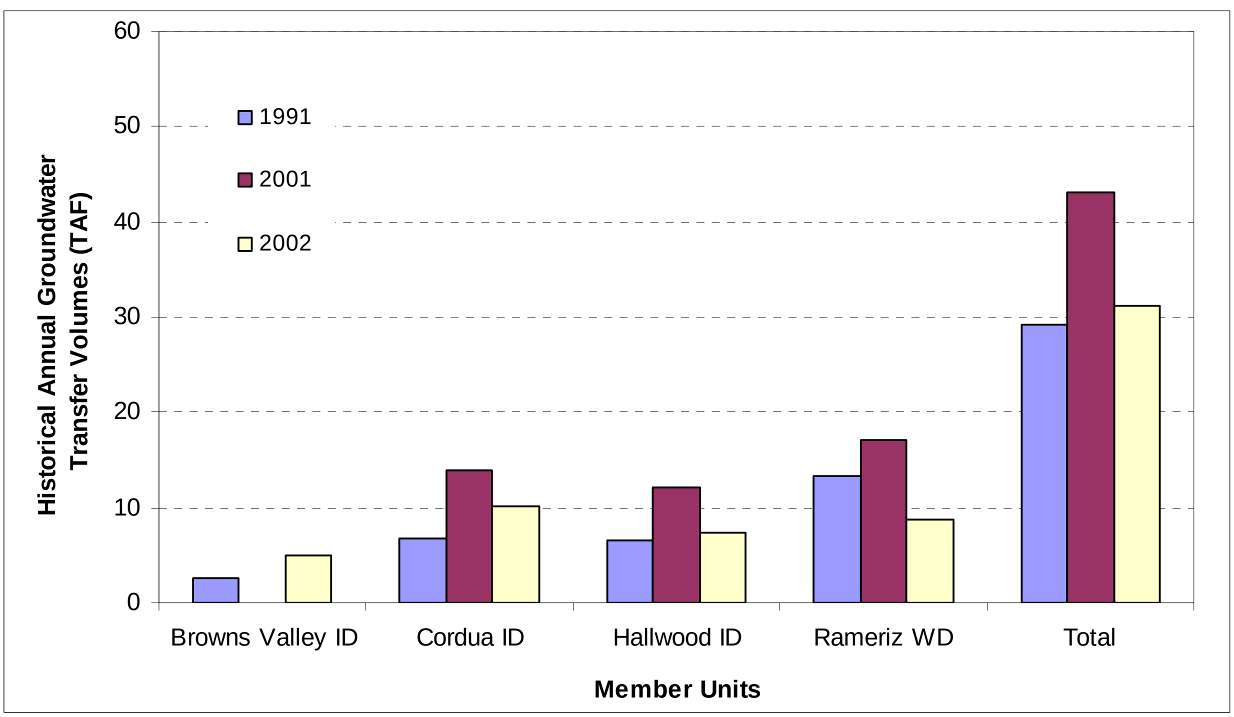


Figure 6-7. Volume of Groundwater Substitution Transfers by Member Units in the North Yuba Subbasin

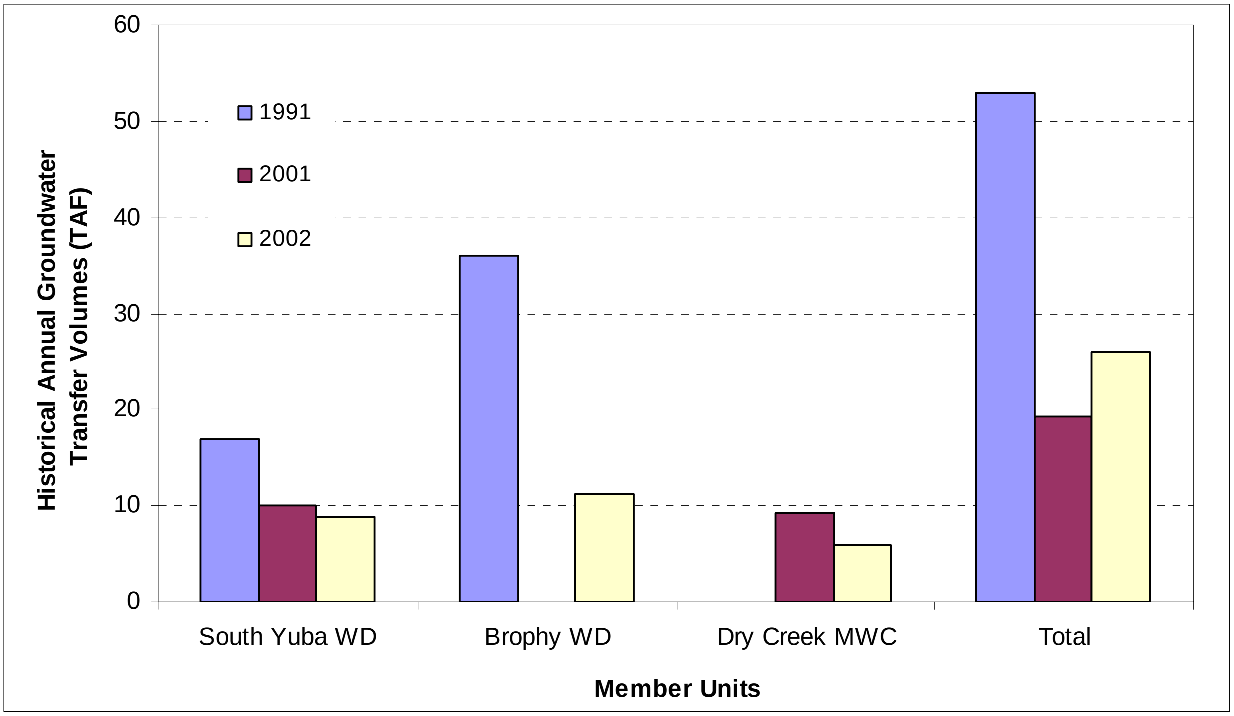


Figure 6-8. Volume of Groundwater Substitution Transfers by Member Units in the South Yuba Subbasin

The first groundwater substitution transfer, in 1991, occurred in response to a call from the Governor of California. The state was in a major drought due to five years of very dry conditions which had taken their toll on California water supplies. YCWA, together with its Member Units, developed a groundwater substitution transfer program to pump over 82 TAF of water for use on local lands for irrigation. This allowed for the release of an equal amount of water from New Bullards Bar Reservoir for use in other parts of the state. This type of groundwater substitution transfer also occurred in 1994, 2001, and 2002.

In the North Subbasin, the reduction in groundwater elevations due to the past groundwater transfers was more pronounced than in the South Yuba Subbasin (Figure 6-4). Despite a significant decline in groundwater levels, the majority of the recovery in the North Yuba Subbasin appears to have occurred within the first two years following each transfer. Landowners in RWD pumped the largest volume of groundwater water during the 1991, 2001, and 2002 groundwater transfers, and experienced the greatest impacts on groundwater elevations. Groundwater elevations in southeast RWD dropped to near historical low levels (e.g., see hydrograph of 16N04E08A01M in Figure 6-4). Within BVID, although the transfer volume was much less than in the RWD, groundwater levels dropped considerably, particularly after the 1991 and 1994 transfers (e.g., see hydrograph of 17N04E27F01M). In the central CID, reductions in groundwater elevations from the transfers appear to have been less, varying between 10 feet and 30 feet (e.g., see hydrograph of 16N04E17R02M). Figure 6-4 shows that groundwater elevations at two monitoring wells (e.g., see hydrographs of 16N04E34Q01M and 15N04E07H01M) located in HIC, about a mile north of the Yuba River, do not seem to show effects from the groundwater substitution transfer pumping. Because of their closeness to the Yuba River, these two monitoring wells might be buffered by the river. The locations of the transfer wells that were used during the 2001 and 2002 groundwater transfers in HIC are actually located further away from the river, approximately 1.5 miles to 2 miles south of the Yuba River (locations of the transfer wells pumped during the 2001 and 2002 groundwater transfers and the distribution of pumping volumes at those locations will be shown and discussed later in Section 6.2.3.1 under "Methodology, Analysis, and Results for Evaluating Short-Term Potential Impacts: Response and Recovery Analysis"). The two monitoring wells in CID (e.g., see hydrograph of 16N04E17R02M and 16N04E22B01M) are located closer to the transfer wells pumped in HIC (Figure 6-3). These two monitoring wells show similar long-term trends and similar declines in groundwater elevations from the groundwater pumping in 2001 and 2002. Overall, the hydrographs shown in Figure 6-4 suggest that impacts on groundwater elevations in the North Yuba Subbasin become greater from south to north away from the Yuba River.

As is shown in Figure 6-5, in the South Yuba Subbasin groundwater elevations recovered to pre-transfer spring elevations rapidly and continued to rise gradually, returning to nearly the same level as pre-transfer elevations within the first two years after the transfers. Recorded post-transfer groundwater elevations in BWD were well above historical lows, although the largest groundwater substitutions in the South Yuba Subbasin, both in 1991 and 2002, occurred in this area. In general, the responses of groundwater levels to transfers in DCMWC were not as noticeable because the recorded groundwater elevations were within the range of historical fluctuations.

6.1.1.7 LOCAL GROUNDWATER AND SURFACE WATER INTERACTIONS

The main surface water features in the Yuba Basin are the Yuba, Feather, and Bear rivers. The North Yuba Subbasin is bounded on the north by a smaller surface water feature, Honcut Creek. Other surface water bodies and wetland communities, such as surface-ponding vernal pools, are present in the Yuba Basin (CDFG 2006), as described below.

The Yuba River running through the study area plays an important role in resource management and planning, including flood management, power generation, water quality, fisheries, and recreation. Physical description of the Yuba River is provided in earlier sections (see Chapter 2). As discussed earlier in Section 6.1.1.2, the upper reach of the lower Yuba River is the primary recharge zone for the Yuba Basin.

The Feather River is a principal tributary of the Sacramento River, flowing through Butte County and between Yuba and Sutter counties. It drains part of the northern Sierra Nevada Mountains and a small portion of the middle part of the Sacramento Valley. Honcut Creek is a major tributary to the lower Feather River, flowing between Butte and Yuba Counties. Downstream from the confluence with Honcut Creek, the lower Feather River meets with the Yuba River at Marysville. Further downstream, the lower Feather River meets with the Bear River along the southern boundary of the Yuba Basin.

Areas along the Feather River within the Yuba Basin do not appear to be major recharge zones based on the contour map of spring 2004 groundwater elevations shown on Figure 6-2. As discussed earlier in Section 6.1.1.2, based on the contour map, groundwater appears to flow from east to west and leave the basin across the Feather River along the western boundary of the Yuba Basin. Although the interpreted groundwater elevations on Figure 6-2 are relatively high along the eastern boundary of the South Yuba Subbasin near the Bear River, Honcut Creek, and Beale AFB, these areas do not appear to be major recharge zones as discussed earlier in Section 6.1.1.2. The lithologic data in conjunction with the relatively small volume of flows in the Bear River suggest that recharge to the Yuba Basin from the Bear River is likely to be small (the Yuba and Bear river flows will be analyzed later in Section 6.2.3.2, see Figure 6-26). The underlying subsurface lithologic data in the vicinity of the Bear River and Beale AFB show the presence of less transmissive materials within these areas compared to highly transmissive materials along the upper channels of the Yuba River (see Figure F2-2 through F2-7 page F-2 through F-7 in Appendix F2). Similarly, recharge to the Yuba Basin from Honcut Creek is anticipated to be limited based on the lack of transmissive materials in the vicinity of Honcut Creek and small volume of surface water flows. Currently, there are no river gages on the Honcut Creek within the Yuba Basin. The closest river gage to the Yuba Basin is South Fork Honcut near Bangor (SFH), which is approximately about 3 miles southeast of the Yuba Basin. This river gage has been operating since June 2006 by DWR and reporting river stages data only (no river flow data are available). River stage data reported in May 2007 at the SFH river gage is significantly smaller than that reported at Yuba River Marysville Gage (MRY) (approximately 2 feet at SFH and 62 feet at MRY as reported at http://cdec.water.ca.gov).

In recent years, DWR Division and Planning and Local Assistance Central District have been working cooperatively with YCWA to install multilevel piezometers along the major rivers within the Yuba Basin. Figure 6-2 shows the locations of three multilevel piezometers recently installed on the Yuba River (YR-1A-D), Bear River (BR-1A-D), and Feather River (FR-1A-D). DWR is collecting and maintaining groundwater elevation data at various depths at these locations. Installation of the fourth multilevel piezometer on the Honcut Creek (HC-1D) is on-going (Figure 6-2). In addition to the multilevel piezometers installed by DWR, an existing multilevel piezometer has been recently reported in the South Yuba Subbasin (Plumas USD-1A-C). No data at this location are currently available (Figure 6-2).

These multilevel piezometers will be used to better understand interactions between groundwater and surface water features such as rivers and to monitor vertical gradients. Below is a description of these multilevel piezometers and available data from DWR at these locations. Information available for the existing surface-ponding vernal pools in the Yuba Basin is also described below. In Section 6.2, potential impacts on local groundwater and surface water interactions will be evaluated for the Proposed Project/Action Alternative and alternatives.

YUBA RIVER

YR-1A-D was installed by DWR in June 2004. It is located adjacent to the river gage MRY along the central portion of the Yuba River (Figure 6-2). YR-1A-D is a quadruple-completion (four-level) multilevel piezometer screened to a total depth of approximately 620 feet bgs. State well ID numbers for YR-1A-D are 15N04E04R02, R03, R04, and R05. The four multilevel piezometers denoted by YR-1A-D are listed below:

- YR-1A with a screened interval from 70 feet bgs to 80 feet bgs
- YR-1B with a screened interval from 250 feet bgs to 260 feet bgs
- YR-1C with a screened interval from 430 feet bgs to 450 feet bgs
- YR-1D with a screened interval from 600 feet bgs to 620 feet bgs

Preliminary groundwater elevation data from September 2004 to September 2006, as provided by DWR Division and Planning and Local Assistance Central District (Bonds, pers. comm. 2006b) (subject to revision during DWR's reviewing process) are provided in Appendix F2 (see Figures F2-8 and F2-9 in pages F2-12 and F2-13). Data suggest that a vertical gradient from the shallow aquifer to the Yuba River exists in this area (see Figure F2-8 and Figure F2-9 in Appendix F2). Data at this location are suggestive only for the location where data are measured; thus, inferences for stream-aquifer interactions for the entire Yuba River should not be made based on these short-term, localized data. Stream-aquifer interactions along the Yuba River are likely to change along the Yuba River given that both the spring 2004 groundwater flow conditions (Figure 6-2) and the subsurface lithology change noticeably from east to west. As discussed previously in Section 6.1.1.2, the upper reach of the Yuba River with coarse-grained beds appears to be the primary recharge zone for the Yuba Basin. Areas farther west toward the Feather River, including area where the YR-1A-D is located, do not appear to be a major recharge zone, based on the spring 2004 groundwater elevation contour map.

BEAR RIVER

BR-1A-D is a quadruple-completion multilevel piezometer installed by DWR in 2003 on the Bear River adjacent to the river gage BPG (Figure 6-2). It was screened to a total depth of approximately 330 feet bgs. The following state well ID numbers were assigned to BR-1A-D: 13N04E11R02, R03, R04, and R05. BR-1A-D represents the following four piezometers:

- BR-1A with a screened interval from 28 feet bgs to 47 feet bgs
- BR-1B with a screened interval from 78 feet bgs to 98 feet bgs
- BR-1C with a screened interval from 215 feet bgs to 245 feet bgs
- BR-1D with a screened interval from 320 feet bgs to 330 feet bgs

A technical memorandum report, published in 2004 by the DWR Division of Planning and Local Assistance Central District, provides peer reviewed groundwater elevation data measured at BR-1A-D and river stage data at the adjacent river gage BPG between April 2003 and March 2004 (DWR 2004). These data shown in Figure F2-10 (page F2-14 in Appendix F2) suggest that groundwater and surface water interactions tend to vary over time. The Bear River appears to be a gaining river in early summer and mid-winter and becomes a losing river all other times throughout the measurement period. A trend of decreasing groundwater elevations with depth suggests a downward vertical hydraulic gradient. More up-to-date groundwater elevation data at BR-1A-D were provided by DWR (Bonds, pers. comm. 2006b) for the period from August 2005 to July 2006 and are shown in Figure F2-11 (page F2-15 in Appendix F2). These data also suggest similar seasonal trends as data from 2003 and 2004.

FEATHER RIVER

FR-1A-D is a quadruple-completion multilevel piezometer installed by DWR in 2005 east of the Feather River in Sutter County (Figure 6-2). It was screened to a total depth of approximately 1,016 feet bgs. Currently, no river gage is located adjacent to FR-1A-D. FR-1A-D represents the four piezometers listed below:

- FR-1A with a screened interval from 40 feet bgs to 60 feet bgs
- FR-1B with a screened interval from 235 feet bgs to 255 feet bgs
- FR-1C with a screened interval from 664 feet bgs to 684 feet bgs
- FR-1D with a screened interval from 996 feet bgs to 1,016 feet bgs

Preliminary groundwater elevation data (subject to revision during DWR's reviewing process) available at FR-1A-D from October 2005 to November 2006 (Bonds, pers. comm. 2006b) are presented in Figure F2-12 in Appendix F2 (see page F2-16). Data from the most shallow piezometer, FR-1A (screened interval from 40 feet bgs to 60 feet bgs) appears to have different trends than the other three piezometers at deeper zones (FR-1B, FR-1C, and FR-1D). Data from the two deep piezometers, FR-1C and FR-1D, correspond well throughout the measurement period. Large fluctuations observed only at FR-1B (screened interval from 235 feet bgs to 255 feet bgs) are likely to be a result of pumping that might have occurred during irrigation season in the vicinity of this well.

HONCUT CREEK

DWR is currently installing a quadruple-completion multilevel piezometer, HC-1A-D, south of Honcut Creek in Yuba County. Figure 6-2 shows the location of HC-1D, which is the deepest piezometer installed with a screen elevation from 524 feet bgs to 554 feet bgs. Installation of the remaining three shallower multilevel piezometers, HC-1A, HC-1B, and HC-1C, is on-going (Bonds, pers. comm. 2006a). Short-term records of groundwater elevation data (starting from 2005) at HC-1D can be obtained from DWR upon request. However, the short-term records may be of limited use for understanding groundwater-surface water interactions at this time.

SURFACE WATER PONDING VERNAL POOLS

In addition to the rivers, surface water-ponding vernal pools are located in the local study area. Locations of the vernal pools are available from CDFG based on California Natural Diversity Database (CNDDB) (CDFG 2006) and are described in Section 6.2. In general, the vernal pools found in the study area do not depend upon groundwater to maintain pool levels (Williamson *et al.* 2005), but instead are recharged by direct precipitation and surface water flows (e.g., agricultural) (see Chapter 11, Section 11.1.2.1). In Section 6.2, data for vernal pool locations are analyzed in relation to groundwater elevation data to further demonstrate that potential impacts to vernal pools would not be expected as a result of groundwater pumping during implementation of the Proposed Project/Action or alternatives in the Yuba Basin.

6.1.1.8 LOCAL GROUNDWATER QUALITY

Groundwater in the North and South Yuba subbasins has similar water quality characteristics and primarily is of good quality for both domestic and agricultural uses. Historical groundwater quality data from 1965 through 1989 are available from 13 monitoring wells, 8 of which are located in the South Yuba Subbasin and 5 in the North Yuba Subbasin. The most recent records of chemistry data in the Yuba Basin were collected during 1998 and 2003 by DWR at 11 of the 13 wells. Additionally, more recent water quality data are available from 84 transfer wells sampled by DWR between July and August during the 2002 transfer. The following is a summary of groundwater quality taken from "*Summary of Groundwater Basin Conditions, Yuba County*" (MWH 2005).

Based on historical data from the 13 monitoring wells, pH data recorded in the North and South Yuba subbasins are similar, ranging from 7.2 to 8.8. Most areas, both in the South and North Yuba subbasins, showed increasing trends for calcium, calcium carbonate, chloride, alkalinity, and conductance, and total dissolved solids (TDS). With respect to nitrate and boron, groundwater across the Yuba Basin does not seem to pose a health risk. Nitrate concentrations (as NO_3), ranging from non-detect to 30 milligrams per liter (mg/l), were well below USEPA and California primary drinking water standard of 45 mg/l. Boron concentrations were measured commonly either below or near the detection limit (0.01 mg/l). Most wells in the Yuba Basin contain low sodium concentrations, suggesting that groundwater is ideal for irrigation (YCWA 2005).

Water quality data recorded in 2002 show similar characteristics of groundwater in the entire basin. Most areas in the North Yuba Subbasin have a bicarbonate + carbonate water type, with a few exceptions where increasing concentrations of sodium + potassium and chloride were encountered. No significant change in water chemistry was observed between the two subbasins. Some transfer wells in the South Yuba Subbasin, particularly within DCMWC and SYWD, recorded levels of TDS near or slightly above the secondary maximum contaminant level (MCL) of 500 mg/l (**Figure 6-9**). Measured values of trace elements (e.g., aluminum, boron, cadmium, copper, iron, lead, manganese, mercury, silver, and zinc) were mostly below the reporting limits for all wells sampled. Average nitrate concentrations in each subbasin were less than 10 mg/l.

DWR is planning to monitor the four multilevel piezometers installed on the Yuba, Bear, Feather rivers and on the Honcut Creek for water quality to characterize groundwater quality changes by depth. Specifically, DWR will monitor for evidence of groundwater quality changes in the deep portions of the freshwater aquifers to verify that groundwater pumping is not raising the base of freshwater.

In addition to DWR's monitoring efforts, other data collection activities have been taking place in the Yuba Basin in response to potential sources of groundwater contamination that may have occurred around Beale AFB, in urban growth areas (e.g., Wheatland, Olivehurst, and Marysville), and from leaking underground storage tanks. These sources are briefly described below. Because future changes in pumping patterns under the Proposed Proposed/Action Alternative would occur primarily, if not entirely, within agricultural portions of the Yuba County, evaluation of water quality impacts did not include compiling water quality data from municipal, industrial or other urban areas.

BEALE AIR FORCE BASE

Waste oils, fuels, and solvents that have been disposed of in above ground and underground storage tanks at Beale AFB have resulted in environmental contamination (CH2M HILL 2004). Groundwater has been monitored at Beale AFB since the 1980s. Evaluation of the extent and types of contaminants at Beale AFB began in 1985 and has resulted in removal of source areas and implementation of remedial activities such as installation of groundwater treatment plants.

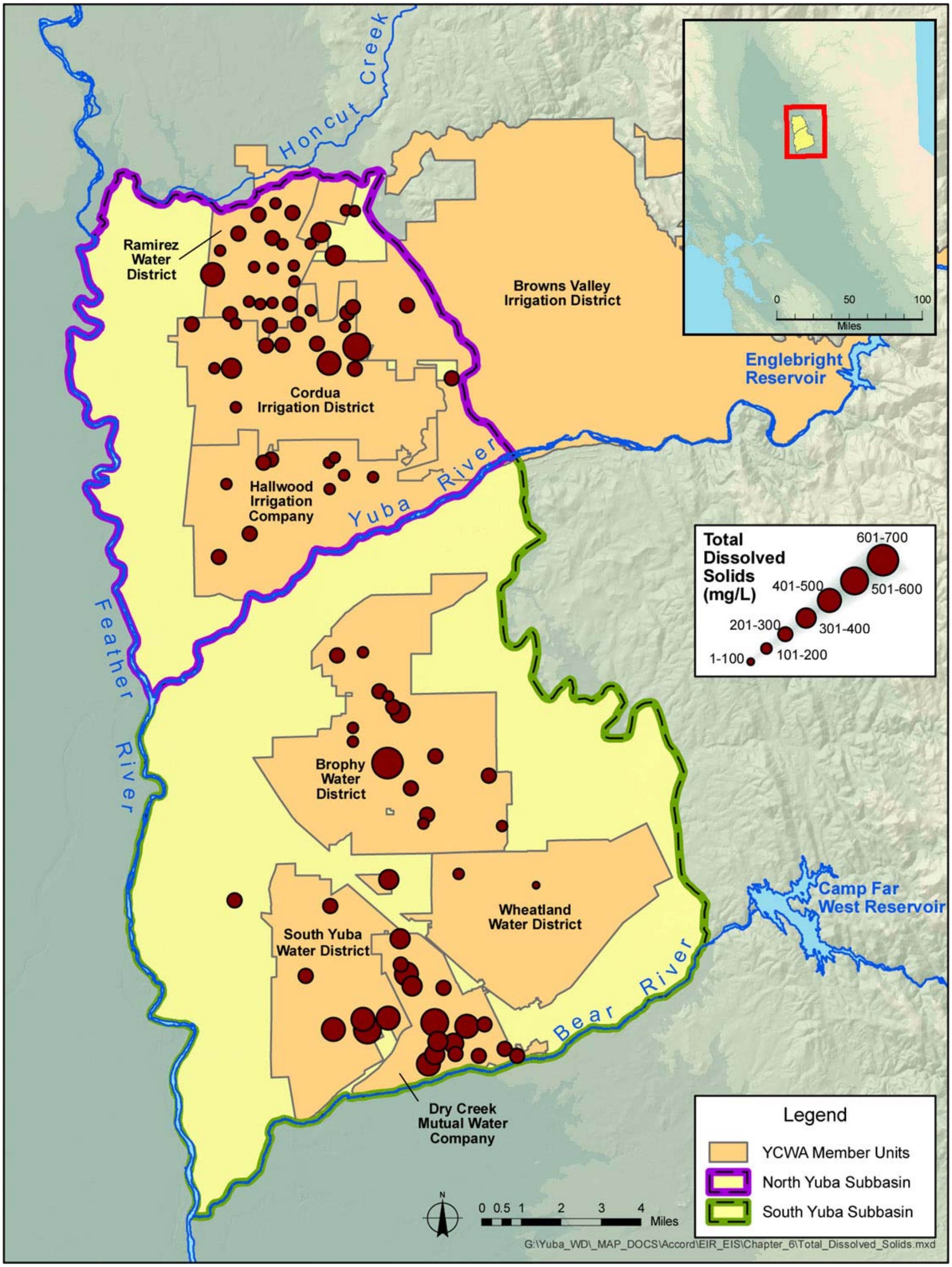


Figure 6-9. Total Dissolved Solids Concentration in Groundwater of North and South Yuba Subbasin (2002) (mg/l)

The goal of Beale AFB is to prevent contaminants that exceed drinking water MCLs from migrating offsite. The lead agency for the groundwater cleanup at the base is the Central Valley RWQCB.

LEAKY UNDERGROUND STORAGE TANKS

There are 43 leaky underground storage tank sites reported in the project area with potential or actual groundwater contamination. Groundwater contamination at these sites is in various stages of remediation, from initial characterization to remediation, and is typically limited to shallow groundwater-bearing zones with downgradient areas being the most affected. Methyl tertiary butyl ether (MTBE), a gasoline oxygenate that is very mobile in groundwater, has been detected in groundwater near some of the underground storage tanks.

6.1.1.9 LOCAL LAND SUBSIDENCE

To date, minimal subsidence monitoring has occurred in Yuba County. Although land subsidence has not been a concern in the local study area, YCWA has an interest in setting up a land subsidence network in the Yuba Basin to ensure the protection of the Yuba Basin against land subsidence. The YCWA GMP adopted in March 2005 includes actions to coordinate with DWR on development and implementation of a land subsidence monitoring program for Yuba County (YCWA 2005). The initial phase of the land subsidence monitoring program that is undertaken by the YCWA will include the initial reconnaissance for documenting existing monuments and for establishing new monuments. YCWA has recently requested that DWR make funding available by amending the scope of an existing state grant (Proposition 13) to include the passive land subsidence monitoring plan. YCWA's close coordination with DWR for developing the land subsidence monitoring program will complement YCWA's groundwater monitoring activities and support basin management objectives stated in the GMP (YCWA 2005).

6.1.2 EXPORT SERVICE AREA

For the purposes of this groundwater evaluation, the Export Service Area is defined as the San Joaquin River Basin and the Tulare Lake Basin, by DWR. These two basins encompass much of the portion of the export service area of the CVP and SWP that is reliant on groundwater to meet irrigation demands when supplemental surface supplies are not available. The estimated annual average percents of demand met with groundwater in the San Joaquin River Basin and the Tulare Lake Basin are 30 percent and 41 percent, respectively (DWR 2003). In many areas within these basins, groundwater levels have fallen since 1970. The subbasins within these two basins that underlie the portion of the CVP and SWP service areas that receive a majority of surface water deliveries are located in the following counties: Fresno, Kern, Kings, Merced, Stanislaus, and Tulare. These subbasins represent the areas that could most benefit from an increase in surface water supply reliability to the CVP and SWP, as examined under this EIR/EIS. **Table 6-1** summarizes pertinent information about groundwater levels and groundwater budget of the subbasins within the aforementioned counties. Combined, the area overlying these subbasins comprises 3,651,000 acres (DWR 2003). Total annual groundwater extraction for all the subbasins is not known, but the total estimated annual average of known urban and agricultural extractions is estimated to be 173.1 TAF and 2,971.0 TAF, respectively (DWR 2003). Annual natural recharge is estimated to average 241.0 TAF (DWR 2003). Artificial recharge has not been calculated for the subbasins, however an estimated 999.0 TAF of surface water is applied annually. Groundwater elevation changes between 1970 and 2000 for each subbasin range between an increase of 4 feet and a decline of 30 feet (DWR 2003).

Table 6-1. Summary of Export Service Area Subbasin Information

Pertinent Data	DWR Subbasin Name and (Number)					
	Merced Subbasin (5-22.04)	Delta-Mendota Subbasin (5-22.07)	Kings Subbasin (5-22.08)	Kaweah Subbasin (5-22.11)	Tulare Lake Subbasin (5-22.12)	Tule Subbasin (5-22.13)
County	Merced	Stanislaus, Merced, Madera, and Fresno	Fresno, Kings, and Tulare	Tulare and Kings	Kings	Tulare
Acres	491,000	747,000	976,000	446,000	524,000	467,000
Groundwater Level Trends	Between 1970 and 2000 average decline of 30.0 feet.	Between 1970 and 2000 average increase of 2.2 feet.	Variability in groundwater levels in response to the 1976-77 drought ranged from 10 feet to 50 feet, with similar declines in the western subbasin during the 1987-92 drought.	Between 1970 and 2000 average declines of 12 feet.	Between 1970 and 2000 average declines of 17 feet.	Between 1970 and 2000 water level has increased 4 feet. Variability in groundwater levels has ranged from 34 feet decreases between 1988 and 1995, to 20 feet increases between 1970 and 1988.
Groundwater Budget	Natural recharge estimated to be 47.0 TAF, artificial recharge not determined but 243.0 TAF of surface water applied annually. Annual urban and agricultural extractions are 54.0 and 492.0 TAF respectively.	Natural recharge estimated to be 8.0 TAF, artificial recharge not determined but 74.0 TAF of surface water applied annually. Annual urban and agricultural extractions are 17.0 and 491.0 TAF respectively.	Recharge and extraction values are not reported by DWR.	Natural recharge estimated to be 62.4 TAF, artificial recharge not determined but 286.0 TAF of surface water applied annually. Annual urban and agricultural extractions are 58.8 and 699.0 TAF respectively	Natural recharge estimated to be 89.2 TAF, artificial recharge not determined but 195.0 TAF of surface water applied annually. Annual urban and agricultural extractions are 24.0 and 648.0 TAF respectively.	Natural recharge estimated to be 34.4 TAF, artificial recharge not determined but 201.0 TAF of surface water applied annually. Annul urban and agricultural extraction are estimated to be 19.3 and 641.0 TAF, respectively.

Source: California Groundwater, Bulletin 118, Update 2003. California Department of Water Resources.

6.1.3 Regulatory Setting

The local and state regulatory settings for groundwater resources in the Yuba Basin are discussed in this section.

6.1.3.1 Local

Documents of the local regulatory setting relevant to groundwater resources include the Yuba County Water Agency Act, Yuba County Water Agency Groundwater Management Plan, and the SVWMP. The SVWMP was described earlier in Chapter 3 (Section 3.2.1.6).

Yuba County Water Agency

YCWA was created in 1959 by the Yuba County Water Agency Act to develop and promote the beneficial use and regulation of the water resources of Yuba County (see Figure 1-2 for the location of Yuba County and the YCWA boundary). Two sections of the Yuba County Water Agency Act are important to implementation of groundwater management in Yuba County. The first section relates to water supply:

> ***§84-4. Availability of water supply; necessary acts***
>
> *Sec. 4. The agency shall have the power as limited in this act to do any and every lawful act necessary in order that sufficient water may be available for any present or future beneficial use or uses of the lands or inhabitants within the agency, including, but not limited to irrigation, domestic, fire protection, municipal, commercial, industrial, recreational, and all other beneficial uses and purposes. (Stats.1959, c. 788, p. 2783, § 4).*

The second section relates to the storage of water:

> ***§84-4.3 Storage of water; conservation and reclamation; actions involving use of waters or water rights***
>
> *Sec. 4.3. The agency shall have the power to store water in surface or underground reservoirs within or outside the agency for the common benefit of the agency; to conserve and reclaim water for present and future use within the agency; to appropriate and acquire water and water rights, and to import water into the agency and to conserve and utilize, within or outside the agency, water for any purpose useful to the agency; …(Stats.1959, c. 788, p. 2783, § 4.3).*

Yuba County Water Agency Groundwater Management Plan

YCWA's Groundwater Management Plan (GMP) was adopted in 2005. The purpose of the GMP is to build on and formalize the historically successful management of Yuba County's groundwater resources and to develop a framework for implementation of future activities. The authority to manage the county's groundwater resource is provided through the Yuba County Water Agency Act and Water Code Division 6, part 2.75 (§ 10750 et seq.). YCWA prepared the Groundwater Management Plan consistent with provisions of CWC § 10750 *et seq.*

YCWA's Groundwater Management Plan includes basin management objectives related to the following measurement and monitoring categories: (1) groundwater levels and storage; (2) groundwater quality; (3) inelastic subsidence; and (4) groundwater and surface water interactions (see Chapter 2 for details on basin management objectives in the GMP).

6.1.3.2 STATE

The California Legislature and Governor, as well as private citizens, have become increasingly concerned about the recent public well closures due to the detection of chemicals, such as MTBE from gasoline and various solvents from industrial sources. As a result of the increased awareness of groundwater quality, the *Supplemental Report of the 1999 Budget Act* required the SWRCB to develop a comprehensive ambient groundwater monitoring plan. To meet this mandate, the SWRCB created the Groundwater Ambient Monitoring and Assessment (GAMA) Program. The primary objective of the GAMA Program is to assess water quality and relative susceptibility of groundwater resources. The GAMA Program has two sampling components: the California Aquifer Susceptibility Assessment for addressing public drinking water wells, and the Voluntary Domestic Well Assessment Project for addressing private drinking water wells.

The GAMA Program is being directed out by the SWRCB Division of Water Quality, Land Disposal Section, Groundwater Special Studies Unit. The Voluntary Domestic Well Assessment Project samples domestic wells for various constituents commonly found in domestic well water and provides that information to domestic well owners. In addition, the Voluntary Domestic Well Assessment Project includes a public education component to aid the public in understanding water quality data and water quality issues affecting domestic water wells. The Voluntary Domestic Well Assessment Project focuses on specific areas, as resources permit. The focus areas are chosen based on existing knowledge of water quality and land use, in coordination with local environmental agencies. The SWRCB incurs the costs of sampling and analysis, and results are provided to domestic well owners as quickly as possible.

During April through June 2002, Voluntary Domestic Well Assessment Project staff sampled 119 domestic supply wells in Yuba County. The majority of the wells sampled are located outside of the Yuba Basin in the foothills to the east. SWRCB GAMA Program Web site provides maps of sampling locations with nitrate and coliform results (http://www.swrcb.ca.gov/gama/voluntry.html#yuba).

6.2 ENVIRONMENTAL IMPACTS/ENVIRONMENTAL CONSEQUENCES

This section addresses potential impacts on groundwater resources in the Yuba Basin as a result of implementing the CEQA and NEPA alternatives described in Chapter 3 (Table 3-1). This section describes anticipated changes in groundwater pumping under each alternative (Section 6.2.1) and groundwater pumping constraints used to predict groundwater pumping volumes that may occur within the Yuba Basin under each alternative (Section 6.2.2). The methodology, analysis, and results for evaluating potential impacts of groundwater pumping are also described in this section (Section 6.2.3). Because most potential impacts would occur in the Yuba Basin, this section focuses mainly on evaluating potential impacts to the Yuba Basin groundwater resources under the alternatives evaluated in this EIR/EIS. Potential impacts to the Export Service Area would be very small; thus, only a brief discussion for the Export Service

Area is provided (Section 6.2.4). This section also describes impact indicators and significance criteria used to evaluate potential impacts on groundwater resources (Section 6.2.5).

As depicted in Chapter 3 (Table 3-1), separate scenarios have been developed to analyze the effects of the CEQA and NEPA alternatives discussed in this EIR/EIS. Impact analyses presented in this section are used to asses potential changes in groundwater levels and storage, groundwater and surface water interactions, groundwater quality, and land subsidence as a result of anticipated changes in groundwater pumping that could occur under the Proposed Project/Action and alternatives (Section 6.2.6 through Section 6.2.12).

6.2.1 ANTICIPATED CHANGES IN GROUNDWATER PUMPING

Anticipated changes in groundwater pumping for the alternatives and scenarios discussed in this EIR/EIS are summarized in **Table 6-2**. Changes in groundwater pumping due to various causes listed in Table 6-2 could impact groundwater resources in the Yuba Basin.

Table 6-2. Anticipated Changes in Groundwater Pumping

Scenario No.	CEQA Scenarios				NEPA Scenarios		
	1	2	3	4	5	6	7
Changes in Groundwater Pumping Conditions	**CEQA Existing Condition**	**CEQA No Project Alternative**	**CEQA Yuba Accord Alternative**	**CEQA Modified Flow Alternative**	**NEPA No Action Alternative**	**NEPA Yuba Accord Alternative**	**NEPA Modified Flow Alternative**
Wheatland Project		√	√	√	√	√	√
SVWMP Groundwater Pumping					√	√	√
YCWA Surface Water Delivery Shortages	√	√	√	√	√	√	√
Short-term Single Year Groundwater Substitution Transfers	√	√		√	√		√
Long-term Multiyear Groundwater Substitution Transfers			√			√	

6.2.1.1 ANTICIPATED CHANGES IN GROUNDWATER PUMPING AFFECTED BY THE PROPOSED YUBA ACCORD

Changes in groundwater pumping are anticipated by the Proposed Project/Action and the action alternative, as described below:

- *YCWA Surface Water Delivery Shortages*: Additional groundwater pumping may occur as mitigation for deficiencies in surface water deliveries from the Yuba River to YCWA Member Units. Annual groundwater pumping, as mitigation for surface water deficiencies, varies among the alternatives considered in this EIR/EIS.

- *Short-term Single-year Groundwater Substitution Transfers:* A portion of water transfers under the Modified Flow Alternative, and all transfers under the CEQA No Project Alternative and NEPA No Action Alternative, would be made up by groundwater pumping under single-year programs. Transfer volumes would vary depending on local groundwater levels, demand, and available Delta transfer capacity.

- *Long-term Multiyear Potential Groundwater Substitution Transfers:* Under the Proposed Project/Action and alternatives, groundwater substitution pumping would occur, depending on hydrologic year CVP/SWP allocations and conveyance capacity through the Delta, to support groundwater transfers.

6.2.1.2 ANTICIPATED CHANGES IN GROUNDWATER PUMPING NOT AFFECTED BY THE PROPOSED YUBA ACCORD

Changes in groundwater pumping that would not be affected by the Proposed Project/Action and alternatives are described below:

- *Wheatland Project*: After implementation of the Wheatland Project, post-2007, and introduction of surface water supplies to WWD from the Yuba River, groundwater pumping in the WWD service area will be reduced. The total future projected annual agricultural water demand for WWD that could be served by the Wheatland Project is approximately 40 TAF.

- *Sacramento Valley Water Management Program:* The SVWMP Short-Term Agreement establishes a framework to meet supply, water quality, and environmental needs in the Sacramento Valley. YCWA is a signatory to the agreement. YCWA is committed to supply 15 TAF for Bay-Delta water quality needs during below normal, dry, and critical years through a groundwater substitution program. The SVWMP EIS/EIR is currently under development. Because the SVWMP EIS/EIR is ongoing during the preparation of this EIR/EIS, it was assumed that implementation of the SVWMP or similar program would occur in the future. Therefore, the analyses in this EIR/EIS that concern future conditions assume that the SVWMP will be implemented.

- *M&I Demand*: Changes in future water demand due to land use conversion in the South Yuba Subbasin, from agriculture to urban, could change the volume of groundwater pumping from this subbasin. As M&I demand increases, agricultural demand decreases in the growth areas.

6.2.2 CONSTRAINTS FOR GROUNDWATER SUBSTITUTION TRANSFER PUMPING

For the purpose of this EIR/EIS, anticipated groundwater pumping volumes that could occur under the Proposed Project/Action and alternatives are tied to surface water resource operations discussed in Chapter 5. Anticipated groundwater volumes for each alternative are based on results of the spreadsheet model that was used to simulate surface water hydrology of the lower Yuba River Basin in Chapter 5. During the simulations of the past hydrologic conditions (73-year period for water years from 1922 to 1994), several constraints were considered in the spreadsheet model to establish the upper bounds of pumping volumes for a single and consecutive year pumping. These constraints are summarized in **Table 6-3** and described below:

Table 6-3. Summary of Maximum Groundwater Pumping Volumes (Thousand Acre-Feet)

Constraints for Groundwater Pumping Volumes	CEQA Scenarios				NEPA Scenarios		
	1	2	3	4	5	6	7
	CEQA Existing Condition	CEQA No Project Alternative	CEQA Yuba Accord Alternative	CEQA Modified Flow Alternative	NEPA No Action Alternative	NEPA Yuba Accord Alternative	NEPA Modified Flow Alternative
Maximum Annual Groundwater Pumping	98	120	120	120	120	120	120
Maximum Annual Groundwater Substitution Pumping	61	70	90	70	70	90	70
Maximum 2-Year Groundwater Pumping	116	120	150	120	120	150	120
Maximum 3-Year Groundwater Pumping	116	140	180	140	140	180	140

- In all scenarios, except the CEQA Existing Condition, the anticipated maximum single-year groundwater pumping of 120 TAF would occur during dry conditions.

- A maximum 3-year groundwater pumping volume would be limited to 180 TAF for the Proposed Project/Action and alternatives with the long-term water purchase agreement (CEQA and NEPA Yuba Accord Alternative in Table 6-3). The resulting 3-year pattern for the maximum annual groundwater substitution pumping would be 90 TAF for year 1, 60 TAF for year 2, and 30 TAF for year 3.

- A maximum 3-year groundwater pumping volume for the Proposed Project/Action and alternatives without the long-term water purchase agreement (the CEQA No Project Alternative, CEQA Modified Flow Alternative, NEPA No Action Alternative, and NEPA Modified Flow Alternative in Table 6-3) would be limited to 140 TAF, with the resulting 3-year pattern of 70 TAF for year 1, 50 TAF for year 2, and 20 TAF for year 3.

- Under the NEPA scenarios shown in Table 6-2, the maximum groundwater pumping would include 15 TAF of pumping for the SVWMP during below normal, dry, and critical water year types.

Annual groundwater pumping volumes within these constraints were estimated by the spreadsheet model to make up for surface water shortages and to participate in groundwater substitution transfers. These constraints were established based on the following considerations:

- Historical 2001 and 2002 groundwater transfer pumping volumes of 62.2 and 57.1 TAF, respectively

- Estimates of historical changes in groundwater storage
- Additional groundwater pumping capacity of approximately 40 TAF, which will be available in the South Yuba Subbasin as a result of the implementation of the Wheatland Project

Based on these considerations, it was apparent that after the 2001 and 2002 transfers, a third year of transfer of a similar volume could have been conducted without inducing any long-term declines in groundwater levels or storage, and without drawing groundwater levels to historical low levels in the Yuba Basin (see Section 6.2.3).

Anticipated annual groundwater pumping volumes and changes in groundwater storage as a function of these pumping volumes were used to evaluate potential impacts for the comparative scenarios presented in Section 6.2.6 through Section 6.2.12. Anticipated changes in groundwater pumping and groundwater storage under cumulative conditions are discussed separately in Section 6.3.

6.2.3 Methodology, Analysis, and Results for Evaluating Potential Impacts to Groundwater Resources in the Yuba Basin

This section describes the methodology, analysis, and results for evaluating the potential impacts of the anticipated changes in groundwater pumping conditions under the Proposed Project/Action and alternatives. Impact assessment presented in this section is based on analysis of various empirical data sources available in the Yuba Basin, as listed below:

- Historical groundwater elevations
- Historical groundwater substitution transfer pumping volumes
- Historical river gage data along the major rivers
- Well construction data for pumping wells
- Subsurface lithology
- Groundwater elevations from the multilevel piezometers in the vicinity of the rivers

Based on evidence from the analysis of empirical data listed above, potential future changes were predicted for: (1) groundwater levels and storage; (2) groundwater and surface water interactions; (3) groundwater quality; and (4) land subsidence.

During implementation of the Proposed Project/Action, YCWA and Member Units would be obligated to monitor and report on groundwater basin conditions for both pre- and post-transfers. As more data become available from monitoring during future groundwater transfers, YCWA and its Member Units would adopt an adaptive management program for taking actions that would determine a safe pumping volume and pumping location based on the considerations of the basin conditions for groundwater levels and storage, groundwater surface water interactions, groundwater quality, and land subsidence.

Numerical groundwater modeling was not performed to evaluate impacts to groundwater resources resulting from the Proposed Project/Action and alternatives for the two reasons listed and explained below:

- The abundance of empirical field data from key wells located throughout the Yuba Basin was adequate to characterize the basin responses to historical groundwater stresses and future stresses resulting from the Proposed Project/Action and alternatives, and

- A calibrated numerical groundwater model, accepted by the Proposed Lower Yuba River Accord EIR/EIS stakeholder group, is not available.

Empirical Field Data: Hydrologic data available for analysis include:

- Records of surface water delivery

- Records of groundwater pumping during groundwater substitution transfers

- Groundwater levels from key well hydrographs located throughout the Yuba Basin.

These empirical data were analyzed to identify trends and patterns in the groundwater response to historical changes in pumping volumes. As mentioned earlier, empirical groundwater elevation data indicate that increasing surface water deliveries to YCWA Member Units have resulted in a gradual increase in groundwater levels and storage throughout the Yuba Basin. The long-term trends in the Yuba Basin can be characterized using the basin-wide empirical data. In addition, during the past groundwater substitution transfers, the Yuba Basin has been subject to quantified changes in groundwater pumping volume. During the 2001 and 2002 transfers, the locations of the pumping wells used for transfers and the volume of groundwater pumped at each transfer well are known. Since the Yuba Basin conditions have been monitored closely during the transfers by YCWA and its Member Units, in close coordination with DWR, the empirical data collected during the past transfers are the keystone for analyzing the short-term responses of the Yuba Basin to future groundwater resources activities. It is anticipated that future pumping under the Proposed Action/Project Alternative probably would take place in areas where the past groundwater transfer substitutions were implemented. Furthermore, future anticipated pumping volumes under the Proposed Action/Project Alternative would be within the range of historical extraction volumes. Therefore, the responses of the Yuba Basin to the past groundwater substitution transfers and the recovery trends of the Yuba Basin from the historical groundwater substitution transfers can be used as a good predictor of the basin responses to future changes in groundwater pumping conditions and to evaluate potential impacts from these anticipated future conditions. Empirical analysis used in this EIR/EIS study takes advantage of the substantial amount of information from historical measurement and monitoring activities undertaken by the YCWA, its Member Units, and DWR.

Numerical Groundwater Modeling: The adequacy of using existing numerical groundwater models to simulate groundwater conditions under the Proposed Action/Project Alternative was evaluated. YCWA concluded that existing models do not adequately account for the hydrogeologic conditions within Yuba Basin as represented in "*Summary of Groundwater Basin Conditions, Yuba County*" (MWH 2005).

A numerical groundwater model is calibrated using one set of empirical data, and is further validated using a second set of empirical data. For the impact analysis in this EIR/EIS, a numerical model would have to be capable of simulating and closely matching the basin responses to the historical 2001 and 2002 groundwater substitution transfers. Such a model could subsequently be used to predict the basin response to a scenario in which groundwater stresses would be much greater in magnitude than what has occurred in the past. For the Yuba Basin, the empirical data describe the response of the basin to groundwater substitution pumping. Projected levels of groundwater substitution pumping under the Proposed Project/Action and alternatives would not be a significant increase over what has occurred historically. In addition, groundwater stresses on the basin will decrease due to the implementation of the Wheatland Project.

Developing a numerical groundwater model consistent with the hydrogeologic understanding of the basin and agreed upon by the Proposed Lower Yuba River Accord stakeholders to support the empirical analysis therefore was not deemed necessary, given the adequacy of the empirical data described above.

6.2.3.1 METHODOLOGY, ANALYSIS, AND RESULTS FOR EVALUATING POTENTIAL IMPACTS TO GROUNDWATER LEVELS AND STORAGE

The objective of this methodology is to assess potential impacts to the Yuba Basin groundwater levels and storage resulting from anticipated groundwater pumping conditions under the Proposed Project/Action and alternatives described in Table 6-3 in Section 6.2.2. Two methods are applied to achieve this objective:

- *Long-term Impact Analysis:* This analysis evaluates long-term trends in groundwater levels and storage within the North and South Yuba subbasins between 1960 and 2005. Based on a study of historical well data, the volume of groundwater pumping that could be sustained in the North and South Yuba subbasins is estimated.

- *Short-term Impact Analysis:* This analysis estimates potential localized short-term impacts resulting from historical pumping in the North and South Yuba subbasins during the previous groundwater transfer years 1991, 1994, 2001, and 2002.

Both the long-term and short-term analyses are based on the underlying assumption that existing groundwater pumping would remain unchanged throughout the analysis period. Detailed descriptions of the methodology used for these two types of impact analyses, relevant results of the analyses, and conclusions drawn are presented in the following sections.

METHODOLOGY, ANALYSIS, AND RESULTS FOR EVALUATING LONG-TERM POTENTIAL IMPACTS: HISTORICAL GROUNDWATER LEVELS AND STORAGE ANALYSIS

The proposed methodology is an incremental analysis used to estimate changes in historical groundwater storage corresponding to observed changes in historical groundwater elevations using the records of groundwater elevations between 1960 and 2005. This historical study is conducted for the North Yuba and South Yuba subbasins separately to allow for the analysis of potential impacts at the subbasin scale.

The long-term impact analysis has two components: (1) a study of historical well data to define a long-term annual basin recharge; and (2) a study of groundwater budget accounting for the impact assessment of groundwater pumping under the Proposed Project/Action and alternatives. Descriptions of these two components, results obtained from the long-term impact analysis, and conclusions are presented below.

Study of Historical Well Data

Steps toward defining the long-term annual basin recharge are as follows:

1. *Compile existing historical groundwater elevation data:* The methodology uses data from a 45-year period of record from 1960 to 2005. Microsoft Access was used to store the data and evaluate average annual (based on water year) groundwater elevation data for water years 1960 through 2005.

2. *Generate groundwater elevation contour maps:* Contour maps for the entire Yuba Basin were created for water years 1960 through 2005 based on the interpolation of historical average annual groundwater elevations. The Visual Basic language and the kriging technique in the Surfer software (Golden Software Inc. 2002) were used to generate interpolated groundwater surfaces and contouring maps. These maps are presented in Figure F2-13 through Figure F2-20 in Appendix F2 and will be discussed below.

3. *Calculate annual groundwater storage change, ΔS, in the North and South Yuba subbasins for water years 1961 through 2005*: Total change in groundwater storage between two consecutive water years (e.g., 1960 and 1961) was calculated based on the volume difference between the two interpolated groundwater surfaces of those water years multiplied by the basin specific yield values, which are reported in "*Summary of Groundwater Basin Conditions, Yuba County*" (MWH 2005).

4. *Estimate an average annual rate of historical groundwater recharge in the North and South Yuba subbasins*:. Annual groundwater recharge was estimated considering the potential effects of surface water deliveries, past groundwater substitution transfers, and hydrologic conditions on groundwater storage changes. Later in this section under "Study of Historical Well Data", the methodology for estimating the annual groundwater recharge rate is described in more details.

Conditions in 1960 represent the zero or baseline reference point from which changes in storage are calculated. The focus of this analysis is on the change in groundwater storage volume over time, not total freshwater volume. Thus, net losses or gains in groundwater storage are reported relative to the 1960 conditions.

Estimations of the historical groundwater storage changes are based on historical records of groundwater elevation compiled from the DWR Water Data Library Website (http://wdl.water.ca.gov) (Step 1 in the methodology) and are based on several simplifying assumptions:

- Existing land use and irrigation practices are representative of future conditions for the Proposed Project/Action and alternatives, excluding changes due to the Wheatland Project. Land use conversions and corresponding changes in M&I demand in the South

Yuba Subbasin will be considered only as part of the future conditions evaluated in the cumulative impacts analysis.

- Inflows to and outflows from the groundwater basin that have existed historically (e.g. natural recharge, groundwater and surface water interactions, and background levels of groundwater pumping) remain unchanged except for hydrologic variations.
- The system response to changes is approximately linear.
- Impact assessment at the subbasin scale is considered a regional impact assessment. Estimates of groundwater level changes at this scale are intended to illustrate a range of potential changes in groundwater levels. The estimates do not characterize localized potential impacts in areas where extensive groundwater withdrawals take place. Estimates from the short-term impact analysis address more-localized effects. The short-term impact analysis is presented later under "Methodology, Analysis, and Results for Evaluating Short-term Potential Impacts: Response and Recovery Analysis".

Study of Groundwater Budget Accounting

The purpose of the groundwater budget accounting analysis is to determine the change in groundwater in storage over time. The analysis does not attempt to determine the total volume of fresh groundwater in storage. Thus, net losses or gains in groundwater storage are reported relative to a zero AF basis of comparison.

Based on the long-term annual recharge estimates and anticipated groundwater pumping volumes, the following analyses were conducted for the impact assessment of groundwater pumping:

Short-term Groundwater Budget Accounting: Short-term (6-year) changes in groundwater storage were estimated with and without the Proposed Project/Action and alternatives using the estimated annual recharge rate to the Yuba Basin (from Step 4 above) and the maximum future groundwater pumping volumes under the alternatives evaluated in this EIR/EIS (presented in Table 6-3). In this analysis, the "worst case" pumping situation with the implementation of the Proposed Project/Action Alternative was analyzed and compared with the maximum groundwater pumping condition without the Proposed Project/Action Alternative (without the long-term water purchase agreement) for a 6-year period. As shown in Table 6-3, the "worst case" pumping situation with the Proposed Project/Action Alternative would be 180 TAF over the 3-year consecutive pumping (with a 3-year pattern of 90 TAF for year 1, 60 TAF for year 2, and 30 TAF for year 3). Without the Proposed Project/Action Alternative, the maximum pumping would occur with the 3-year consecutive pumping of 140 TAF (with a 3-year pattern of 70 TAF for year 1, 50 TAF for year 2, and 20 TAF for year 3). For this analysis, it was assumed that the annual recharge rate of 30 TAF to the Yuba Basin would be constant and that the beginning of the analysis would represent the baseline reference point from which changes in storage are calculated.

Long-term Groundwater Budget Accounting: Long-term (73-year) changes in groundwater storage were estimated for the Proposed Project/Action and alternatives using the estimated annual recharge rate to the Yuba Basin (from Step 4 above) and anticipated groundwater pumping volumes for the past 73-year period (for water years from 1922 to 1994). As discussed earlier in Section 6.2.2, anticipated annual groundwater pumping volumes based on the past hydrologic conditions for water years from 1922 to 1994 were estimated for each alternative using the spreadsheet model. For this analysis, it was assumed that the annual recharge rate of 30 TAF to the Yuba Basin would be constant and that water year 1922 would represent the baseline zero reference point from which changes in groundwater storage are calculated.

Results from Study of Historical Well Data

Groundwater contour maps representing groundwater levels in the Yuba Basin for the entire analysis period, from 1960 to 2005, are presented in Figure F2-13 through Figure F2-20 in Appendix F2 (Step 2 in the methodology). Groundwater contour maps for the water years 1960, 1982, and 2005 are shown in **Figure 6-10**, **Figure 6-11**, and **Figure 6-12**, respectively, to highlight several significant historical trends in groundwater elevations in the Yuba Basin. Similar to the contour map of the spring 2004 groundwater flow conditions in , the groundwater contour maps from 1960 to 2005 show high groundwater elevations along the eastern edge of the South Yuba Subbasin. Although the interpreted groundwater elevations are high, this area is not considered as a primary recharge area based on lithologic data suggesting that the underlying groundwater aquifer in the vicinity of this area appears to be thin and contains deposits of very low hydraulic conductivity. As mentioned in Section 6.1.1.2, high groundwater levels are attributed to topographic controls of the Sierra Nevada Foothills.

The key results of the long-term potential impact analysis are summarized below:

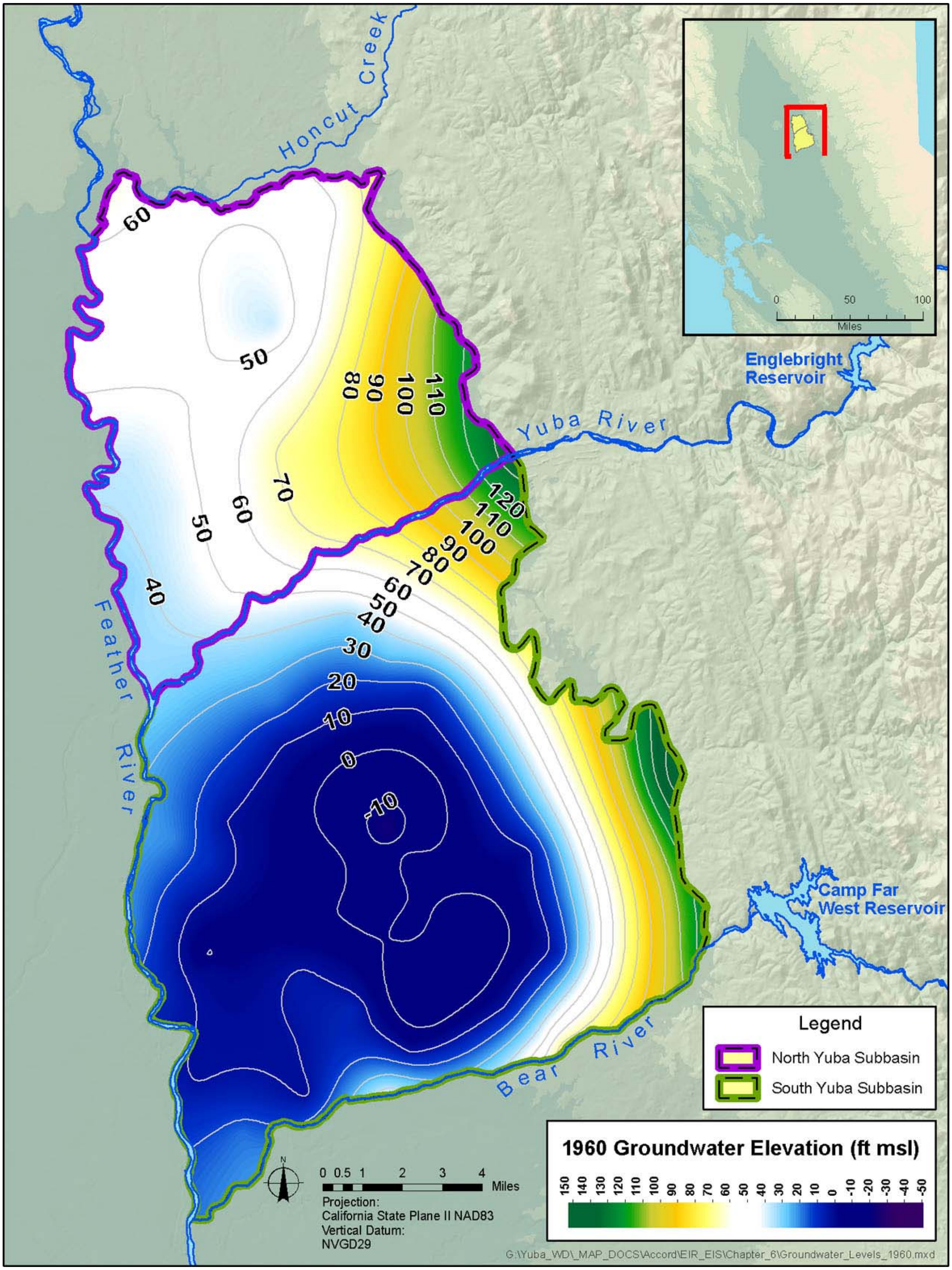
- Analysis of the empirical groundwater elevation data show that groundwater storage in the South Yuba Subbasin has increased by nearly 368 TAF since the surface water delivery to the Member Units in the South Yuba Subbasin began in the early 1980s. This substantial increase in storage capacity in the South Yuba Subbasin could be utilized for long-term groundwater substitution transfers at historical volumes without causing any long-term impacts on groundwater levels and storage (**Figure 6-13**).

- In most areas of the South Yuba Subbasin, current groundwater levels and storage have increasing trends and are higher than under the 2001 pre-transfer conditions (Figure 6-5 and Figure 6-13.

- Currently, groundwater levels and storage in the North Yuba Subbasin are higher than the 2002 post-transfer conditions and considerably higher than historical low levels (Figure 6-5 and Figure 6-6).

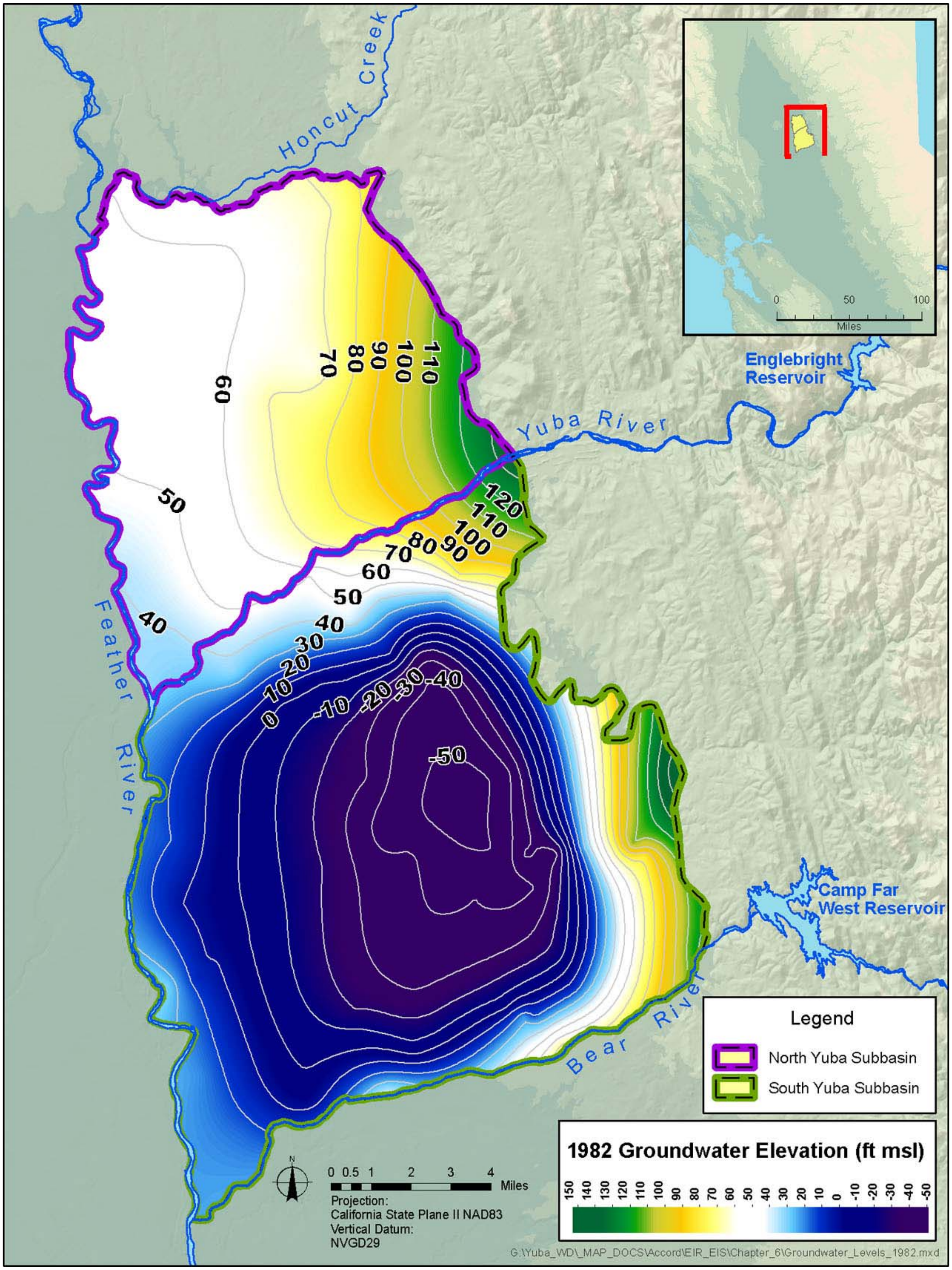
On an average, total annual recharge rate to the Yuba Basin would be approximately 30 TAF. Annual recharge rates in the South Yuba Subbasin appear to be relatively stable and positive, ranging from 14 TAF to 28 TAF. In the North Yuba Subbasin, annual recharge rates are estimated to range from 9 TAF to 11 TAF.

Detailed descriptions of the results are provided in the following sections for the South Yuba and North Yuba subbasins.



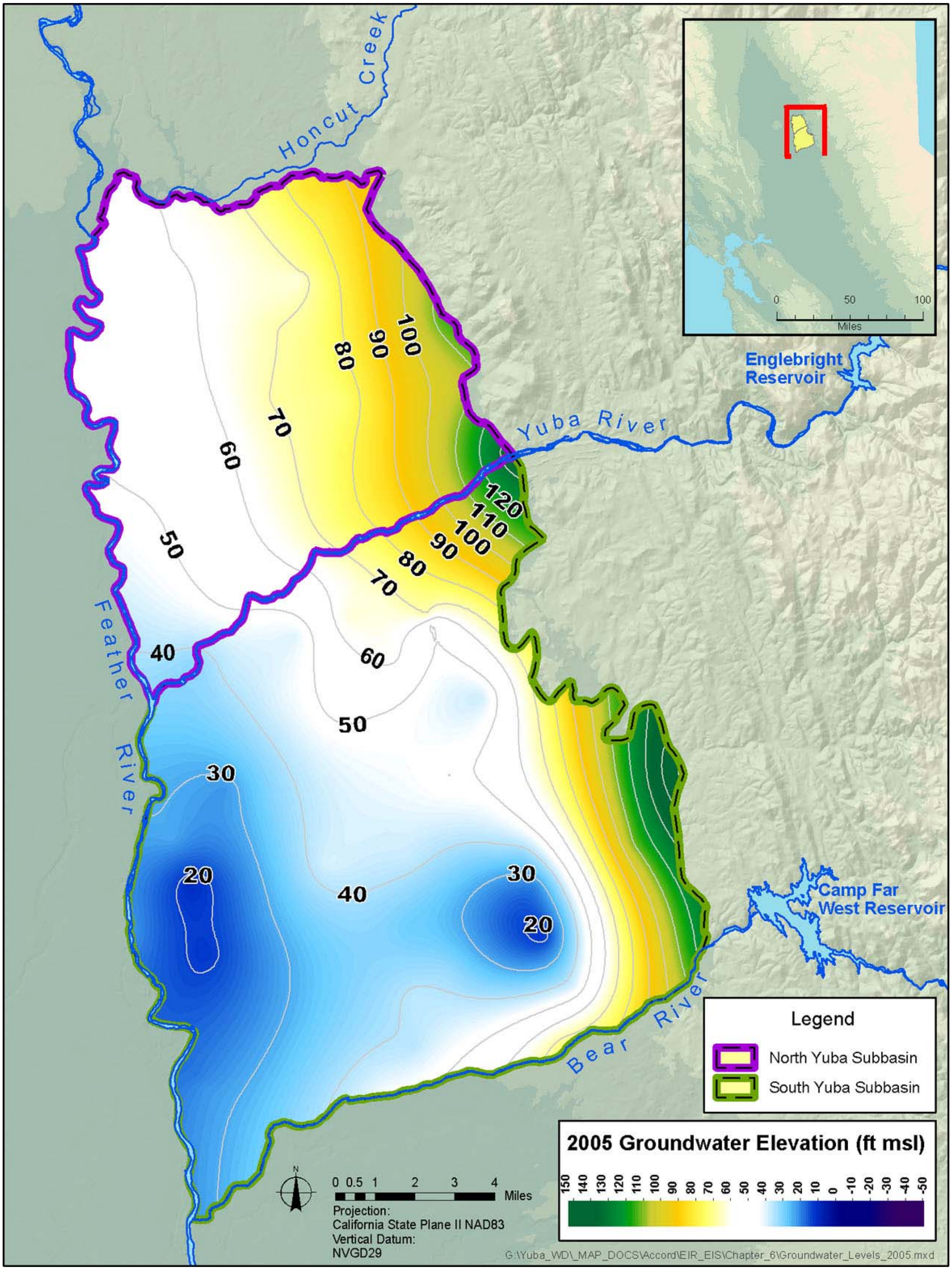
(based on annual average groundwater elevation data for water year 1960)

Figure 6-10. Groundwater Contour Map of the Yuba Basin for 1960 Conditions



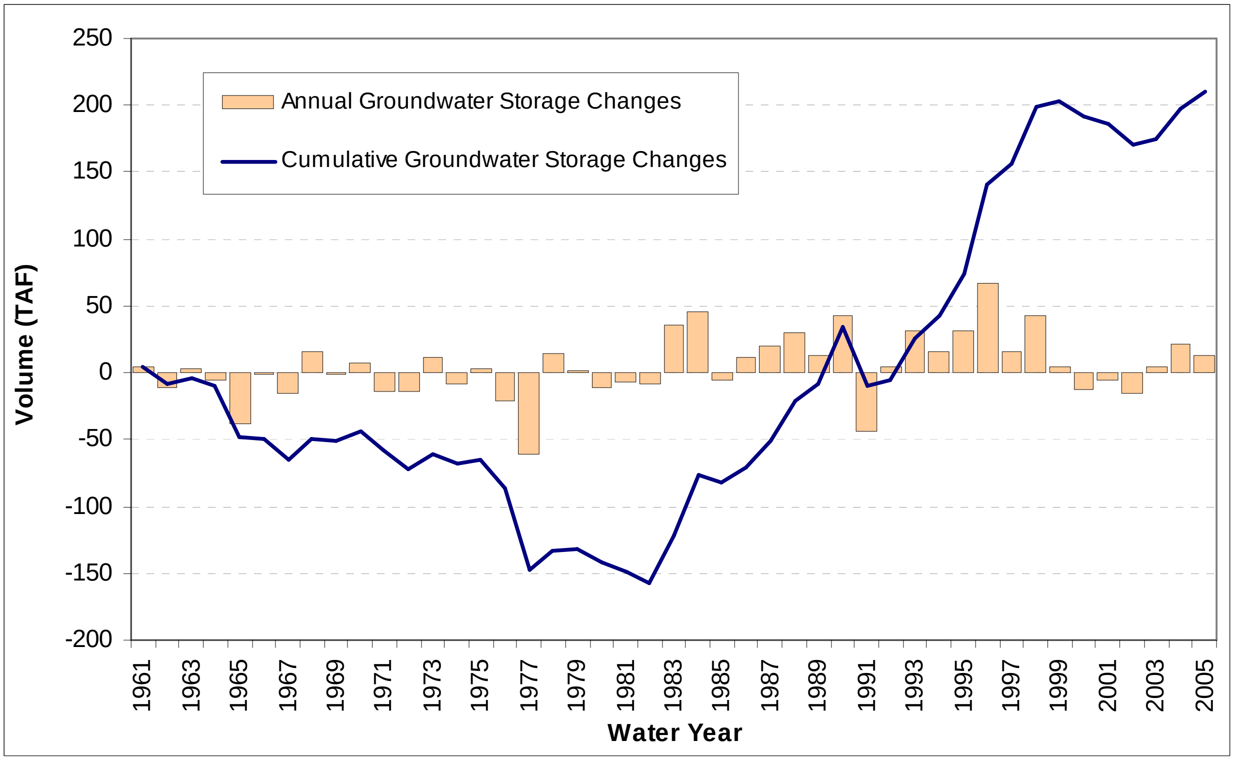
(based on annual average groundwater elevation data for water year 1982)

Figure 6-11. Groundwater Contour Map of the Yuba Basin for 1982 Conditions



(based on annual average groundwater elevation data for water year 2005)

Figure 6-12. Groundwater Contour Map in the Yuba Basin for 2005 Conditions



(1960 represents the baseline year from which changes in groundwater storage are calculated)

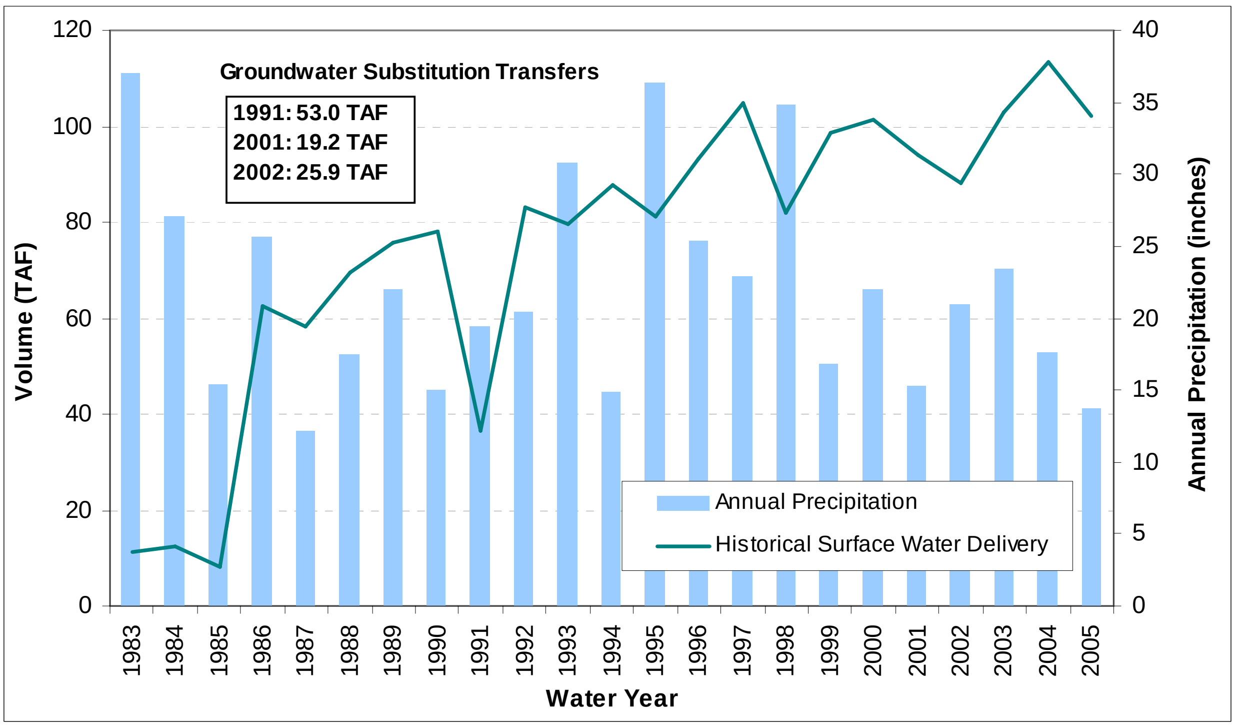
Figure 6-13. Estimated Groundwater Storage Changes in the South Yuba Subbasin from 1960 to 2005

South Yuba Subbasin

Figure 6-13 shows groundwater storage changes and cumulative storage changes in the South Yuba Subbasin from water years 1960 to 2005, assuming 1960 is the zero or baseline reference point from which changes in storage are calculated (Step 3 in the methodology). Annual storage changes between 1960 and 1982 were mostly negative, indicating a net loss of water in the groundwater basin due to extensive groundwater pumping. The abrupt decrease in the 1976 to 1977 period was a result of extensive drought in California. The beginning of a significant rebound of groundwater storage in 1983 was a result of the start of surface water delivery from YCWA to its Member Units through the South Yuba Canal. Storage decreases during 1991, 2001, and 2002 were due to groundwater substitution transfers. In general, significant changes in the long-term state of the South Yuba Subbasin were due, in part, to the following factors: (1) development of groundwater as an irrigation source, (2) surface water deliveries, (3) past groundwater substitution transfer, and (4) hydrological conditions.

Among the factors listed above, development of groundwater as an irrigation source and surface water deliveries to the Member Units appear to have been the main causes of changes in historical groundwater levels and storage. Prior to the Yuba River Development Project, groundwater was the primary supply for agricultural development in the South Yuba Basin. As discussed in Section 6.1.1.5, since the delivery of surface water to the Member Units began in 1983, groundwater elevations have risen to historical high levels in some areas of the South Yuba Subbasin and have exceeded historical high levels in other areas. Activities undertaken through the groundwater substitution transfers have led to the further development of groundwater use as an irrigation source in the Yuba Basin. During the groundwater transfer pumping years, groundwater was used on local lands for irrigation in lieu of surface water and equal amount of surface water was released from New Bullards Bar Reservoir for use in other parts of the state.

Surface water deliveries to the Member Units in the South Yuba Subbasin appear to have been the main cause of increasing groundwater levels and storage after 1982. Surface water deliveries, while varying year to year based on hydrologic conditions, have increased tenfold, from approximately 11 TAF in 1983 to 114 TAF in 2002 (**Figure 6-14**). The first major surface water delivery was in 1986, with more than 60 TAF delivered to BWD and SYWD. DCMWC began receiving surface water in 1998. Estimated total increase in groundwater storage since surface water deliveries to the Member Units started in 1983 is nearly 368 TAF. During the 22-year period of 1982 and 2005, this would correspond to an average annual recharge rate of approximately 17 TAF per year.

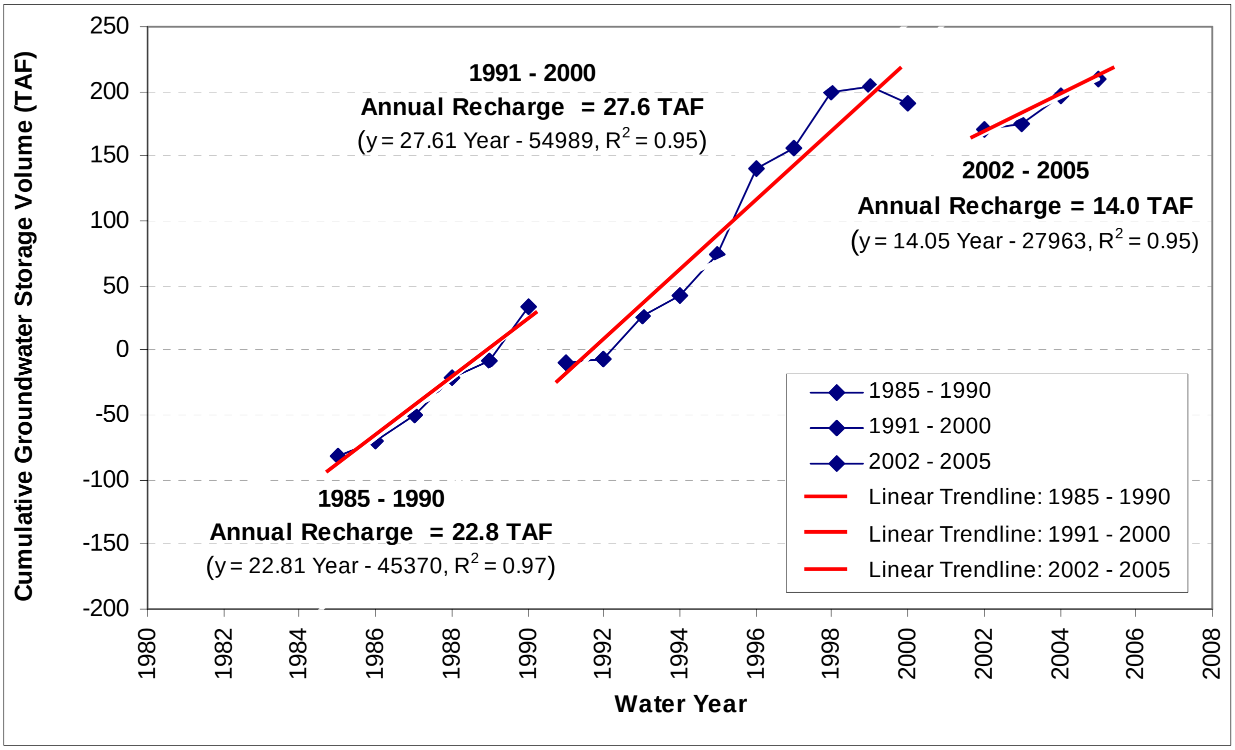


(at Marysville, California)

Figure 6-14. Historical Surface Water Deliveries to South Yuba Subbasin and Annual Precipitation

Considering the potential effects of the past groundwater substitution transfers on recharge rates, the 17 TAF of annual recharge to the South Yuba Subbasin could be a low estimate. Total groundwater transfer pumping of 98.1 TAF during the 1991, 2001, and 2002 transfer years resulted in a total groundwater storage decline of approximately 68.4 TAF.

In addition to surface water deliveries and past groundwater substitution transfers, groundwater storage in the South Yuba Subbasin may be controlled as much as by a hydrologic year type as by the extractions in any given year. **Figure 6-15** shows estimated annual recharge rates of approximately 22.8 TAF per year, 27.6 TAF per year, and 14 TAF per year during three periods, 1986 to 1990, 1992 to 2000, and 2003 to 2005, respectively.



(1960 represents the baseline year from which changes in groundwater storage are calculated)

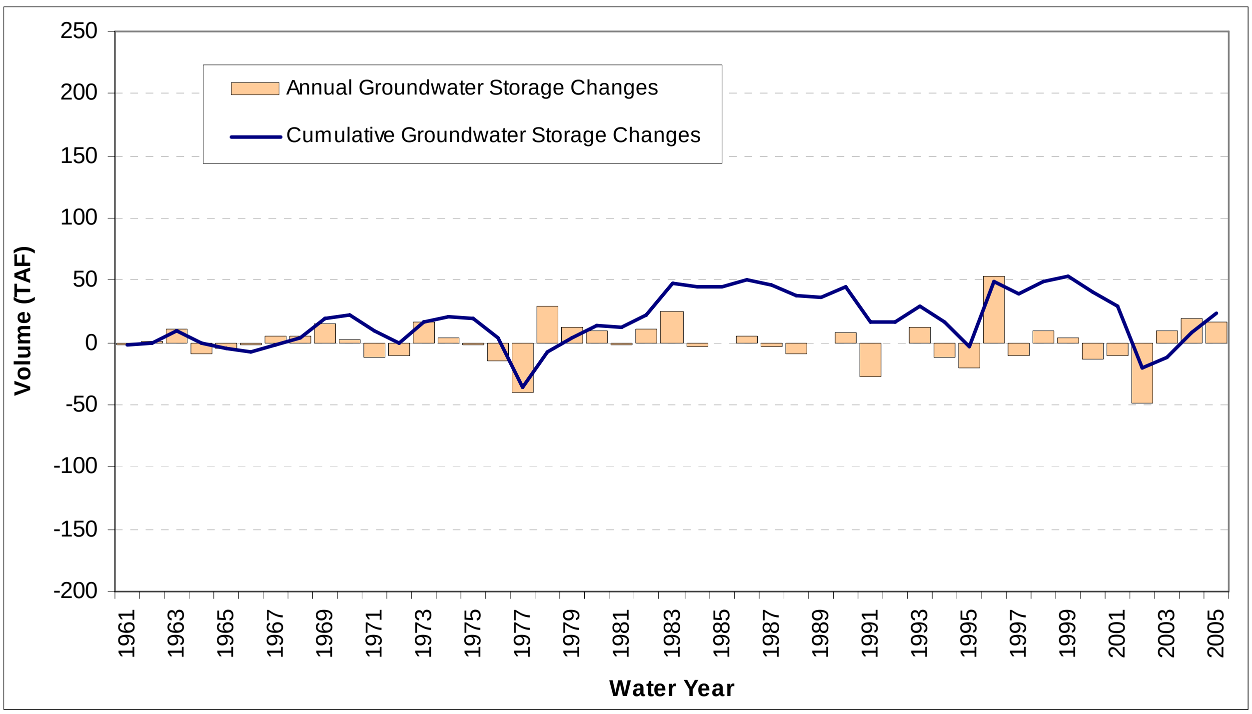
Figure 6-15. Estimated Annual Groundwater Recharge Rate between 1985 and 2005 (excluding data during the past groundwater substitution transfers)

Data points during the transfer years and during 1983 and 1984 were excluded to eliminate the effects of the past transfer pumping and initially small surface water deliveries on the storage values. Note that the annual recharge rate of 22.8 TAF and 27.6 TAF would coincide with the drying and wetting periods, respectively, based on the hydrological data shown in Figure . The lowest annual recharge rate of 14 TAF per year could be explained by decreasing inflow to the Yuba Basin (due to decreasing hydraulic gradient) as the South Yuba Subbasin has replenished over time. An average of the three recharge rates is estimated to be approximately 21.5 TAF (Step 4 in the methodology).

Overall, based on the analysis of groundwater storage changes, the annual recharge rate of approximately 21 TAF is considered to be a safe, sustainable long-term recharge rate that could be maintained without altering long-term groundwater levels and storage trends within the South Yuba Subbasin (Step 4 in the methodology).

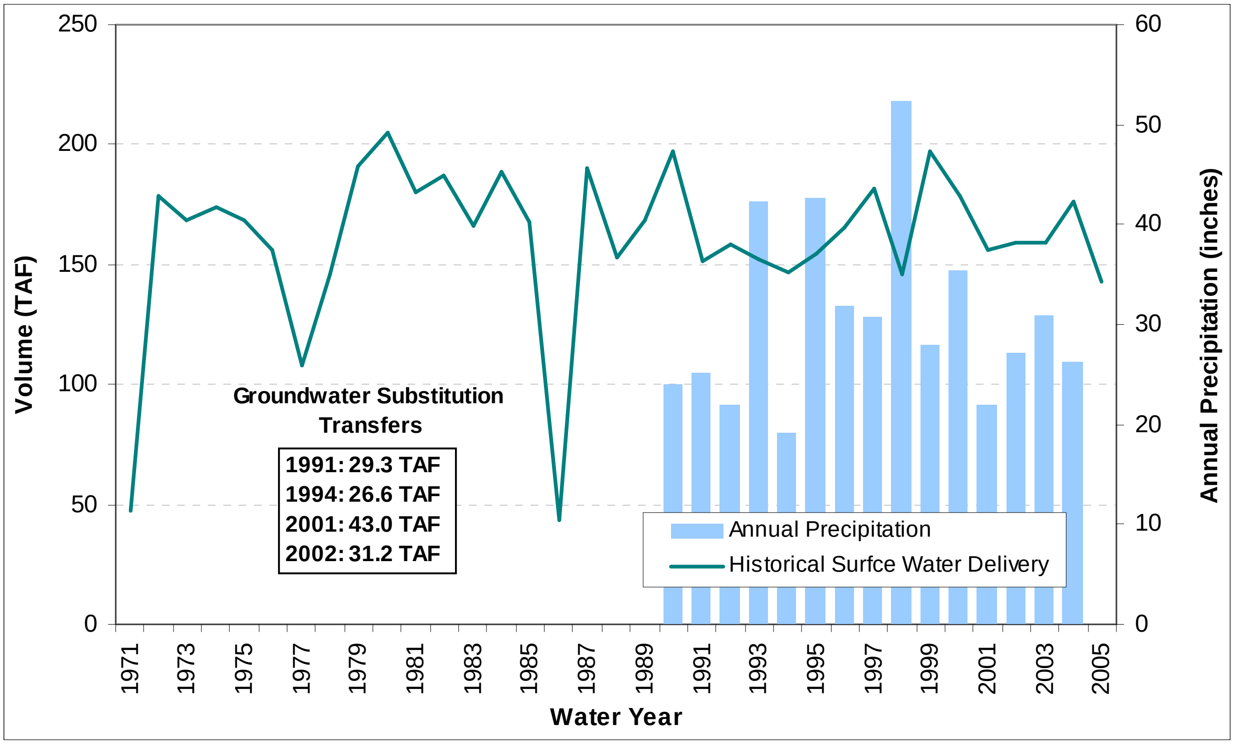
North Yuba Subbasin

Figure 6-16 shows groundwater storage changes and cumulative storage changes in the North Yuba Subbasin from water years 1960 to 2005, assuming 1960 is the zero or baseline reference point from which changes in storage are calculated (Step 3 in the methodology). Similar to the South Yuba Subbasin, the past transfer pumping resulted in negative storage changes. Total groundwater substitution pumping of 129 TAF during 1991, 1994, 2001, and 2002 resulted in a total storage decline of 100.3 TAF. Because the North Yuba Subbasin has been historically receiving surface water (**Figure 6-17**), the effects of surface water deliveries on groundwater levels are not as pronounced in the North Yuba Subbasin as in the South Yuba Subbasin. The longest period of groundwater recharge occurred between 1977 and 1985, as shown in Figure . During this period surface water deliveries remained relatively unchanged, implying that groundwater pumping would also remain relatively unchanged. The average recharge rate estimated for this period was approximately 11 TAF per year (Step 4 in the methodology) (**Figure 6-18**). This rate, however, would not be considered as a representative long-term recharge rate in the North Yuba Subbasin because recharge at this rate does not appear to be continuous over time.



(1960 represents the baseline year from which changes in groundwater storage are calculated)

Figure 6-16. Estimated Groundwater Storage Changes in the North Yuba Subbasin from 1960 to 2005



(at Browns Valley, California)

Figure 6-17. Historical Surface Water Deliveries to North Yuba Subbasin and Annual Precipitation

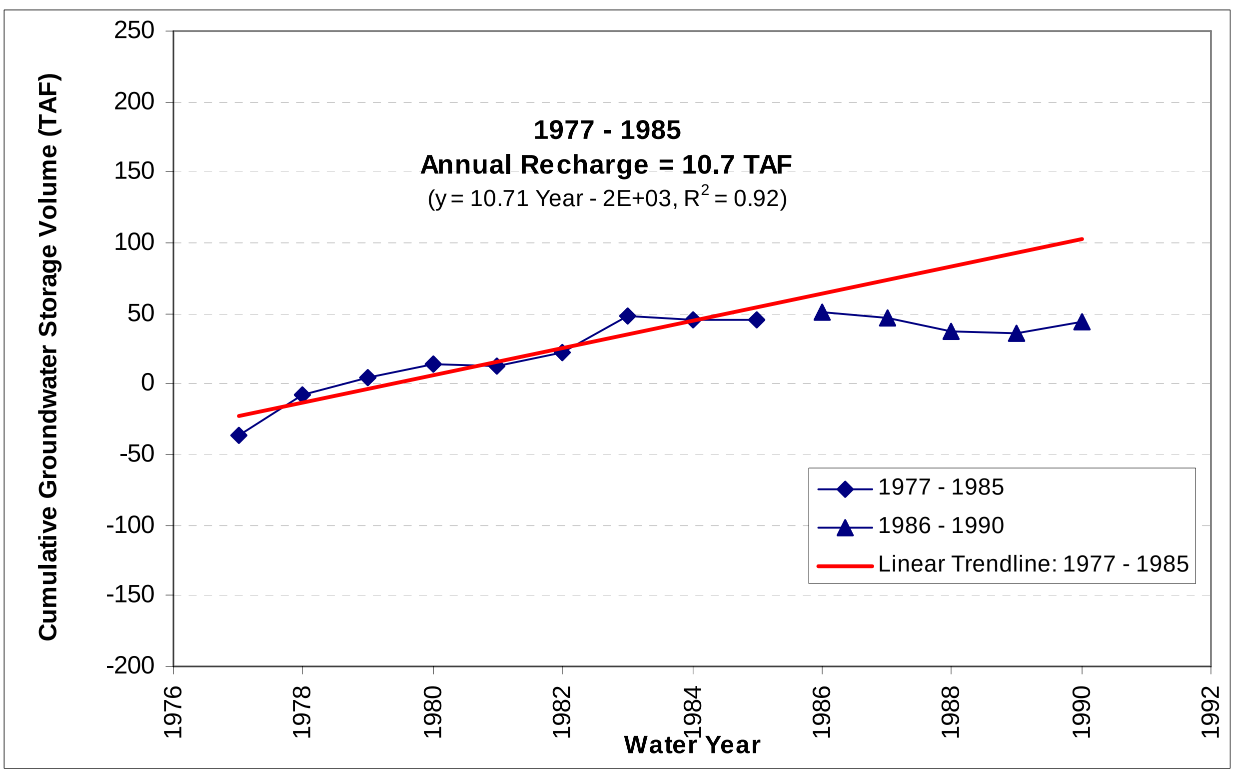


Figure 6-18. Estimated Annual Groundwater Recharge Rate Between 1977 and 1985

Results from Study of Groundwater Budget Accounting

Results from the groundwater budget accounting analysis described earlier in Section 6.2.3.1 are presented below.

Short-term Groundwater Budget Accounting: Groundwater storage changes in the Yuba Basin were analyzed over 6 years based on the estimated annual recharge rate of 30 TAF and the maximum annual groundwater pumping considered with and without the Proposed Project/Action Alternative. **Figure 6-19** and **Figure 6-20** below illustrate annual groundwater recharge, maximum annual groundwater pumping and cumulative groundwater storage changes over 6 years with and without the Proposed Project/Action Alternative, respectively. As shown in Figure 6-19, under the "worst case" groundwater pumping with the Proposed Project/Action Alternative, cumulative decline in groundwater storage over 6 years would be 180 TAF. This decline would be a result of the maximum 3-year consecutive pumping of 180 TAF (90 TAF for year 1, 60 TAF for year 2, and 30 TAF for year 3). Figure 6-20 shows that without the Proposed Project/Action Alternative, the maximum 3-year consecutive pumping of 140 TAF (70 TAF for year 1, 50 TAF for year 2, and 20 TAF for year 3) would result in a cumulative groundwater storage decline of 100 TAF over 6 years.

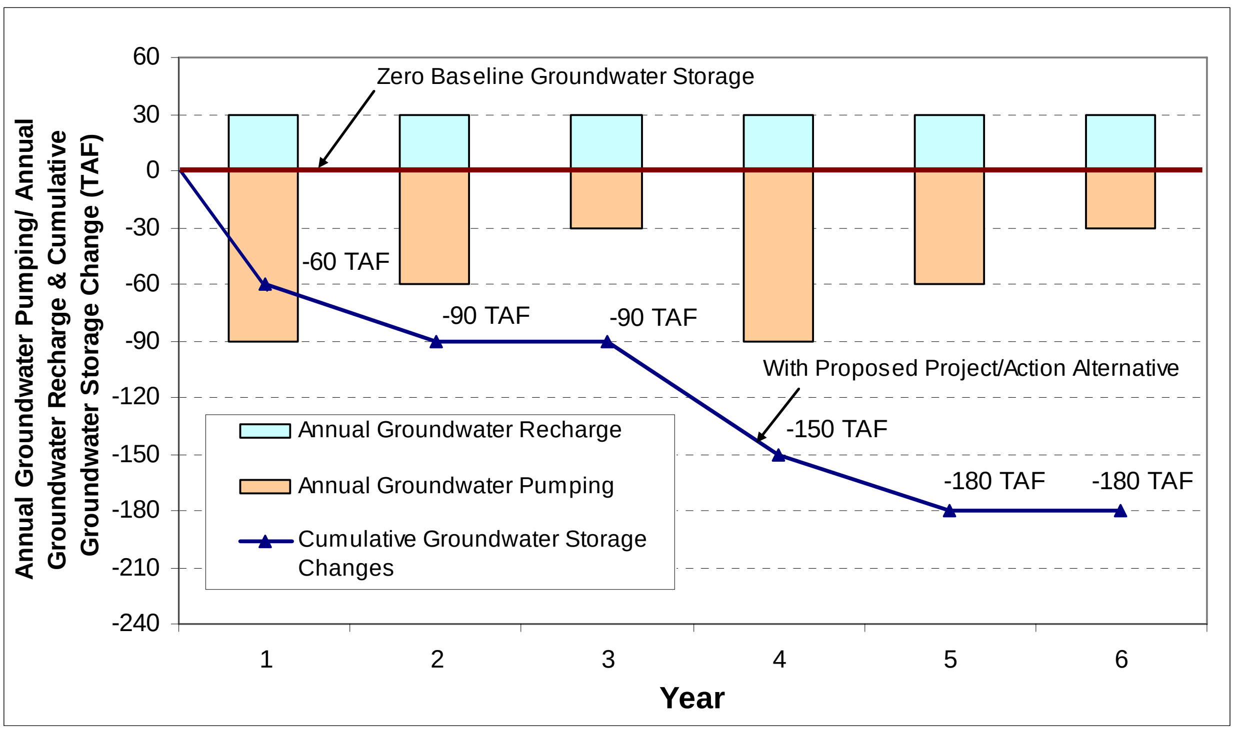


Figure 6-19. Cumulative Groundwater Storage Changes With the Proposed Project/Action Alternative Based on Annual Groundwater Recharge Rate (30 TAF) and Maximum 3-Year Groundwater Pumping Volume (180 TAF)

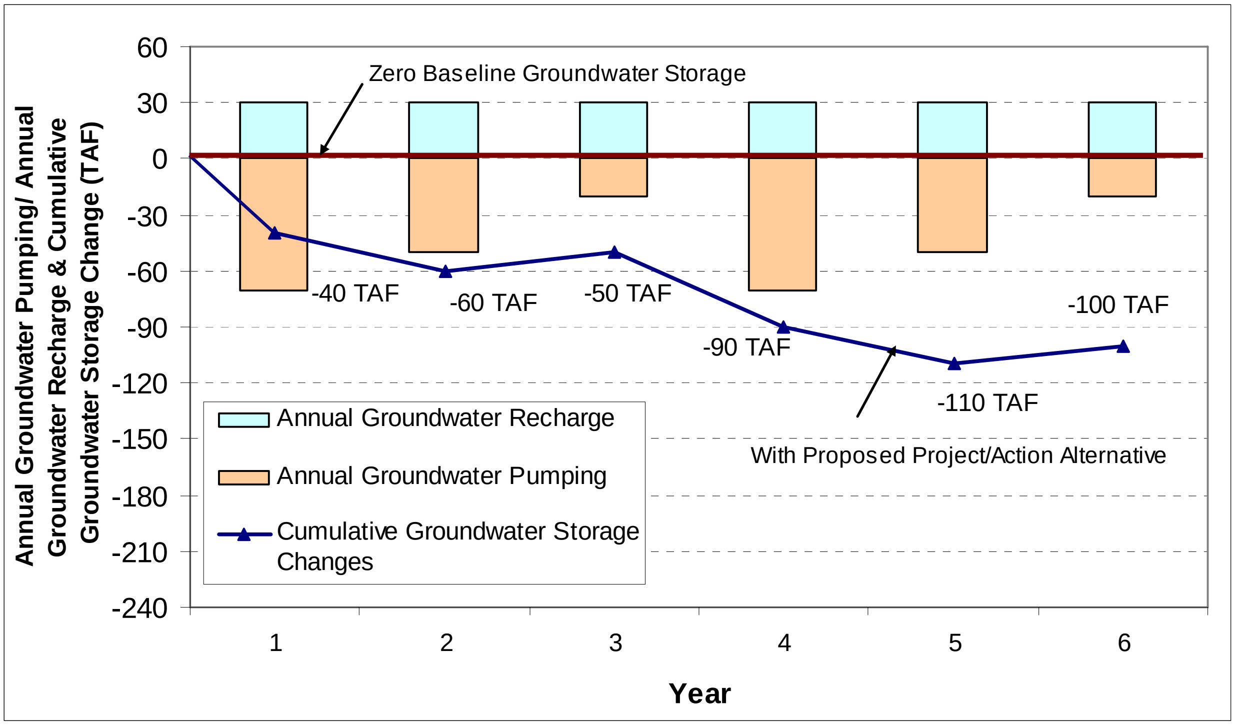


Figure 6-20. Cumulative Groundwater Storage Changes With the Proposed Project/Action Alternative Based on Annual Groundwater Recharge Rate (30 TAF) and Maximum 3-Year Groundwater Pumping Volume (140 TAF)

Even with the "worst case" pumping situation under the Proposed Project/Action Alternative, groundwater storage in the South Yuba Subbasin alone would not decline to historical groundwater storage conditions. **Figure 6-21** illustrates that if the condition of the South Yuba Subbasin in 2005 was assumed to be the baseline year, groundwater storage with the maximum groundwater pumping of 6 years under the Proposed Project/Action Alternative would still be 190 TAF above the historical lows experienced in the early 1980s. Given the annual recharge rate of 30 TAF to the Yuba Basin, it would take less than 3 years for the Yuba Basin to recover from the 80 TAF additional pumping under the Proposed Project/Action Alternative (180 TAF minus 100 TAF over 6 years).

Long-term Groundwater Budget Accounting: Long-term changes in groundwater storage in the Yuba Basin were estimated for each alternative evaluated in this EIR/EIS study. As discussed earlier in Section 6.2.2, annual anticipated groundwater pumping volumes were simulated for each alternative using the spreadsheet model based on the past 73-year period from 1922 to 1994 water years and the groundwater pumping constraints summarized in Table 6-3. Groundwater storage changes for the 73-year period were calculated using the simulated annual groundwater pumping volumes and annual groundwater recharge rate of 30 TAF. **89HFigure 6-22** and **90HFigure 6-23** present a summary of the long-term groundwater budget accounting analysis for each alternative. In these two figures, positive values represent a net gain in groundwater storage while negative values represent a net loss or decline in groundwater storage based on the assumption that 1922 represents the baseline zero reference point. 91HFigure 6-22 shows the long-term annual average groundwater storage change calculated for each alternative. The NEPA Yuba Accord Alternative would result in an annual average groundwater storage decline of 1 TAF. For the other alternatives, groundwater storage increases range from 2 TAF under the CEQA Yuba Accord Alternative to 11 TAF under the CEQA Existing Condition. 92HFigure 6-23 shows the net change in groundwater storage over the 73-year period for each alternative. Based on the results, groundwater storage would decline under the Proposed Project/Action Alternative: approximately 68 TAF of decline under the NEPA Yuba Accord Alternative and 48 TAF of decline under the CEQA Yuba Accord Alternative. Without the Proposed Project/Action Alternative, increase in groundwater storage would range from 2 TAF to 146 TAF.

Table 6-4 summarizes groundwater pumping volumes from the 73-year simulations for each alternative. Results are reported by pumping categories (YCWA delivery shortages, groundwater substitution transfers, and SVWMP groundwater pumping), by total groundwater pumping, and by water year type (wet, above normal, below normal, dry, and critical). Values for the five year types are based on the average of all the years within each year type classification. "Average" values in 89HFigure 6-22 and **90HFigure 6-23** present a summary of the long-term groundwater budget accounting analysis for each alternative. In these two figures, positive values represent a net gain in groundwater storage while negative values represent a net loss or decline in groundwater storage based on the assumption that 1922 represents the baseline zero reference point. 91HFigure 6-22 shows the long-term annual average groundwater storage change calculated for each alternative. The NEPA Yuba Accord Alternative would result in an annual average groundwater storage decline of 1 TAF. For the other alternatives, groundwater storage increases range from 2 TAF under the CEQA Yuba Accord Alternative to 11 TAF under the CEQA Existing Condition. 92HFigure 6-23 shows the net change in groundwater storage over the 73-year period for each alternative. Based on the results, groundwater storage would decline under the Proposed Project/Action Alternative: approximately 68 TAF of decline under the NEPA Yuba Accord Alternative and 48 TAF of decline under the CEQA Yuba Accord Alternative. Without the Proposed Project/Action Alternative, increase in groundwater storage would range from 2 TAF to 146 TAF.

Table 6-4 represents the long-term annual average groundwater pumping based on the results from the entire 73-year period. The simulation results indicate that total annual average groundwater pumping would range from 19 TAF for the CEQA Existing Condition to 31 TAF for the NEPA Yuba Accord Alternative. The NEPA Yuba Accord Alternative, with the maximum annual average groundwater pumping of 31 TAF, would result in the maximum changes in groundwater storage.

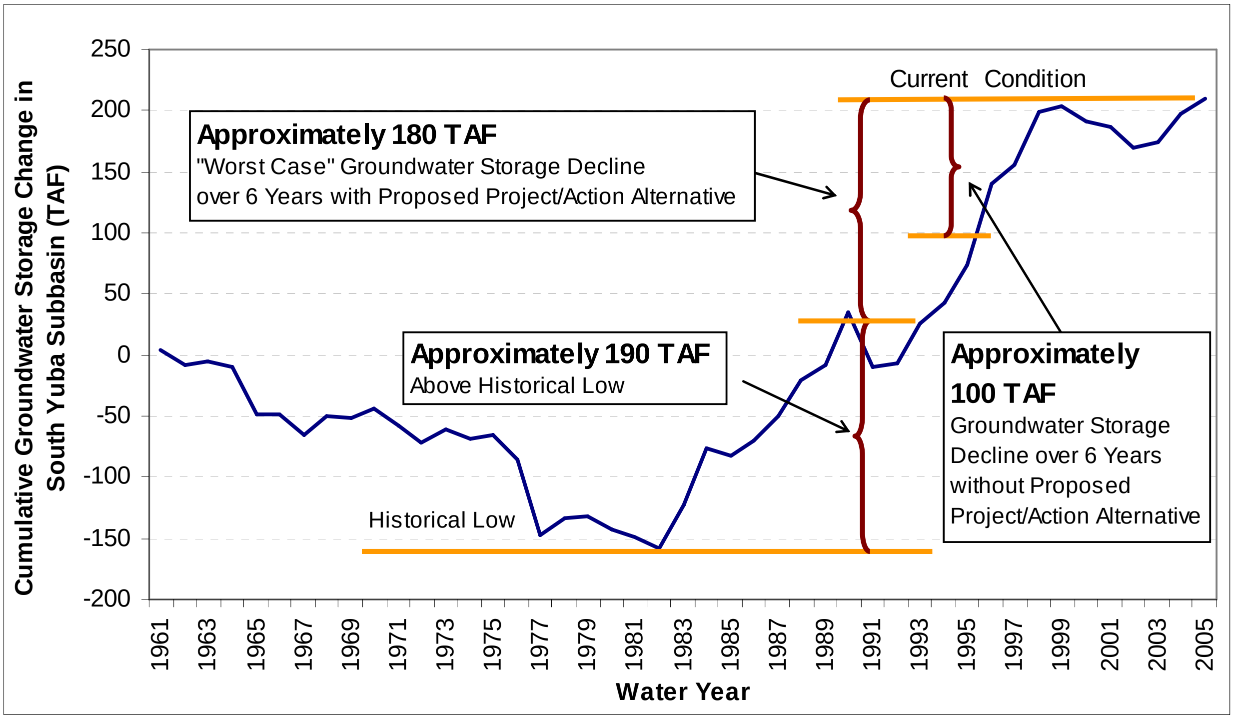


Figure 6-21. Cumulative Groundwater Storage Changes in the South Yuba Subbasin Compared to "Worst Case" Groundwater Storage Change Over 6-Year Period With the Proposed Project/Action Alternative (180 TAF) and Without the Proposed Project/Action Alternative (110 TAF)

Figure 6-22 and **Figure 6-23** present a summary of the long-term groundwater budget accounting analysis for each alternative. In these two figures, positive values represent a net gain in groundwater storage while negative values represent a net loss or decline in groundwater storage based on the assumption that 1922 represents the baseline zero reference point. Figure 6-22 shows the long-term annual average groundwater storage change calculated for each alternative. The NEPA Yuba Accord Alternative would result in an annual average groundwater storage decline of 1 TAF. For the other alternatives, groundwater storage increases range from 2 TAF under the CEQA Yuba Accord Alternative to 11 TAF under the CEQA Existing Condition. Figure 6-23 shows the net change in groundwater storage over the 73-year period for each alternative. Based on the results, groundwater storage would decline under the Proposed Project/Action Alternative: approximately 68 TAF of decline under the NEPA Yuba Accord Alternative and 48 TAF of decline under the CEQA Yuba Accord Alternative. Without the Proposed Project/Action Alternative, increase in groundwater storage would range from 2 TAF to 146 TAF.

Table 6-4. Summary of Groundwater Pumping Volumes under the Proposed Project/Action and Alternatives

Groundwater Pumping Categories	Year Type	CEQA Scenarios				NEPA Scenarios		
		1	2	3	4	5	6	7
		CEQA Existing Condition	CEQA No Project Alternative	CEQA Yuba Accord Alternative	CEQA Modified Flow Alternative	NEPA No Action Alternative	NEPA Yuba Accord Alternative	NEPA Modified Flow Alternative
YCWA Surface Water Delivery Shortages	Average	2	5	3	2	5	3	3
	Wet	0	0	1	0	0	1	0
	Above Normal	0	0	0	0	0	0	0
	Below Normal	0	5	0	0	5	0	0
	Dry	0	10	0	0	10	0	5
	Critical	10	14	17	10	14	17	10
Groundwater Substitution Transfers	Average	18	19	25	21	13	19	14
	Wet	0	0	0	0	0	0	0
	Above Normal	0	0	0	0	0	0	0
	Below Normal	0	0	0	0	0	0	0
	Dry	50	50	71	58	36	58	41
	Critical	42	49	59	49	29	38	29
SVWMP Groundwater Pumping	Average	0	0	0	0	9	9	9
	Wet	0	0	0	0	0	0	0
	Above Normal	0	0	0	0	0	0	0
	Below Normal	0	0	0	0	15	15	15
	Dry	0	0	0	0	15	15	15
	Critical	0	0	0	0	15	15	15
Total Groundwater Pumping	Average	19	25	28	22	27	31	25
	Wet	0	0	1	0	0	1	0
	Above Normal	0	0	0	0	0	0	0
	Below Normal	0	5	0	0	20	15	15
	Dry	50	60	71	58	60	73	61
	Critical	52	63	76	59	58	69	54

Considering that the NEPA Yuba Accord Alternative represents the "worst case" situation in terms of groundwater pumping volumes and groundwater storage changes, results of the long-term groundwater budget accounting analysis for the entire 73-year period are presented below only the NEPA Yuba Accord Alternative. Later in Sections 6.2.6 through 6.2.12, potential impacts are evaluated for the comparative scenarios based on the anticipated total groundwater pumping volumes and changes in groundwater storage. In those sections, references to the data shown in Figure 6-22 and Figure 6-23 are also provided to evaluate groundwater storage changes for the comparative scenarios.

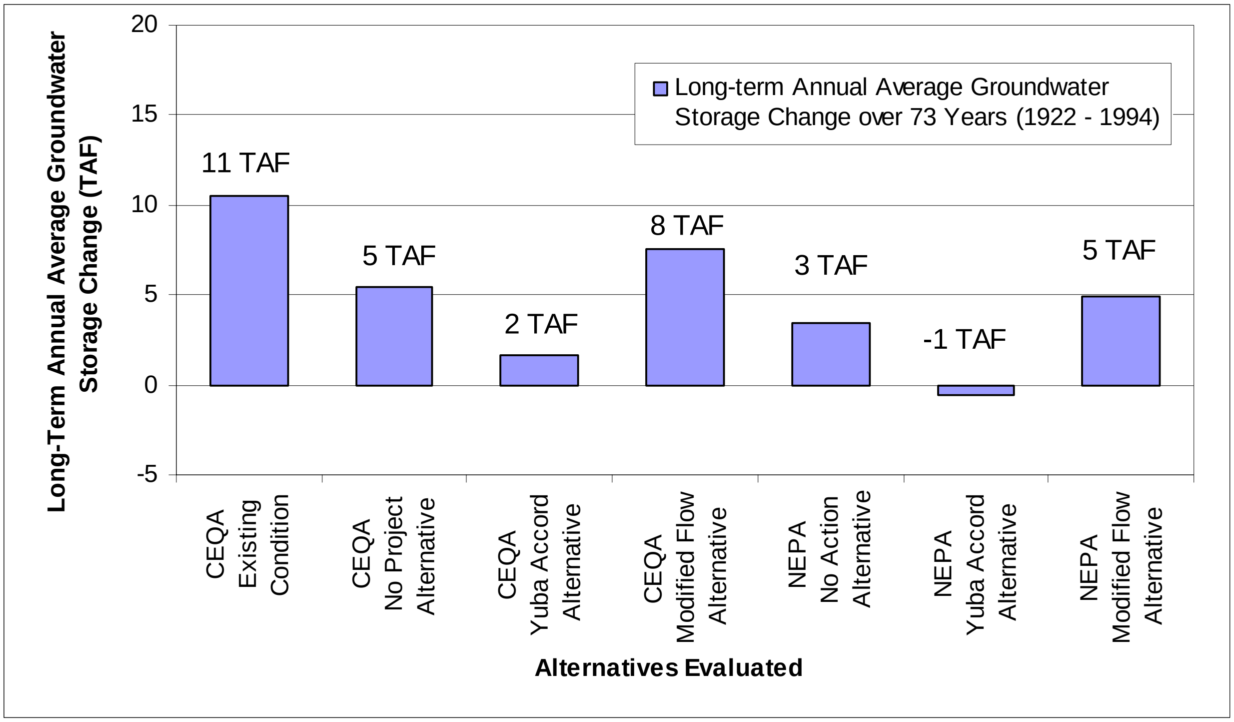


Figure 6-22. Long-Term Annual Average Groundwater Storage Changes Estimated Based on Groundwater Pumping Volumes for the 73-year Hydrologic Conditions from 1992 to 1994 Water Years and Annual Groundwater Recharge of 30 TAF

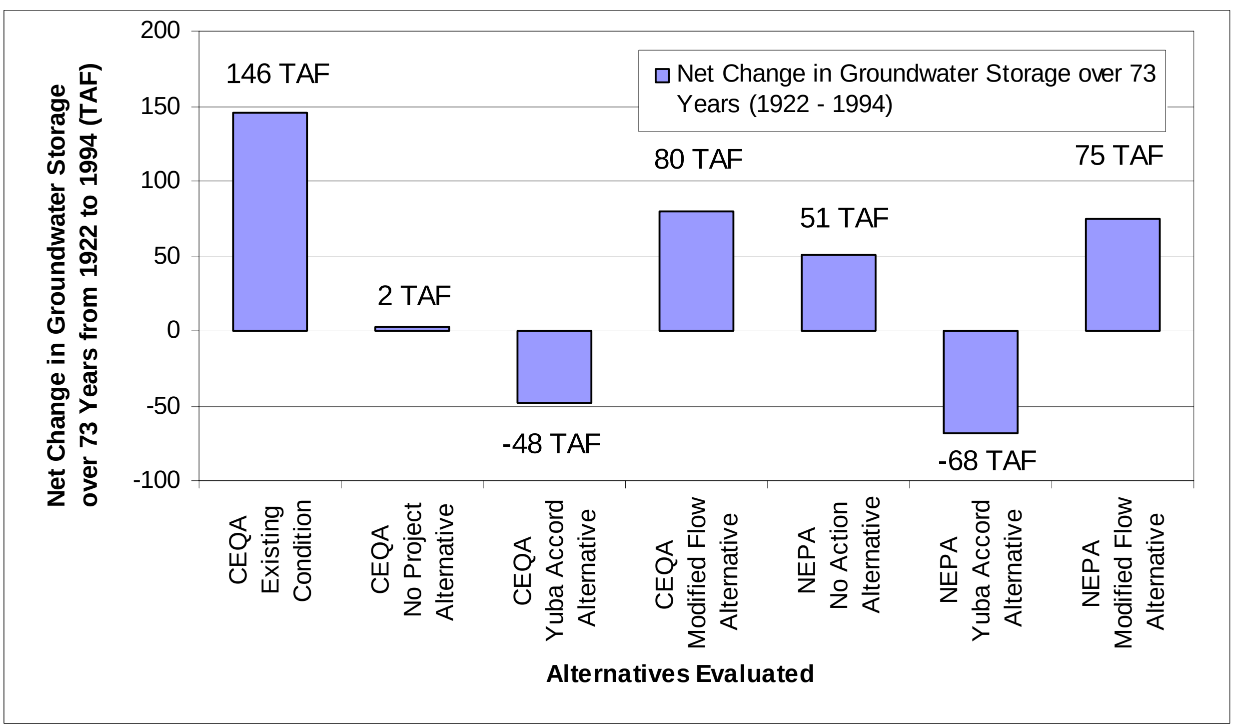


Figure 6-23. Net Change in Groundwater Storage Based on Groundwater Pumping Volumes for the 73-year Hydrologic Conditions from 1992 to 1994 Water Years and Annual Groundwater Recharge of 30 TAF

Figure 6-24 illustrates the results of the long-term groundwater budget accounting analysis for the NEPA Yuba Accord Alternative. This figure shows the annual groundwater recharge, annual groundwater pumping volumes and calculated groundwater storage for the 73-year period. Based on the worst case scenario represented by the NEPA Yuba Accord Alternative, results suggest that, although groundwater storage would fluctuate over the 73 years, the net groundwater decline during this period would be only 68 TAF, as mentioned above. Analysis based on the long-term 73-year hydrologic data suggests that the maximum pumping would occur occasionally only during dry/critical periods. As a result, the long-term decline in groundwater storage, as shown in Figure 6-24, would be much smaller than the estimated groundwater storage decline resulting from the maximum pumping conditions illustrated in Figure 6-19. The groundwater storage decline of 68 TAF over the 73-year period is nearly one third of the groundwater storage decline of 180 TAF that was estimated based on the short-term groundwater budget accounting with the maximum pumping over 6 years consecutively.

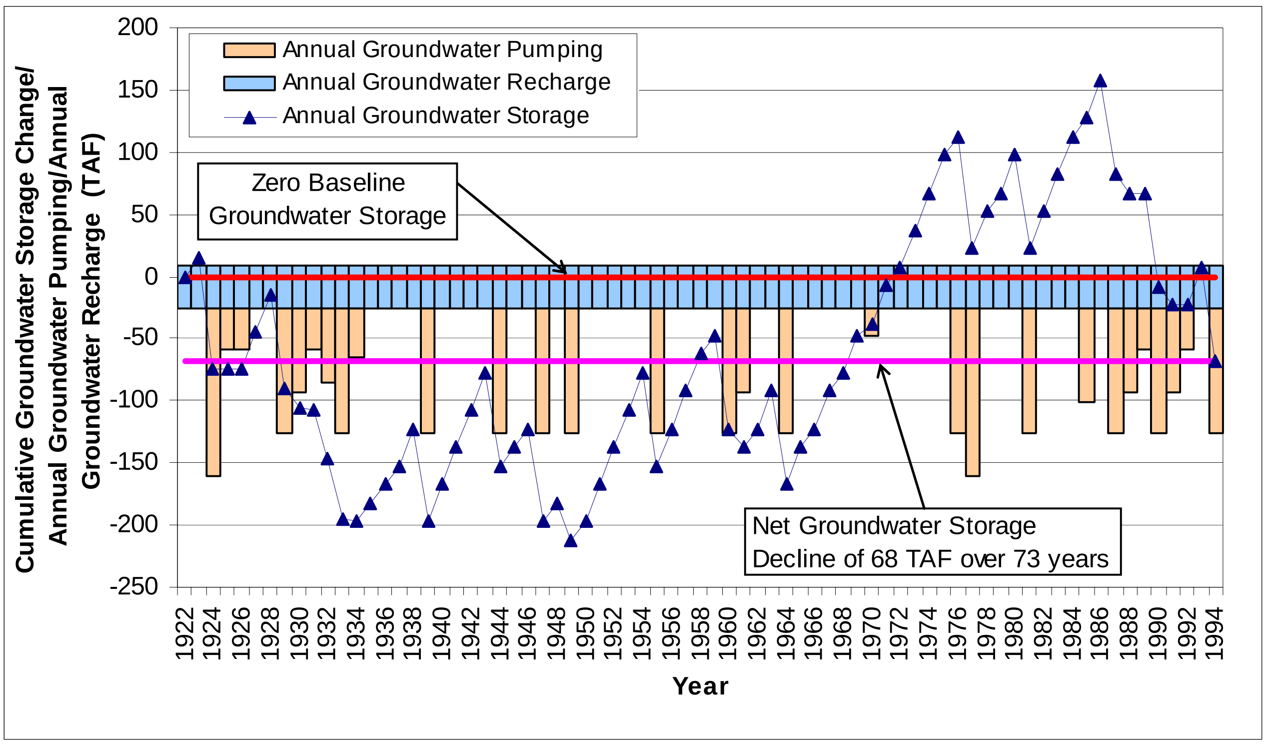


Figure 6-24. Estimated Cumulative Groundwater Storage Changes over the 73-year Period (1922 – 1994) in the Yuba Basin with the NEPA Yuba Accord Alternative
(1922 represents the baseline year from which changes in groundwater storage are calculated)

It is important to note that groundwater storage declines illustrated under the "worst case" pumping situation both for the short-term and long-term groundwater budget accounting analysis (Figure 6-19 and Figure 6-24) may be an overestimation of future conditions. The following factors could potentially increase future groundwater recharge to the Yuba Basin and, in turn, result in less groundwater storage declines than those presented above:

- The annual groundwater recharge of 30 TAF estimated from historical data is considered to be a low estimate because it does not take into account the reduction in groundwater pumping in the WWD during the implementation of the Wheatland

Project. Post 2007, groundwater pumping in the WWD will be reduced as a result of the annual surface water deliveries of approximately 40 TAF to this area.

- Future implementation of groundwater substitution pumping could induce higher groundwater recharge to the Yuba Basin due to increasing hydraulic gradient. As discussed earlier under "Results from Study of Historical Well Data", the lowest annual recharge rate of 14 TAF in the South Yuba Subbasin was estimated during the most recent years (2002 through 2005) (Figure). This lowest recharge rate could be attributed to the decreasing inflow to the Yuba Basin as the basin has replenished.

Conclusions Based on Long-Term Impact Analysis

The South and North Yuba subbasins are in good condition, with significant amounts of groundwater storage availability, relatively high annual recharge rates, and relatively short recovery periods to pre-pumping conditions. Future groundwater transfer volumes anticipated during the implementation of the Proposed Project/Action and alternatives would not lower groundwater levels to historical low levels and would not result in long-term negative impacts on groundwater levels and storage, as described below.

For the worst case scenario, anticipated groundwater pumping under the NEPA Yuba Accord Alternative would result in a net groundwater storage decrease of 68 TAF over the entire 73-year period simulated in this study, as shown above in Figure 6-24. This decline would be insignificant considering the current amount of groundwater storage in the Yuba Basin that could be utilized for future pumping. As discussed earlier, the South Yuba Subbasin alone has gained nearly 368 TAF of storage since the historical low levels were experienced in the early 1980s (Figure 6-13).

Even if the maximum pumping volumes were implemented over 6 years consecutively under the Yuba Accord Alternative (e.g., 3-year 180 TAF pumping), the estimated total groundwater storage after the maximum groundwater decline of 180 TAF (Figure 6-19) would be much higher than historical low conditions. Figure 6-20 demonstrates conceptually how groundwater storage in the South Yuba Subbasin would change as a result of the worst case groundwater storage decline of 180 TAF. Assuming 2005 represents the baseline year from which changes in groundwater storage are estimated, the resulting new groundwater storage after a groundwater storage decline of 180 TAF would still be 190 TAF above the historical low conditions.

These results lead to the conclusion that even considering the worst case pumping conditions under this EIR/EIS, impacts on long-term trends of groundwater levels and storage in the Yuba Basin during the implementation of the Yuba Accord Alternative would be less than significant.

METHODOLOGY, ANALYSIS, AND RESULTS FOR EVALUATING SHORT-TERM POTENTIAL IMPACTS: RESPONSE AND RECOVERY ANALYSIS

This section presents the methodology, analysis, and results for evaluating the localized short-term impacts under this EIR/EIS primarily based on the historical groundwater transfers in the South and North Yuba subbasins. Short-term impact analysis is used to estimate potential localized short-term impacts based on historical pumping from the North and South Yuba subbasins during the previous groundwater transfer years of 1991, 1994, 2001, and 2002. This impact assessment focuses on areas where concentrated pumping occurred in the past. Future pumping is likely to take place in these areas; thus, an analysis of short-term impacts from the past groundwater substitution transfers would help predict short-term potential impacts and responses to the future changes in groundwater pumping conditions. The proposed methodology involves a response and recovery analysis. A response analysis was used to evaluate the responses of the North Yuba and South Yuba subbasins to previous transfer pumpings. A recovery analysis was used to quantify the recovery period of the South and North Yuba subbasins to the pre-transfer conditions. Response and recovery analyses were applied at two scales: (1) at the local scale to predict short-term localized impacts; and (2) at the large scale to predict short-term impacts at a scale larger than the local scale. Short-term impact analysis at the local and large scales was applied in an attempt to evaluate the basin responses to the historical past groundwater transfer pumpings at two different scales.

The short-term impact analysis includes the following steps:

- ❑ Select monitoring wells at key locations in the North Yuba and South Yuba subbasins where the most groundwater transfer pumping occurred in the past. At the local scale, eight key monitoring wells with historical groundwater elevation data were selected. At the large scale, two key monitoring wells were selected in two sub-areas of the basin: (1) RWD and CID; and (2) DCMWC and SYWD (representing conditions in north central and southern parts of the groundwater basin, respectively).

- ❑ Compile historical groundwater elevation data at the key monitoring wells, including pre- and post-transfer groundwater elevations during each transfer year.

- ❑ Compile pumping records from transfer pumping wells in the vicinity of the key monitoring wells. At the local scale, total pumping by a group of wells was considered. The underlying assumption is that transfer pumping wells located near a selected key monitoring well (approximately within a 0.5-mile radius of the monitoring well) have impacts on groundwater declines observed at that selected key monitoring well. At the large scale, groundwater declines at each key monitoring well were analyzed relative to total pumping conducted within each subarea. The distribution of groundwater extraction by individual transfer pumping wells during 1991 and 1994 is unknown. Therefore, the short-term impact analysis at the local scale uses data from the 2001 and 2002 transfer pumping wells only.

- ❑ Perform response analysis at the local scale and the two subareas. For the response analysis, groundwater declines at each selected key monitoring well were analyzed relative to the total groundwater pumped by the selected transfer pumping wells.

- ❑ Perform recovery analysis at the local scale and the three sub-areas: Post-transfer recovery (in percentage) was quantified following the 2001 and 2002 transfer years. The following formula illustrates how the recovery by spring 2002 following the 2001 transfer is calculated:

Percent 2002 Recovery from the 2001 Transfer =
(Spring 2002 WSE – Fall 2001 WSE) / (Spring 2001 WSE - Fall 2001 WSE)

To calculate the recovery by spring 2003 following the 2001 transfer (Percent 2003 Recovery from the 2001 Transfer), Spring 2002 WSE was replaced with Spring 2003 WSE in the numerator.

Data used for the short-term impact analysis include groundwater transfer pumping records and pre- and post- groundwater elevation data. Historical records of groundwater elevation were compiled from the DWR Water Data Library Website (http://wdl.water.ca.gov).

Results of Historical Response and Recovery Analysis of the Yuba Basin

Figure 6-25 shows the distribution of the 2001 and 2002 groundwater transfer pumping volumes and the locations of 17 monitoring wells. Of these, eight wells were selected for the response and recovery analysis and nine wells were primarily used to evaluate changes in groundwater elevations during the 2001 and 2002 transfers compared to the historical trends. Two monitoring wells, 14N04E36G001M and 16N04E08A001M, located in north central and southern parts of the groundwater basin, respectively, were considered as the key wells both for the local and large scale analysis.

Results of the recovery and response analysis for the eight wells are shown in Appendix F2. Hydrographs of all 17 wells used to evaluate local impacts are also shown in Appendix F2. **Table 6-5** summarizes historical data for these 17 monitoring wells, including seasonal and annual fluctuations in groundwater elevations, seasonal changes during the 2001 and 2002 groundwater substitution transfers and spring to spring elevations following the transfers. Changes in groundwater elevations (referred to as ΔWSE) represent absolute changes. Monthly transfer records indicate that the majority of the total pumping (more than 90 percent) in 2001 and 2002 occurred during May through October. Therefore, spring measurements (usually in April) would be appropriate to represent pre-transfer conditions while fall measurements (usually in October) would be representative of post-transfer levels.

South Yuba Subbasin

Five key monitoring wells (13N05E06R004M, 13N05E06E001M, 14N04E36G001M, 14N04E24P001M, and 14N04E15C005M) were selected for the response and recovery analysis based on the distribution of the 2001 and 2002 groundwater transfer volumes (Figure 6-25). Hydrographs of these wells and the results of the response and recovery analysis are presented in Appendix F2. Hydrographs of six additional wells are also included in Appendix F-2 to show historical trends in the South Yuba Subbasin.

As depicted in Table 6-5, while changes in groundwater elevations in response to pumping volumes varied by location, similar trends for response and recovery were observed at each location analyzed. Local short-term water level declines were mostly within the range of historical seasonal changes. The majority of the recovery to the pre-transfer spring groundwater elevation appears to have occurred consistently within three years. Data from hydrographs suggest that spring 2004 levels were only slightly below early summer 2002 levels and were substantially above the levels of 1991 and 1994 transfers. By 2005, groundwater elevations tend to recover from the back-to-back transfer or even exceed the pre-transfer spring 2001 conditions.

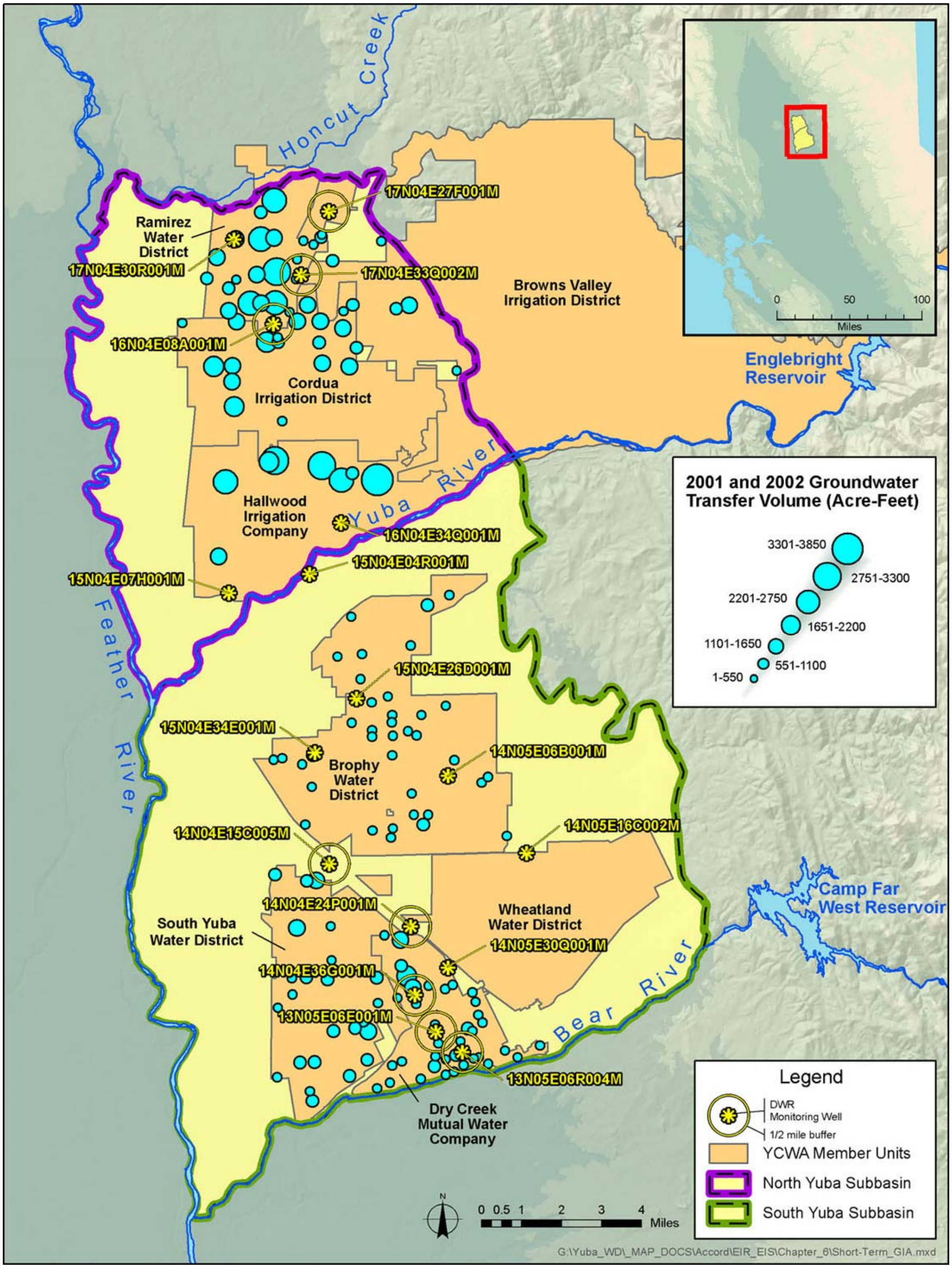


Figure 6-25. Distribution of 2001 and 2002 Groundwater Transfer Volumes in the Yuba Basin and Locations of DWR Monitoring Wells Used for Recovery and Response Analysis

Table 6-5. Summary Comparison of Historical Seasonal and Annual Fluctuations in Groundwater elevations with Seasonal and Spring to Spring Elevation Changes Following the 2001 and 2002 Groundwater Substitution Transfers for Select Monitoring Wells in the Yuba Basin (feet above msl)

Subbasin	Member Unit	Well ID	Well Data Analysis Type	Historical Fluctuations		Groundwater Elevation Data								
				Seasonal (Spring - Fall)	Annual (Spring - Spring)	2001			2002			2003	2004	2005
						Spring	Fall	ΔWSE	Spring	Fall	ΔWSE	Spring	Spring	Spring
South Yuba Subbasin	Dry Creek Mutual Water Company	14N04E36G001M[a]	R & R	3 - 21	0.2 - 12	42.6	29	**13.6**	38	24.8	**13.2**	37.4	43.2	46.5
		13N05E06E001M[a]	R & R	2 - 20	0.2 - 20	46.4	32	**14.4**	40.8	33.1	**7.7**	41.1	47.3	48.7
		13N05E06R004M[a]	R & R	8 - 11	0 - 7	52.1	38.7	**13.4**	46.3	27.7	**18.6**	47.7	52.1	52.5
		14N05E30Q001M	Hist. Trends	8 - 37	0.1 - 9	38.1	16.4	**21.7**	36.4	20.1	**16.3**	36.1	41	44.3
	Brophy Water District	15N04E34E001M	Hist. Trends	0.3 - 14	0.1 - 7	40.9	37.7	**3.2**	40.8	34.9	**5.9**	37.9	N/A	N/A
		15N04E26D001M	Hist. Trends	0.2 - 5	0.6 - 16	51.1	48.1	**3**	50.5	46.2	**4.3**	53	N/A	N/A
		14N05E06B001M	Hist. Trends	1 - 24	0 - 19	47.2	41.5	**5.7**	45.4	47.6	**-2.2**	49.1	51.4	51.4
	Wheatland Water District	14N05E16C002M	Hist. Trends	3 - 33	0.2 - 9	39.1	20.8	**18.3**	40.7	25.4	**15.3**	41.1	44.1	45.3
	Other	14N04E24P001M[a]	R & R	1 - 33	1 - 12	35.1	25.2	**9.9**	27.8	23.6	**4.2**	27.5	36.7	38.7
		14N04E15C005M	Hist. Trends	1 - 11	0.3 - 7	43.3	38.7	**4.6**	41.8	37.9	**3.9**	41	43.6	45
		15N04E04R001M	Hist. Trends	0.3 - 6	0.2 - 4	N/A	N/A	**N/A**	57.9	52.8	**5.1**	54.6	56	N/A
North Yuba Subbasin	Hallwood Irrigation District	15N04E07H001M	Hist. Trends	0.8 - 7	0.4 - 5	53.1	50.4	**2.7**	52.3	49.8	**2.5**	51.9	55	53.7
		16N04E34Q001M	Hist. Trends	0.2 - 6	0.4 - 3	78.6	75.4	**3.2**	76.9	78	**-1.1**	76.4	76.8	74.9
	Ramirez Water District	16N04E08A001M[a]	R & R	1 - 22	0 - 7	78.3	24.2	**54.1**	63.9	31.8	**32.1**	58.2	69.8	74.8
		17N04E33Q002M[a]	R & R	3 - 6	0 - 1.4	52.1	38.7	**13.4**	43.6	34.8	**8.8**	48.5	52.8	53.7
		17N04E30R001M	Hist. Trends	2 - 21	0.2 - 9	76.4	N/A	**N/A**	44.8	46.6	**-1.8**	60.5	67.5	73.4
	Browns Valley Irrigation District	17N04E27F001M[a]	R & R	3 - 17	0 - 9	89.3	56.6	**32.7**	72.3	53.9	**18.4**	63.4	80.5	92.9

[a]Monitoring wells used to perform response and recovery analysis

Key:

ΔWSE: change in groundwater elevation

N/A: groundwater elevation data not available

Hist. Trends: Historical Trends

R & R: Response and Recovery

Groundwater elevation declines due to the transfers ranged from approximately 3 feet to 22 feet. These changes were comparable to historical seasonal fluctuations that ranged from 0 feet to 37 feet. The largest change in WSE during 2001 occurred in DCMWC near the WWD boundary (see hydrograph of 14N05E30Q01M in page F2-34, Figure F2-40 in Appendix F2). This decline could be caused by a combination of transfer pumping in DCMWC and pumping within WWD. Within BWD, overall responses to pumping appear to be within historical seasonal fluctuations. In 2001, BWD did not participate to the transfer while in 2002 farmers in BWD pumped more than 11 TAF for the transfer (nearly 40 percent of the total transfer in the South Yuba Subbasin). However, changes in groundwater elevations following the 2002 transfer were less compared to changes experienced in other areas of the subbasin.

North Yuba Subbasin

Three monitoring wells (16N04E08A001M, 17N04E33Q002M, and 17N04E27F001M) were selected in the North Yuba Subbasin for the short-term response and recovery analysis based on the distribution of the 2001 and 2002 groundwater transfer volumes (Figure 6-25). Hydrographs of these wells and the results of the response and recovery analysis are presented in Appendix F2 (see page F2-30 through F2-32). Hydrographs of three additional wells are also included in Appendix F-2 to illustrate historical trends (see page F2-33 through F2-35).

In general, results of the response and recovery analysis suggest that groundwater elevations decrease with pumping. Both recovery rates and recovery periods in the North Yuba Subbasin are smaller than in the South Yuba Subbasin. The majority of the recovery to the pre-transfer spring groundwater elevations appears to have occurred consistently within three years after the back-to-back transfer. By spring 2005, WSE recovered from the transfers or exceeded the pre-transfer spring 2001 conditions.

As shown in Appendix F2 (see page F2-30 through F2-32) and in Table 6-5, localized short-term water level declines during the 2001 and 2002 groundwater substitution transfer years ranged from approximately 3 feet to 54 feet. This was response to a total pumping ranging from approximately 31 TAF to 43 TAF during 2001 and 2002 transfers, respectively. In general, changes in groundwater elevations due to these transfers were comparable to historical seasonal fluctuations that range from 0 feet to 22 feet. Hydrographs show that the earlier transfers in 1991 and 1994 appeared to have caused larger groundwater level declines (mostly between 40 feet and 52 feet) than the recent back-to-back transfers, although the 2001 and 2002 groundwater transfer volumes were larger than the 1991 and 1994 transfer volumes (29.3 TAF and 26 TAF, respectively). Variations in groundwater levels from the groundwater transfer pumpings could be mainly due to variations in groundwater pumping locations and the current stable conditions of the North Yuba Subbasin, and partially due to variations in hydrologic conditions. Pumping locations during the 1991 and 1994 transfers may have been different than those during the 2001 and 2002 transfers. At the time of the publication of this EIR/EIS, the 1991 and 1994 pumping locations and volumes by individual wells are not available. Pumping volumes in the 2001 transfer were higher than those in the 2002 transfer, yet pumping locations during both transfers were similar. In terms of the effect of hydrologic conditions, both 1991 and 1994 were critical years while 2001 and 2002 were dry years.

In RWD, where the largest volume of groundwater was pumped during 2001, localized reduction in groundwater levels was approximately 54 feet (Table 6-5). The monitoring well in BVID also appears to have experienced significant groundwater declines after the transfer even though BVID did not participate in the 2001 transfer. In both RWD and BVID, the majority of the recovery to pre-spring conditions was attained by spring 2005. In HIC, despite the extensive pumping that occurred, short-term impacts on groundwater levels from pumping were little to none during both transfer years. Responses to each transfer were within a range of historical seasonal fluctuations. Recovery periods following each transfer were relatively short even though the difference in pumping volumes between the two transfers was large.

An area located in the North Yuba Subbasin within the central eastern region of CID was closely monitored in 2002 transfer because domestic wells in this area experienced the effects of the 2001 transfer. This area, named Trainer Hills, consists of a hill that has been recently developed as a residential area with several domestic wells constructed during the recent development. Because of lower groundwater levels in domestic wells, either reduced well pumping capacity or loss of pumping capacity occurred. In response to these short-term impacts, CID lowered the pumps or deepened the wells for five residences. During the 2002 transfers, YCWA and CID met with residents to address their concerns. As a result of the immediate response to these incidents, no significant unmitigated impacts to the residents of this area occurred.

Conclusions Based on Short-Term Impact Analysis

Overall, historical response and recovery trends suggest the following:

- The past groundwater substitution transfers depleted only a small portion of the basin capacity, especially in the South Yuba Subbasin (Figure).

- Localized short-term declines of groundwater levels in response to the total pumping of 120 TAF in 2001 and 2002 were mostly within historical seasonal and annual fluctuations ranging from 22 feet in the North Yuba Subbasin to 37 feet in the South Yuba Subbasin (Table 6-5).

- Groundwater levels recovered to the pre-pumping conditions within two to three years following the transfers. Spring 2004 groundwater elevations suggest that in most locations groundwater elevations recovered to and even exceeded spring 2001 conditions. In some areas, full recovery to spring 2001 conditions occurred by spring 2005.

- It is anticipated that future pumping volumes within the past groundwater substitution transfer volumes would result in responses and recoveries similar to those experienced historically under similar hydrologic conditions.

6.2.3.2 *Methodology, Analysis, and Results for Evaluating Potential Impacts to Groundwater and Surface Water Interactions*

Groundwater and surface water interactions in the Yuba Basin are of interest in this EIR/EIS because changes in groundwater pumping conditions within the vicinity of a surface water body under the Proposed Project/Action and alternatives could alter the existing hydrologic interactions between surface water and groundwater. For this EIR/EIS, the following methodologies were used to assess potential impacts of anticipated groundwater pumping on groundwater and surface water interactions, using pertinent information available for the Yuba Basin:

- Comparative analyses of surface water flow volumes relative to historical and proposed groundwater pumping
- Analyses of historical and current groundwater elevation maps
- Reviews of subsurface lithology and well construction data
- Analyses of river gage data for estimating accretion/depletion along the lower Yuba River
- Use of multilevel piezometers in the adaptive management program
- Analyses of groundwater elevations in relation to the locations of vernal for assessing potential impacts on wetland communities

In this section, the methodologies, analysis, and results for evaluating potential impacts to groundwater and surface water interactions are presented and discussed. This section also describes the analytical approach commonly used to quantify the flow rate between the aquifer and surface water systems. As discussed below, the application of this analytical approach for the Yuba Basin is not considered feasible based on the current information available for the Yuba Basin. Instead, based on the large amount of data available in the Yuba Basin, it was determined that the methods listed above would be appropriate to predict potential impacts on groundwater and surface water interactions.

ANALYTICAL APPROACH BASED ON DARCY'S EQUATION

Based on the analytical approach, the rate of water movement over time (Q) between surface and groundwater systems can be quantified using Darcy's equation:

$$Q = K \cdot A \cdot \frac{dh}{dl}$$

Where K is the hydraulic conductivity (or ability of porous media to transmit water) of the streambed, dh is the hydraulic head difference between head above and below the streambed, and dl is the streambed thickness, and Q is the total flux over the area A which is the streambed through which surface water percolates. The direction of water movement between the surface water and groundwater system may change over time or over the extent of the surface water body depending on the sign of dh/dl.

Table 6-6 lists the required data inputs to apply this approach for quantifying the flow rate between the river and aquifer. For the Yuba Basin, this approach has shortcomings because data inputs are known only at selected locations and are not available for the entire river channel.

Table 6-6. Use of Analytical Approach for Analysis of Groundwater and Surface Water Interactions

Inputs	Output	Unknowns for the Yuba Basin
❑ Hydraulic conductivity of the river channel (K). ❑ Hydraulic gradient between surface water system and groundwater (dh/dl). ❑ The area of the streambed through which surface water percolates (A).	Flow rate (or total flux Q) over the area A.	❑ Hydraulic conductivity values along the entire Yuba River channel is limited. ❑ The hydraulic gradient along the entire reach of the Yuba River is not known. Current knowledge is limited based on the location of a single multilevel piezometer on the Yuba River.

This analytical approach was previously used for the Yuba Basin in the *"Ground Water Resources Management in Yuba County"* (Bookman-Edmonston 1992) to develop estimates of river seepage and accretions for 1970, 1982, and 1990. Using river segments of approximately 2.5 miles each, hydraulic gradients were calculated using average river stage and average groundwater elevations at distances of 2.5 miles from each river segment. Average groundwater elevations were estimated using groundwater contours for the Yuba Basin. The transmissivity for each river was based on published general ranges of transmissivities in the Yuba Basin.

COMPARATIVE ANALYSIS OF SURFACE WATER FLOW VOLUMES RELATIVE TO HISTORICAL AND PROPOSED GROUNDWATER PUMPING

This method was used to compare the flow of total annual groundwater extraction (past and future proposed) relative to flow volumes in the surface water bodies in the Yuba Basin. Only the Yuba and Bear rivers were included in the analysis for the following reasons: (1) river gage on the Feather River only reports stage levels; and (2) no river gage is located on Honcut Creek within and near the Yuba Basin.

Figure 6-26 compares Yuba and Bear river flows with average pumping volumes anticipated under the Proposed Project/Action Alternative and the maximum annual groundwater pumping that occurred during the past groundwater substitution transfers. Average values (both critical year average and long-term annual average) for the Proposed Project/Action Alternative represent average values of the CEQA Yuba Accord Alternative and NEPA Yuba Accord Alternative. The following conclusions can be drawn based on this comparison:

- ❑ Groundwater pumping is a very small fraction of total annual water budget in the Yuba Basin.
- ❑ The river with less flow (the Bear River) may be most sensitive if a direct connection occurs between surface water and groundwater.

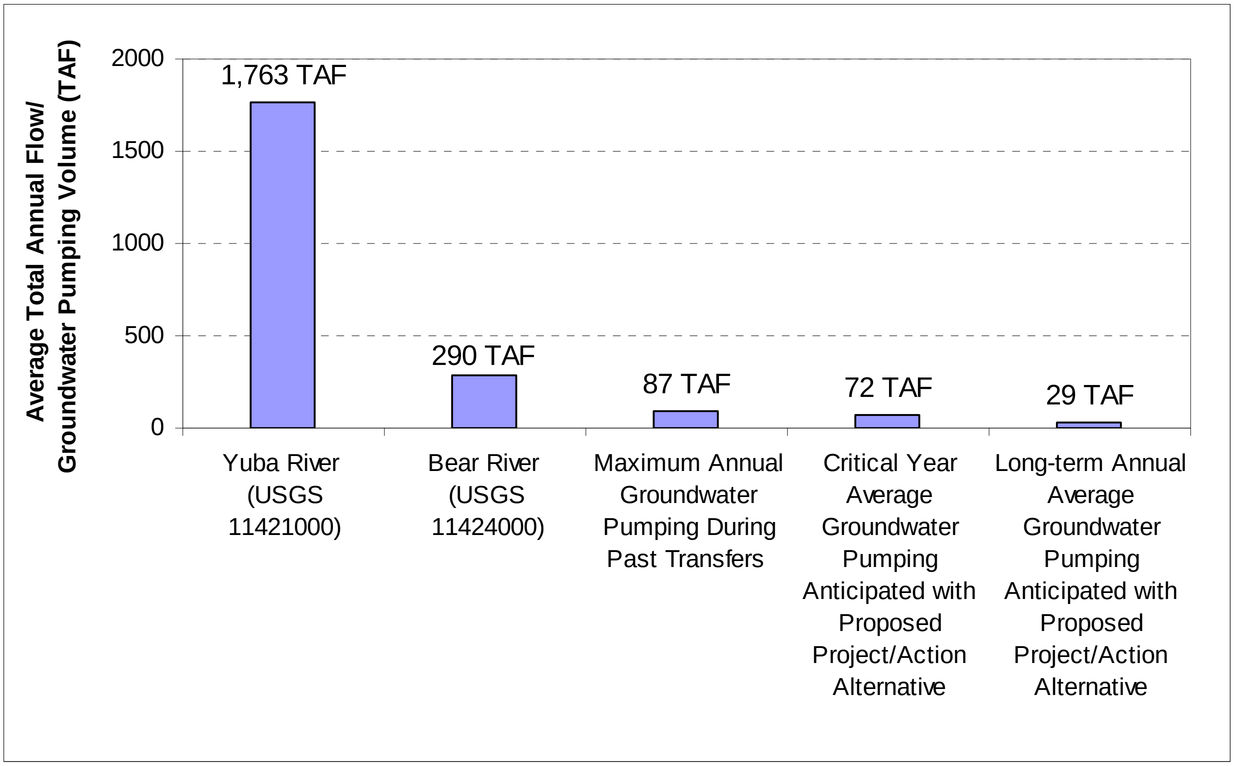


Figure 6-26. Comparison of Yuba and Bear River Flows with Past and Proposed Groundwater Pumping under the Proposed Project/Action Alternative

ANALYSIS OF HISTORICAL AND CURRENT GROUNDWATER ELEVATION MAPS

Groundwater elevation maps and data for subsurface lithology were used for a qualitative analysis of the level of connection between the rivers and groundwater aquifer along the major rivers in the Yuba Basin. The interpreted spring 2004 groundwater elevation contour map (Figure 6-2) and historical (average) groundwater elevation contour maps from 1960 to 2005 Figure 6-10 through Figure 6-12, and Figure F2-13 through Figure F2-20 in Appendix F2), when analyzed with lithologic data, show the following results:

- The Yuba River is the primary recharge to the North and South Yuba subbasins.
- Recharge to the Yuba Basin from the Bear and Feather rivers and Honcut Creek are small.
- Groundwater levels both in the South Yuba and North Yuba subbasins showed very little changes during the past groundwater pumping transfers along the Feather and Honcut Creek (see page F2-17 through F2-24 in Appendix F2 for groundwater elevation contour maps for pre-transfer (1990, 1993, 2000, 2001), transfer (1991, 1994, 2001, and 2002) and post-transfer (1992, 1995, 2001, and 2002) years).
- As also supported by the lithologic cross sections presented in Appendix F2 (see page F2-2 and F2-7), a limited aquifer-river connection is anticipated along the Feather River.

- The lithologic cross sections reveal that along the eastern boundary of the Yuba Basin, where coarse-grained materials appear at shallow depths, groundwater flow could occur in unconfined conditions. Along the western boundary of the Yuba Basin, on the other hand, groundwater flow appears to occur in confined layers.

These results lead to the following conclusions:

- Areas most prone to potential impacts would include the upper portion of the Yuba River, the upper portion of the lower Bear River, and upper portion of Honcut Creek, where depths to water table tends to be shallow and where coarse-grained materials are present at shallow depths.

- Impacts on Honcut Creek would be less than significant, based on little changes seen on groundwater levels during the past groundwater substitution transfers.

- Impacts on the Feather River would be less than significant because: (1) little changes in groundwater levels occurred along the Feather River during the past groundwater substitution transfers; (2) limited connection is likely between surface water and pumping zone (likely confined); and (3) no groundwater transfer pumping occurred in the vicinity of the Feather River.

REVIEW OF SUBSURFACE LITHOLOGY AND WELL CONSTRUCTION DATA

Subsurface lithology and well construction data available for the Yuba Basin were analyzed to further evaluate the connection between surface water and underlying pumping zones based on the presence or absence of transmissive materials (coarse-grained sands and gravels). Lithologic cross sections presented in Appendix F2 show the distribution of permeable materials above the base of fresh water (see page F2-2 and F2-7 in Appendix F2). Well construction information (screen intervals) for transfer wells was used to show the vertical distribution of major pumping zones in relation to aquifer zones (confined vs. unconfined).

Several lithologic cross sections, prepared from east to west and north to south, based on interpretations of lithologic data show that:

- The upper portion of the lower Yuba River, which has been dredged extensively for gold (the Gold Fields), consists of highly permeable deposits of coarse-grained gravels and cobbles near the ground surface.

- The coarse-grained beds found along the upper stream channels of the Yuba River become increasingly thinner toward the west and pinch out into impermeable clay beds intermixing with discontinuous, thin sand lenses.

Well construction data available for irrigation wells in the North Yuba Subbasin suggest that:

- More than 50 percent of pumping wells in the North Yuba Subbasin (based on 10 well driller’s logs) have screen depths greater than 240 feet and more than 90 percent wells have open screenings between 100 and 600 feet (i.e., open hole completion wells).

- A number of wells in the South Yuba Subbasin are exceptionally deep with the greatest screen intervals. The majority of the wells have screen depths greater than 200 feet. Particularly in SYWD, DCMWC, and WWD, some wells have a total depth of up to 600 feet. Wells in SYWD and DCMWC have a screen interval ranging from 90 feet bgs to 475 feet bgs (see Table F2-1 in Appendix F2 for detailed well construction information).

These observations lead to the following conclusions:

- Impacts on Honcut Creek and Bear River would be less than significant, given the absence of transmissive materials along these rivers.

- Interaction with surface hydrology along the Feather River on the western border of the Yuba Basin would be unlikely given the lack of transmissive material near the ground surface (see page F2-2 through F2-7 for Figure F2-2 through F2-7 in Appendix F2).

- Based on the lithologic data, the upper reach of the Yuba River appears to be the area most prone to potential impacts. Although a strong connection between the upper Yuba River and shallow portion of aquifer could occur under unconfined flow conditions, pumping may not affect the surface water flow immediately if the majority of the wells in the Yuba Basin would have similar characteristics and would extend to great depths (approximately 400 feet to 600 feet bgs) in the Laguna and Mehrten formations.

- Downstream users would not be affected by any potential changes in groundwater surface water interactions along the Yuba River because YCWA would meet instream flow requirements at the Marysville gage.

ANALYSIS OF RIVER GAGE DATA FOR ESTIMATING ACCRETION/DEPLETION ALONG THE LOWER YUBA RIVER

In this analysis, the term "accretion/depletion" represents all unquantified inflows and outflows along the lower Yuba River between the Smartville and the Marysville river gages. This may include, but is not limited to:

- Overland flow into the Yuba River

- Flow from Dry Creek into the Yuba River

- Losses from the Yuba River into the underlying groundwater aquifers

- Losses or gains into or out of the Gold Fields. Anecdotal information indicates that the cobble and boulder field associated with this area fills with water during periods of high river stage and drains back into the river during periods of low river stage.

At this time, it is not feasible to quantify these individual components. Thus, they have all been lumped into a single closure term that is explained below. The hypothesis in the closure term analysis is that if river flow depletion from the Yuba River into the underlying aquifer significantly increases in response to groundwater substitution transfer pumping, then this impact would result in reduction in the closure term either during the transfer years or in subsequent years as the Yuba Basin is refilling.

Information presented earlier suggests that the upper reach of the lower Yuba River appears to be the area most prone to potential impacts. River gage data were analyzed in an attempt to determine if a correlation exists between the lower Yuba River flows (accretions/depletions) and the past groundwater substitution transfers.

A closure term was developed based on the following water-budget equation to resolve cumulative discrepancies for river flows between the Smartsville and Marysville river gages:

Closure Term = $(Q_{out} + D) - (Q_{in} + RI)$

Where:

Q_{out}	River outflow at Marysville gage (USGS 11421000)
D	Diversions from the river (e.g., South Canal, North Canal , and Pipeline diversions)
Q_{in}	River inflow at Smartsville gage (USGS 11418000)
RI	Inflows to the river (e.g., Deer Creek)

Figure 6-27 illustrates how the closure term was developed conceptually. The closure-term approach is based on water budget accounting of historical flow volumes between the Smartsville and Marysville river gages, and inflows and diversions that occurred between these two gages.

Figure 6-28 shows estimated closure terms from 1980 to 2004 and the historical groundwater transfer pumping that occurred in 1991, 1994, 2001, and 2002. Based on Figure 6-28, the following conclusions become apparent:

- No correlation exists between pumping and closure-term values. This may indicate that historical groundwater transfer pumping did not have a significant effect on the Yuba River flows during the transfer years and subsequent years as the Yuba Basin refills.

- Hydrologic conditions, on the other hand, significantly affect Yuba River flows. During dry and critical years, the closure term tends to decrease (less flow in the river) while during wet years it increases (more flow in the river).

- Although a lack of correlation is apparent between the historical pumping and the closure term values, this method will be used as part of the YCWA's adaptive management approach during the implementation of the Yuba Accord. This method of analysis will improve as YCWA is better able to quantify the individual components of the closure term.

USE OF MULTILEVEL PIEZOMETERS IN THE ADAPTIVE MANAGEMENT PROGRAM

Inferences can be made for groundwater and surface water interactions based on measurements of vertical hydraulic gradient between the river and groundwater aquifer in the proximity of surface water bodies. Data from the three multilevel piezometers, YR-1A-D, BR-1A-D, and FR-1A-D, in the Yuba Basin were used for a qualitative analysis of the hydraulic gradient (upward vs. downward) between surface water and groundwater levels. Based on the locations shown in Figure 6-2, none of these multilevel piezometers are located in the vicinity of the primary recharge zones described earlier.

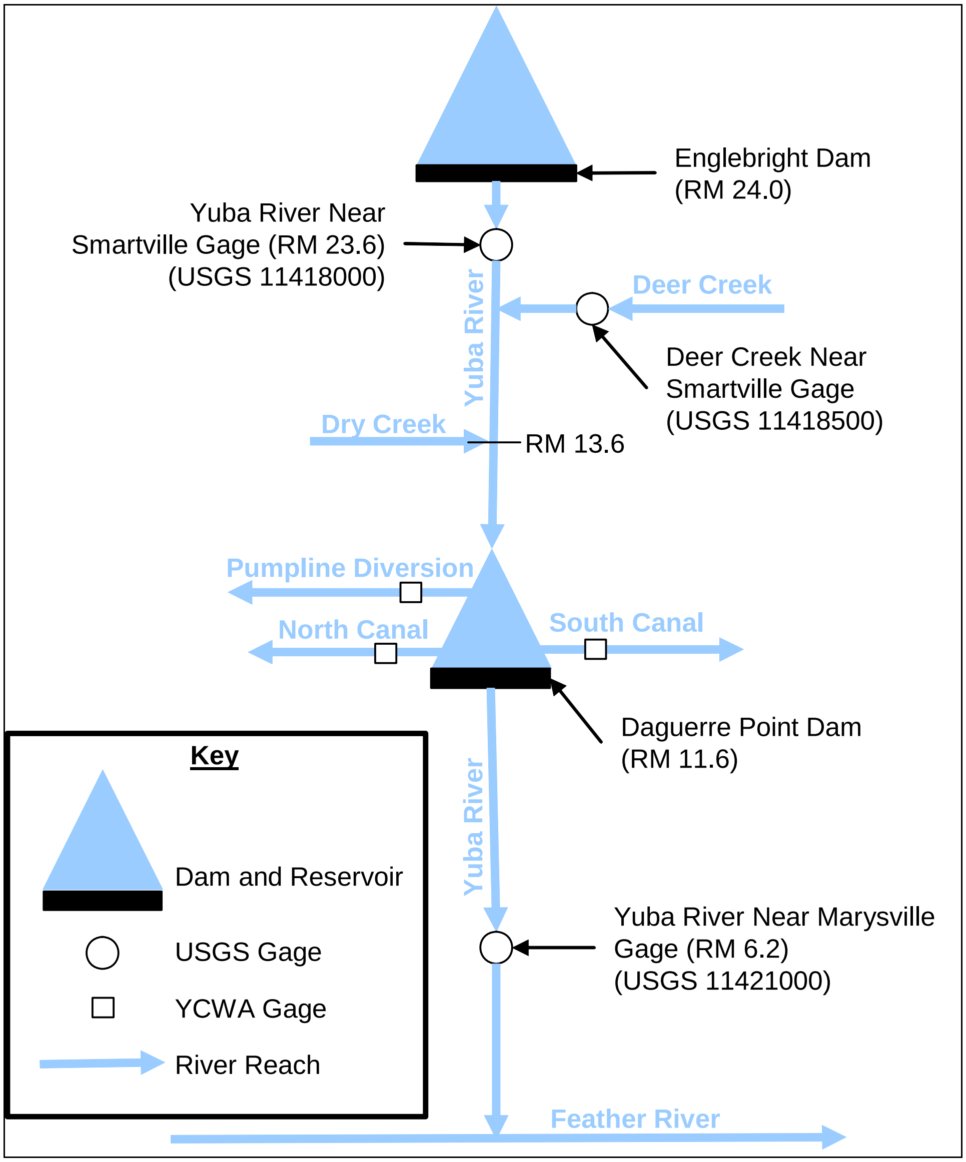


Figure 6-27. Schematic Illustration of Closure-Term Approach

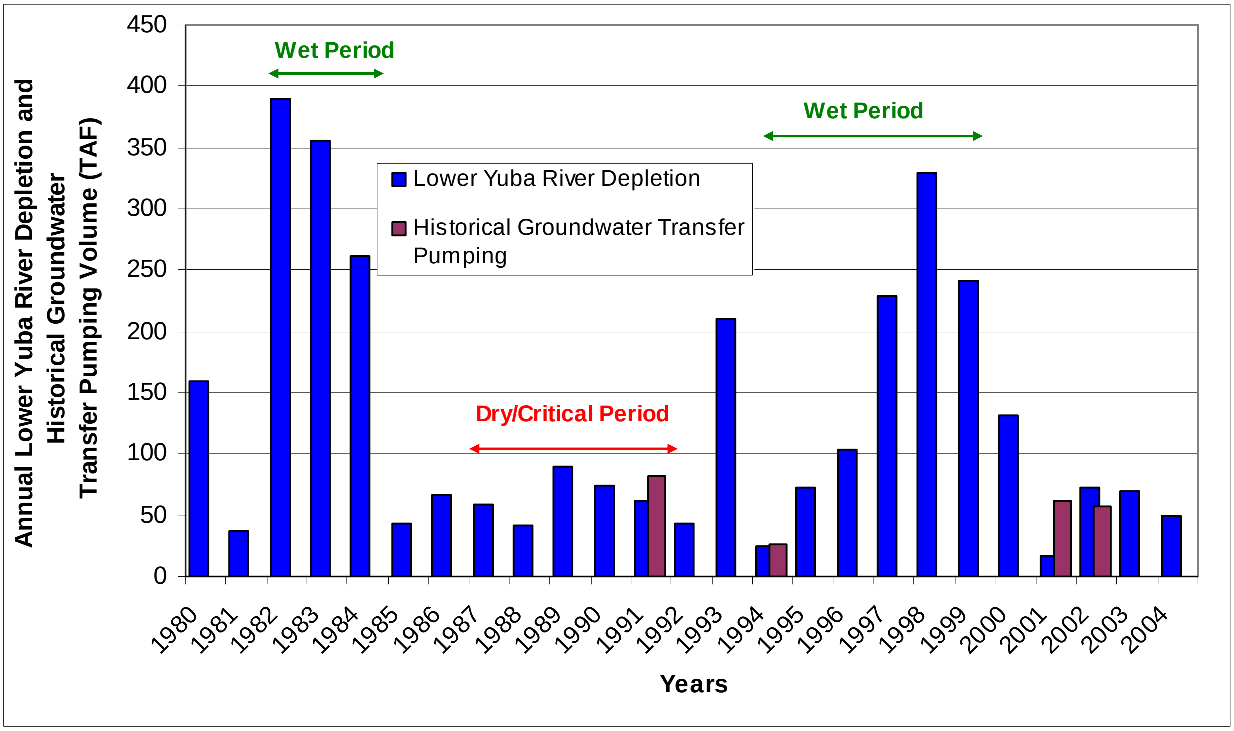


Figure 6-28. Comparison of Closure Term with Historical Groundwater Transfer Pumping

Recent groundwater elevation data measured at various depths from these multilevel piezometers are presented in Appendix F2 (see page F2-12 through F2-16) and discussed below.

Yuba River

Preliminary groundwater elevation data at YR-1A-D from September 2004 to September 2005 (see page F2-12 and F2-13 in Appendix F2) do not suggest a downward flow. Groundwater elevations measured at the most shallow piezometer YR-1A (with a screened interval from 70 feet bgs to 80 feet bgs) and the river gage levels follow similar trends. River gage data are consistently lower than groundwater elevations measured at YR-1A. Data from YR-1B (with a screened interval from 250 feet bgs to 260 feet bgs) and YR-1C (with a screened interval from 430 feet to 450 feet), correspond well with each other, both experiencing large fluctuations during irrigation periods, but do not seem to correlate well with YR-1A and the river gage data.

Bear River

Preliminary groundwater elevation data for BR-1A-D from April 2003 to March 2004 and from August 2005 to July 2005 (see page F2-14 and F2-15 in Appendix F2) suggest that water levels at this location tend to decrease with depth. Data also suggest that the most shallow piezometer, BR-1A with a screen interval from 28 feet bgs to 48 feet bgs, and river gage data at the Bear River have similar trends. Trends seen in groundwater levels at BR-1B (with a screened interval from 78 feet bgs to 98 feet bgs), BR-1C (with a screened interval from 215 feet to 245 feet), and BR-1D (the deepest piezometer with a screened interval from 320 feet bgs to 330 feet bgs) are similar, yet fluctuations in groundwater levels tend to increase with depth.

Feather River

Preliminary groundwater elevation data (subject to revision by DWR) from October 2005 to November 2006 (see page F2-16 in Appendix F2) from the two deep piezometers, FR-1C and FR-1D, correspond well throughout the measurement period. At this location, no river gage is available. Data at the most shallow piezometer, FR-1A (with a screened interval from 40 feet bgs to 60 feet bgs) appears to have different trends than wells at deeper zones. Larger fluctuations observed at FR-1B (with a screened interval from 235 feet bgs to 255 feet bgs) are likely to be a result of pumping that might have occurred during irrigation season in the vicinity of this area. Based on the data currently available from these multilevel piezometers and the locations of the multilevel piezometers, the following conclusions were made:

- Additional multilevel piezometers are needed in areas most prone to recharge (e.g., upper reaches of the major rivers).
- As part of the adaptive management program under the Yuba Accord, future groundwater elevation data from these multilevel piezometers will be used to better understand interactions between groundwater and surface water features especially during groundwater substitution transfer pumpings.
- Water quality data from the multilevel piezometers will be used to characterize groundwater quality changes by depth and to look for evidence of groundwater flow between different zones based on similarities and discrepancies in groundwater quality.

During the past transfers, no long- and short term significant impacts on surface hydrology have occurred. Because anticipated groundwater pumping under the alternatives evaluated in this EIR/EIS would be within historical transfer volumes, no significant long-term impacts on groundwater and surface water interactions are anticipated. During the implementation of the Yuba Accord groundwater transfers, YCWA will identify and mitigate local impacts, including those related to groundwater and surface water interactions, if they occur as part of the adaptive management program.

METHODOLOGY, ANALYSIS, AND RESULTS FOR EVALUATING POTENTIAL IMPACTS TO TERRESTRIAL RESOURCES

Hydraulic connectivities between groundwater systems and other surface water such as vernal pools, wetlands and riparian habitat communities, would be unlikely given the subsurface geology of the Yuba Basin with near surface confining layers and the presence of a deep unsaturated zone. **Figure 6-29** shows the locations of the vernal pools and depths to water table based on spring 2004 conditions.

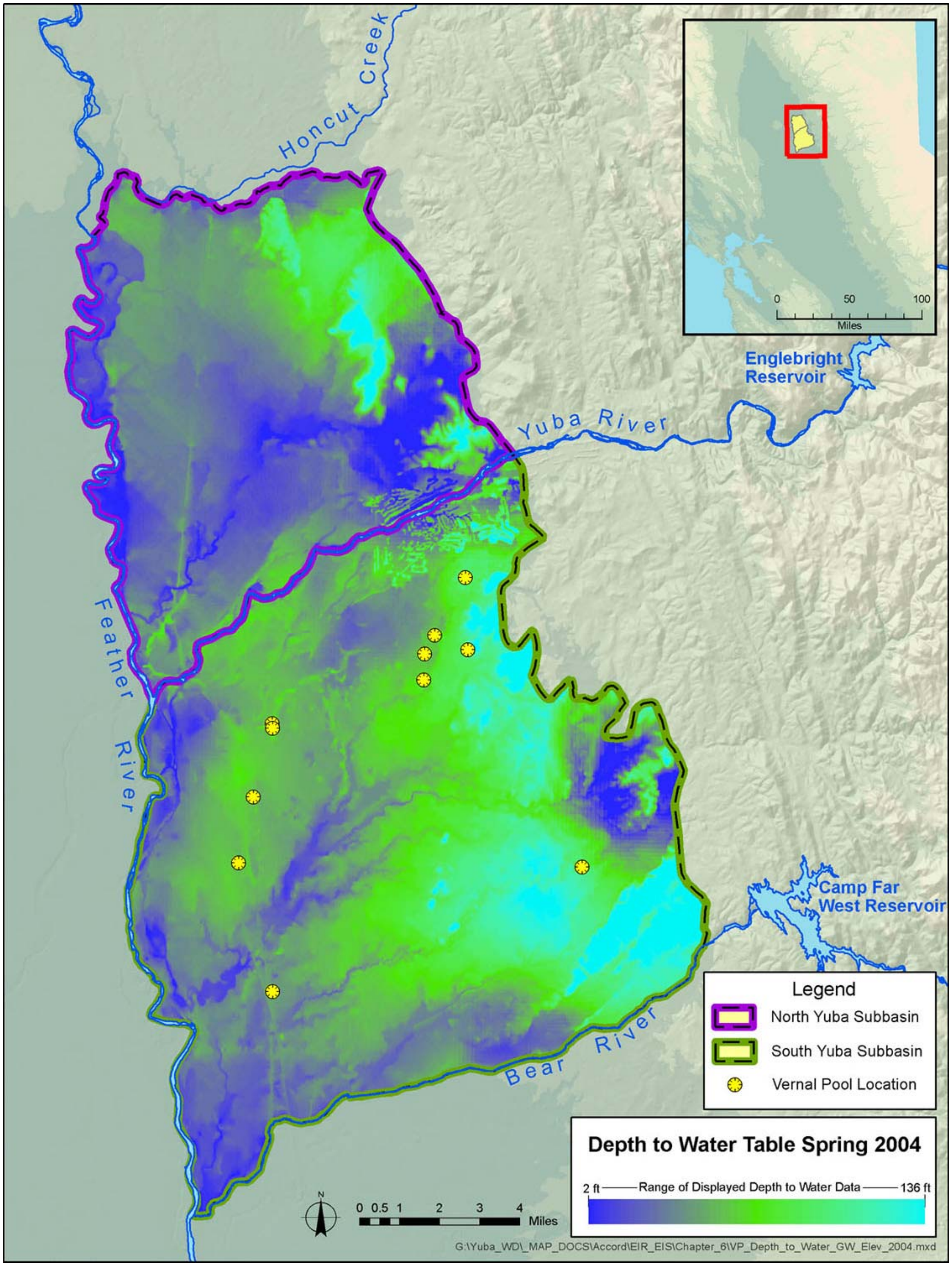


Figure 6-29. Locations of Vernal Pools in the Yuba Basin and Depth to Water Table Map in the Yuba Basin

According to the CNDDB, 11 vernal pools were identified in the South Yuba Subbasin, based on a query performed in June 2006 (CDFG 2006). Comparisons of the locations of vernal pools and depth to water table data suggest the presence of a deep vadose zone in the vicinity of vernal pools that would separate the surface hydrology and terrestrial communities from the groundwater pumping zone. Therefore, groundwater pumping would not alter the quantity or seasonality of waters contained in these communities. As also outlined in Chapter 8, potential impacts to these terrestrial resources as a result of groundwater substitution transfers under the Proposed Project/Action and alternatives would be expected to be less than significant.

6.2.3.3 METHODOLOGY, ANALYSIS, AND RESULTS FOR EVALUATING POTENTIAL IMPACTS TO GROUNDWATER QUALITY

The methodology for evaluating potential impacts to groundwater quality included the following:

- Compilation and review of existing information (these data are summarized in Section 6.1.1.8)
- Presentation of selected groundwater quality information on a map (data are shown in Figure 6-9)
- Comparison of historic groundwater pumping volumes with anticipated pumping volumes under the Proposed Project/Action Alternative (Figure 6-26)
- Providing an opinion on groundwater quality impacts anticipated under the Proposed Project/Action Alternative and alternatives

As discussed earlier in Section 6.1.1.8, currently, the Yuba Basin is in healthy condition with respect to water quality. During the past groundwater substitution transfers, no long-term significant impacts on groundwater quality conditions have occurred. One potential adverse impact associated with lowering groundwater levels below the range of historical low levels would be the potential mobilization of saline water from deeper zones to shallower zones. However, because anticipated future pumping with implementation of the alternatives evaluated in this EIR/EIS would be within historical pumping volumes, impacts to groundwater quality would be less than significant. Because future changes in pumping patterns under the Proposed Proposed/Action Alternative would occur primarily, if not entirely, within agricultural portions of the Yuba County, this presentation and evaluation of water quality impacts did not include compiling water quality data from municipal, industrial or other urban areas.

During the implementation of the Yuba Accord groundwater transfers, the YCWA and Member Units will be obligated to monitor and report on groundwater basin conditions both pre- and post-transfers. Using the adaptive management program, YCWA will identify local impacts and take actions that would result in mitigating any local water quality concerns. As part of the adaptive management program of the Yuba Accord Alternative, water quality data collected by DWR from the multilevel piezometers will be used to characterize groundwater quality changes with depth.

6.2.3.4 METHODOLOGY, ANALYSIS, AND RESULTS FOR EVALUATING POTENTIAL IMPACTS TO LAND SUBSIDENCE

Groundwater elevations in the Yuba Basin would have to drop below historic low levels before land subsidence could occur. In the North Yuba Subbasin, the lowest groundwater levels were experienced in 1977 (Figure 6-4 and Figure) while in the South Yuba Subbasin, groundwater levels were at historical lows in 1982 (Figure 6-5 and Figure 6-13). The hydrographs shown in Figure 6-4 indicate that groundwater levels in the North Yuba Subbasin have increased by approximately 30 – 80 feet since the early 1980s. In the South Yuba Subbasin, current groundwater elevations are approximately 30 - 100 feet higher than the historical lows, as shown by the hydrographs in Figure 6-5.

Anticipated groundwater levels under the NEPA Yuba Accord Alternative, which is the worst case scenario in terms of groundwater pumping conditions, are not expected to draw groundwater levels below historical low levels (Figure 6-21 and Figure 6-23). For this reason, impacts on land subsidence would be less than significant under the Yuba Accord Alternative. Although potential impacts would be less than significant, YCWA still would coordinate with DWR to monitor land subsidence across the Yuba Basin. If inelastic subsidence is documented in conjunction with declining groundwater elevations during transfers, YCWA will investigate appropriate actions to avoid adverse impacts.

6.2.4 METHODOLOGY, ANALYSIS, AND RESULTS FOR EVALUATING POTENTIAL IMPACTS TO THE EXPORT SERVICE AREA

The Proposed Project/Action would increase the supply reliability of SWP and CVP users. Currently CVP and SWP water users in the Export Service Area pump groundwater to supplement water supply. The potential impacts of the Yuba Accord Alternative on groundwater basins in the Export Service Area would result in a reduction of extraction due to an increase in surface water supply reliability. The actual reduction in groundwater extraction from the increase in surface water supply reliability that would occur in the Export Service Area under the Proposed Yuba River Accord would be relatively small. The estimates of annual groundwater extractions in the Export Service Area are millions of acre feet (DWR 2003) and the average annual volumes of water available under the Proposed Yuba Accord would be 76 TAF, most of which would go to EWA. Nevertheless, the Yuba Accord Alternative would have a positive, albeit limited, impact by reducing reliance on groundwater in the Export Service Area. Because this positive impact to the groundwater basins would be limited, it is not quantified in this document.

6.2.5 IMPACT INDICATORS AND SIGNIFICANCE CRITERIA

Impact indicators and significance criteria developed for the evaluation of groundwater resources are presented in **Table 6-7.** Groundwater impacts are considered significant if actions related to the Proposed Project/Action or alternatives would cause one or more of the impacts described in Table 6-7 to be significant. Potential impacts in the Yuba Basin will be evaluated with respect to: groundwater levels and storage; groundwater and surface water interactions; groundwater quality; and inelastic subsidence. No changes in, or impacts on, local geology and soil are anticipated under the Proposed Project/Action or alternatives. Thus, changes in local geology and soils are not considered as impact indicators.

During implementation of the Proposed Project/Action or an alternative, YCWA and its Member Units would adopt the adaptive management program to monitor and manage the groundwater basin and groundwater and surface water interactions. The adaptive management program would be used to meet the needs of measurement and monitoring of the Yuba Basin throughout groundwater activities that would take place under the Proposed Project/Action or an alternative. During implementation of the Proposed Project/Action or an alternative, if groundwater pumping would result in isolated, site-specific third-party impacts on groundwater levels in shallow domestic wells, the adaptive management program would help guide YCWA operations to avoid unmitigated third-party effects in the four categories listed in Table 6-7.

Table 6-7. Impact Indicators and Significance Criteria for Groundwater Resources

Impact Indicator	Significance Criteria
Groundwater levels and storage	Substantial reduction of groundwater levels and depletions of storage that would cause long-term overdraft conditions at the basin scale or that would result in short-term adverse third party and/or environmental impacts at the local level.
Groundwater and surface water interactions	Substantial reductions of instream flows in rivers and streams caused by groundwater pumping within the vicinity of rivers and streams.
Groundwater quality	Degradations in groundwater quality that would threaten to cause groundwater quality to exceed drinking water and agricultural water quality standards or that would substantially impair anticipated beneficial uses of groundwater.
Land subsidence	Permanent land subsidence caused by water level declines due to pumping.

In addition to the adaptive management program, the actions taken under the GMP will compliment future groundwater activities under the Proposed Project/Action. As part of the GMP, the Yuba Basin will be monitored for the health of the long-term basin storage and levels and for localized short-term impacts from pumping.

As discussed in Chapter 4, CEQA and NEPA have different legal and regulatory standards that require slightly different assumptions in the modeling runs used to compare the Proposed Project/Action and alternatives to the appropriate CEQA and NEPA bases of comparison in the impact assessments. Although only one project (the Yuba Accord Alternative) and one action alternative (the Modified Flow Alternative) are evaluated in this EIR/EIS, it is necessary to use separate NEPA and CEQA modeling scenarios for the Proposed Project/Action, alternatives and bases of comparisons to make the appropriate comparisons. As a result, the scenarios compared in the impact assessments below have either a “CEQA” or a “NEPA” prefix before the name of the alternative being evaluated. A detailed discussion of the different assumptions used for the CEQA and NEPA scenarios is included in Appendix D.

As also discussed in Chapter 4, while the CEQA and NEPA analyses in this EIR/EIS refer to “potentially significant,” “less than significant,” “no” and “beneficial” impacts, the first two comparisons (CEQA Yuba Accord Alternative compared to the CEQA No Project Alternative and CEQA Modified Flow Alternative compared to the CEQA No Project Alternative) presented below instead refer to whether or not the proposed change would “unreasonably affect” the evaluated impact indicator. This is because these first two comparisons are made to determine whether the action alternative would satisfy the requirement of Water Code section

1736 that the proposed change associated with the action alternative "would not unreasonably affect fish, wildlife, or other instream beneficial uses."

6.2.6 ENVIRONMENTAL IMPACTS/ENVIRONMENTAL CONSEQUENCES OF THE CEQA YUBA ACCORD ALTERNATIVE COMPARED TO THE CEQA NO PROJECT ALTERNATIVE

Table 6-8 summarizes groundwater pumping volumes and changes in groundwater storage associated with the CEQA Yuba Accord Alternative and CEQA No Project Alternative for five water year types (wet, above normal, below normal, dry, and critical years). Values for the five water year types are based on the average of all the years within each year type classification. The long-term annual average values reported in Table 6-8 represent the average values for the 73-year period.

Table 6-8. Summary Comparison of Groundwater Pumping Volumes and Groundwater Storage Changes Associated with the CEQA Yuba Accord Alternative and the CEQA No Project Alternative

Year Type	Total Annual Groundwater Pumping (TAF)			Annual Change in Groundwater Storage (TAF)		
	CEQA Yuba Accord Alternative	CEQA No Project Alternative	Difference	CEQA Yuba Accord Alternative	CEQA No Project Alternative	Difference
Long-term Annual Average	28	25	3	2	5	-3
Wet	1	0	1	29	30	-1
Above Normal	0	0	0	30	30	0
Below Normal	0	5	-5	30	25	5
Dry	71	60	11	-41	-30	-11
Critical	76	63	13	-46	-33	-13

The data presented in Table 6-8 show that for wet, above normal and below normal years, differences in total annual groundwater pumping would be insignificant (up to 5 TAF). For those years, a net increase in groundwater storage of approximately 25 TAF to 30 TAF would occur under both alternatives. However, as expected, groundwater pumping during drier years would increase under both alternatives due to increasing deficiencies in surface water deliveries and participation in groundwater substitution transfers. In dry and critically dry years, total annual groundwater pumping under the CEQA Yuba Accord Alternative would exceed pumping under the CEQA No Project Alternative by 11 TAF and 13 TAF, respectively because of more pumping for delivery shortages and groundwater substitution transfers. The groundwater pumping experienced during dry and critically dry years would result in a net decrease in groundwater storage under both alternatives.

Based on methodology described in Section 6.2.3.2, average annual changes in groundwater storage for the 73-year period of record were estimated for each alternative. This value is useful for evaluating whether each alternative would result in a long-term net increase or net decrease in groundwater storage compared to a baseline. The actual values are relative to an arbitrary baseline, therefore evaluations are made of the relative difference in the values, and not of the actual values.

The long-term annual average groundwater storage changes for the CEQA Yuba Accord Alternative and the CEQA No Project Alternative would be 2 TAF and 5 TAF, respectively, as shown in Table 6-8 and in Figure 6-22. The 3 TAF less storage for the CEQA Yuba Accord Alternative compared to the CEQA No Project Alternative would be insignificant and this difference would not be anticipated to cause any long-term changes in groundwater storage under the CEQA Yuba Accord Alternative. The 73-year simulation results also indicate that the CEQA Yuba Accord Alternative would result in a net groundwater storage decline of 48 TAF compared to a net groundwater storage increase of 2 TAF under the CEQA No Project Alternative (Figure 6-23).

Impact 6.2.6-1: Reductions in local groundwater levels and storage to either affect long-term overdraft conditions in the basin or result in short-term adverse third party impacts

Because the anticipated groundwater pumping under both the CEQA Yuba Accord Alternative and the CEQA No Project Alternative would be within historical ranges, and because current groundwater storage capacity and groundwater levels are substantially higher than historical lows in the Yuba Basin, impacts from these ranges of pumping on groundwater levels and storage, and third-party impacts would be less than significant, as described in Section 6.2.3.1. Short-term changes in groundwater levels and storage similar to those experienced historically would occur.

While impacts on groundwater levels and storage, and third-party impacts from both alternatives would be less than significant, the CEQA Yuba Accord Alternative would be preferred because it would include self-mitigating measures and the adaptive management program that would be implemented to identify and mitigate any local short-term impacts that might occur.

Impact 6.2.6-2: Changes in groundwater pumping that could affect groundwater and surface water interactions and result in reduced instream flows in local rivers and streams

Anticipated groundwater pumping under the CEQA Yuba Accord Alternative and the CEQA No Project Alternative would be similar, both within historical transfer volumes. Because no long- or short-term significant impacts on surface hydrology have occurred during the past groundwater substitution transfers, impacts on groundwater and surface water interactions would be less than significant, as discussed earlier in Section 6.2.3.2.

While impacts on groundwater and surface water interactions and on instream flows in local rivers and streams from both alternatives would be less than significant, the CEQA Yuba Accord Alternative would be preferred because it would include self-mitigating measures and the adaptive management program that would be implemented to identify and mitigate any local impacts on groundwater and surface water interactions that might occur.

Impact 6.2.6-3: Changes in groundwater quality that could degrade conditions and result in exceedance of drinking water or agricultural water quality standards, or result in adverse affects to designated beneficial uses of groundwater

Impacts on groundwater quality from the ranges of pumping shown in Table 6-8 would be less than significant; thus no significant or unmitigated long-term impacts to groundwater quality in the Yuba Basin would occur.

Because impacts on groundwater quality from both alternatives would be less than significant, the CEQA Yuba Accord Alternative is preferred because it would include self-mitigating measures and the adaptive management program that would be implemented to identify and mitigate any local impacts that might occur.

Impact 6.2.6-4: Increases in groundwater pumping to cause groundwater level reductions that result in permanent land subsidence

As described in Section 6.2.3.4, impacts on land subsidence from the ranges of pumping under the CEQA Yuba Accord Alternative and the CEQA No Project Alternative would be less than significant; thus no significant or unmitigated long-term impacts in the Yuba Basin would occur.

Because impacts on land subsidence from both alternatives would be less than significant, the CEQA Yuba Accord Alternative is preferred because it would include self-mitigating measures and the adaptive management program that would be implemented to identify and mitigate any unanticipated local impacts that might occur.

6.2.7 Environmental Impacts/Environmental Consequences of the CEQA Modified Flow Alternative Compared to the CEQA No Project Alternative

Table 6-9 summarizes groundwater pumping volumes and changes in groundwater storage associated with the CEQA Modified Flow Alternative and the CEQA No Project Alternative for five water year types (wet, above normal, below normal, dry, and critical years). Values for the five water year types are based on the average of all the years within each year type classification. The long-term annual average values reported in Table 6-9 represent the average values for the 73-year period of record.

Table 6-9. Summary Comparison of Groundwater Pumping Volumes and Groundwater Storage Changes Associated with the CEQA Modified Flow Alternative and the CEQA No Project Alternative

Year Type	Total Annual Groundwater Pumping (TAF)			Annual Change in Groundwater Storage (TAF)		
	CEQA Modified Flow Alternative	CEQA No Project Alternative	Difference	CEQA Modified Flow Alternative	CEQA No Project Alternative	Difference
Long-term Annual Average	22	25	-3	8	5	3
Wet	0	0	0	30	30	0
Above Normal	0	0	0	30	30	0
Below Normal	0	5	-5	30	25	5
Dry	58	60	-2	-28	-30	2
Critical	59	63	-4	-29	-33	4

The data presented in Table 6-9 show that differences in groundwater pumping between the two alternatives would be insignificant: no pumping would occur during wet and above normal years for each alternative and only 5 TAF more pumping would occur during wet, above normal, and below normal water years under the CEQA Modified Flow Alternative . The lack of pumping during wet, above normal and below normal years would result in a net increase in groundwater storage of approximately 25 TAF to 30 TAF under both alternatives. Groundwater pumping during drier years would increase under both alternatives, as expected, due to increased deficiencies in surface water deliveries and participation in groundwater substitution transfers. In dry and critically dry years, total annual groundwater pumping for the CEQA Modified Flow Alternative would be approximately 58 TAF and 59 TAF, respectively. These pumping volumes would be approximately 2 TAF and 4 TAF less than those under the CEQA No Project Alternative during dry and critical years, respectively. As expected, the increased pumping during dry and critical years would cause a net decrease in groundwater storage under each alternative.

Based on methodology described in Section 6.2.3.2, average annual changes in groundwater storage for the 73-year period of record were estimated for each alternative. The long-term annual average groundwater storage changes under the CEQA Modified Flow Alternative and the CEQA No Project Alternative would be 8 TAF and 5 TAF, respectively, as shown in Table 6-9 and shown in Figure 6-22. These values suggest that the long-term annual average groundwater storage volume would be approximately 3 TAF greater under the CEQA Modified Flow Alternative than under the CEQA No Project Alternative. The 73-year simulation results also show that the CEQA Modified Flow Alternative would result in a groundwater storage increase of 80 TAF compared to 2 TAF under the CEQA No Project Alternative (Figure 6-23).

Impact 6.2.7-1: Reductions in local groundwater levels and storage to either affect long-term overdraft conditions in the basin or result in short-term adverse third party impacts

Anticipated groundwater pumping under both the CEQA Modified Flow Alternative and the CEQA No Project would be within historical ranges. Because groundwater storage capacity and groundwater levels in the Yuba Basin are well above historical lows and no-long term impacts occurred from the past groundwater substitution transfers, the ranges of pumping under these two alternatives would not result in long-term significant or unmitigated impacts to groundwater levels and storage, as described in Section 6.2.3.1. Thus, impacts on groundwater levels and storage, and third-party impacts under each alternative would be less than significant.

Neither of these alternatives would have the adaptive management program that would be implemented under the Yuba Accord Alternative.

Impact 6.2.7-2: Changes in groundwater pumping that could affect groundwater and surface water and result in reduced instream flows in local rivers and streams

Anticipated groundwater pumping under CEQA Modified Flow Alternative and the CEQA No Project would be similar, both within historical transfer volumes. Because no long- or short-term significant impacts on surface hydrology have occurred during the past groundwater substitution transfers, impacts on groundwater and surface water interactions would be less than significant and would not significantly affect instream flows in local rivers and streams, as discussed earlier in Section 6.2.3.2.

Neither of these alternatives would have the adaptive management program that would be implemented under the Yuba Accord Alternative.

Impact 6.2.7-3: Changes in groundwater quality that could degrade conditions and result in exceedance of drinking water or agricultural water quality standards, or result in adverse affects to designated beneficial uses of groundwater

Impacts on groundwater quality from these ranges of pumping would be less than significant; thus no significant or unmitigated long-term impacts to groundwater quality in the Yuba Basin would occur.

Neither of these alternatives would have the adaptive management program that would be implemented under the Yuba Accord Alternative.

Impact 6.2.7-4: Increases in groundwater pumping to cause groundwater level reductions that result in permanent land subsidence

As described in Section 6.2.3.4, impacts on land subsidence from these ranges of pumping would be less than significant; thus no significant or unmitigated long-term impacts in the Yuba Basin would occur.

Neither of these alternatives would have the adaptive management program that would be implemented under the Yuba Accord Alternative.

6.2.8 ENVIRONMENTAL IMPACTS/ENVIRONMENTAL CONSEQUENCES OF THE CEQA YUBA ACCORD ALTERNATIVE COMPARED TO THE CEQA EXISTING CONDITION

Table 6-10 summarizes groundwater pumping volumes associated with the CEQA Yuba Accord Alternative and the CEQA Existing Condition for five water year types (wet, above normal, below normal, dry, and critical years) based on data for the 73-year period for water years from 1922 to 1994. Values for the five water year types are based on the average of all the years within each year type classification. The long-term annual average values reported in Table 6-10 represent the average values for the 73-year period.

Table 6-10. Summary Comparison of Groundwater Pumping Volumes and Groundwater Storage with the CEQA Yuba Accord Alternative and CEQA Existing Condition

Year Type	Total Annual Groundwater Pumping (TAF)			Annual Change in Groundwater Storage (TAF)		
	CEQA Yuba Accord Alternative	CEQA Existing Condition	Difference	CEQA Yuba Accord Alternative	CEQA Existing Condition	Difference
Long-term Annual Average	28	19	9	2	11	-9
Wet	1	0	1	29	30	-1
Above Normal	0	0	0	30	30	0
Below Normal	0	0	0	30	30	0
Dry	71	50	21	-41	-20	-21
Critical	76	52	24	-46	-22	-24

The data presented in Table 6-10 show that, for wet, above normal and below normal years, total annual groundwater pumping would not occur and a net increase in groundwater storage of approximately 30 TAF would occur under both alternatives. However, as expected, groundwater pumping during drier years would increase under both alternatives due to increasing deficiencies in surface water deliveries and participation in groundwater substitution transfers. In dry and critically dry years, total annual groundwater pumping under the CEQA Yuba Accord Alternative would exceed that under the CEQA Existing Condition by 21 TAF and 24 TAF, respectively. As a result of the increased groundwater pumping during dry and critically dry years, both alternatives would cause a net decrease in groundwater storage volume during those types of water years.

Based on methodology described in Section 6.2.3.2, the long-term annual average groundwater storage changes under the CEQA Yuba Accord Alternative and the CEQA Existing Condition would be 2 TAF and 11 TAF, respectively, as shown in Table 6-10 and in Figure 6-22. These values show that on average the CEQA Yuba Accord Alternative would result in approximately 9 TAF less groundwater storage change than the CEQA Existing Condition. The results from the 73-year simulations also indicate that the CEQA Yuba Accord Alternative would result in a net groundwater storage decline of 48 TAF compared to a net groundwater storage increase of 146 TAF under the CEQA Existing Condition (Figure 6-23).

Impact 6.2.8-1: Reductions in local groundwater levels and storage to either affect long-term overdraft conditions in the basin or result in short-term adverse third party impacts

Currently, groundwater storage capacity and groundwater levels are above historical lows in the Yuba Basin and the anticipated groundwater pumping under both the CEQA Yuba Accord Alternative and the CEQA Existing Condition would be within historical ranges. As described in Section 6.2.3.1, impacts from these ranges of pumping to groundwater levels and storage and third-party impacts would be less than significant; thus no significant or unmitigated long-term impacts in the Yuba Basin would occur.

Because both alternatives would result in less than significant impacts, the Yuba Accord Alternative is preferred because it would include self-mitigating measures and the adaptive management program that would be implemented should any impacts occur.

Impact 6.2.8-2: Changes in groundwater pumping that could affect groundwater and surface water and result in reduced instream flows in local rivers and streams

As described in Section 6.2.3.2, pumping under the two alternatives evaluated here would be within historical pumping volumes. Impacts from these ranges of pumping to groundwater and surface water interactions would be less than significant; thus no significant or unmitigated long-term impacts in the Yuba Basin would occur.

Because both alternatives would result in less than significant impacts, the CEQA Yuba Accord Alternative is preferred because it would include self-mitigating measures and the adaptive management program that would be implemented should any impacts occur.

Impact 6.2.8-3: Changes in groundwater quality that could degrade conditions and result in exceedance of drinking water or agricultural water quality standards, or result in adverse affects to designated beneficial uses of groundwater

Impacts to groundwater quality from the ranges of pumping anticipated under the two alternatives would be less than significant; thus no significant or unmitigated long-term impacts to the groundwater quality in the Yuba Basin would occur.

Given that both alternatives would result in less than significant impacts, the CEQA Yuba Accord Alternative is preferred because it would include self-mitigating measures and the adaptive management program that would be implemented should unanticipated impacts occur.

Impact 6.2.8-4: Increases in groundwater pumping to cause groundwater level reductions that result in permanent land subsidence

As described in Section 6.2.3.4, impacts from the ranges of pumping anticipated under the CEQA Yuba Accord Alternative and the CEQA Existing Condition to land subsidence would be less than significant; thus no significant or unmitigated long-term impacts in the Yuba Basin would occur.

Given that both alternatives will result in less than significant impacts, the CEQA Yuba Accord Alternative is preferred because it would include self-mitigating measures and the adaptive management program that would be implemented should unanticipated impacts occur.

6.2.9 ENVIRONMENTAL IMPACTS/ENVIRONMENTAL CONSEQUENCES OF THE CEQA MODIFIED FLOW ALTERNATIVE COMPARED TO THE CEQA EXISTING CONDITION

Table 6-11 summarizes groundwater pumping volumes and changes in groundwater storage under the CEQA Modified Flow Alternative and the CEQA Existing Condition. Values are reported based on the average of the 73-year data (long-term annual average) and average of five water year types (wet, above normal, below normal, dry, and critical years).

Table 6-11. Summary Comparison of Groundwater Pumping Volumes and Groundwater Storage with the CEQA Modified Flow Alternative and Existing Condition

Year Type	Total Annual Groundwater Pumping (TAF)			Annual Change in Groundwater Storage (TAF)		
	CEQA Modified Flow Alternative	CEQA Existing Condition	Difference	CEQA Modified Flow Alternative	CEQA Existing Condition	Difference
Long-term Annual Average	22	19	3	8	11	-3
Wet	0	0	0	30	30	0
Above Normal	0	0	0	30	30	0
Below Normal	0	0	0	30	30	0
Dry	58	50	8	-28	-20	-8
Critical	59	52	7	-29	-22	-7

The data presented in Table 6-11 indicate that groundwater pumping would not occur during wet, above normal and below normal water years under both alternatives. During these years, the basin would experience a net increase in groundwater storage of approximately 30 TAF under either alternative. However, during drier years, groundwater pumping would increase under both alternatives due to increasing deficiencies in surface water deliveries and participation in groundwater substitution transfers. During dry and critical years, annual groundwater pumping under the CEQA Modified Flow Alternative would be 58 TAF and 59 TAF, respectively. Compared to the CEQA Modified Flow Alternative, annual groundwater pumping under the CEQA Existing Condition would be 8 TAF and 7 TAF less during dry and critical years, respectively. Under both alternatives, the increased groundwater pumping would result in net decrease in groundwater storage for that year.

Based on methodology described in Section 6.2.3.2, the long-term annual average groundwater storage changes for the CEQA Modified Flow Alternative and the CEQA Existing Condition, would be 8 TAF and 11 TAF, respectively, as shown in Table 6-11 and in Figure 6-22. These values suggest that the average long-term groundwater storage volume in the Yuba Basin would be 3 TAF less under CEQA Modified Flow Alternative. The results from the 73-year simulations also indicate that the CEQA Modified Flow Alternative would result in a net groundwater storage increase of 80 TAF compared to a net groundwater storage increase of 146 TAF under the CEQA Existing Condition (Figure 6-23).

Impact 6.2.9-1: Reductions in local groundwater levels and storage to either affect long-term overdraft conditions in the basin or result in short-term adverse third party impacts

The anticipated pumping both under the CEQA Modified Flow Alternative and the CEQA Existing Condition would be within historical ranges and would not result in long-term significant or unmitigated impacts to groundwater levels and storage. As described in Section 6.2.3.1, currently, groundwater storage capacity and groundwater levels are above historical lows in the Yuba Basin. Thus, impacts from the ranges of pumping under these two alternatives on groundwater levels and storage and impacts on third-parties would be less than significant.

Neither of these alternatives would have the adaptive management program that would be implemented under the Yuba Accord Alternative.

Impact 6.2.9-2: Changes in groundwater pumping that could affect groundwater and surface water interactions and result in reduced instream flows in local rivers and streams

As described in Section 6.2.3.2, impacts from the ranges of pumping under the CEQA Modified Flow Alternative and the CEQA Existing Condition to groundwater and surface water interactions would be less than significant; thus no significant or unmitigated long-term impacts in the Yuba Basin would occur.

Neither of these alternatives would have the adaptive management program that would be implemented under the Yuba Accord Alternative.

Impact 6.2.9-3: Changes in groundwater quality that could degrade conditions and result in exceedance of drinking water or agricultural water quality standards, or result in adverse affects to designated beneficial uses of groundwater

Impacts from the pumping within the range of historical volumes to groundwater quality would be less than significant; thus no significant or unmitigated long-term impacts to groundwater quality in the Yuba Basin would occur.

Neither of these alternatives would have the adaptive management program that would be implemented under the Yuba Accord Alternative.

Impact 6.2.9-4: Increases in groundwater pumping to cause groundwater level reductions that result in permanent land subsidence

As described in Section 6.2.3.4, impacts from the pumping within the range of historical volumes to land subsidence would be less than significant; thus no significant or unmitigated long-term impacts in the Yuba Basin would occur.

Neither of these alternatives would have the adaptive management program that would be implemented under the Yuba Accord Alternative.

6.2.10 ENVIRONMENTAL IMPACTS/ENVIRONMENTAL CONSEQUENCES OF THE CEQA NO PROJECT /NEPA NO ACTION ALTERNATIVE COMPARED TO THE CEQA EXISTING CONDITION/NEPA AFFECTED ENVIRONMENT

As discussed in Chapter 3, the key elements and activities (e.g., implementation of the RD-1644 Long-term instream- flow requirements) for the CEQA No Project Alternative would be the same for the NEPA No Action Alternative. The primary differences between the CEQA No Project and NEPA No Action alternatives are various hydrologic and other modeling assumptions (see Section 4.5 and Appendix D). Because of these differences between the No Project and No Action alternatives, these alternatives are distinguished as separate alternatives for CEQA and NEPA evaluation purposes.

Based on current plans and consistent with available infrastructure and community services, the CEQA No Project Alternative in this EIR/EIS is based on current environmental conditions (e.g., project operations, water demands, and level of land development) plus potential future operational and environmental conditions (e.g., implementation of the RD-1644 Long-term instream flow requirements in the lower Yuba River) that probably would occur in the foreseeable future in the absence of the Proposed Project/Action or another action alternative. The NEPA No Action Alternative also is based on conditions without the proposed project, but uses a longer-term future timeframe that is not restricted by existing infrastructure or physical and regulatory environmental conditions. The differences between these modeling characterizations and assumptions for the CEQA No Project and the NEPA No Action alternatives, including the rationale for developing these two different scenarios for this EIR/EIS, are explained in Chapter 4[2].

Although implementation of the RD-1644 Long-term instream flow requirements would occur under both the CEQA No Project and the NEPA No Action alternatives, the resultant model outputs for both scenarios are different because of variations in the way near-term and long-term future operations are characterized for other parameters in the CEQA and NEPA assumptions. As discussed in Chapter 4, the principal difference between the CEQA No Project Alternative and the NEPA No Action Alternative is that the NEPA No Action Alternative includes several potential future water projects in the Sacramento and San Joaquin valleys (e.g.,

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[2] For modeling purposes related to CEQA analytical requirements, OCAP Study 3 (2001 level of development) is used as the foundational study upon which the modeling scenarios for the CEQA No Project Alternative and the CEQA Existing Condition were developed. For modeling purposes related to NEPA analytical requirements, OCAP Study 5 (2020 level of development) is used as the foundational study upon which the modeling scenario for the NEPA No Action Alternative was developed.

CVP/SWP Intertie, FRWP, SDIP and a long-term EWA Program or a program equivalent to the EWA), while the CEQA No Project Alternative does not. Because many of the other assumed conditions for these two scenarios are similar, the longer-term analysis of the NEPA No Action Alternative compared to the NEPA Affected Environment builds upon the nearer-term analysis of the CEQA No Project Alternative compared to the CEQA Existing Condition.

Because the same foundational modeling base (OCAP Study 3) was used to characterize near-term conditions (2001 level of development) both the CEQA No Project Alternative and the CEQA Existing Condition, it was possible to conduct a detailed analysis to quantitatively evaluate the hydrologic changes in the Yuba Region and the CVP/SWP system that would be expected to occur under these conditions Building on this CEQA analysis, the NEPA No Action Alternative compared to the NEPA Affected Environment consists of two components: (1) an analysis of near-term future without project conditions quantified through the CEQA No Project Alternative, relative to the CEQA Existing Condition; and (2) a qualitative analysis of longer-term future without project conditions (the NEPA No Action Alternative). CEQA No Project Alternative Compared to the CEQA Existing Condition

Table 6-12 summarizes groundwater pumping volumes and changes in groundwater storage under the CEQA No Project Alternative and the CEQA Existing Condition. Values are reported based on the average of the 73-year data (long-term annual average) and average of five water year types (wet, above normal, below normal, dry, and critical years).

Table 6-12. Summary Comparison of Groundwater Pumping Volumes and Groundwater Storage Changes Associated with the CEQA No Project Alternative and the CEQA Existing Condition Year Type

	Total Annual Groundwater Pumping (TAF)			Annual Change in Groundwater Storage (TAF)		
	CEQA No Project Alternative	CEQA Existing Condition	Difference	CEQA No Project Alternative	CEQA Existing Condition	Difference
Long-term Annual Average	25	19	6	5	11	-6
Wet	0	0	0	30	30	0
Above Normal	0	0	0	30	30	0
Below Normal	5	0	5	25	30	-5
Dry	60	50	10	-30	-20	-10
Critical	63	52	11	-33	-22	-11

The data presented in Table 6-12 show that during wet and above normal years no pumping would occur under both alternatives. During below normal years, the difference in annual groundwater pumping between the two alternatives would be only 5 TAF. During those years, the lack of groundwater pumping would allow groundwater storage to increase approximately 25 TAF to 30 TAF each year. During drier years, decreases in available surface water supplies or groundwater substitution transfers would result in increased groundwater pumping under each alternative. During dry and critical years, groundwater pumping under the CEQA No Project Alternative would exceed pumping under the CEQA Existing Condition by 10 TAF and 11 TAF, respectively. During those same years, the groundwater storage volume would decrease as a result of the increased pumping under either alternative.

Based on methodology described in Section 6.2.3.2, the long-term annual average values of groundwater storage changes under the CEQA No Project Alternative and the CEQA Existing Condition would be 5 TAF and 11 TAF, respectively, as shown in Table 6-12 and Figure 6-22. These values suggest that the long-term average groundwater storage volume would be approximately 6 TAF less under the CEQA No Project Alternative, compared to the CEQA Existing Condition. The results from the 73-year simulations also indicate that the CEQA No Project Alternative would result in a net groundwater storage increase of 2 TAF compared to a net groundwater storage increase of 146 TAF under the CEQA Existing Condition (Figure 6-23).

Impact 6.2.10-1: Reductions in local groundwater levels and storage to either affect long-term overdraft conditions in the basin or result in short-term adverse third party impacts

Currently, groundwater storage capacity and groundwater levels are above historical lows in the Yuba Basin. Because the anticipated groundwater pumping under both the CEQA No Project Alternative and the CEQA Existing Condition would be within historical ranges, these ranges of pumping would not result in long-term significant or unmitigated impacts to groundwater levels and storage, as described in Section 6.2.3.1. Thus, impacts on groundwater levels and storage, and third-party impacts under each alternative would be less than significant.

Neither of these alternatives would have the adaptive management program that would be implemented under the Yuba Accord Alternative.

Impact 6.2.10-2: Changes in groundwater pumping that could affect groundwater and surface water interactions and result in reduced instream flows in local rivers and streams

As described in Section 6.2.3.2, impacts from the pumping within the range of historical volumes to groundwater and surface water interactions would be less than significant; thus no significant or unmitigated long-term impacts in the Yuba Basin would occur.

Neither of these alternatives would have the adaptive management program that would be implemented under the Yuba Accord Alternative.

Impact 6.2.10-3: Changes in groundwater quality that could degrade conditions and result in exceedance of drinking water or agricultural water quality standards, or result in adverse affects to designated beneficial uses of groundwater

Impacts from the pumping within the range of historical volumes to groundwater quality would be less than significant; thus no significant or unmitigated long-term impacts to groundwater quality in the Yuba Basin would occur.

Neither of these alternatives would have the adaptive management program that would be implemented under the Yuba Accord Alternative.

Impact 6.2.10-4: Increases in groundwater pumping to cause groundwater level reductions that result in permanent land subsidence

As described in Section 6.2.3.4, impacts from the pumping that occur within the range of historical volumes to land subsidence would be less than significant; thus no significant or unmitigated long-term impacts in the Yuba Basin would occur.

Neither of these alternatives would have the adaptive management program that would be implemented under the Yuba Accord Alternative.

6.2.10.1 NEPA No Action Alternative Compared to the NEPA Affected Environment

In the Yuba Region (i.e., Yuba Basin for groundwater resources), differences between the NEPA No Action Alternative and the NEPA Affected Environment include changes in lower Yuba River flows associated with the implementation of the RD-1644 Long-term instream flow requirements, that replace the RD-1644 Interim instream flow requirements, implementation of the Wheatland Project that will increase surface water diversions at Daguerre Point Dam, and groundwater substitution pumping associated with the SVWMP.

In the Yuba Region, differences between the CEQA No Project and the Existing Condition include implementation of RD-1644 Long-term instream flow requirements, and implementation of the Wheatland Project. Therefore, in the Yuba Region, assumptions regarding the volume of groundwater substitution pumping that may occur in the future are the only difference between the NEPA No Action and the CEQA No Project alternatives. Although groundwater substitution transfers may take place under different programs (single-year transfers versus SVWMP), the total volume of groundwater substitution would be similar. Total groundwater pumping volumes are therefore similar for the NEPA No Action Alternative compared to the NEPA Affected Environment, and for the CEQA No Project Alternative compared to the CEQA Existing Condition. Quantitative analysis for the latter is presented in Section 6.2.10.1 above. Impacts on groundwater resources and impact assessments previously presented for the CEQA No Project Alternative relative to the CEQA Existing Condition (Table 6-12) are similar to the comparison of the NEPA No Action Alternative relative to the NEPA Affected Environment, and are not repeated here.

6.2.11 Environmental Impacts/Environmental Consequences of the NEPA Yuba Accord Alternative Compared to the NEPA No Action Alternative

Table 6-13 summarizes groundwater pumping volumes and changes in groundwater storage under the NEPA Yuba Accord Alternative and the NEPA No Action Alternative. Values are reported based on the average of the 73-year data (long-term annual average) and average of five water year types (wet, above normal, below normal, dry, and critical years).

The data summarized in Table 6-13 show that during wet and above normal years groundwater pumping would be negligible for both alternatives. During those years, groundwater storage would increase by approximately 30 TAF due to natural recharge. During drier years, groundwater pumping would increase under both alternatives. During below normal years, average annual pumping under the NEPA No Action Alternative would exceed annual pumping by 5 TAF under the NEPA Yuba Accord Alternative. Average annual groundwater pumping during dry and critical years would be approximately 73 TAF and 69 TAF, respectively, under the NEPA Yuba Accord Alternative compared to approximately 60 TAF and 58 TAF under the NEPA No Action Alternative. During dry and critical years, the increased pumping under both alternatives would cause a net decrease in groundwater storage.

Table 6-13. Summary Comparison of Groundwater Pumping Volumes and Groundwater Storage with the NEPA Yuba Accord Alternative and NEPA No Action Alternative

Year Type	Total Annual Groundwater Pumping (TAF)			Annual Change in Groundwater Storage (TAF)		
	NEPA Yuba Accord Alternative	NEPA No Action Alternative	Difference	NEPA Yuba Accord Alternative	NEPA No Action Alternative	Difference
Long-term Annual Average	31	27	4	-1	3	-4
Wet	1	0	1	29	30	-1
Above Normal	0	0	0	30	30	0
Below Normal	15	20	-5	15	10	5
Dry	73	60	13	-43	-30	-13
Critical	69	58	11	-39	-28	-11

Based on methodology described in Section 6.2.3.2, the long-term annual average values of groundwater storage changes under the NEPA Yuba Accord Alternative and NEPA No Action Alternative would be -1 TAF and 3 TAF, respectively, as shown in Table 6-13 and in Figure 6-22. These values suggest that on average groundwater storage would be approximately 4 TAF less under the NEPA Yuba Accord Alternative, compared to the NEPA No Action Alternative. The results from the 73-year simulations also indicate that the NEPA Yuba Accord Alternative would result in a net groundwater storage decrease of 68 TAF compared to a net groundwater storage increase of 51 TAF under the NEPA No Action Alternative (Figure 6-23).

Impact 6.2.11-1: Reductions in local groundwater levels and storage to either affect long-term overdraft conditions in the basin or result in short-term adverse third party impacts

Currently, groundwater storage capacity and water levels are above historical lows in the Yuba Basin. Because the anticipated groundwater pumping under both the NEPA Yuba Accord Alternative and the NEPA No Action Alternative would be within historical ranges, impacts from these ranges of pumping to groundwater levels and storage, and third-party impacts would be less than significant, as described in Section 6.2.3.1. No significant or unmitigated long-term impacts in the Yuba Basin would occur under either alternative.

Because both alternatives would result in less than significant impacts to groundwater levels and storage, and third-parties, the NEPA Yuba Accord Alternative is preferred because it would include self-mitigating measures and the adaptive management program that would minimize and avoid any unanticipated short-term impacts.

Impact 6.2.11-2: Changes in groundwater pumping that could affect groundwater and surface water interactions and result in reduced instream flows in local rivers and streams

As described in Section 6.2.3.2, impacts from these ranges of pumping to groundwater and surface water interactions would be less than significant; thus no significant or unmitigated long-term impacts in the Yuba Basin would occur.

Because both alternatives would result in less than significant impacts, the NEPA Yuba Accord Alternative is preferred because it would include self-mitigating measures and the adaptive management program that would minimize and avoid any unanticipated impacts.

Impact 6.2.11-3: Changes in groundwater quality that could degrade conditions and result in exceedance of drinking water or agricultural water quality standards, or result in adverse affects to designated beneficial uses of groundwater

Impacts from the anticipated ranges of pumping under each alternative to groundwater quality would be less than significant; thus no significant or unmitigated long-term impacts to groundwater quality in the Yuba Basin would occur.

Because both alternatives would result in less than significant impacts, the NEPA Yuba Accord Alternative is preferred because it would include self-mitigating measures and the adaptive management program that would be implemented to minimize and avoid any unanticipated impacts.

Impact 6.2.11-4: Increases in groundwater pumping to cause groundwater level reductions that result in permanent land subsidence

As described in Section 6.2.3.4, impacts from the pumping within historical volumes to land subsidence would be less than significant; thus no significant or unmitigated long-term impacts in the Yuba Basin would be anticipated.

Because both alternatives would result in less than significant impacts, the NEPA Yuba Accord Alternative is preferred because it would include self-mitigating measures and the adaptive management program that would be implemented to minimize and avoid any unanticipated impacts.

6.2.12 Environmental Impacts/Environmental Consequences of the NEPA Modified Flow Alternative Compared to the NEPA No Action Alternative

Table 6-14 summarizes groundwater pumping volumes and changes in groundwater storage associated with the NEPA Modified Flow Alternative and NEPA No Action Alternative. Values are reported based on the average of the 73-year data (long-term annual average) and average of five water year types (wet, above normal, below normal, dry, and critical years).

Table 6-14. Summary Comparison of Groundwater Pumping Volumes and Groundwater Storage with the NEPA Modified Flow Alternative and NEPA No Action Alternative

Year Type	Total Annual Groundwater Pumping (TAF)			Annual Change in Groundwater Storage (TAF)		
	NEPA Modified Flow Alternative	NEPA No Action Alternative	Difference	NEPA Modified Flow Alternative	NEPA No Action Alternative	Difference
Long-term Annual Average	25	27	-2	5	3	2
Wet	0	0	0	30	30	0
Above Normal	0	0	0	30	30	0
Below Normal	15	10	-5	15	10	5
Dry	61	60	1	-31	-30	-1
Critical	54	58	-4	-24	-28	4

The data shown in Table 6-14 indicate that, for wet and above normal water years, no groundwater pumping would occur under either alternative. During those years, groundwater storage would increase approximately 30 TAF due to natural recharge. Groundwater pumping would increase during below normal, dry, and critical years in both alternatives. During dry and critical years, the differences in groundwater pumping between the two alternatives would be negligible. During below normal years, the NEPA Modified Flow Alternative would result in approximately 5 TAF more pumping compared to the NEPA Modified Flow Alternative. On average, groundwater storage would increase approximately 15 TAF and 10 TAF for the NEPA Modified Flow and NEPA No Action Alternatives, respectively, during below normal years. During dry and critical years, groundwater storage would experience a net decline of up to 31 TAF under the NEPA Modified Alternative and up to 30 TAF under the NEPA No Action Alternative.

Based on methodology described in Section 6.2.3.2, the long-term annual average groundwater storage changes under the NEPA Modified Flow Alternative and NEPA No Action Alternative would be 5 TAF and 3 TAF, respectively, as shown in Table 6-14 and in Figure 6-22. These values suggest that the long-term annual average volume of groundwater storage would be approximately 2 TAF less with the NEPA Yuba Accord Alternative, compared to the NEPA Modified Flow Alternative. The results from the 73-year simulations also indicate that the NEPA Modified Flow Alternative would result in a net groundwater storage increase of 75 TAF compared to 51 TAF under the NEPA No Action Alternative (Figure 6-23).

Impact 6.2.12-1: Reductions in local groundwater levels and storage to either affect long-term overdraft conditions in the basin or result in short-term adverse third party impacts

Currently, groundwater storage capacity and water levels are above historical lows in the Yuba Basin. Because the anticipated groundwater pumping for both the NEPA Modified Flow Alternative and the NEPA No Action Alternative would be within historical ranges, no long-term significant or unmitigated impacts to groundwater storage or water levels would be anticipated under either alternative, as described in Section 6.2.3.1. Impacts on groundwater levels and storage, and third-party impacts under each alternative would be less than significant.

Neither of these alternatives would have the adaptive management program that would be implemented under the Yuba Accord Alternative.

Impact 6.2.12-2: Changes in groundwater pumping that could affect groundwater and surface water interactions and result in reduced instream flows in local rivers and streams

As described in Section 6.2.3.2, impacts from pumping within historical ranges to groundwater and surface water interactions would be less than significant; thus no significant or unmitigated long-term impacts in the Yuba Basin would occur.

Neither of these alternatives would have the adaptive management program that would be implemented under the Yuba Accord Alternative.

Impact 6.2.12-3: Changes in groundwater quality that could degrade conditions and result in exceedance of drinking water or agricultural water quality standards, or result in adverse affects to designated beneficial uses of groundwater

Impacts from the anticipated pumping under each alternative to groundwater quality would be less than significant; thus no significant or unmitigated long-term impacts in the Yuba Basin would occur.

Neither of these alternatives would have the adaptive management program that would be implemented under the Yuba Accord Alternative.

Impact 6.2.12-4: Increases in groundwater pumping to cause groundwater level reductions that result in permanent land subsidence

As described in Section 6.2.3.4, impacts from the ranges of pumping under both alternatives to land subsidence would be less than significant; thus no significant or unmitigated long-term impacts in the Yuba Basin would occur.

Neither of these alternatives would have the adaptive management program that would be implemented under the Yuba Accord Alternative.

6.3 CUMULATIVE IMPACTS

Hydrologic modeling was used to evaluate the cumulative effects of the Yuba Accord Alternative and other likely changes in CVP/SWP operations on hydrology and water supply. The proposed projects that have been adequately defined (e.g., in recent project-level environmental documents or CALSIM II modeling) and that have the potential to contribute to cumulative impacts are included in the quantitative assessment of the Yuba Accord's impacts. For analytical purposes of this EIR/EIS, the projects that are considered well defined and "reasonably foreseeable" are described in Chapter 21. Additionally, the assumptions used to categorize future hydrologic cumulative conditions that are quantitatively simulated using CALSIM II and the post-processing tools are presented in Appendix D. To the extent feasible, potential cumulative impacts on resources dependent on hydrology or water supply (e.g., reservoir surface elevations) are analyzed quantitatively. Because several projects cannot be accurately characterized for hydrologic modeling purposes at this time, either due to the nature of the particular project or because specific operations details are only in the preliminary phases of development, these projects are evaluated qualitatively.

Only those projects that could affect surface water quality are included in the qualitative evaluation that is presented in subsequent sections of this chapter. Although most of the proposed projects described in Chapter 21 could have project-specific impacts that will be addressed in future project-specific environmental documentation, future implementation of these projects is not expected to result in cumulative impacts to regional water supply operations, or water-related and water dependent resources that also could be affected by the Proposed Project/Action or an action alternative (see Chapter 21). For this reason, only the limited number of projects with the potential to cumulatively impact groundwater resources in the project study area are specifically considered qualitatively in the cumulative impacts analysis for groundwater resources. These projects are:

- ***Projects Related to Changes in CVP/SWP System Operations***
  - CVP/SWP Integration Proposition
  - San Joaquin River Restoration Settlement Act (Friant Settlement Legislation)
  - City of Stockton Delta Water Supply Project
- ***Groundwater Banking Projects***
  - South-of-Delta Water Banking: Madera Irrigation District Water Banking Project
  - South-of-Delta Water Banking: Semitropic Water Storage District Groundwater Banking Project

These projects are described in Chapter 21 and qualitatively addressed below. Reasonably foreseeable projects and actions within the local study area (Yuba Basin) that could potentially affect groundwater resources are:

- YCWA Groundwater Management Plan
- Yuba River Development Project FERC Relicensing
- The Wheatland Project
- Sacramento Valley Water Management Program (SVWMP)
- Land Use Changes in the South Yuba Subbasin along the Feather River and Resulting Changes in M&I Demand

These local projects and actions could affect water supply and management either through changing the available surface water supply and in turn changing the demand on groundwater. Potential impacts associated with these projects and actions are discussed qualitatively in Section 6.3.

6.3.1 ENVIRONMENTAL IMPACTS/ENVIRONMENTAL CONSEQUENCES OF THE YUBA ACCORD ALTERNATIVE CUMULATIVE CONDITION COMPARED TO THE EXISTING CONDITION

For CEQA, the purpose of the cumulative analysis is to determine whether the incremental effects of the Proposed Project/Action would be expected to be "cumulatively considerable" when viewed in connection with the effects of past projects, other current projects, and probable future projects (Public Resources Code Section 21083, subdivision (b)(2)).3 The following sections describe this analysis for each type of project discussed above.

For NEPA, the scope of an EIS must include "Cumulative actions, which when viewed with other proposed actions have cumulatively significant impacts and should therefore be discussed in the same impact statement (40 CFR, §1508.25(a)(2)).

Because the CEQ regulations for implementing NEPA and the CEQA guidelines contain very similar requirements for analyzing, and definitions of, cumulative impacts, the discussions of cumulative impacts of the Yuba Accord Alternative Cumulative Condition relative to the Existing Condition will be the basis for evaluation of cumulative impacts for both CEQA and

[3] The "*Guide to the California Environmental Quality Act*" (Remy *et. al.* 1999) states that "*…although a project may cause an "individually limited" or "individually minor" incremental impact that, by itself, is not significant, the increment may be "cumulatively considerable", and thus significant, when viewed against the backdrop of past, present, and probable future projects*." (CEQA Guidelines, § 15064, subd. (i)(l), 15065, subd. (c), 15355, subd. (b)).

NEPA. In addition, an analysis of the Modified Flow Alternative Cumulative Condition relative to the Existing Condition is provided to fulfill NEPA requirements.

The following sections describe this analysis for the projects discussed in Section 6.3 above.

6.3.1.1 PROJECTS RELATED TO CVP/SWP SYSTEM OPERATIONS

Changes in CVP/SWP system operations could potentially change water allocations and deliveries and in turn could result in changes in groundwater pumping in the CVP/SWP service area. The Yuba Accord Alternative would not adversely affect these long-term project water supplies. Because groundwater pumping under the Yuba Accord Alternative would occur only within historical ranges, the incremental effects of the Yuba Accord Alternative would be expected to be less than cumulatively considerable when viewed in connection with the effects of CVP/SWP system operations.

6.3.1.2 WATER TRANSFER AND ACQUISITION PROGRAMS

Future groundwater transfers and acquisitions under the Yuba Accord Alternative, including water transfers to EWA, are anticipated to be within the ranges of historical groundwater pumping volumes. Therefore, the incremental effects of the Yuba Accord Alternative are expected to be less than cumulatively considerable when viewed in connection with the effects of future water transfer programs.

6.3.1.3 GROUNDWATER BANKING PROJECTS

Groundwater banking projects could change groundwater pumping operations and demand on surface water especially in the areas where groundwater banking projects take place. Because groundwater pumping under the Yuba Accord Alternative would be within historical volumes, it is unlikely that the Yuba Accord Alternative under cumulative conditions would present a risk to groundwater resources operations. Therefore, the overall incremental effects of the Yuba Accord Alternative when viewed with groundwater banking projects would be expected to be less than cumulatively considerable, resulting in a less than significant impact on the groundwater resources.

6.3.1.4 LOCAL PROJECTS IN THE YUBA REGION

As discussed qualitatively below, potential cumulative impacts of the projects identified in the Yuba Region (Yuba Basin) would be less than cumulatively considerable.

- *YCWA Groundwater Management Plan:* As part of the YCWA's Groundwater Management Plan, the Yuba Basin will be monitored for the long-term health of the Yuba Basin for the following four measurement and monitoring categories: (1) groundwater levels and storage, (2) groundwater quality, (3) inelastic subsidence, and (4) groundwater and surface water interactions. Actions taken under the YCWA GMP will complement future groundwater activities under the Yuba Accord Alternative. The monitoring and measurement program adopted in the GMP provides a framework for observing impacts during the Yuba Accord implementation. Therefore, it is anticipated that the Yuba Accord Alternative when viewed in connection with the

YCWA GMP would have a positive impact on groundwater resources in the Yuba Basin.

- *Yuba River Development Project FERC Relicensing:* Through the relicensing process, FERC may impose new regulatory constraints on the Yuba Project, which could affect New Bullards Bar Reservoir operations and YCWA's ability to implement groundwater transfers. However, future groundwater transfers under the Yuba Accord Alternative are anticipated to be within historical volumes. Therefore, the incremental effects of the Yuba Accord Alternative under cumulative conditions would be less than cumulatively considerable.

- *The Wheatland Project:* The Wheatland Project is included in the quantitative assessment of impacts on groundwater resources. Potential impacts to groundwater resources in the local study area were previously discussed quantitatively for the CEQA and NEPA comparative scenarios in Sections 6.2.6 through 6.2.12.

- *The Sacramento Valley Water Management Program:* The SVWMP is under development and in the process of completing separate environmental documentation for CEQA and NEPA regulatory compliance purposes. Groundwater substitution pumping within the local study area for the SVWMP is included in the quantitative assessment of impacts. Potential impacts to groundwater resources in the local study area were previously discussed quantitatively for the CEQA and NEPA comparative scenarios in Sections 6.2.6 through 6.2.12.
- *Land Use Changes in the South Yuba Subbasin along the Feather River and Resulting Changes in M&I Demand:* Land use changes in the South Yuba Subbasin along the Feather River and resulting changes in M&I demand could have effects on groundwater pumping in the Yuba Basin. Yuba County is anticipated to experience significant urban development during the next 10 to 15 years. The majority of new development will occur in the South Yuba Subbasin in the Linda/Olivehurst/Plumas Lake areas. Based on the projected land use conversions from existing irrigated land to urban, the total increase in annual demand for municipal water supply within these areas is estimated to be 30 TAF (SWRCB 2000). In the absence of treated surface water supplies, this demand would be met by groundwater pumping. However, 40 TAF per year less groundwater will be pumped in the WWD in the future, and because existing groundwater pumping for irrigation in the Linda/Olivehurst/Plumas Lake areas will stop when the irrigated land is converted to urban uses, the projected 30 TAF increase in groundwater pumping to meet M&I demands will not cause any net effect on groundwater levels or groundwater storage. Therefore, the impacts of land use changes and resulting M&I demand on groundwater would be less than cumulatively considerable, resulting in a less than significant impact on groundwater resources.

6.3.1.5 Other Cumulative Groundwater Resources Impact Considerations

The quantitative operations-related groundwater resources impact considerations for the CEQA Yuba Accord Alternative, relative to the CEQA Existing Condition, are discussed in Section 6.2.8. Potential impacts identified in Section 6.2.8 are summarized below and provide an indication of the potential incremental contributions of the Yuba Accord Alternative to cumulative impacts. These potential impacts are:

- Impact 6.2.8-1: Reductions in local groundwater levels and storage to either affect long-term overdraft conditions in the basin or result in short-term adverse third party impacts – Less than Significant

- Impact 6.2.8-2: Changes in groundwater pumping that could affect groundwater and surface water interactions and result in reduced instream flows in local rivers and streams – Less than Significant

- Impact 6.2.8-3: Changes in groundwater quality that could degrade conditions and result in exceedance of drinking water or agricultural water quality standards, or result in adverse affects to designated beneficial uses of groundwater – Less than Significant

- Impact 6.2.8-4: Increases in groundwater pumping to cause groundwater level reductions that result in permanent land subsidence – Less than Significant

Although all of these impacts would be less than significant, the potential nevertheless exists for cumulative impacts. Cumulative impact determinations are presented below, and are based upon consideration of the quantified Yuba Accord Alternative impacts relative to the CEQA Existing Condition, in combination with the potential impacts of other reasonably foreseeable projects. These cumulative impact determinations are summarized below by region.

6.3.1.6 *Potential for Cumulative Groundwater Resources Impacts within the Project Study Area*

As discussed above, potential impacts to groundwater resources from the projects related to the CVP/SWP system operations, water transfer and acquisition programs, and groundwater banking projects would be less than cumulatively considerable. Groundwater substitution activities associated with the Yuba Accord Alternative would occur only in the Member Unit service areas within the Yuba County, and large scale projects and programs in the CVP/SWP Upstream of the Delta Region, the Delta Region, and the Export Service Area would not affect local groundwater resources in the Yuba Region. Therefore, only the projects and actions within the Yuba Region are discussed below.

Impact 6.3.1.6-1 Potential for significant cumulative groundwater resources impacts within the Yuba Basin

For the assessment of impacts on groundwater resources, YCWA GMP, Yuba River Development Project FERC Relicensing, and changes in M&I demands due to land use changes in the South Yuba Subbasin along the Feather River are specifically considered qualitatively for the Yuba Accord Alternative Cumulative Condition compared to the Existing Condition. As discussed above qualitatively (Section 6.3), the overall cumulative effects of these projects on groundwater resources in the Yuba Basin would be minor. Therefore, the impacts on groundwater resources in the Yuba Basin under the Yuba Accord Alternative Cumulative Condition compared to the Existing Condition would be less than significant.

Of the projects identified in the Yuba Region, potential impacts of groundwater pumping due to the Wheatland Project and SVWMP were previously discussed quantitatively for the CEQA and NEPA comparative scenarios in Sections 6.2.6 through 6.2.12.

6.3.2 ENVIRONMENTAL IMPACTS/ENVIRONMENTAL CONSEQUENCES OF THE MODIFIED FLOW ALTERNATIVE CUMULATIVE CONDITION COMPARED TO THE EXISTING CONDITION

It is anticipated that the Modified Flow Alternative Cumulative Condition will have the same potential for cumulative impacts as the Yuba Accord Alternative Cumulative Condition. Therefore, the description of the potential impacts in Section 6.3.1 also serves as the description of cumulative impacts associated with the Modified Flow Alternative.

6.4 MITIGATION MEASURES/ENVIRONMENTAL COMMITMENTS

As discussed above, no adverse effects would occur to groundwater resources under the Proposed Project/Action or an action alternative and, thus, no mitigation measures are required. Anticipated future groundwater pumping conditions under the Proposed Project/Action or an action alternative would be within historical groundwater pumping volumes, and would not result in long-term impacts on groundwater resources and would not result in unmitigated third-party impacts to other groundwater users within the Yuba Basin.

During the implementation of groundwater substitution transfers under the Yuba Accord Alternative, YCWA would participate in close monitoring of the groundwater basin. As stated in the EWA Final EIS/EIR released in January 2004, future groundwater transfers to the EWA require an established measurement and monitoring program for groundwater levels and storage, groundwater quality, land subsidence, and groundwater and surface water interactions (EWA 2004). Monitoring and measurement requirements and the associated adaptive management strategy discussed in the next paragraph during transfers together would reduce unforeseeable impacts to less than significant levels.

During the implementation of the Yuba Accord Alternative, if monitoring results indicate any potential short-term significant impacts, YCWA would implement a rapid response program to mitigate the impacts. Under the Yuba Accord Alternative, YCWA also would implement the adaptive management program for future planning of transfers based on the changing conditions of the basin during previous transfers. The adaptive management program would change the location and volume of transfer pumping to avoid adverse impacts to the basin and other groundwater users in the basin.

6.5 POTENTIALLY SIGNIFICANT UNAVOIDABLE IMPACTS

Table 6-15 summarizes the results of the impact assessments discussed in Sections 6.2.6 through 6.2.12. In Table 6-15, significance levels are reported by the impact indicators. Overall, there are no potentially significant unavoidable impacts to groundwater resources associated with the implementation of the Proposed Project/Action or an action alternative. As shown in Table 6-15, for both CEQA and NEPA purposes, the Yuba Accord Alternative would result in less than significant impacts compared to the bases of comparison. The Yuba Accord Alternative would be preferred over the other alternatives because it would offer significant beneficial effects with regards to the Yuba Basin's long-term health conditions, as discussed previously in Section 6.2.3. Similarly, potential impacts under the Modified Flow Alternative also would be less than significant.

Table 6-15. Summary of Significance Levels for Impact Indicators for the Comparisons of the CEQA and NEPA Alternatives

Comparisons of the CEQA and NEPA Alternatives	Impact Indicator			
	Groundwater Levels and Storage	Groundwater and Surface Water Interactions	Groundwater Quality	Land Subsidence
CEQA Yuba Accord Alternative Compared to CEQA No Project Alternative	B, LTS	B, LTS	B, LTS	B, LTS
CEQA Modified Flow Alternative Compared to CEQA No Project Alternative	LTS	LTS	LTS	LTS
CEQA Yuba Accord Alternative Compared to CEQA Existing Condition	B, LTS	B, LTS	B, LTS	B, LTS
CEQA Modified Flow Alternative Compared to CEQA Existing Condition	LTS	LTS	LTS	LTS
CEQA No Project Alternative Compared to CEQA Existing Condition	LTS	LTS	LTS	LTS
NEPA No Action Alternative Compared to NEPA Affected Environment	LTS	LTS	LTS	LTS
NEPA Yuba Accord Alternative Compared to NEPA No Action Alternative	B, LTS	B, LTS	B, LTS	B, LTS
NEPA Modified Flow Alternative Compared to NEPA No Action Alternative	LTS	LTS	LTS	LTS
Key: B - Beneficial Impact LTS - Less Than Significant				

CHAPTER 7
POWER PRODUCTION AND ENERGY CONSUMPTION

Hydroelectric facilities generate a significant portion of California's energy requirements. Private electric utilities and water agencies own and operate reservoirs that store and release water to generate hydroelectric power. Electric utilities produce power for their customers, while water agencies produce power for their own use and market the excess to electric utilities, government and public installations, and commercial customers.

Chapter 7 describes how and when electricity is generated at hydropower facilities within the project study area and assesses how the Proposed Project/Action and alternatives would benefit or adversely affect this resource.

7.1 ENVIRONMENTAL SETTING/AFFECTED ENVIRONMENT

Because of the coordinated operations of CVP and SWP water projects in California, where management decisions or alterations in one basin may directly impact the operations of projects in other basins, the Proposed Project/Action and alternatives evaluated in this EIR/EIS have the potential to affect hydropower resources and power consumption in several watersheds. The local environmental setting includes a description of hydropower resources within the Yuba Region, which is followed by a general discussion of CVP and SWP hydropower facilities, seasonal generating characteristics and CVP/SWP power customers and descriptions of hydropower facilities specific to the CVP/SWP Upstream of the Delta Region (e.g., the Sacramento, Feather, and American rivers), the Delta Region and the Export Service Area. The hydroelectric facilities included in the project study area are listed below by region and river in **Table 7-1**.

Table 7-1. Hydroelectric and Pumping Plant Facilities Located in the Project Study Area

Location	Facility		Operator
Yuba Region			
Yuba River	New Bullards Bar Dam	New Colgate Powerhouse	YCWA
Yuba River	New Bullards Bar Dam and Reservoir	Fish Release Powerhouse	YCWA
Yuba River	Englebright Dam	Narrows I Powerhouse	PG&E
Yuba River	Englebright Dam	Narrows II Powerhouse	YCWA
CVP/SWP Upstream of the Delta Region			
Sacramento River	Shasta Dam	Shasta Power Plant	Reclamation (CVP)
Sacramento River	Keswick Dam	Keswick Power Plant	Reclamation (CVP)
Feather River	Oroville Dam	Hyatt-Thermalito Power Plant Complex	DWR (SWP)
Delta Region			
South Delta	Banks Pumping Plant		DWR (SWP)
North Delta	Barker Slough Pumping Plant		DWR (SWP)
South Delta	Jones Pumping Plant		Reclamation (CVP)
Export Service Area			
California Aqueduct	O'Neill Forebay/San Luis Reservoir	O'Neil Pumping-Generating Plant	Reclamation (CVP)
Delta-Mendota Canal	O'Neill Forebay/San Luis Reservoir	William R. Gianelli Pumping-Generating Plant	Joint CVP/SWP Facility

7.1.1 YUBA REGION

Hydroelectric facilities on the Yuba River include New Colgate Powerhouse and the Fish Release Powerhouse, both of which are associated with New Bullards Bar Dam, and Narrows I and II powerhouses associated with Englebright Dam. The locations of these facilities are shown on Figure 5-1.

7.1.1.1 NEW COLGATE POWERHOUSE AND FISH RELEASE POWERHOUSE

New Bullards Bar Dam and New Colgate Powerhouse are parts of the Yuba Project, which was constructed by YCWA to provide flood control protection for Yuba and Sutter counties, irrigation water for Yuba County agriculture, recreation, and hydropower generation. The New Colgate Powerhouse is located below the confluence of the Middle and North Yuba rivers, about 5 miles downstream of New Bullards Bar Dam. The New Colgate Powerhouse receives water through the New Colgate tunnel and penstock from New Bullards Bar Reservoir. The maximum release capacity of the New Colgate Powerhouse is 3,700 cfs and the total generating capacity of the twin turbines is 315 MW. Average annual generation for the New Colgate Powerhouse is 1,314,000 MWh.

YCWA has a contract with PG&E through 2016 regarding power generation at the New Colgate and Narrows II powerhouses. The power purchase contract between YCWA and PG&E is described in Section 7.1.3.2. The power purchase contract provides funds for payments on project bonds and operation and maintenance, with the exception of recreation. The power purchase contract describes the formal operating agreement between YCWA and PG&E, and YCWA and PG&E collaborate closely to operate New Bullards Bar and Englebright reservoirs, and the three powerhouses associated with these reservoirs. YCWA and PG&E operate outside the specific operating provisions agreement of the power purchase contract when such operations benefit both parties; however, this past practice is not binding on any future operations.

While the amounts of seasonal and total daily releases from the New Colgate Powerhouse are typically driven by downstream demands, the short-term scheduling of releases is determined by power generation needs. Hourly releases are scheduled to meet demands of PG&E customers, and to regulate loads on the PG&E grid. Re-regulation of variable flows from the New Colgate Powerhouse at Englebright Reservoir allows more uniform releases from the Narrows I and Narrows II powerhouses to the lower Yuba River.

In addition to New Colgate Powerhouse, YCWA constructed the Fish Release Powerhouse in 1986 at the base of New Bullards Bar Dam. This facility generates power from water released through the lower dam outlet that is used for fishery maintenance in the North Yuba River. The Fish Release Powerhouse has a capacity of 150 kilowatts, which is sufficient to operate the spillway gates of New Bullards Bar Dam in the event of a power outage. The powerhouse generates about 1,300 MWh of electricity per year.[1]

[1] YCWA also owns the Deadwood Creek Powerhouse, which is a 2 MW facility located at the upper end of the New Bullards Bar Reservoir. The powerhouse went into service in 1993 and generates about 5,100 MWh of electricity per year. The tailrace of the Deadwood Creek Powerhouse is above New Bullards Bar Reservoir, so it lies outside of the designated local study area.

7.1.1.2 *NARROWS I AND II POWERHOUSES*

Englebright Dam, which is located about 10 miles downstream of New Colgate Powerhouse, was built in 1941 by the Corps. Its original purpose was to keep upstream hydraulic gold mining debris out of the lower reaches of the river. Two tunnels at the dam convey water to the turbines that generate electricity at the Narrows I and Narrows II powerhouses, which are located on opposite sides of the river.

Narrows I Powerhouse, constructed in 1942, is owned and operated by PG&E. The Narrows I Powerhouse has a discharge capacity of approximately 730 cfs and a bypass flow capacity (when the generator is not operating) of 540 cfs. The powerhouse has a generating capacity of 12 MW and produces an average of 45,600 MWh of electricity per year.

Narrows II Powerhouse, located about 400 feet downstream of Englebright Dam, was constructed in 1970 as part of the Yuba Project (FERC No. 2246). The powerhouse is owned and operated by YCWA. At full load and full head (235.0 feet gross head), the Narrows II Powerhouse has a discharge capacity of about 3,400 cfs; however, when the turbines go off-line, flow must be routed through a bypass system with a maximum release capacity of about 3,000 cfs. The powerhouse has a generating capacity of about 50 MW, and produces an average 248,000 MWh of electricity per year.

YCWA and PG&E coordinate the operations of the Narrows I and Narrows II powerhouses for hydropower efficiency and to maintain a relatively constant flow in the lower Yuba River. The Narrows I Powerhouse typically is used for low flow reservoir releases (less than 730 cfs), or to supplement the Narrows II Powerhouse capacity when high-flow reservoir releases are occurring.

Annual maintenance requires the Narrows II Powerhouse to be shut down for a two to three week period, or longer if major maintenance is performed. Maintenance is typically scheduled for the beginning of September, when Narrows I can discharge the total reservoir release, or during the winter months when cold water can be spilled over the dam. The Narrows II Bypass Project, which recently was completed, has a 3,000 cfs bypass capacity for the Narrows II Powerhouse that can be used during maintenance and emergency shutdowns.

7.1.1.3 *GROUNDWATER PUMPING*

Groundwater pumping for agricultural use within the Yuba Region is also described in Chapters 6, 15, and 17.

7.1.2 CVP/SWP SYSTEM

The area of analysis used to evaluate the potential effects of the Proposed Project/Action and alternatives on hydropower generation and electrical energy consumption includes CVP/SWP hydroelectric facilities located in the following regions: (1) CVP/SWP Upstream of the Delta Region (i.e., the Sacramento and Feather rivers); (2) the Delta Region; and (3) the Export Service Area.

Both the CVP and SWP rely on their hydroelectric facilities to reduce the cost of operations and maintenance and to repay the capital costs of the projects. Hydropower from the CVP/SWP is an important renewable energy source and comprises approximately 36 percent of the total online capacity of California hydroelectric facilities. Overall, CVP/SWP hydroelectric facilities comprise nearly 7 percent of the total online capacity of all California power plants.

CVP power is a source of electricity for CVP pumping facilities throughout the Central Valley and the Delta, and for many of California's communities. The Western Area Power Administration (Western) sells excess CVP capacity and energy (supplementary to CVP internal needs) to municipal utilities, irrigation districts, and institutions and facilities such as schools, prisons, and military bases. Both CVP and SWP sell power at rates designed to recover costs. For the CVP, these rates historically have been slightly below market rates. Revenue from Western power sales is an important funding source for the CVP Restoration Fund and for repaying project debt incurred during construction of the CVP.

The SWP uses its power primarily to run the pumps that move SWP water to agricultural and municipal users and to provide peak power to California utilities. SWP long-term power contracts act as exchange agreements with utility companies. These exchange agreements allow the SWP and utilities to integrate the uses of their individual power resources in a mutually beneficial manner. In these agreements, the SWP provides on-peak energy to the utilities in exchange for the return of a greater amount of mid-peak and off-peak energy. The SWP also may receive other compensation in the form of annual monetary payments and/or reduced transmission service rates for SWP facilities served by the utility. Except during surplus conditions in extremely wet years, all SWP power is used for peak power exchange agreements and to operate pumping facilities. In all years, the SWP must purchase additional power to meet some of its pumping requirements.

Due to the integrated nature of the CVP and SWP power generation facilities throughout the various study areas, the CVP and SWP systems will be evaluated as a whole, rather than by region.

7.1.2.1 CVP HYDROPOWER SYSTEM

Hydropower generation at CVP facilities substantively contributes to the reliability of California's electrical power system. The CVP hydropower system contains eight power plants and two pump-generating plants (**Table 7-2**). This system is fully integrated with the Northern California power system and provides a significant portion of the hydropower available for use in central and northern California. The installed capacity of the system is 2,044 MW (Reclamation 2001). In comparison, the combined capacity of the 368 operational hydroelectric power plants in California is 12,866 MW. The area's major power supplier, PG&E, has a generating capacity from all sources of over 20,000 MW.

Hydropower produced at CVP facilities is first used to meet the power needs at CVP pumping plants (Project Use). In the past, Project Use load has consumed approximately 20 to 30 percent of the 4,600,000 MWh average annual gross energy generation of the CVP. The average annual energy consumption of the major CVP pumping facilities is presented in **Table 7-3**.

Hydropower not used at CVP facilities is allocated based on classification as First Preference customers or Preference customers. First Preference customers are customers wholly located in Trinity, Calaveras, or Tuolumne counties, as specified under the Trinity River Diversion Act (69 Stat. 719), and the New Melones provisions of the Flood Control Act of 1962 (76 Stat. 1173, 1191-1192). Under both statutes, the customers of these counties are entitled to 25 percent of the additional CVP energy resulting from the operational integration of their specific unit or division into the CVP.

Table 7-2. Hydropower Facilities of the Central Valley Project

Unit	Maximum Generating Capacity (MW)
Sacramento River Service Area	
Carr [a]	154
Keswick	105
Shasta	629
Spring Creek [a]	200
Trinity [a]	140
Subtotal	*1,228*
American River Service Area	
Folsom	215
Nimbus	14
Subtotal	*229*
Delta Export and San Joaquin Valley	
New Melones [a]	383
O'Neill [b]	29
San Luis [b,c]	202
Subtotal	*614*
Total	**2,071**

[a] CVP power plants unaffected by Yuba Accord.
[b] Pump-generating plant.
[c] Jointly owned, pumping and generating facility. Federal share only.
Source: (Western 2002; Western 2003; Western 2004)

Table 7-3. Major Pumping Plants of the Central Valley Project

Unit	Annual Energy Use (MWh)
Sacramento River Service Area	
Tehama-Colusa Canal	7,900
Corning Canal	5,200
Subtotal	*13,100*
American River Service Area	
Folsom Pumping Plant	1,041
Delta Export and San Joaquin Valley	
Contra Costa Canal	18,908
Dos Amigos [b]	180,146 [a]
O'Neill [b]	87,185 [a]
San Luis [b]	306,225 [a]
Jones	620,712
Subtotal	*1,213,176*
Total	**1,227,317**

[a] Federal energy use.
[b] Joint state-federal facility.
Source: (Reclamation 2001)

Preference Customers are those who have contracts subject to the requirements of Reclamation law, which provides that preference in the sale of federal power shall be given to municipalities and other public corporations or agencies and also to cooperatives and other nonprofit organizations financed in whole or in part by loans made pursuant to the Rural Electrification Act of 1936.

Western is the marketing agency for power generated at Reclamation's CVP facilities. Created in 1977 under the Department of Energy Organization Act, Western markets and transmits electric power throughout 15 western states. Western's Sierra Nevada Customer Service Region annually markets approximately 8,000 MWh, including 3,000 MWh produced by CVP generation and 5,000 MWh produced by other sources. Western's mission is to sell and deliver electricity that is excess to project use (power required for CVP operations). Western's power marketing responsibility includes managing the federal transmission system and, as a federal agency, ensuring that operations of the hydropower facilities are consistent with its regulatory responsibilities.

7.1.2.2 SWP HYDROPOWER SYSTEM

The primary purpose of the SWP power generation facilities is to help meet energy requirements of the SWP pumping plants. To the extent possible, SWP pumping is scheduled during off-peak periods, and energy generation is scheduled during peak periods. Although the SWP uses more energy than it generates from its hydroelectric facilities, DWR has exchange agreements with other utility companies and has developed other power resources. DWR sells surplus power, when it is available, to minimize the net cost of pumping energy. DWR first sold excess power commercially in 1968.

The SWP conveys an annual average of about 2.5 MAF of water through its 17 pumping plants, eight hydroelectric power plants, 32 storage facilities, and over 660 miles of aqueduct and pipelines. Hydroelectric generation provides the greatest share of SWP power resources. The Edward Hyatt Pumping-Generating Plant and Thermalito Pumping-Generating Plant (Hyatt-Thermalito Power Plant Complex) at Oroville Reservoir generate about 2,200,000 MWh of energy in a median water year, while the Thermalito Diversion Dam Power Plant adds another 24,000 MWh of electrical energy per year. Generation at SWP plants (Gianelli, Alamo, Devil Canyon, Warne, and Mojave Siphon) varies with the amount of water conveyed. SWP hydropower and pumping plants and their capacities are listed in **Table 7-4** and **Table 7-5**.

Table 7-4. Major Power Plants of the State Water Project

Hydroelectric Power Plant	Maximum Generating Capacity (MW)
Thermalito Diversion Dam	3,300
Hyatt-Thermalito	840,000
Gianelli	222,000
Alamo	18,000
Warne	78,200
Mojave Siphon	30,000
Devil Canyon	291,000
Source: (DWR 2004)	

Table 7-5. Major Pumping Plants of the State Water Project

Pumping Plant	Annual Energy Use (MWh)
North Bay Interim	13
Cordelia	9,257
Barker Slough	9,094
South Bay	100,405
Del Valle	655
Banks	727,300
Buena Vista	445,956
Teerink	479,653
Chrisman	1,061,571
Edmonston	3,875,692
Pearblossom	552,048
Oso	211,909
Las Perillas	7,756
Badger Hill	20,747
Devil's Den	23,106
Bluestone	22,154
Polonio Pass	22,961
Source: (DWR 2004)	

7.1.2.3 Seasonal Variation of Pumping and Power Generation

CVP and SWP power requirements vary seasonally depending on demands in export areas south of the Delta, project water allocations, and filling of San Luis Reservoir. During the winter (December through February), water demands are relatively low, but in the wetter years Delta exports may be high until San Luis Reservoir fills. Typically, CVP generation is sufficient in the winter months to satisfy power needs for project use, but insufficient to satisfy both project pumping requirements and Preference Customer load requirements; therefore, Western must purchase additional energy from other sources. Generation from SWP hydropower facilities and the Reid Gardner coal-fired plant is sufficient to satisfy SWP pumping loads in the winter. Winter power generation is higher in winter than in fall if flood control operations require additional releases from reservoirs.

During the spring (March through May), exports from the Delta may be limited either because San Luis Reservoir is full or because of Delta export restrictions; thus, project-pumping loads may be lower in spring than in winter. Late season rainfall and snowmelt flood releases govern the timing of power generation. Spring is a transitional period for power, as the purchase of additional energy is sometimes, but not always, required for CVP pumping and preference load requirements. Generation from SWP hydropower facilities and the Reid Gardner coal-fired plant is sufficient to satisfy SWP pumping loads in the spring.

CVP and SWP water demands are highest during the summer (June through August). Releases to meet these water demands produce energy at the upstream reservoirs and at San Luis Reservoir. Although generation at CVP power plants is high because of releases for CVP water demands, pumping loads combined with high preference customer loads frequently require the import of additional energy from the Pacific Northwest. SWP generation at its hydropower facilities also is higher in response to increased releases to meet water demands; however, this generation, combined with Reid Gardner generation, is typically insufficient to meet SWP loads. In summer, the SWP relies on its power exchange agreements and energy purchases (primarily from the Pacific Northwest) to meet its remaining energy requirements.

During the fall (September through November) agricultural demands are low, and the CVP and SWP start to fill San Luis Reservoir. CVP generation is sufficient in the fall months to satisfy power pumping requirements and Preference Customer load requirements. Generation from SWP hydropower facilities and the Reid Gardner coal-fired plant is sufficient to satisfy SWP pumping loads in the fall.

7.1.3 Regulatory Setting

The Proposed Project/Action and alternatives will either continue to be operated under existing regulations, or will require modifications of existing regulations. These regulations range from agreements with state or federal agencies state and federal laws.

7.1.3.1 Federal and State

The regional study area comprises CVP and SWP facilities located upstream of the Delta, in the Delta, and in the Export Service Area. The hydroelectric generation facilities of the CVP and SWP are operated by Reclamation and DWR respectively. Hydropower operations at these facilities must comply with regulations governing flows in the downstream river reaches and flow requirements in the Delta. These flow requirements are discussed in Chapter 5.

7.1.3.2 *LOCAL*

YCWA's activities on the lower Yuba River are regulated through a series of licenses, permits, contracts, and laws. The primary focus of these regulations is the flow in the lower Yuba River, but powerhouse operations are also subject to control by some of these various regulations.

FERC LICENSE FOR YUBA RIVER DEVELOPMENT PROJECT

FERC originally issued a license under the Federal Power Act for the Yuba Project on May 16, 1963. On May 6, 1966, FERC issued an order amending this license. On November 22, 2005, FERC approved an amendment to YCWA's license specifying revised flow fluctuation and ramping criteria. YCWA is obligated to operate its facilities to meet minimum flow schedules and flow fluctuation criteria below New Bullards Bar Dam, Englebright Dam, and Daguerre Point Dam. These requirements are described in Chapter 5.

1966 POWER PURCHASE CONTRACT

YCWA executed a power purchase contract with PG&E on May 13, 1966. The Yuba County Water Agency Power Purchase Contract, which allowed for financing the construction of the Yuba Project, specifies the conditions of PG&E's power purchase from YCWA and PG&E's rights to require releases of water from New Bullards Bar Reservoir for power production.

Power Purchase Contract Appendix C, Subsection C-2.A.(b), Water for Power and Irrigation, details the monthly storage criteria and monthly power quotas. The maximum end-of-month storage amount (the "critical line") is described in paragraph (1):

> *"When it appears that storage by the end of any month will exceed the critical amount for such month listed in Appendix D, project power plants shall be operated, unless otherwise agreed, to reduce the storage on hand by the end of such month to the amount specified in Appendix D but at rates not to exceed the amount required for full capability operation except when greater releases are needed by reason of flood control requirements …."*

Compliance with this criterion requires releases of up to 3,400 cfs at New Colgate Powerhouse to bring the end-of-month storage to, or below, the amounts listed in **Table 7-6**, which is the "critical storage at end of month in Yuba's New Bullards Bar Reservoir" in Appendix D.

Table 7-6. Storage Criteria for New Bullards Bar Reservoir Under 1966 PG&E Power Purchase Contract

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Storage (TAF)	660	645	645	600	600	685	825	930	890	830	755	705

In addition to the storage requirements, a power production quota also is imposed when the operations described above would result in an end-of-month storage at or below the critical line. This quota schedule is described in the contract as follows:

> *"When drafts of storage will result in the storage on hand at the end of any month being equal to or less than the critical amount for such month listed in Appendix D, then, unless otherwise requested by Pacific, Yuba shall release during that month only a sufficient amount of water, in accordance with schedules furnished from time to time by Pacific, to generate the following specified amount of energy at the new Colgate Power Plant".*

Table 7-7 gives the required power generation criteria. The contract also provides that Narrows II Power Plant *"… shall be operated in a manner consistent with the foregoing water release requirements."*

Table 7-7. Minimum Required Power Production under 1966 PG&E Power Purchase Contract

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Power (MWh)	39,300	39,500	37,800	81,700	81,700	81,500	81,700	82,000	82,100	37,700	38,200	38,900

1993 NARROWS I FERC LICENSE

In 1993, FERC issued a new license to PG&E for continued operation of the Narrows I Powerhouse which is located downstream of the left abutment of Englebright Dam. This order contains a new set of instream flow requirements. The order requires flows measured at Smartville on the Lower Yuba River to meet the schedule listed in **Table 7-8**, subject to several important conditions.

Table 7-8. Narrows I FERC License Lower Yuba River Instream Flow Requirements at Smartville

Period	Flow (cfs)
October 1 to March 31	700
April 1 to April 30	1,000
May 1 to May 31	2,000
June 1 to June 30	1,500
July 1 to September 30	450

Table 2 of the order lists the "Conditions Defining When the Licensee Shall Maintain the Schedule of Daily Average Flows." The two basic conditions are: (1) when the total volume of water released to maintain the schedule of daily average flows during the water year, as quantified in the above table, is less than 45 TAF, and (2) when storage in Englebright Reservoir exceeds 60 TAF or when PG&E is entitled to dispatch releases of water from New Bullards Bar Reservoir under the terms of PG&E's Power Purchase Contract with YCWA (i.e., when storage in New Bullards Bar Reservoir exceeds the critical line).

7.2 ENVIRONMENTAL IMPACTS/ENVIRONMENTAL CONSEQUENCES

Reductions in YCWA's or the CVP/SWP's hydropower capacity and generation, and increases in energy requirements for pumping, would have economic consequences by decreasing their abilities to market excess power or by increasing their needs to purchase capacity or energy to support loads.

Proposed Yuba Accord actions may impact energy generation and use by: (1) decreasing reservoir water surface elevations, thereby decreasing hydropower capacity and generation; (2) changing the timing of hydropower generation to a season when market prices for electricity are lower; (3) increasing power consumption at CVP/SWP facilities in the Delta; and (4) increasing electrical demands of YCWA participating member units at groundwater wells as a part of groundwater substitution transfers, or in response to surface water delivery deficiencies.

7.2.1 IMPACT ASSESSMENT METHODOLOGY

The computer models developed to simulate the operations of the Proposed Project/Action and alternatives are driven by the water supply operations of the local and regional study areas.

The hydropower generation and power consumption calculations resulting from these water supply models can be used in a comparative sense to determine the effects on net electrical generation of one alternative versus another. Results from a single simulation may not necessarily correspond to actual system operations for a specific month or year, but are representative of general electrical generation and use. The applications of the water supply computer models are described in Section 5.2.1.

7.2.1.1 METHODOLOGY FOR EVALUATING POTENTIAL IMPACTS TO YUBA RIVER BASIN HYDROPOWER

Potential impacts to hydropower resources in the Yuba Region are evaluated using the YPM described in Section 5.2.1, and Attachment A of Appendix D. The YPM computes electrical generation for each month of the period of simulation for the New Colgate Powerhouse and Narrows I and Narrows II powerhouses. Power generation at New Colgate Powerhouse is calculated based on flow through the powerhouse, New Bullards Bar Reservoir surface water elevation, flow-dependent tailwater elevation, and an assumed efficiency of 90 percent. Power generation at Narrows I and Narrows II powerhouses is calculated in a similar manner, except that power generation is calculated based on an assumed Englebright Reservoir surface water elevation of 530 feet msl, which corresponds to 60 TAF of storage. The YPM assumes constant storage in Englebright Reservoir.

7.2.1.2 METHODOLOGY FOR EVALUATING POTENTIAL IMPACTS TO SWP AND CVP HYDROPOWER AND POWER CONSUMPTION

Changes to CVP and SWP hydropower production and power consumption resulting from implementation of the Proposed Project/Action and alternatives are assessed using CALSIM II. To quantify changes in CVP net electricity use, CALSIM II output is analyzed using the LongTermGen Model. This is a CVP power model developed to estimate the CVP power generation, capacity, and Project Use power based on the operations defined by a CALSIM II simulation. The LongTermGen Model computes monthly hydropower generation, capacity, and CVP Project Use power for each month of the CALSIM II simulation, over the 2-year simulation period.

Similarly, changes in SWP electricity generation and consumption are assessed using a CALSIM II power module developed by DWR.

7.2.2 IMPACT INDICATORS AND SIGNIFICANCE CRITERIA

The CEQA Guidelines do not provide any specific guidance regarding changes in hydropower generation or power consumption. Significance criteria have been tailored specifically to address these issues. The impact indicators and significance criteria for power production and energy consumption are presented in **Table 7-9**.

Table 7-9. Impact Indicators and Significance Criteria for Power Production and Energy Consumption

Impact Indicator	Significance Criteria
Power generation at New Colgate, Narrows I and Narrows II powerhouses	❑ Decrease in long-term average annual hydropower generation of more than 5 percent. ❑ Change in long-term average monthly hydropower generation of more than 5 percent.
Power generation at Oroville-Thermalito Complex	
Power generation at the San Luis Pumping-Generating Plant	
Power consumption at groundwater wells within YCWA Member Units	❑ Increase in long-term average annual power requirement of more than 5 percent.
Power consumption at the CVP Jones Pumping Plant	
Power consumption at SWP Banks Pumping Plant	
Power consumption at the O'Neil Forebay Pumping Plant	
Power consumption at the San Luis Pumping-Generating Plant	

7.2.2.1 HYDROPOWER

The Proposed Project/Action and alternatives would result in a potentially significant impact on hydropower production if generation at affected facilities were reduced, or if the timing of generation were changed to seasons with less favorable market price conditions. An effect on hydropower production is considered potentially significant if implementing a particular action would cause either of the following:

- ❑ An average annual decrease in hydropower capacity or generation for the 72-year simulation period; and
- ❑ A change in the season pattern of power generation.

A net decrease in hydropower generation is defined as significant if the average annual energy generated over the 72-year period of simulation changes by more than 5 percent. A threshold of 5 percent is selected as the threshold of significance for hydroelectric generation for several reasons. First, hydropower by its nature is highly susceptible to seasonal and annual variation resulting from hydrologic variability, including the timing of precipitation and runoff. Secondly, short-term operations decisions (related to flood control, coordinated releases, timing of demand for agricultural water deliveries related to weather and cropping patterns, etc.) also contribute to variations in seasonal and total annual generation levels. Finally, regional power market demands and prices provide a backdrop for hydropower generation decisions, as excess generation from hydro facilities is delivered to the transmission grid for use. Hydroelectric operators would typically change generation patterns to match to the extent possible periods of high energy demand. Taken together, these factors would cause generation patterns to vary (potentially quite substantially) seasonally or on a year-to-year basis, even if water deliveries and groundwater utilization was exactly the same. As a result, generation variations of less than 5 percent are not considered significant.

Changes to the seasonal pattern of generation may be considered significant if there is a change of generation out of high demand periods to low demand periods. Typically, generating resources are dispatched to meet demand utilizing the most efficient units first. During periods of high demand, the marginal units (the last units dispatched to meet the peak of demand) may be the least efficient, and as a result changing of generation out of high demand periods to low demand periods may result in negative environmental impacts.

Usually some degree of seasonal variation in generation would be anticipated in year-on-year operations for the same suite of reasons that overall generation variation can occur (as described in the previous paragraphs, changes in hydrology, operations decisions, and delivery patterns). Additionally, water, the "fuel" for hydroelectric generation, is easily stored by retention in the reservoir, with essentially no differential if used sooner or later in the season. As a result, seasonal variations measured by a change in monthly generation of less than 5 percent per month are not considered significant; only changes of 5 percent or more in a month's generation are considered potentially significant.

7.2.2.2 POWER CONSUMPTION

For electricity consumption, the environmental consequences of the Proposed Project/Action and alternatives are measured in terms of how they would affect the net energy requirements of groundwater wells within YCWA Member Units and the CVP and SWP. This is consistent with the significance criteria used in the CALFED Bay-Delta Program Final Programmatic EIS/EIR (CALFED 2000).

For this analysis, it is assumed that any additional water provided by the Proposed Project/Action or alternatives available for export would be conveyed through the Banks and Jones pumping plants. Additional water pumped through project facilities, and additional groundwater pumping by YCWA Member Units, would increase power consumption. To estimate the power requirement for groundwater pumping, the maximum power requirement, as described in Section 7.1.1.3 will be used to determine the total power consumption. This approach may overestimate the amount of power required to pump the groundwater for the various alternatives, because there are several variables making a precise determination impossible. These variables include:

- The amount of lift required to extract the groundwater. The vertical distribution of groundwater is not adequately determined at this time to accurately determine the amount of lift required. Similarly, there are no modeling data available to indicate localized effects of groundwater pumping to determine the groundwater surface elevation. The range of depths to the groundwater surface is assumed to be between 10 and 120 feet.
- The pump efficiency is unknown. Well surveys for Yuba County indicate the range of pump efficiencies to be between 0.585 and 0.715.

With these ranges of depth to the groundwater surface and pump efficiency, a maximum and minimum power requirement per acre-foot can be estimated. The minimum power requirement would represent a 10-foot depth to groundwater surface and a 0.715 pump efficiency, indicating a power requirement of 14 KWh/AF. The maximum power requirement would represent a 120-foot depth to groundwater surface and a 0.585 pump efficiency, requiring 210 KWh/AF.

Using these power requirements, a maximum and minimum annual power usage for each alternative can be determined and compared. For the purposes of determining the maximum change in long-term power requirement for each alternative, the maximum groundwater pumping power requirement is used in analysis.

The change in power requirements is defined as significant if the net energy consumption over the 72-year period of simulation increases by more than 5 percent.

As discussed in Chapter 4, CEQA and NEPA have different legal and regulatory standards that require slightly different assumptions in the modeling runs used to compare the Proposed Project/Action and alternatives to the appropriate CEQA and NEPA bases of comparison in the impact assessments. Although only one project (the Yuba Accord Alternative) and one action alternative (the Modified Flow Alternative) are evaluated in this EIR/EIS, it is necessary to use separate NEPA and CEQA modeling scenarios for the Proposed Project/Action, alternatives and bases of comparisons to make the appropriate comparisons. As a result, the scenarios compared in the impact assessments below have either a "CEQA" or a "NEPA" prefix before the name of the alternative being evaluated. A detailed discussion of the different assumptions used for the CEQA and NEPA scenarios is included in Appendix D.

As also discussed in Chapter 4, while the CEQA and NEPA analyses in this EIR/EIS refer to "potentially significant," "less than significant," "no" and "beneficial" impacts, the first two comparisons (CEQA Yuba Accord Alternative compared to the CEQA No Project Alternative and CEQA Modified Flow Alternative compared to the CEQA No Project Alternative) presented below instead refer to whether or not the proposed change would "unreasonably affect" the evaluated parameter. This is because these first two comparisons are made to determine whether the action alternative would satisfy the requirement of Water Code Section 1736 that the proposed change associated with the action alternative "would not unreasonably affect fish, wildlife, or other instream beneficial uses."

7.2.3 ENVIRONMENTAL IMPACTS/ENVIRONMENTAL CONSEQUENCES OF THE CEQA YUBA ACCORD ALTERNATIVE COMPARED TO THE CEQA NO PROJECT ALTERNATIVE

Impact 7.2.3-1: Decreases in long-term average annual hydropower generation at New Colgate, Narrows I and Narrows II powerhouses, at the Oroville-Thermalito Complex, or at the San Luis Pumping-Generating Plant

As shown in Table F3-1, there would be less than 1 percent change in average annual power generation at the New Colgate Powerhouse, Narrows I or II powerhouses, at the Oroville-Thermalito Complex, or at the San Luis Pumping-Generating Plant with the implementation of the CEQA Yuba Accord Alternative as compared to the CEQA No Project Alternative. Therefore, the CEQA Yuba Accord Alternative, relative to the CEQA No Project Alternative, would not unreasonably affect long-term average annual hydropower generation.

Impact 7.2.3-2: Change in long-term average monthly hydropower generation at New Colgate, Narrows I and Narrows II powerhouses

As shown in Table F3-2, there would be decreases in average monthly generation of more than 5 percent in December, January, February and May at either Colgate or Narrows I and II powerhouses, with the implementation of the CEQA Yuba Accord Alternative as compared to the CEQA No Project Alternative. There would be increases of 5 percent or more in July, August, September and October for this comparison.

As described in Section 7.2.2.1, a change in generation from high demand periods to low demand periods would likely have negative environmental impacts; conversely, changing generation from low demand months to high demand months would have relatively positive environmental impacts. Since this seasonal change in generation for this comparison would be from periods of generally lower power demand in California (the winter months) to periods of generally higher power demand (the summer months), it is likely that this change would result in minimal or generally positive environmental impacts. Thus, the CEQA Yuba Accord Alternative, relative to the CEQA No Project Alternative, would not unreasonably affect long-term average monthly hydropower generation at the Colgate or Narrows facilities.

Impact 7.2.3-3: Decreases in long-term average annual or change in long-term average monthly hydropower generation at the Oroville-Thermalito Complex

As shown in Table F3-2, there would be no months with decreases of 5 percent or more in average monthly generation. Therefore, the CEQA Yuba Accord Alternative, relative to the CEQA No Project Alternative, would not unreasonably affect hydropower generation at the Oroville-Thermalito Complex.

Impact 7.2.3-4: Decreases in long-term average annual or change in long-term average monthly hydropower generation at the San Luis Pumping-Generating Plant

As shown in Table F3-2, there would be one month (December) with a decrease of 5 percent or more in average monthly generation. However, December is the month that has the second lowest generation production for the San Luis Pumping-Generating Plant (1,864 MWh under the CEQA Yuba Accord Alternative, 1,973 MWh under the CEQA No Project Alternative). In contrast, average monthly generation during the months of April through July is over 31,850 MWh per month under either scenario, and a change in generation of 191 MWh in May between the CEQA Yuba Accord Alternative and the CEQA No Project Alternative represents only a 0.4 percent change in generation. While the change in generation during December for this comparison would be large relative to the total December generation for the San Luis Pumping Generating Plant, but very low relative to the average monthly generation for the San Luis facility, and since the total average annual generation for the San Luis facility would vary by less than 0.05 percent, it can be concluded that the generation change for this single month under the CEQA Yuba Accord Alternative, relative to the CEQA No Project Alternative, would not unreasonably affect hydropower generation.

Impact 7.2.3-5: Increases in long-term average annual power consumption for groundwater pumping within YCWA Member Unit service areas

As shown in Table F3-3, a 10 percent increase in average annual power consumption would be expected with the implementation of the CEQA Yuba Accord Alternative as compared to the CEQA No Project Alternative. Overall, the CEQA Yuba Accord Alternative, relative to the CEQA No Project Alternative, would have a potential unreasonable effect on annual power consumption for groundwater pumping within YCWA Member Unit service areas.

Impact 7.2.3-6: Increases in long-term average annual power consumption at the Banks Pumping Plant, the Jones Pumping Plant, the O'Neill Forebay Pumping Plant and the San Luis Pumping-Generating Plant

As shown in Table F3-4, there would be less than 1 percent change in average annual power consumption at the Banks, Jones, and O'Neill Forebay Pumping Plants and at the San Luis Pumping-Generating Plant with the implementation of the CEQA Yuba Accord Alternative as compared to the CEQA No Project Alternative. Therefore, the CEQA Yuba Accord Alternative, relative to the CEQA No Project Alternative, would not unreasonably affect annual power consumption at these facilities.

7.2.4 ENVIRONMENTAL IMPACTS/ENVIRONMENTAL CONSEQUENCES OF THE CEQA MODIFIED FLOW ALTERNATIVE COMPARED TO THE CEQA NO PROJECT ALTERNATIVE

Impact 7.2.4-1: Decreases in long-term average annual hydropower generation at New Colgate, Narrows I and Narrows II powerhouses, at the Oroville-Thermalito Complex, or at the San Luis Pumping-Generating Plant

As shown in Table F3-5, there would be less than 1 percent change in average annual power generation at the New Colgate Powerhouse, Narrows I or II powerhouses, at the Oroville-Thermalito Complex, or at the San Luis Pumping-Generating Plant with the implementation of the CEQA Modified Flow Alternative as compared to the CEQA No Project Alternative. Therefore, the CEQA Modified Flow Alternative, relative to the CEQA No Project Alternative, would not unreasonably affect long-term average annual hydropower generation.

Impact 7.2.4-2: Change in long-term average monthly hydropower generation at New Colgate, Narrows I and Narrows II powerhouses

As shown in Table F3-6, there would be decreases in average monthly generation of more than 5 percent in November, December, January and May at either Colgate or Narrows I and II powerhouses, with the implementation of the CEQA Modified Flow Alternative as compared to the CEQA No Project Alternative. There would be increases of 5 percent or more in July and August for this comparison.

As described in Section 7.2.2.1, a change in generation from high demand periods to low demand periods would likely have negative environmental impacts; conversely, changing generation from low demand months to high demand months would have relatively positive environmental impacts. Since the seasonal change in generation for this comparison would be from periods of generally lower power demand in California (the winter months) to periods of generally higher power demand (the summer months), it is likely that this change would result in minimal environmental impacts. Thus, the CEQA Modified Flow Alternative, relative to the CEQA No Project Alternative, would not unreasonably affect long-term average monthly hydropower generation at the Colgate or Narrows facilities.

Impact 7.2.4-3: Decreases in long-term average annual or change in long-term average monthly hydropower generation at the Oroville-Thermalito Complex

As shown in Table F3-6, there would be no months with decreases of 5 percent or more in average monthly generation. Therefore, the CEQA Modified Flow Alternative, relative to the CEQA No Project Alternative, would not unreasonably affect hydropower generation at the Oroville-Thermalito Complex.

Impact 7.2.4-4: Decreases in long-term average annual or change in long-term average monthly hydropower generation at the San Luis Pumping-Generating Plant

As shown in Table F3-6, there would be no months with decreases of 5 percent or more in average monthly generation. Therefore, the CEQA Modified Flow Alternative, relative to the CEQA No Project Alternative, would not unreasonably affect hydropower generation at the San Luis Pumping-Generating Plant.

Impact 7.2.4-5: Increases in long-term average annual power consumption for groundwater pumping within YCWA Member Unit service areas

As shown in Table F3-7, a 10 percent decrease in average annual power consumption would be expected with the implementation of the CEQA Yuba Accord Alternative as compared to the

CEQA No Project Alternative. This decrease in power consumption would not be considered an unreasonable effect on annual power consumption for groundwater pumping within YCWA Member Unit service areas for the CEQA Modified Flow Alternative, relative to the CEQA No Project Alternative.

Impact 7.2.4-6: Increases in long-term average annual power consumption at the Banks Pumping Plant, the Jones Pumping Plant, the O'Neill Forebay Pumping Plant and the San Luis Pumping-Generating Plant

As shown in Table F3-8, there would be less than 1 percent change in average annual power consumption at the Banks, Jones, and O'Neill Forebay pumping plants and at the San Luis Pumping-Generating Plant with the implementation of the CEQA Modified Flow Alternative as compared to the CEQA No Project Alternative. Therefore, the CEQA Modified Flow Alternative, relative to the CEQA No Project Alternative, would not unreasonably affect annual power consumption at these facilities.

7.2.5 ENVIRONMENTAL IMPACTS/ENVIRONMENTAL CONSEQUENCES OF THE CEQA YUBA ACCORD ALTERNATIVE COMPARED TO THE CEQA EXISTING CONDITION

Impact 7.2.5-1: Decreases in long-term average annual hydropower generation at New Colgate, Narrows I and Narrows II powerhouses; at the Oroville-Thermalito Complex, or at the San Luis Pumping-Generating Plant

As shown in Table F3-9, there would be less than 1 percent change in average annual power generation at the New Colgate Powerhouse, Narrows I or II powerhouses, at the Oroville-Thermalito Complex, or at the San Luis Pumping-Generating Plant with the implementation of the CEQA Yuba Accord Alternative as compared to the CEQA Existing Condition. Therefore, the CEQA Yuba Accord Alternative, relative to the CEQA Existing Condition, would result in a less than significant impact to long-term average annual hydropower generation.

Impact 7.2.5-2: Change in long-term average monthly hydropower generation at New Colgate, Narrows I and Narrows II powerhouses

As shown in Table F3-10, there would be decreases in average monthly generation of more than 5 percent in July at either Colgate or Narrows I and II powerhouses, with the implementation of the CEQA Yuba Accord Alternative as compared to the CEQA Existing Condition. There would be increases of 5 percent or more in June, September, October, November and December for this comparison.

As described in Section 7.2.2.1, a change in generation from high demand periods to low demand periods would likely have negative environmental impacts; conversely, changing generation from low demand months to high demand months would have relatively positive environmental impacts. In this comparison, the net reduction in generation at the Colgate and Narrows facilities would be more than replaced by the increases in generation in June and September, resulting in a change between months within the high demand period, not a change out of the high demand period. The increases in generation in the fall and winter months would not in themselves be potentially significant. In summary, the CEQA Yuba Accord Alternative, relative to the CEQA Existing Condition, would result in a less than significant impact to long-term average monthly hydropower generation at the Colgate or Narrows facilities.

Impact 7.2.5-3: Decreases in long-term average annual or change in long-term average monthly hydropower generation at the Oroville-Thermalito Complex

As shown in Table F3-10, there would be no months with decreases of 5 percent or more in average monthly generation. Therefore, the CEQA Yuba Accord Alternative, relative to the CEQA Existing Condition, would result in a less than significant impact to hydropower generation at the Oroville-Thermalito Complex.

Impact 7.2.5-4: Decreases in long-term average annual or change in long-term average monthly hydropower generation at the San Luis Pumping-Generating Plant

As shown in Table F3-10, there would be one month (December) with a decrease of 5 percent or more in average monthly generation. However, December is the month that would have the second lowest generation production for the San Luis Pumping-Generating Plant (1,864 MWh under the CEQA Yuba Accord Alternative, 2,012 MWh under the CEQA Existing Condition). In contrast, average monthly generation during the months of April through July would be over 31,850 MWh per month under either scenario, and a change in generation of 191 MWh in May between the CEQA Yuba Accord Alternative and the CEQA Existing Condition would represent only a 0.4 percent change in generation. While the change in generation during December for this comparison would be large relative to the total December generation for the San Luis complex, but very low relative to the average monthly generation for the San Luis complex, and since the total average annual generation for the San Luis complex would vary by less than 0.05 percent, it can be concluded that the generation change for this single month under the CEQA Yuba Accord Alternative, relative to the CEQA Existing Condition, would not represent a significant impact.

Impact 7.2.5-5: Increases in long-term average annual power consumption for groundwater pumping within YCWA Member Unit service areas

As shown in Table F3-11, a 51 percent increase in average annual power consumption would be expected with the implementation of the CEQA Yuba Accord Alternative as compared to the CEQA Existing Condition. Overall, the CEQA Yuba Accord Alternative would have a potentially significant impact on annual increases in long-term power consumption for groundwater pumping within YCWA Member Unit service areas, relative to the CEQA Existing Condition.

Impact 7.2.5-6: Increases in long-term average annual power consumption at the Banks Pumping Plant, the Jones Pumping Plant, the O'Neill Forebay Pumping Plant and the San Luis Pumping-Generating Plant

As shown in Table F3-12, there would be less than 1 percent change in average annual power consumption at the Banks, Jones, and O'Neill Forebay pumping plants and at the San Luis Pumping-Generating Plant with the implementation of the CEQA Yuba Accord Alternative as compared to the CEQA No Project Alternative. Therefore, the CEQA Yuba Accord Alternative, relative to the CEQA Existing Condition, would have a less than significant impact on annual power consumption at these facilities.

7.2.6 ENVIRONMENTAL IMPACTS/ENVIRONMENTAL CONSEQUENCES OF THE CEQA MODIFIED FLOW ALTERNATIVE COMPARED TO THE CEQA EXISTING CONDITION

Impact 7.2.6-1: Decreases in long-term average annual hydropower generation at New Colgate, Narrows I and Narrows II Powerhouses; at the Oroville-Thermalito Complex, or at the San Luis Pumping-Generating Plant

As shown in Table F3-13, there would be less than 1 percent change in average annual power generation at the New Colgate Powerhouse, Narrows I or II Powerhouses, at the Oroville-Thermalito Complex, or at the San Luis Pumping-Generating Plant with the implementation of the CEQA Modified Flow Alternative as compared to the CEQA Existing Condition. Therefore, the CEQA Modified Flow Alternative, relative to the CEQA Existing Condition, would result in a less than significant impact to long-term average annual hydropower generation.

Impact 7.2.6-2: Change in long-term average monthly hydropower generation at New Colgate, Narrows I and Narrows II powerhouses

As shown in Table F3-14, there would be a decrease in average monthly generation of more than 5 percent in August at either Colgate or Narrows I and II powerhouses, with the implementation of the CEQA Modified Flow Alternative as compared to the CEQA Existing Condition. There would be an increase of 5 percent or more in December for this comparison.

As described in Section 7.2.2.1, a change in generation from high demand periods to low demand periods would likely have negative environmental impacts. Thus, there would potentially be a significant impact to long-term average monthly hydropower generation at the Colgate or Narrows facilities under the CEQA Modified Flow Alternative, relative to the CEQA Existing Condition.

Impact 7.2.6-3: Decreases in long-term average annual or change in long-term average monthly hydropower generation at the Oroville-Thermalito Complex

As shown in Table F3-14, there would be no months with decreases of 5 percent or more in average monthly generation. Therefore, the CEQA Modified Flow Alternative, relative to the CEQA Existing Condition, would result in a less than significant impact to hydropower generation at the Oroville-Thermalito Complex.

Impact 7.2.6-4: Decreases in long-term average annual or change in long-term average monthly hydropower generation at the San Luis Pumping-Generating Plant

As shown in Table F3-14, there would be no months with decreases of 5 percent or more in average monthly generation. Therefore, the CEQA Modified Flow Alternative, relative to the CEQA Existing Condition, would result in a less than significant impact to hydropower generation at the San Luis Pumping-Generating Plant.

Impact 7.2.6-5: Increases in long-term average annual power consumption for groundwater pumping within YCWA Member Unit service areas

As shown in Table F3-15, a 23 percent increase in average annual power consumption would be expected with the implementation of the CEQA Modified Flow Alternative as compared to the CEQA Existing Condition. This increase in power consumption would be considered a significant impact on annual power consumption for groundwater pumping within YCWA Member Unit service areas under the CEQA Modified Flow Alternative, relative to the CEQA Existing Condition.

Impact 7.2.6-6: Increases in long-term average annual power consumption at the Banks Pumping Plant, the Jones Pumping Plant, the O'Neill Forebay Pumping Plant and the San Luis Pumping-Generating Plant

As shown in Table F3-16, there would be less than 1 percent change in average annual power consumption at the Banks, Jones, and O'Neill Forebay pumping plants and at the San Luis Pumping-Generating Plant with the implementation of the CEQA Modified Flow Alternative as compared to the CEQA Existing Condition. Therefore, the CEQA Modified Flow Alternative, relative to the CEQA Existing Condition, would result in a less than significant impact to annual power consumption at these facilities.

7.2.7 ENVIRONMENTAL IMPACTS/ENVIRONMENTAL CONSEQUENCES OF THE CEQA NO PROJECT/NEPA NO ACTION ALTERNATIVE COMPARED TO THE CEQA EXISTING CONDITION/NEPA AFFECTED ENVIRONMENT

As discussed in Chapter 3, the key elements and activities (e.g., implementation of the RD-1644 Long-term instream flow requirements) for the CEQA No Project Alternative would be the same for the NEPA No Action Alternative. The primary differences between the CEQA No Project and NEPA No Action alternatives are various hydrologic and other modeling assumptions (see Section 4.5 and Appendix D). Because of these differences between the No Project and No Action alternatives, these alternatives are distinguished as separate alternatives for CEQA and NEPA evaluation purposes.

Based on current plans and consistent with available infrastructure and community services, the CEQA No Project Alternative in this EIR/EIS is based on current environmental conditions (e.g., project operations, water demands, and level of land development) plus potential future operational and environmental conditions (e.g., implementation of the RD-1644 Long-term instream flow requirements in the lower Yuba River) that probably would occur in the foreseeable future in the absence of the Proposed Project/Action or another action alternative. The NEPA No Action Alternative also is based on conditions without the proposed project, but uses a longer-term future timeframe that is not restricted by existing infrastructure or physical and regulatory environmental conditions. The differences between these modeling characterizations and assumptions for the CEQA No Project and the NEPA No Action alternatives, including the rationale for developing these two different scenarios for this EIR/EIS, are explained in Chapter 4[2].

Although implementation of the RD-1644 Long-term instream flow requirements would occur under both the CEQA No Project and the NEPA No Action alternatives, the resultant model outputs for both scenarios are different because of variations in the way near-term and long-term future operations are characterized for other parameters in the CEQA and NEPA assumptions. As discussed in Chapter 4, the principal difference between the CEQA No Project Alternative and the NEPA No Action Alternative is that the NEPA No Action Alternative includes several potential future water projects in the Sacramento and San Joaquin valleys (e.g., CVP/SWP Intertie, FRWP, SDIP and a long-term EWA Program or a program equivalent to the

[2] For modeling purposes related to CEQA analytical requirements, OCAP Study 3 (2001 level of development) is used as the foundational study upon which the modeling scenarios for the CEQA No Project Alternative and the CEQA Existing Condition were developed. For modeling purposes related to NEPA analytical requirements, OCAP Study 5 (2020 level of development) is used as the foundational study upon which the modeling scenarios for the NEPA No Action Alternative was developed.

EWA), while the CEQA No Project Alternative does not. Because many of the other assumed conditions for these two scenarios are similar, the longer-term analysis of the NEPA No Action Alternative compared to the NEPA Affected Environment builds upon the nearer-term analysis of the CEQA No Project Alternative compared to the CEQA Existing Condition.

Because the same foundational modeling base (OCAP Study 3) was used to characterize near-term conditions (2001 level of development) both the CEQA No Project Alternative and the CEQA Existing Condition, it was possible to conduct a detailed analysis to quantitatively evaluate the hydrologic changes in the Yuba Region and the CVP/SWP system that would be expected to occur under these conditions. Building on this CEQA analysis, the analysis of the NEPA No Action Alternative compared to the NEPA Affected Environment consists of two components: (1) an analysis of near-term future without project conditions quantified through the CEQA No Project Alternative, relative to the CEQA Existing Condition; and (2) a qualitative analysis of longer-term future without project conditions (the NEPA No Action Alternative)[3].

7.2.7.1 CEQA No Project Alternative Compared to the CEQA Existing Condition

Impact 7.2.7.1-1: Decreases in long-term average annual hydropower generation at New Colgate, Narrows I and Narrows II Powerhouses; at the Oroville-Thermalito Complex, or at the San Luis Pumping-Generating Plant

As shown in Table F3-17, there would be less than 1 percent change in average annual power generation at the New Colgate Powerhouse, Narrows I or II Powerhouses, at the Oroville-Thermalito Complex, or at the San Luis Pumping-Generating complex with the implementation of the CEQA No Project Alternative as compared to the CEQA Existing Condition. Therefore, the CEQA No Project Alternative, relative to the CEQA Existing Condition, would result in a less than significant impact to long-term average annual hydropower generation.

Impact 7.2.7.1-2: Change in long-term average monthly hydropower generation at New Colgate, Narrows I and II Powerhouses

As shown in Table F3-18, there would be a decrease in average monthly generation of more than 5 percent in July, August and September at either Colgate or Narrows I and II powerhouses, with the implementation of the CEQA No Project Alternative as compared to the CEQA Existing Condition. There would be an increase of 5 percent or more in May, June, November, December and January for this comparison.

As described in Section 7.2.2.1, a change in generation from high demand periods to low demand periods would likely have negative environmental impacts. Thus, there would potentially be a significant impact to long-term average monthly hydropower generation at the Colgate or Narrows facilities under the CEQA No Project Alternative, relative to the CEQA Existing Condition.

Impact 7.2.7.1-3: Decreases in long-term average annual or change in long-term average monthly hydropower generation at the Oroville-Thermalito Complex

As shown in Table F3-18, there would be no months with decreases of 5 percent or more in average monthly generation. Therefore, the CEQA No Project Alternative, relative to the CEQA

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[3] The second analytical component cannot be evaluated quantitatively due to the differences in the underlying baseline assumptions for OCAP Study 3 and OCAP Study 5.

Existing Condition, would result in a less than significant impact to hydropower generation at the Oroville-Thermalito Complex.

Impact 7.2.7.1-4: Decreases in long-term average annual or change in long-term average monthly hydropower generation at the San Luis Pumping-Generating Plant

As shown in Table F3-18, there would be no months with decreases of 5 percent or more in average monthly generation. Therefore, the CEQA No Project Alternative, relative to the CEQA Existing Condition, would result in a less than significant impact to hydropower generation at the San Luis Pumping-Generating Plant.

Impact 7.2.7.1-5: Increases in long-term average annual power consumption for groundwater pumping within YCWA Member Unit service areas

As shown in Table F3-19, a 37 percent increase in average annual power consumption would be expected with the implementation of the CEQA No Project Alternative as compared to the CEQA Existing Condition. This increase in power consumption would be considered a significant impact on annual power consumption for groundwater pumping within YCWA Member Unit service areas under the CEQA No Project Alternative, relative to the CEQA Existing Condition.

Impact 7.2.7.1-6: Increases in long-term average annual power consumption at the Banks Pumping Plant, the Jones Pumping Plant, the O'Neill Forebay Pumping Plant and the San Luis Pumping-Generating Plant

As shown in Table F3-20, there would be less than 1 percent change in average annual power consumption at the Banks, Jones, and O'Neill Forebay pumping plants and at the San Luis Pumping-Generating Plant with the implementation of the CEQA No Project Alternative as compared to the CEQA Existing Condition. Therefore, the CEQA No Project Alternative, relative to the CEQA Existing Condition, would result in a less than significant impact to annual power consumption at these facilities.

7.2.7.2 NEPA No Action Alternative Compared to the NEPA Affected Environment

In the Yuba Region, the primary difference between the NEPA No Action Alternative and the NEPA Affected Environment would be the changes in lower Yuba River flows associated with the implementation of the RD-1644 Long-term instream flow requirements, to replace the RD-1644 Interim instream flow requirements, and the increased local surface water demands for WWD. These also are the primary difference that would occur in the Yuba Region between the CEQA No Project Alternative and the CEQA Existing Condition. These potential effects to power production and energy consumption that were evaluated in the quantitative analyses that is presented in Section 7.2.7.1 above for the CEQA No Project Alternative, relative to the CEQA Existing Condition (see also Appendix F3, Table F3-17 through Table F3-20), therefore also are used for comparison of the NEPA No Action Alternative relative to the NEPA Affected Environment, and are not repeated here.

As discussed above, the analysis of the NEPA No Action Alternative includes several additional proposed water supply and operations projects in the project study area that are not included in the CEQA analysis. However, these other proposed projects would not significantly affect hydrologic conditions or hydroelectric generation in the Yuba Region and, thus, are only discussed in the context of CVP/SWP operations upstream of and within the Delta.

Under the NEPA No Action Alternative, several water storage, supply or re-operations projects may be implemented to supply future levels of demand for water in California, including water storage and conveyance projects (e.g., SDIP[4]), water transfers and acquisition programs (e.g., a long-term EWA Program or a program equivalent to the EWA) and other projects related to CVP/SWP system operations (e.g., CVP/SWP Intertie and FRWP).

Construction and operation of conveyance projects, implementation of water transfer and acquisition projects, or future changes in CVP/SWP system operations under the NEPA No Action Alternative could alter hydroelectric generation output or total electrical loads related to pumping compared to the NEPA Affected Environment. Other than new storage projects, most projects that would be implemented or ongoing under the NEPA No Action Alternative would likely not result in an overall increase or decrease in total hydroelectric generation or pumping, but could result in shifting of generation and/or pumping to different months in a given year. To the extent that water acquisition projects (e.g., SVWMP, a long-term EWA Program or a program equivalent to the EWA) would purchase water through groundwater substitution programs, additional pumping and/or shifting of release of reservoir water to accommodate the groundwater usage could also cause a shift in generation patterns as well as additional electrical usage for pumping, either from additional pumping at the Jones or Banks facilities for export, or from groundwater pumping for substitution.

Generally, impacts to hydroelectric generation related to new water conveyance projects, new water transfer and acquisition programs, and other projects related to CVP/SWP operations under the NEPA No Action Alternative would be shifts in generation patterns; although there could be some minor increase or decrease in generation, it is not likely that changes in generation quantity would be significant. Various projects could impact generation timing at the Oroville-Thermalito complex or at the San Luis Pumping-Generating Plant. Water transfer and acquisition projects have the potential to increase the long-term average annual power consumption for pumping at the CVP/SWP pumping facilities (Banks and Jones), or increase pumping of groundwater for water supply, with corresponding secondary impacts in pollution resulting from replacing lost generation or providing additional energy from polluting sources as described in Sections 7.2.2.1 and 7.2.2.2.

7.2.8 Environmental Impacts/Environmental Consequences of the NEPA Yuba Accord Alternative Compared to the NEPA No Action Alternative

Impact 7.2.8-1: Decreases in long-term average annual hydropower generation at New Colgate, Narrows I and Narrows II powerhouses; at the Oroville-Thermalito Complex, or at the San Luis Pumping-Generating Plant

As shown in Table F3-21, there would be less than 1 percent change in average annual power generation at the New Colgate Powerhouse, Narrows I or II powerhouses, at the Oroville-Thermalito Complex, or at the San Luis Pumping-Generating Plant with the implementation of the NEPA Yuba Accord Alternative as compared to the NEPA No Action Alternative. Therefore, the NEPA Yuba Accord Alternative, relative to the NEPA No Action Alternative, would result in a less than significant impact to long-term average annual hydropower generation.

[4] The SDIP includes a maximum pumping rate of 8,500 cfs at the Banks Pumping Plant.

Impact 7.2.8-2: Change in long-term average monthly hydropower generation at New Colgate, Narrows I and II powerhouses

As shown in Table F3-22, there would be a decrease in average monthly generation of more than 5 percent in January, February, May and December at either Colgate or Narrows II and II powerhouses, with the implementation of the NEPA Yuba Accord Alternative as compared to the NEPA No Action Alternative. There would be an increase of 5 percent or more in July, August, September and October for this comparison.

As described in Section 7.2.2.1, a change in generation from high demand periods to low demand periods would likely have negative environmental impacts; conversely, changing generation from low demand months to high demand months would have relatively positive environmental impacts. Since the seasonal change in generation for this comparison would be from periods of generally lower power demand in California (the winter months) to periods of generally higher power demand (the summer months), it is likely that this change would result in minimal environmental impacts. Thus, the NEPA Yuba Accord Alternative, relative to the NEPA No Action Alternative, would result in a less than significant impact to long-term average monthly hydropower generation at the Colgate or Narrows facilities.

Impact 7.2.8-3: Decreases in long-term average annual or change in long-term average monthly hydropower generation at the Oroville-Thermalito Complex

As shown in Table F3-22, there would be no months with decreases of 5 percent or more in average monthly generation. Therefore, the NEPA Yuba Accord Alternative relative to the NEPA No Action Alternative would result in a less than significant impact to hydropower generation at the Oroville-Thermalito Complex.

Impact 7.2.8-4: Decreases in long-term average annual or change in long-term average monthly hydropower generation at the San Luis Pumping-Generating Plant

As shown in Table F3-22, there would be no months with decreases of 5 percent or more in average monthly generation. Therefore, the NEPA Yuba Accord Alternative, relative to the NEPA No Action Alternative, would result in a less than significant impact to hydropower generation at the San Luis Pumping-Generating Plant.

Impact 7.2.8-5: Increases in long-term average annual power consumption for groundwater pumping within YCWA Member Unit service areas

As shown in Table F3-23, an 11 percent increase in average annual power consumption would be expected with the implementation of the NEPA Yuba Accord Alternative as compared to the NEPA No Action Alternative. This increase in power consumption would be considered a significant impact on annual power consumption for groundwater pumping within YCWA Member Unit service areas under the NEPA Yuba Accord Alternative, relative to the NEPA No Action Alternative.

Impact 7.2.8-6: Increases in long-term average annual power consumption at the Banks Pumping Plant, the Jones Pumping Plant, the O'Neill Forebay Pumping Plant and the San Luis Pumping-Generating Plant

As shown in Table F3-24, there would be less than 1 percent change in average annual power consumption at the Banks, Jones, and O'Neill Forebay pumping plants and at the San Luis Pumping-Generating Plant with the implementation of the NEPA Yuba Accord Alternative as compared to the NEPA No Action Alternative. Therefore, the NEPA Yuba Accord Alternative, relative to the NEPA No Action Alternative, would result in a less than significant impact to annual power consumption at these facilities.

7.2.9 ENVIRONMENTAL IMPACTS/ENVIRONMENTAL CONSEQUENCES OF THE NEPA MODIFIED FLOW ALTERNATIVE COMPARED TO THE NEPA NO ACTION ALTERNATIVE

Impact 7.2.9-1: Decreases in long-term average annual hydropower generation at New Colgate, Narrows I and Narrows II powerhouses; at the Oroville-Thermalito Complex, or at the San Luis Pumping-Generating Plant

As shown in Table F3-25, there would be less than 1 percent change in average annual power generation at the New Colgate Powerhouse, Narrows I or II powerhouses, at the Oroville-Thermalito Complex, or at the San Luis Pumping-Generating Plant with the implementation of the NEPA Modified Flow Alternative as compared to the NEPA No Action Alternative. Therefore, the NEPA Modified Flow Alternative, relative to the NEPA No Action Alternative, would result in a less than significant impact to long-term average annual hydropower generation.

Impact 7.2.9-2: Change in long-term average monthly hydropower generation at New Colgate, Narrows I and II powerhouses

As shown in Table F3-26, there would be a decrease in average monthly generation of more than 5 percent in January, May, November and December at either Colgate or Narrows I and II powerhouses, with the implementation of the NEPA Modified Flow Alternative as compared to the NEPA No Action Alternative. There would be an increase of 5 percent or more in July, August, September and October for this comparison.

As described in Section 7.2.2.1, a change in generation from high demand periods to low demand periods would likely have negative environmental impacts; conversely, changing generation from low demand months to high demand months would have relatively positive environmental impacts. Since the seasonal change in generation for this comparison would be from periods of generally lower power demand in California (the winter months) to periods of generally higher power demand (the summer months), it is likely that this change would result in minimal environmental impacts. Thus, the NEPA Modified Flow Alternative, relative to the NEPA No Action Alternative, would result in a less than significant impact to long-term average monthly hydropower generation at the Colgate or Narrows facilities.

Impact 7.2.9-3: Decreases in long-term average annual or change in long-term average monthly hydropower generation at the Oroville-Thermalito Complex

As shown in Table F3-26, there would be no months with decreases of 5 percent or more in average monthly generation. Therefore, the NEPA Modified Flow Alternative, relative to the NEPA No Action Alternative, would result in a less than significant impact to hydropower generation at the Oroville-Thermalito Complex.

Impact 7.2.9-4: Decreases in long-term average annual or change in long-term average monthly hydropower generation at the San Luis Pumping-Generating Plant

As shown in Table F3-26, there would be no months with decreases of 5 percent or more in average monthly generation. Therefore, the NEPA Modified Flow Alternative, relative to the NEPA No Action Alternative, would result in a less than significant impact to hydropower generation at the San Luis Pumping-Generating Plant.

Impact 7.2.9-5: Increases in long-term average annual power consumption for groundwater pumping within YCWA Member Unit service areas

As shown in Table F3-27, an 8 percent decrease in average annual power consumption would be expected with the implementation of the NEPA Modified Flow Alternative as compared to the NEPA No Action Alternative. This decrease in power consumption would not be considered a significant impact on annual power consumption for groundwater pumping within YCWA Member Unit service areas for the NEPA Yuba Accord Alternative, relative to the NEPA No Action Alternative.

Impact 7.2.9-6: Increases in long-term average annual power consumption at the Banks Pumping Plant, the Jones Pumping Plant, the O'Neill Forebay Pumping Plant and the San Luis Pumping-Generating Plant

As shown in Table F3-28, there would be less than 1 percent change in average annual power consumption at the Banks, Jones, and O'Neill Forebay pumping plants and at the San Luis Pumping-Generating Plant with the implementation of the NEPA Modified Flow Alternative as compared to the NEPA No Action Alternative. Therefore, the NEPA Modified Flow Alternative, relative to the NEPA No Action Alternative, would result in a less than significant impact to annual power consumption at these facilities.

7.3 CUMULATIVE IMPACTS

Hydrologic modeling was used to evaluate the cumulative effects of the Yuba Accord Alternative and other likely changes in CVP/SWP operations on hydrology and water supply. The proposed projects that have been adequately defined (e.g., in recent project-level environmental documents or CALSIM II modeling) and that have the potential to contribute to cumulative impacts are included in the quantitative assessment of the Yuba Accord's impacts. For analytical purposes of this EIR/EIS, the projects that are considered well defined and "reasonably foreseeable" are described in Chapter 21. Additionally, the assumptions used to categorize future hydrologic cumulative conditions that are quantitatively simulated using CALSIM II and the post-processing tools are presented in Appendix D. To the extent feasible, potential cumulative impacts on resources dependent on hydrology or water supply (e.g., reservoir surface elevations) are analyzed quantitatively. Because several projects cannot be accurately characterized for hydrologic modeling purposes at this time, either due to the nature of the particular project or because specific operations details are only in the preliminary phases of development, these projects are evaluated qualitatively.

Only those projects that could affect surface water quality are included in the qualitative evaluation that is presented in subsequent sections of this chapter. Although most of the proposed projects described in Chapter 21 could have project-specific impacts that will be addressed in future project-specific environmental documentation, future implementation of these projects is not expected to result in cumulative impacts to regional water supply operations, or water-related and water dependent resources that also could be affected by the Proposed Project/Action or alternatives (see Chapter 21). For this reason, only the limited number of projects with the potential to cumulatively impact power production and energy consumption in the project study area are specifically considered qualitatively in the cumulative impacts analysis for power production and energy consumption. These projects are:

- Water Storage and Conveyance Projects
  - Shasta Lake Water Resources Investigation (Shasta Lake Enlargement)
  - Upper San Joaquin River Basin Storage Investigation
- Projects Related to CVP/SWP System Operations
  - Delta Cross Channel Re-operation and Through-Delta Facility
  - Long-Term CVP and SWP Operations Criteria and Plan
  - CVP/SWP Integration Proposition
  - Isolated Delta Facility
  - Delta-Mendota Canal Recirculation Feasibility Study
  - Oroville Facilities FERC Relicensing
- Water Transfer and Acquisition Programs
  - Delta Improvements Package
  - Sacramento Valley Water Management Program
  - Dry Year Water Purchase Program
- Ecosystem Restoration and Flood Control Projects
  - San Joaquin River Restoration Settlement Act (Friant Settlement Legislation)
- Local Projects in the Yuba Region
  - Yuba River Development Project FERC Relicensing

These projects are described in Chapter 21 and qualitatively addressed below.

7.3.1 ENVIRONMENTAL IMPACTS/ENVIRONMENTAL CONSEQUENCES OF THE YUBA ACCORD ALTERNATIVE CUMULATIVE CONDITION COMPARED TO THE EXISTING CONDITION

For CEQA, the purpose of the cumulative analysis is to determine whether the incremental effects of the Proposed Project (Yuba Accord Alternative) would be expected to be "cumulatively considerable" when viewed in connection with the effects of past projects, other current projects, and probable future projects (PRC Section 21083, subdivision (b)(2)).[5]

For NEPA, the scope of an EIS must include "cumulative actions", which when viewed with other proposed actions, have cumulatively significant impacts and should therefore be discussed in the same impact statement (40 CFR, §1508.25(a)(2)).

Because the CEQ regulations implementing NEPA and the CEQA guidelines contain very similar requirements for analyzing, and definitions of, cumulative impacts, the discussions of cumulative impacts of the Yuba Accord Alternative Cumulative Condition relative to the Existing Condition will be the basis for evaluation of cumulative impacts for both CEQA and

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[5] The "*Guide to the California Environmental Quality Act*" (Remy *et al.* 1999) states that "*…although a project may cause an "individually limited" or "individually minor" incremental impact that, by itself, is not significant, the increment may be "cumulatively considerable", and thus significant, when viewed against the backdrop of past, present, and probable future projects.*" (CEQA Guidelines, § 15064, subd. (i)(l), 15065, subd. (c), 15355, subd. (b)).

NEPA. In addition, an analysis of the Modified Flow Alternative Cumulative Condition relative to the Existing Condition is provided to fulfill NEPA requirements.

The following sections describe this analysis for the projects discussed in Section 7.3 above.

7.3.1.1 *Water Storage Projects*

Enlargement of existing dam and reservoir facilities would involve the additional storage of water, and presumably additional water releases for hydroelectric generation, although actual additional generation potential will be determined in part by flood control and other operational changes. To the extent that additional hydroelectric generation is provided to the grid, corresponding reductions in generation by thermal or other polluting sources would be a net benefit to the environment from the perspective of energy generation.

7.3.1.2 *Projects Related to CVP/SWP System Operations*

Changes in CVP/SWP system operations may modify hydroelectric generation output or total electrical loads related to pumping. Most of these projects would likely not result in an overall increase or decrease in total hydroelectric generation or pumping, but would more likely result in changing of generation and/or pumping to different months in a given year.

7.3.1.3 *Water Transfer and Acquisition Programs*

Several water projects (e.g., SVWMP, Dry Year Water Purchase Program, a long-term EWA Program or a program equivalent to the EWA) could purchase water through groundwater substitution programs. Water held in reservoirs during April through June generally would be released during July through September under such programs. Agencies participating in groundwater substitution programs or other water transfer programs could cause reservoirs to release more water during July through September than under existing conditions. If these programs were to be implemented, it is possible that hydroelectric generation could increase during summer (high demand) seasons, and be reduced during winter/spring (generally lower demand) seasons during reservoir refill. It is also possible that pumping loads could increase, either from additional pumping at the Jones or Banks facilities for export, or from groundwater pumping for substitution.

7.3.1.4 *Ecosystem Restoration and Flood Control Projects*

The San Joaquin River Restoration Settlement Act includes changes in the operations of the San Joaquin River facilities, including releases for instream uses. This project could result in either a reduction in hydroelectric generation or in an inter-seasonal changing of generation.

7.3.1.5 *Local Projects in the Yuba Region*

Of the projects identified above, only the Yuba River Development Project FERC Relicensing has the potential to affect hydropower generation operations in the Yuba Region. Through the relicensing process, FERC may impose new regulatory constraints (such as additional instream flow releases) on the Yuba Project which would likely reduce the total annual generation of the Yuba Project. Corresponding increases in local groundwater pumping in dry year conditions may be expected to offset reduced water deliveries from the Yuba Project.

7.3.1.6 *Other Cumulative Power Production and Energy Consumption Impact Considerations*

The quantitative operations-related impact considerations for the CEQA Yuba Accord Alternative, relative to the CEQA Existing Condition, are discussed in Section 7.2.5. Potential impacts identified in Section 7.2.5 are summarized below and provide an indication of the potential incremental contributions of the Yuba Accord Alternative to cumulative impacts. These potential impacts are summarized here:

- Impact 7.2.5-1: Decreases in long-term average annual hydropower generation at New Colgate, Narrows I and Narrows II powerhouses; at the Oroville-Thermalito Complex, or at the San Luis Pumping-Generating Plant – Less than significant
- Impact 7.2.5-2: Change in long-term average monthly hydropower generation at New Colgate, Narrows I and II powerhouses – Less than significant
- Impact 7.2.5-3: Decreases in long-term average annual or change in long-term average monthly hydropower generation at the Oroville-Thermalito Complex – Less than significant
- Impact 7.2.5-4: Decreases in long-term average annual or change in long-term average monthly hydropower generation at the San Luis Pumping-Generating Plant – Less than significant
- Impact 7.2.5-5: Increases in long-term average annual power consumption for groundwater pumping within YCWA Member Unit service areas – Potentially significant
- Impact 7.2.5-6: Increases in long-term average annual power consumption at the Banks Pumping Plant, the Jones Pumping Plant, the O'Neill Forebay Pumping Plant and the San Luis Pumping-Generating Plant – Less than significant

Although most of these impacts would be less than significant, the potential nevertheless exists for cumulative impacts. Cumulative impact determinations are presented below, and are based upon consideration of the quantified Yuba Accord Alternative impacts relative to the CEQA Existing Condition, in combination with the potential impacts of other reasonably foreseeable projects.

7.3.1.7 *Potential for Cumulative Power Production and Energy Consumption Impacts within the Project Study Area*

Of the projects discussed above, the Yuba River Development Project FERC Relicensing has the potential to significantly affect generation at the Colgate and Narrows powerhouses. In addition, the relicensing has the potential to impact the long-term average annual power consumption for groundwater pumping within the YCWA Member Units, by reducing the amount of water available for diversion for surface water supply. Several of the other Water Storage, CVP/SWP System Operations, or Water Transfer and Acquisition Projects may impact generation at the Oroville-Thermalito complex or at the San Luis Pumping-Generating Plant. In addition, the Water Transfer and Acquisition projects have the potential to increase the long-term average annual power consumption for pumping at the CVP/SWP pumping facilities (Banks and Jones), as a result of increased export levels.

It is possible that some combination of these projects may reach a level of significance either in reduction or changing of generation, or increases in electrical pumping load, with corresponding secondary impacts in pollution resulting from replacing lost generation or providing additional energy from polluting sources as described in Sections 7.2.2.1 and 7.2.2.2.

Therefore, there is a potential for future cumulative significant and unavoidable impacts to the hydroelectric generation and power consumption for pumping in the Project Study Area as a result of the Yuba Accord Cumulative Condition compared to the existing condition.

7.3.2 Environmental Impacts/Environmental Consequences of the Modified Flow Alternative Cumulative Condition Compared to the Existing Condition

It is anticipated that the Modified Flow Alternative Cumulative Condition will have the same potential cumulative and unavoidable impacts as the Yuba Accord Alternative Cumulative Condition. Therefore, the description of the potential impacts in Section 7.3.1 also serves as the description of cumulative impacts associated with the Modified Flow Alternative.

7.4 Potential Conditions to Support Approval of YCWA's Water Rights Petition

No unreasonable adverse effects to power production and energy consumption would occur under the Proposed Project/Action or alternatives and, thus, no impact avoidance measures or other protective conditions are identified for the SWRCB's consideration in determining whether or not to approve YCWA's petitions to implement the Yuba Accord.

7.5 Mitigation Measures/Environmental Commitments

No specific mitigation measure are suggested for the increase in consumption of electrical energy, the decrease in production of hydroelectric generation, or the change in production of energy.

7.6 Potentially Significant Unavoidable Impacts

There are several potentially significant unavoidable impacts to power production and energy consumption associated with the implementation of the Proposed Project/Action or alternatives, as shown in **Table 7-10**.

Each of these potential significant unavoidable impacts is the result of a decrease in energy production (decrease in hydropower generation) or an increase in energy usage (increased annual power consumption for pumping). These unavoidable impacts are potentially significant because they will require the generation of electrical energy from another source (to replace lost hydroelectric generation or to provide additional power for pumping). Replacement or additional generation would likely come from a thermal generation source, such as a combined cycle natural gas fired turbine, or a coal fired power plant. Generation from a source that meets the California Public Utilities Commission's Emissions Performance Standards would contribute up to 1,200 pounds/MWh of greenhouse gasses, plus other pollutants such as particulates and oxides of nitrogen. Thus, additional pumping electrical load of 5,000 MWh per year would likely contribute 3,000 tons or more of greenhouse gasses to the atmosphere.

Table 7-10 Potentially Significant Unavoidable Impacts to Power Production and Energy Consumption

Comparison	Potentially Significant Impact	Potential Impact Level
CEQA Yuba Accord Alternative Compared to the CEQA No Project Alternative CEQA Yuba Accord Alternative Compared to the CEQA Existing Condition	*Impact 7.2.3-5*: Increase in long-term average annual power consumption for groundwater pumping within YCWA Member Units *Impact 7.2.5-5:* Increase in long-term average annual power consumption for groundwater pumping within YCWA Member Units	605 MWh increase in consumption 2,153 MWh increased in consumption
CEQA Modified Flow Alternative Compared to the CEQA Existing Condition	*Impact 7.2.6-2*: Change in long-term average monthly hydropower generation at New Colgate, Narrows I and II Powerhouses *Impact 7.2.6-5*: Increase in long-term average annual power consumption for groundwater pumping within YCWA Member Units	2,892 MWh net change + 954 MWh increase in consumption
CEQA No Project Alternative Compared to the CEQA Existing Condition	*Impact 7.2.7-2*: Change in long-term average monthly hydropower generation at New Colgate, Narrows I and II Powerhouses *Impact 7.2.7-5*: Increase in long-term average annual power consumption for groundwater pumping within YCWA Member Units	28,970 MWh net change + 1,549 MWh increase in consumption
NEPA No Action Alternative Compared to the NEPA Affected Environment	*Impact 7.2.7-2*: Change in long-term average monthly hydropower generation at New Colgate, Narrows I and II Powerhouses *Impact 7.2.7-5*: Increase in long-term average annual power consumption for groundwater pumping within YCWA Member Units	28,970 MWh net change + 1,549 MWh increase in consumption
NEPA Yuba Accord Alternative Compared to the NEPA No Action Alternative	*Impact 7.2.8-5*: Increase in long-term average annual power consumption for groundwater pumping within YCWA Member Units	592 MWh increase in consumption

The CEQA No Project Alternative compared to the CEQA Existing Condition and the NEPA No Action Alternative compared to the NEPA Affected Environment would have the greatest relative environmental impacts of all of the potentially significant environmental impacts identified in the comparisons.

CHAPTER 8
FLOOD CONTROL

Floods can be damaging and costly, often resulting in loss of life or substantial property damage. Levees, dams, and reservoirs provide flood control throughout most of California. Dams and reservoir operations can reduce flows downstream by storing inflows and controlling releases. Levees are intended to confine flows within river channels. The effectiveness of a levee is a function of the levee's integrity and its maximum design flow capacity. This chapter discusses the effects of the Proposed Project/Action and alternatives on flood control, relative to the bases of comparison.

8.1 ENVIRONMENTAL SETTING/AFFECTED ENVIRONMENT

This section describes the existing flood control operations within the three areas potentially affected by implementing the Proposed Project/Action or an alternative: (1) the Yuba Region; (2) the CVP/SWP Upstream of the Delta Region; and (3) the Delta Region.

8.1.1 YUBA REGION

New Bullards Bar Reservoir, located on the North Yuba River, is the storage facility of the Yuba Project. The reservoir has a total storage capacity of 966 TAF with a required minimum pool of 234 TAF (as required by YCWA's FERC license), thus leaving 732 TAF of capacity that can be regulated. A portion of this regulated capacity, up to 170 TAF, normally must be held empty from September 15 through May 31 for flood control. This flood control storage space is utilized to maintain Yuba River instream flows below the river's flood channel capacity, which ranges between 120,000 cfs and 180,000 cfs depending on the flow in the Feather River.

Under normal operations, the North Yuba River inflow to New Bullards Bar Reservoir is augmented by diversions from the Middle Yuba River to Oregon Creek via the Lohmann Ridge Tunnel, and by diversions from Oregon Creek into the reservoir via the Camptonville Tunnel. During major flood control operations, these diversions are normally closed. The average combined inflow to New Bullards Bar Reservoir from the North Yuba River and the diversions from the Middle Yuba River and Oregon Creek is about 1.2 MAF[1]. Non-flood releases from New Bullards Bar Reservoir are made through the New Colgate Powerhouse, which has a capacity of 3,400 cfs. During flood operations, releases also are made through the New Bullards Bar spillway gates and the bottom outlet. The maximum objective flood control release for New Bullards Bar Reservoir is 50,000 cfs and the spillway gate release capacity at full pool is 150,000 cfs.

New Bullards Bar Reservoir releases and flows from the Middle Yuba and South Yuba Rivers pass through Englebright Reservoir into the lower Yuba River. Englebright Reservoir has a total storage capacity of 70 TAF and has limited regulating capability. Under non-flood flow conditions, Englebright Reservoir is used to attenuate power peaking releases from the New Colgate Powerhouse and tributary inflows. Englebright Reservoir does not have any dedicated flood storage space and only provides minimal flood control benefits. Because the outlet

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[1] Based on model simulations of current facilities for the 1922 to 1994 period, and estimated historical inflows for the 1995 to 2005 period.

capacity of the Narrows I and Narrows II powerhouses that release flow to the lower Yuba River from Englebright Reservoir totals 4,170 cfs, flows above that level are uncontrolled (spilling over the top of Englebright Dam). Differences in flows between the Proposed Project/Action and the basis of comparison above that level therefore tend to be a function of river and reservoir operations in response to storm and flood control requirements.

8.1.2 CVP/SWP UPSTREAM OF THE DELTA REGION

The CVP/SWP Upstream of the Delta Region is defined as those waterways and flood control infrastructure (e.g., levees, pumps, diversion weirs, and bypass channels) associated with CVP/SWP operations including:

- Oroville Reservoir and the Feather River downstream from Oroville Reservoir to the confluence with the Sacramento River; and
- The Sacramento River downstream from the Feather River confluence to the Delta.

For reservoirs, the CVP/SWP Upstream of the Delta Region encompasses the reservoirs and associated flood control structures.

8.1.2.1 FEATHER RIVER BASIN

The Feather River contributes very significant flood flows to the Sacramento River Flood Control Project (SRFCP). Approximately 50 percent of the design flow for the Sacramento River at Sacramento and the Yolo Bypass near Sacramento originates in the Feather River watershed. Feather River flood flows are significantly regulated by Oroville and New Bullards Bar reservoirs.

Oroville Reservoir holds winter and spring runoff for later releases into the Feather River. During flood events, Oroville Reservoir aids in reducing downstream flooding. Up to 750 TAF of flood space is preserved within the 3.5 MAF of storage capacity for the storage of flood flows, as required by the Corps. From October through March, the maximum designated flood space is 750 TAF. From April through June, the flood space requirement decreases to zero. The flood space requirement increases again in September in preparation for the upcoming flood season. Flood control releases are made to meet Corps flood control criteria. During times when flood control space is not required to accomplish flood control objectives, reservoir space can be used for storing water (DWR 2001). Similar to Shasta Reservoir, the actual volume of storage capacity reserved for flood control varies from month-to-month and year-to-year depending on hydrologic conditions.

The lower Feather River is leveed from its confluence with the Sacramento River upstream to Hamilton Bend near the City of Oroville on the west bank, and from the confluence upstream to Honcut Creek on the east bank. Oroville Dam, the lower-most dam on the Feather River, regulates downstream flows, and is located downstream of the confluence of the West Branch and the North, Middle, and South forks of the Feather River, upstream from Honcut Creek, the Yuba River and the Bear River (**Figure 8-1**). The lower Feather River channel capacity above the confluence with the lower Yuba River is 210,000 cfs (Reclamation *et al.* 2004).

Figure 8-1. Feather River Reference Map

8.1.2.2 SACRAMENTO RIVER BASIN

The Sacramento River is leveed from Ord Ferry to the southern tip of Sherman Island in the Delta. Flood control on the Sacramento River also is managed by a system of weirs and bypasses constructed by the Corps. The system includes five bypasses: Butte Basin, Sutter, Yolo, Tisdale, and Sacramento bypasses. Moulton and Colusa weirs feed floodwaters into the Butte Basin Bypass, water flows over the Tisdale Weir into Sutter Bypass, and over the Fremont Weir and the Sacramento Bypass into the Yolo Bypass. The Yolo Bypass carries five times the flow of the Sacramento River at peak flood flows. Flood control operations are based on regulating criteria developed by the Corps, pursuant to the Flood Control Act of 1944.

The SRFCP, consisting of levees built, improved or adopted by the Corps and turned over to state and local agencies for maintenance, provides flood protection for the lower reaches of the Sacramento River and into the Delta.

8.1.3 DELTA REGION

The flood control system in the Delta (with the exception of the Delta Cross Channel control gates) operates passively. Since the construction of the CVP/SWP, and more importantly, since construction of the Yolo Bypass system, flood flows in the Delta have been more controlled. Flooding still occurs, but has been confined to the individual islands or tracts and is due mostly to levee instability or overtopping. The major factors influencing Delta water levels include high flows, high tide, and wind. The highest water stages typically occur in December through February when these factors are compounded.

8.1.4 REGULATORY SETTING

8.1.4.1 FEDERAL AND STATE

Responsibility for flood control in California is shared between agencies. The Corps and the State of California share ownership of the levees in the Sacramento Flood Control System. The flood control system is carefully regulated to provide planned flood protection. The State Reclamation Board regulates all activities on or adjacent to levees that have the potential to impact the operation and efficacy of the levees. Permits must be obtained from the State Reclamation Board prior to any alteration of the levee system.

The Corps provides written instructions on the operation of the major flood control reservoirs. The Corps monitors the operation of the reservoirs to assure they are operated in accordance with Corps regulations. In addition, the Corps is responsible for administering Section 404 of the CWA. The CWA may impact operation and maintenance activities concerning the levees and flood control channels.

8.1.4.2 LOCAL

The Yuba and Feather River levees are operated and maintained by local levee and reclamation districts. These maintenance activities are monitored by the State Reclamation Board to assure compliance with federal regulations. New Bullards Bar Reservoir is operated by YCWA.

NEW BULLARDS BAR DAM FLOOD CONTROL REGULATIONS

New Bullards Bar Dam must be operated from September 16 to May 31 to comply with Part 208 *"Flood Control Regulations, New Bullards Bar Dam and Reservoir, North Yuba River, California,"* pursuant to Section 7 of the Flood Control Act of 1944 (58 Stat. 890). Under the contract between the United States and YCWA entered into on May 9, 1966, YCWA agreed to reserve 170 TAF of storage space for flood control in accordance with rules and regulations enumerated in Appendix A of the "*Report on Reservoir Regulation for Flood Control*." The seasonal flood storage space allocation schedule is presented in **Table 8-1**.

Table 8-1. New Bullards Bar Reservoir Flood Storage End-of-Month Space Allocation (TAF)

End of Month	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Flood Space	170	170	170	170	170	170	70	0	0	0	0	56

New Bullards Bar Reservoir is operated to limit flows in the lower Yuba River and lower Feather River to design flood capacity. **Table 8-2** lists the flow capacity objectives of these two rivers.

Table 8-2. Lower Yuba River and Lower Feather River Flow Capacity Objectives (cfs)

New Bullards Bar Maximum Objective Flow Below Dam	50,000
Yuba River Upstream from Feather River (High Feather River Flows)	120,000
Yuba River Upstream from Feather River (Low Feather River Flows)	180,000
Feather River Below Oroville Dam	150,000
Feather River Upstream from Yuba River	210,000
Feather River Downstream from Yuba River	300,000
Feather River at Nicolaus	320,000

8.2 ENVIRONMENTAL IMPACTS/ENVIRONMENTAL CONSEQUENCES

The Proposed Project/Action and alternatives would not: (1) involve the construction or modification of any infrastructure that would alter existing drainage patterns; (2) substantially increase surface runoff conditions on land areas within the study region; (3) result in surface runoff conditions that would exceed existing or planned drainage systems; (4) contribute substantial levels of polluted runoff to the system; or (5) place housing or other structures within the 100-year flood hazard area. In addition, the Proposed Project/Action and alternatives would not affect channel carrying capacities, nor would they require modifications of any existing flood control diagrams.

With implementation of the Proposed Project/Action or alternatives, New Bullards Bar Reservoir storage would be expected to be utilized to a greater degree than under the bases of comparison, to maintain higher minimum instream flows. Because the Proposed Project/Action and alternatives are expected to reduce New Bullards Bar Reservoir storage, relative to the bases of comparison, increases in the magnitude or frequency of New Bullards Bar Reservoir flood control releases are not expected to occur with implementation of the Proposed Project/Action or alternatives. However, the Proposed Project/Action and alternatives do have the potential to affect the magnitude, frequency, and timing of Oroville Reservoir releases, relative to the bases of comparison, when the following conditions are met:

- Lower Yuba River instream flows are greater than the legally required minimum instream flows (e.g., RD-1644 Interim or RD-1644 Long-term flows);
- Oroville Reservoir releases are greater than the flow needed to meet both the lower Feather River diversion demands and the legally required minimum instream flows

immediately downstream of the Thermalito Afterbay return (i.e., upstream of the Yuba River confluence); and

- Hydrologic or operational conditions in the Delta prohibit water transfers.

Under these conditions, Oroville Reservoir releases may be decreased by the incremental amount of lower Yuba River instream flows that are above the legally required minimum instream flows. The incremental amount of water is not released from Oroville Reservoir, and is therefore effectively "backed-up" or stored in Oroville Reservoir. Because Oroville Reservoir storage may increase under these conditions, changes in the timing, magnitude, or frequency of Oroville Reservoir flood control releases may occur, relative to the bases of comparison. Any potential increase in Oroville Reservoir storage resulting from using lower Yuba River flows to "back-up" Feather River (into Oroville Reservoir) flows is expected to be small. Nevertheless, this chapter quantitatively evaluates the potential for flood control impacts resulting from the "backing-up" of water into Oroville Reservoir, which may occur with implementation of the Proposed Project/Action or one of the alternatives.

8.2.1 IMPACT ASSESSMENT METHODOLOGY

The impact assessment relies on mass balance hydrologic modeling to provide a quantitative basis from which to assess the potential impacts of the Proposed Project/Action and alternatives on flood control within the project study area. Specifically, the hydrologic modeling analyses and post-processing applications are utilized to simulate data representing Yuba River Basin and CVP/SWP operational conditions that would occur from implementation of any of the alternatives evaluated in this EIR/EIS, which are compared to modeled data representing operational conditions under the bases of comparison. The hydrologic modeling analyses were conducted using a 72-year simulation period, spanning from 1922 to 1993.

This assessment is based on the potential impacts the Proposed Project/Action and alternatives may have on the flood protection provided by the affected reservoirs (i.e., New Bullards Bar and Oroville reservoirs) and rivers (i.e., Yuba, Sacramento, and Feather rivers), relative to the bases of comparison. Flood control releases are evaluated differently for New Bullards Bar and Oroville reservoirs because each reservoir has different operational criteria, varying in complexity, during those months when potential floods may occur.

The evaluation applicable to New Bullards Bar Reservoir is a two-step process. First, the occurrences of the reservoir storage level reaching the minimum reservoir storage reserved for flood control, expected for each month in which flood control storage reservation is specified, are identified over the 72-year simulation period for the Proposed Project/Action and alternatives and the bases of comparison. Second, the frequency and magnitude of flood control releases expected with implementation of the Proposed Project/Action and alternatives are examined, relative to the bases of comparison. It is recognized that mean monthly flows produced by the model do not capture the magnitude of any particular flood control release; however, comparison of mean monthly flows between the Proposed Project/Action and the bases of comparison will provide a relative indicator of the differences in magnitude of flood control flow events. The number of occurrences of flood control releases (cfs) expected for each individual month over the 72-year simulation period is compared between the Proposed Project/Action and the bases of comparison for each alternative. For the purposes of this analysis, a flood control release is represented by the end-of-month storage volume reaching or encroaching into the minimum reservoir storage reserved for flood control. On the Yuba River, flood control releases are triggered when New Bullards Bar Reservoir storage volume reaches

796 TAF any time during October through March; 896 TAF during April; and 910 TAF during September. There are no storage volume flood control release triggers from May through August. The frequency at which flood control releases would occur at New Bullards Bar Reservoir under the Proposed Project/Action and alternatives is compared to the frequency at which flood control releases would occur under the bases of comparison. Additionally, the exceedance percentages of flood flows (flows greater than 4,170 cfs as recorded at Smartville) are compared between the Proposed Project/Action and alternatives, and the bases of comparison.

Flood control operations at Oroville Reservoir are more complex than those at New Bullards Bar in that minimum flood control storage requirements can differ from month-to-month and year-to-year based on several parameters (i.e., precipitation index, water year type, and maximum flow requirements at different nodes downstream of the reservoir). To simplify the evaluation process, long-term average end-of-month storage volumes and end-of-month storage volumes by water year type are evaluated for the Proposed Project/Action, relative to the bases of comparison for Oroville Reservoir. The evaluation is conducted for the months of September through April.

8.2.2 IMPACT INDICATORS AND SIGNIFICANCE CRITERIA FOR FLOOD CONTROL

For the Yuba River, a substantial increase in the number of potential flood control releases (i.e., reservoir storage reaches flood control target value) from New Bullards Bar Reservoir under the Proposed Project/Action and alternatives, relative to the bases of comparison, would be considered significant. Additionally, a substantial increase in mean monthly flows exceeding 4,170 cfs is considered an indicator of a potential increase in the magnitude of flood flows. For Oroville Reservoir, long-term average end-of-month storage volumes and end-of-month storage volumes by water year type under the Proposed Project/Action and alternatives, relative to the bases of comparison, is evaluated. For CEQA and NEPA purposes, a substantial increase in end-of-month storage volumes under the Proposed Project/Action or an alternative, relative to the bases of comparison, would be considered significant.

As discussed in Chapter 4, CEQA and NEPA have different legal and regulatory standards that require slightly different assumptions in the modeling runs used to compare the Proposed Project/Action and alternatives to the appropriate CEQA and NEPA bases of comparison in the impact assessments. Although only one project (the Yuba Accord Alternative) and one other action alternative (the Modified Flow Alternative) are evaluated in this EIR/EIS, it is necessary to use separate NEPA and CEQA modeling scenarios for the Proposed Project/Action, alternatives and bases of comparisons to make the appropriate comparisons. As a result, the scenarios compared in the impact assessments below have either a "CEQA" or a "NEPA" prefix before the name of the alternative being evaluated. A detailed discussion of the different assumptions used for the CEQA and NEPA scenarios is included in Appendix D.

As also discussed in Chapter 4, while the CEQA and NEPA analyses in this EIR/EIS refer to "potentially significant," "less than significant," "no" and "beneficial" impacts, the first two comparisons (CEQA Yuba Accord Alternative compared to the CEQA No Project Alternative and CEQA Modified Flow Alternative compared to the CEQA No Project Alternative) presented below instead refer to whether or not the proposed change would "unreasonably affect" the evaluated parameter. This is because these first two comparisons are made to determine whether the action alternative would satisfy the requirement of Water Code Section 1736 that the proposed change associated with the action alternative "*would not unreasonably affect fish, wildlife, or other instream beneficial uses*."

8.2.3 ENVIRONMENTAL IMPACTS/ENVIRONMENTAL CONSEQUENCES OF THE CEQA YUBA ACCORD ALTERNATIVE COMPARED TO THE CEQA NO PROJECT ALTERNATIVE

Impact 8.2.3-1: Increases in New Bullards Bar Reservoir end-of-month storage volumes that could affect flood control releases

Minimum storage space reserved for flood control purposes in New Bullards Bar Reservoir is set for the September through April time period as described above. Over the 72-year simulation period, New Bullards Bar Reservoir would reach minimum flood control storage levels 49 times under the CEQA Yuba Accord Alternative compared to 54 times under the CEQA No Project Alternative (Appendix F4, 3 vs. 2, pgs. 2 - 8, and 13).

When flows exceed 4,170 cfs in the lower Yuba River, Englebright Dam is spilling and flows are considered uncontrolled. During the months of October through April, the likelihood of flows exceeding 4,170 cfs would be the same or less under the CEQA Yuba Accord Alternative relative to the CEQA No Project Alternative (Appendix F4, 3 vs. 2, pgs. 101 through 107). Therefore, the CEQA Yuba Accord Alternative, relative to the CEQA No Project Alternative, would not unreasonably affect flood control releases.

Impact 8.2.3-2: Increases in Oroville Reservoir end-of-month storage volumes that could affect flood control releases

Simulated end-of-month storage volumes in Oroville Reservoir under the CEQA Yuba Accord Alternative would be within one percent of those simulated under the CEQA No Project Alternative for all water year types (Appendix F4, 3 vs. 2, pg. 406). Therefore, the CEQA Yuba Accord Alternative, relative to the CEQA No Project Alternative, would not unreasonably affect flood control releases.

8.2.4 ENVIRONMENTAL IMPACTS/ENVIRONMENTAL CONSEQUENCES OF THE CEQA MODIFIED FLOW ALTERNATIVE COMPARED TO THE CEQA NO PROJECT ALTERNATIVE

Impact 8.2.4-1: Increases in New Bullards Bar Reservoir end-of-month storage volumes that could affect flood control releases

Minimum storage space reserved for flood control purposes in New Bullards Bar Reservoir is set for the September through April time period as described above. Over the 72-year simulation period, New Bullards Bar Reservoir would reach minimum flood control storage levels 51 times under the CEQA Modified Flow Alternative compared to 54 times under the CEQA No Project Alternative (Appendix F4, 4 vs. 2, pgs. 2 - 8, and 13).

When flows exceed 4,170 cfs in the lower Yuba River, Englebright Dam is spilling and flows are considered uncontrolled. During the months of October through April, the likelihood of flows exceeding 4,170 cfs would be the same or less under the CEQA Modified Flow Alternative and the CEQA No Project Alternative (Appendix F4, 4 vs. 2, pgs. 101 through 107). Therefore, the CEQA Modified Flow Alternative, relative to the CEQA No Project Alternative, would not unreasonably affect flood control releases.

Impact 8.2.4-2: Increases in Oroville Reservoir end-of-month storage volumes that could affect flood control releases

Simulated end-of-month storage volumes in Oroville Reservoir under the CEQA Modified Flow Alternative would be within one percent of those simulated under the CEQA No Project

Alternative for all water year types (Appendix F4, 4 vs. 2, pg. 406). Therefore, the CEQA Modified Flow Alternative, relative to the CEQA No Project Alternative, would not unreasonably affect flood control releases.

8.2.5 ENVIRONMENTAL IMPACTS/ENVIRONMENTAL CONSEQUENCES OF THE CEQA YUBA ACCORD ALTERNATIVE COMPARED TO THE CEQA EXISTING CONDITION

Impact 8.2.5-1: Increases in New Bullards Bar Reservoir end-of-month storage volumes that could affect flood control releases

Minimum storage space reserved for flood control purposes in New Bullards Bar Reservoir is set for the September through April time period as described above. Over the 72-year simulation period, New Bullards Bar Reservoir would reach minimum flood control storage levels 49 times under the CEQA Yuba Accord Alternative compared to 51 times under the CEQA Existing Condition (Appendix F4, 3 vs. 1, pgs. 2 - 8, and 13).

When flows exceed 4,170 cfs in the lower Yuba River, Englebright Dam is spilling and flows are considered uncontrolled. During the months of October through January, the likelihood of flows exceeding 4,170 cfs would be slightly more (one to three percent) under the CEQA Yuba Accord Alternative relative to the CEQA Existing Condition. From February through April, the likelihood of flows exceeding 4,170 cfs would be slightly less (one to two percent) under the CEQA Yuba Accord Alternative relative to CEQA Existing Condition (Appendix F4, 3 vs. 1, pgs. 101 through 107). Therefore, potential impacts associated with changes in flood control releases under the CEQA Yuba Accord Alternative, relative to the CEQA Existing Condition, would be less than significant.

Impact 8.2.5-2: Increases in Oroville Reservoir end-of-month storage volumes that could affect flood control releases

Simulated end-of-month storage volumes in Oroville Reservoir under the CEQA Yuba Accord Alternative would be within one percent of those simulated under the CEQA Existing Condition for all water year types (Appendix F4, 3 vs. 1, pg. 406). Therefore, potential impacts associated with changes in flood control releases under the CEQA Yuba Accord Alternative, relative to the CEQA Existing Condition, would be less than significant.

8.2.6 ENVIRONMENTAL IMPACTS/ENVIRONMENTAL CONSEQUENCES OF THE CEQA MODIFIED FLOW ALTERNATIVE COMPARED TO THE CEQA EXISTING CONDITION

Impact 8.2.6-1: Increases in New Bullards Bar Reservoir end-of-month storage volumes that could affect flood control releases

Minimum storage space reserved for flood control purposes in New Bullards Bar Reservoir is set for the September through April time period as described above. Over the 72-year simulation period, New Bullards Bar Reservoir would reach minimum flood control storage levels the same number of times under the CEQA Modified Flow Alternative compared to the CEQA Existing Condition (Appendix F4, 4 vs. 1, pgs. 2 - 8, and 13).

When flows exceed 4,170 cfs in the lower Yuba River, Englebright Dam is spilling and flows are considered uncontrolled. During the months of October and November, the likelihood of flows exceeding 4,170 cfs would be the same under the CEQA Modified Flow Alternative compared to the CEQA Existing Condition. During December and January, the likelihood of flows exceeding 4,170 cfs would be two percent and one percent higher, respectively, under the CEQA Modified Flow Alternative, relative to CEQA Existing Condition. During February, the likelihood of flows exceeding 4,170 cfs would be two percent lower under the CEQA Modified Flow Alternative, relative to CEQA Existing Condition and from March through April, the likelihood of flows exceeding 4,170 cfs would be the same under both scenarios (Appendix F4, 4 vs. 1, pgs. 101 through 107). Therefore, potential impacts associated with changes in flood control releases under the CEQA Modified Flow Alternative, relative to the CEQA Existing Condition, would be less than significant.

Impact 8.2.6-2: Increases in Oroville Reservoir end-of-month storage volumes that could affect flood control releases

Simulated end-of-month storage volumes in Oroville Reservoir under the CEQA Modified Flow Alternative would be within one percent of those simulated under the CEQA Existing Condition for all water year types (Appendix F4, 4 vs. 1, pg. 406). Therefore, potential impacts associated with changes in flood control releases under the CEQA Modified Flow Alternative, relative to the CEQA Existing Condition, would be less than significant.

8.2.7 ENVIRONMENTAL IMPACTS/ENVIRONMENTAL CONSEQUENCES OF THE CEQA NO PROJECT/NEPA NO ACTION ALTERNATIVE COMPARED TO THE CEQA EXISTING CONDITION/NEPA AFFECTED ENVIRONMENT

As discussed in Chapter 3, the key elements and activities (e.g., implementation of the RD-1644 Long-term instream flow requirements) for the CEQA No Project Alternative would be the same for the NEPA No Action Alternative. The primary differences between the CEQA No Project and NEPA No Action alternatives are various hydrologic and other modeling assumptions (see Section 4.5 and Appendix D). Because of these differences between the No Project and No Action alternatives, these alternatives are distinguished as separate alternatives for CEQA and NEPA evaluation purposes.

Based on current plans and consistent with available infrastructure and community services, the CEQA No Project Alternative in this EIR/EIS is based on current environmental conditions (e.g., project operations, water demands, and level of land development) plus potential future operational and environmental conditions (e.g., implementation of the RD-1644 Long-term instream flow requirements in the lower Yuba River) that probably would occur in the foreseeable future in the absence of the Proposed Project/Action or another action alternative. The NEPA No Action Alternative also is based on conditions without the proposed project, but uses a longer-term future timeframe that is not restricted by existing infrastructure or physical and regulatory environmental conditions. The differences between these modeling characterizations and assumptions for the CEQA No Project and the NEPA No Action alternatives, including the rationale for developing these two different scenarios for this EIR/EIS, are explained in Chapter 4[2].

Although implementation of the RD-1644 Long-term instream flow requirements would occur under both the CEQA No Project and the NEPA No Action alternatives, the resultant model

[2] For modeling purposes related to CEQA analytical requirements, OCAP Study 3 (2001 level of development) is used as the foundational study upon which the modeling scenarios for the CEQA No Project Alternative and the CEQA Existing Condition were developed. For modeling purposes related to NEPA analytical requirements, OCAP Study 5 (2020 level of development) is used as the foundational study upon which the modeling scenarios for the NEPA No Action Alternative was developed.

outputs for both scenarios are different because of variations in the way near-term and long-term future operations are characterized for other parameters in the CEQA and NEPA assumptions. As discussed in Chapter 4, the principal difference between the CEQA No Project Alternative and the NEPA No Action Alternative is that the NEPA No Action Alternative includes several potential future water projects in the Sacramento and San Joaquin valleys (e.g., CVP/SWP Intertie, FRWP, SDIP and a long-term EWA Program or a program equivalent to the EWA), while the CEQA No Project Alternative does not. Because many of the other assumed conditions for these two scenarios are similar, the longer-term analysis of the NEPA No Action Alternative compared to the NEPA Affected Environment builds upon the nearer-term analysis of the CEQA No Project Alternative compared to the CEQA Existing Condition.

Because the same foundational modeling base (OCAP Study 3) was used to characterize near-term conditions (2001 level of development) for both the CEQA No Project Alternative and the CEQA Existing Condition, it was possible to conduct a detailed analysis to quantitatively evaluate the hydrologic changes in the Yuba Region and the CVP/SWP system that would be expected to occur under these conditions. Building on this CEQA analysis, the analysis of the NEPA No Action Alternative compared to the NEPA Affected Environment, consists of two components: (1) an analysis of near-term future without project conditions quantified through the CEQA No Project Alternative, relative to the CEQA Existing Condition; and (2) a qualitative analysis of longer-term future without-project conditions (the NEPA No Action Alternative)[3].

8.2.7.1 CEQA NO PROJECT ALTERNATIVE COMPARED TO THE CEQA EXISTING CONDITION

Impact 8.2.7.1-1: Increases in New Bullards Bar Reservoir end-of-month storage volumes that could affect flood control releases

Minimum storage space reserved for flood control purposes in New Bullards Bar Reservoir is set for the September through April time period as described above. Over the 72-year simulation period, New Bullards Bar Reservoir would reach minimum flood control storage levels 55 times under the CEQA No Project Alternative compared to 51 times under the CEQA Existing Condition (Appendix F4, 2 vs. 1, pgs. 2 - 8, and 13).

When flows exceed 4,170 cfs in the lower Yuba River, Englebright Dam is spilling and flows are considered uncontrolled. During the months of October and November, the likelihood of flows exceeding 4,170 cfs would be slightly more (one percent) under the CEQA No Project Alternative, relative to the CEQA Existing Condition. During December, the likelihood of flows exceeding 4,170 cfs would be eight percent higher under the CEQA No Project Alternative, relative to the CEQA Existing Condition. During January, the likelihood of flows exceeding 4,170 cfs would be two percent less under the CEQA No Project Alternative, relative to the CEQA Existing Condition. From February through April, the likelihood of flows exceeding 4,170 cfs would be slightly more (one percent) under the CEQA No Project Alternative relative to the CEQA Existing Condition (Appendix F4, 2 vs. 1, pgs. 101 through 107). Therefore, potential impacts associated with changes in flood control releases under the CEQA No Project Alternative, relative to the CEQA Existing Condition, would be less than significant.

[3] The second analytical component cannot be evaluated quantitatively due to the differences in the underlying baseline assumptions for OCAP Study 3 and OCAP Study 5.

Impact 8.2.7.1-2: Increases in Oroville Reservoir end-of-month storage volumes that could affect flood control releases

Simulated end-of-month storage volumes in Oroville Reservoir under the CEQA No Project Alternative would be within one percent of those simulated under the CEQA Existing Condition for all water year types (Appendix F4, 2 vs. 1, pg. 406). Therefore, potential impacts associated with changes in flood control releases under the CEQA No Project Alternative, relative to the CEQA Existing Condition, would be less than significant.

8.2.7.2 NEPA No Action Alternative Compared to the NEPA Affected Environment

In the Yuba Region, the primary differences between the NEPA No Action Alternative and the NEPA Affected Environment would be the changes in lower Yuba River flows associated with the implementation of the RD-1644 Long-term instream flow requirements, to replace the RD-1644 Interim instream flow requirements, and the increased local surface water demands for the Wheatland Water District. These also are the primary difference that would occur in the Yuba Region between the CEQA No Project Alternative and the CEQA Existing Condition. The potential effects to flood control that were evaluated in the quantitative analyses that is presented in Section 8.2.7.1 above for the CEQA No Project Alternative relative to the CEQA Existing Condition (see also Appendix F4, 2 vs. 1) therefore also are used for comparison of the NEPA No Action Alternative relative to the NEPA Affected Environment, and are not repeated here.

As discussed above, the analysis of the NEPA No Action Alternative includes several additional proposed projects in the project study area that are not included in the CEQA analysis. However, these other proposed projects would not significantly affect hydrologic conditions needed for flood control in the Yuba Region and, thus, are only discussed in the context of CVP/SWP operations upstream of and within the Delta.

Under the NEPA No Action Alternative, future levels of demand for water in California would be addressed through the implementation of numerous projects, including water conveyance projects (e.g., SDIP[4]), water transfers and acquisition programs (e.g., a long-term EWA Program or a program equivalent to the EWA) and other projects related to CVP/SWP system operations (e.g., CVP/SWP Intertie and FRWP).

Agencies participating in groundwater substitution programs or other water transfer programs could cause reservoirs to release more water during July through September than under NEPA Affected Environment. Thus, because end-of-September carry-over storage most likely would be lower, the extra volumes of available storage space could alter the timing or necessity to make flood control release events. However, CVP/SWP reservoir flood control operations are governed by the Corps flood control guidelines, which are designed to limit reservoir releases such that they are within channel capacities. Although future CVP/SWP reservoir operations may be altered as a result of new projects under the NEPA No Action Alternative compared to the NEPA Affected Environment, flood control operations would continue to adhere to Corps guidelines. Therefore, it is anticipated that potential effects on flood control associated with water conveyance projects, water transfer and acquisition programs and other projects related

[4] The SDIP includes a maximum pumping rate of 8,500 cfs at the Banks Pumping Plant.

to CVP/SWP operations under the NEPA No Action Alternative, compared to the NEPA Affected Environment, would be minimal.

8.2.8 ENVIRONMENTAL IMPACTS/ENVIRONMENTAL CONSEQUENCES OF THE NEPA YUBA ACCORD ALTERNATIVE COMPARED TO THE NEPA NO ACTION ALTERNATIVE

Impact 8.2.8-1: Increases in New Bullards Bar Reservoir end-of-month storage volumes that could affect flood control releases

Minimum storage space reserved for flood control purposes in New Bullards Bar Reservoir is set for the September through April time period as described above. Over the 72-year simulation period, New Bullards Bar Reservoir would reach simulated minimum flood control storage levels 55 times under the NEPA No Action Alternative compared to 49 times under the NEPA Yuba Accord Alternative (Appendix F4, 6 vs. 5, pgs. 2 - 8, and 13).

When flows exceed 4,170 cfs in the lower Yuba River, Englebright Dam is spilling and flows are considered uncontrolled. During the months of October through April the likelihood of flows exceeding 4,170 cfs would be the same or less (two to six percent) under the NEPA Yuba Accord Alternative, relative to the NEPA No Action Alternative (Appendix F4, 6 vs. 5, pgs. 101 through 107). Therefore, potential impacts associated with changes in flood control releases under the NEPA Yuba Accord Alternative, relative to the NEPA No Action Alternative, would be less than significant.

Impact 8.2.8-2: Increases in Oroville Reservoir end-of-month storage volumes that could affect flood control releases

Simulated end-of-month storage volumes in Oroville Reservoir under the NEPA Yuba Accord Alternative would be within one percent of those simulated under the NEPA No Action Alternative for all water year types (Appendix F4, 6 vs. 5, pg. 406). Therefore, potential impacts associated with changes in flood control releases under the NEPA Yuba Accord Alternative, relative to the NEPA No Action Alternative, would be less than significant.

8.2.9 ENVIRONMENTAL IMPACTS/ENVIRONMENTAL CONSEQUENCES OF THE NEPA MODIFIED FLOW ALTERNATIVE COMPARED TO THE NEPA NO ACTION ALTERNATIVE

Impact 8.2.9-1: Increases in New Bullards Bar Reservoir end-of-month storage volumes that could affect flood control releases

Minimum storage space reserved for flood control purposes in New Bullards Bar Reservoir is set for the September through April time period as described above. Over the 72-year simulation period, New Bullards Bar Reservoir would reach simulated minimum flood control storage levels 55 times under the NEPA No Action Alternative compared to 51 times under the NEPA Modified Flow Alternative (Appendix F4, 7 vs. 5, pgs. 2 - 8, and 13).

When flows exceed 4,170 cfs in the lower Yuba River, Englebright Dam is spilling and flows are considered uncontrolled. During the months of October through April, the likelihood of flows exceeding 4,170 cfs would be the same or less (two to six percent) under the NEPA Modified Flow Alternative, relative to the NEPA No Action Alternative (Appendix F4, 7 vs. 5, pgs. 101 through 107). Therefore, potential impacts associated with changes in flood control releases under the NEPA Modified Flow Alternative, relative to the NEPA No Action Alternative, would be less than significant.

Impact 8.2.9-2: Increases in Oroville Reservoir end-of-month storage volumes that could affect flood control releases

Simulated end-of-month storage volumes in Oroville Reservoir under the NEPA Modified Flow Alternative would be within one percent of those simulated under the NEPA No Action Alternative for all water year types (Appendix F4, 7 vs. 5, pg. 406). Therefore, potential impacts associated with changes in flood control releases under the NEPA Modified Flow Alternative, relative to the NEPA No Action Alternative, would be less than significant.

8.3 CUMULATIVE IMPACTS

Hydrologic modeling was used to evaluate the cumulative effects of the Yuba Accord Alternative and other likely changes in CVP/SWP operations on hydrology and water supply. The proposed projects that have been adequately defined (e.g., in recent project-level environmental documents or CALSIM II modeling) and that have the potential to contribute to cumulative impacts are included in the quantitative assessment of the Yuba Accord's impacts. For analytical purposes of this EIR/EIS, the projects that are considered well-defined and "reasonably foreseeable" are described in Chapter 21. Additionally, the assumptions used to categorize future hydrologic cumulative conditions that are quantitatively simulated using CALSIM II and the post-processing tools are presented in Appendix D. To the extent feasible, potential cumulative impacts on resources dependent on hydrology or water supply (e.g., reservoir surface elevations) are analyzed quantitatively. Because several projects cannot be accurately characterized for hydrologic modeling purposes at this time, either due to the nature of the particular project or because specific operations details are only in the preliminary phases of development, these projects are evaluated qualitatively.

Only those projects that could affect surface water quality are included in the qualitative evaluation that is presented in subsequent sections of this chapter. Although most of the proposed projects described in Chapter 21 could have project-specific impacts that will be addressed in future project-specific environmental documentation, future implementation of these projects is not expected to result in cumulative impacts to regional water supply operations, or water-related and water dependent resources that also could be affected by the Proposed Project/Action or alternatives (see Chapter 21). For this reason, only the limited number of projects with the potential to cumulatively impact flood control in the project study area are specifically considered qualitatively in the cumulative impacts analysis for flood control:

- ❑ Water Storage Projects
  - Upstream of Delta Off-Stream Storage (Sites Reservoir)
  - Shasta Lake Water Resources Investigation (Shasta Reservoir Enlargement)
  - Folsom Dam Safety and Flood Damage Reduction Project
  - Folsom Dam Raise Project
  - Upper San Joaquin River Basin Storage Investigation
- ❑ Projects Related to Changes in CVP/SWP System Operations
  - Long-Term CVP and SWP Operations Criteria and Plan
  - Delta Cross Channel Re-operation and Through-Delta Facility
  - CVP/SWP Integration Proposition
  - Isolated Delta Facility
  - Delta-Mendota Canal Recirculation Feasibility Study

- Oroville Facilities FERC Relicensing
- Monterey Plus EIR

❑ Water Transfer and Acquisition Programs

- Dry Year Water Purchase Program
- Sacramento Valley Water Management Program
- Delta Improvements Package
- CVPIA Water Acquisition Program
- City of Stockton Delta Water Supply Project

❑ Flood Control, Ecosystem Restoration and Fisheries Improvement Projects

- North Delta Flood Control and Ecosystem Restoration Project
- Lower San Joaquin Flood Improvements
- San Joaquin River Restoration Settlement Act (Friant Settlement Legislation)

❑ Local Projects in the Yuba Region

- Yuba River Development Project FERC Relicensing

These projects are described in Chapter 21 and qualitatively addressed below.

8.3.1 ENVIRONMENTAL IMPACTS/ENVIRONMENTAL CONSEQUENCES OF THE YUBA ACCORD ALTERNATIVE CUMULATIVE CONDITION COMPARED TO THE EXISTING CONDITION

For CEQA, the purpose of the cumulative analysis is to determine whether the incremental effects of the Proposed Project (Yuba Accord Alternative) would be expected to be "cumulatively considerable" when viewed in connection with the effects of past projects, other current projects, and probable future projects (PRC Section 21083, subdivision (b)(2)).[5] The following sections describe this analysis for each type of project discussed above.

For NEPA, the scope of an EIS must include "*cumulative actions, which when viewed with other proposed actions have cumulatively significant impacts and should therefore be discussed in the same impact statement*" (40 CFR Section 1508.25(a)(2)).

Because the CEQ regulations implementing NEPA and the CEQA guidelines contain very similar requirements for analyzing, and definitions of, cumulative impacts, the discussions of cumulative impacts of the Yuba Accord Alternative Cumulative Condition relative to the Existing Condition will be the basis for evaluation of cumulative impacts for both CEQA and NEPA. In addition, an analysis of the Modified Flow Alternative Cumulative Condition relative to the Existing Condition is provided to fulfill NEPA requirements.

The following sections describe this analysis for the projects discussed in Section 8.3 above.

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[5] The "*Guide to the California Environmental Quality Act*" (Remy *et al.* 1999) states that "*…although a project may cause an "individually limited" or "individually minor" incremental impact that, by itself, is not significant, the increment may be "cumulatively considerable", and thus significant, when viewed against the backdrop of past, present, and probable future projects*." (CEQA Guidelines, Section 15064, subd. (i)(l), 15065, subd. (c), 15355, subd. (b)).

8.3.1.1 WATER STORAGE PROJECTS

Enlargement of existing dam and reservoir facilities would involve raising their flood control pools, which would provide additional storage space and capacity for flood control operations. The ability of these reservoirs to hold more flood water also would allow for longer timeframes for evacuating downstream communities, if necessary. Because many of the other reasonably foreseeable projects would occur in river systems (e.g., San Joaquin and lower American rivers) located outside of the project study area, it is unlikely that the Yuba Accord Alternative would contribute to, or even affect, flood control operations in these river systems under cumulative conditions.

8.3.1.2 PROJECTS RELATED TO CVP/SWP SYSTEM OPERATIONS

Changes in CVP/SWP system operations could contribute to increases in water storage volumes in some reservoirs, resulting in reductions of flood control capacities. CALFED storage and levee program actions, as well as other regional projects, could contribute to cumulative flood control and levee stability effects within the CVP/SWP system. CVP/SWP reservoir flood control operations are governed by the Corps' flood control guidelines, which are designed to limit reservoir releases such that the releases are within channel capacities. Although future CVP/SWP reservoir operations may be altered as a result of new projects on the planning horizon, flood control operations would continue to adhere to Corps guidelines.

8.3.1.3 WATER TRANSFER AND ACQUISITION PROGRAMS

Several water projects (e.g., SVWMP, Dry Year Water Purchase Program, CVPIA Water Acquisition Program, in addition to a long-term EWA Program or a program equivalent to the EWA) could purchase water through groundwater substitution programs. Under these programs, water held in reservoirs during April through June generally would be released during July through September. Water releases to help meet refuge demands generally would occur when these demands are greatest, typically from April through May and September through December. Agencies participating in groundwater substitution programs or other water transfer programs could cause reservoirs to release more water during July through September than under existing conditions. Thus, because end-of-September carry-over storage most likely would be lower, the extra volumes of available storage space could alter the timing or necessity to make flood control release events. Except for the EWA Program, no other water transfer programs are currently managing water that involves early deliveries, and none are likely to do so (Reclamation *et al.* 2003). Because Component 1 water from the Yuba Accord Alternative would be provided to the EWA Program (or an equivalent program), potential cumulative effects on flood control as a result of pre-delivery are not anticipated.

Because the Proposed Project/Action is expected to reduce New Bullards Bar Reservoir storage, relative to the basis of comparison, increases in the magnitude or frequency of New Bullards Bar Reservoir flood control releases are not anticipated. Additionally, increased releases associated with water transfers from the Yuba Accord Alternative and other projects would occur outside the flood season and, therefore, would not present a risk to flood control.

8.3.1.4 FLOOD CONTROL, ECOSYSTEM RESTORATION AND FISHERIES IMPROVEMENT PROJECTS

Flood control, ecosystem restoration and fisheries improvement projects would be targeted to improve flood control and aquatic habitat conditions within the project study area. Other reasonably foreseeable flood control and ecosystem restoration projects would be limited to the Delta Region. Over time, habitat restoration actions could improve floodplain development by increasing riparian and wetland habitats that may help to dissipate stream energy associated with high flows (BLM 1998). In some years, flood releases from Friant Dam on the San Joaquin River are large enough to overwhelm parts of the river channel and the aging levee system (Environmental Entrepreneurs Website 2006). As part of the actions to be undertaken by San Joaquin River Restoration Settlement Act, restoring the river channel and improving the levees to allow for natural river functions, including the capacity to carry higher flows for out-migrating juvenile salmon, would naturally provide greater flood-carrying capacity. Implementation of other projects could improve channel capacity and conveyance of flood flows through the Delta by allowing floodwaters to move through the system in a more controlled manner, thus reducing surge effects and potential levee failures (DWR 2004).

Because the Proposed Project/Action is expected to reduce New Bullards Bar Reservoir storage, relative to the basis of comparison, increases in the magnitude or frequency of New Bullards Bar Reservoir flood control releases are not anticipated. The Proposed Project/Action would not store or transfer water when flood control operations are in effect.

If the Yuba Accord Alternative is implemented, revenues could be used to fund local flood control improvement projects in Yuba County. These types of activities would occur subsequent to the Yuba Accord, and would require separate supplemental environmental documentation prior to implementation, but would be expected to provide a beneficial effect to flood control management in the Yuba Region.

8.3.1.5 Local Projects in the Yuba Region

Of the projects identified above, only the Yuba River Development Project FERC Relicensing has the potential to affect future flood control operations in the Yuba Region. Through the relicensing process, FERC may impose new regulatory constraints on the Yuba Project, which could affect New Bullards Bar Reservoir operations and YCWA's ability to manage flood control releases into the lower Yuba River. However, flood control guidelines would be followed regardless of whether or not the Yuba Accord Alternative was implemented.

8.3.1.6 Other Cumulative Flood Control Impact Considerations

The quantitative operations-related impact considerations for the CEQA Yuba Accord Alternative, relative to the CEQA Existing Condition, are discussed in Section 8.2.5. Potential impacts identified in Section 8.2.5 are summarized below and provide an indication of the potential incremental contributions of the Yuba Accord Alternative to cumulative impacts. These potential impacts are summarized here:

- Impact 8.2.5-1: Increases in New Bullards Bar Reservoir end-of-month storage volumes that could affect flood control releases – Less than Significant
- Impact 8.2.5-2: Increases in Oroville Reservoir end-of-month storage volumes that could affect flood control releases - Less than Significant

Although these impacts would be less than significant, the potential nevertheless exists for cumulative impacts. Cumulative impact determinations are presented below, and are based upon consideration of the quantified Yuba Accord Alternative impacts relative to the CEQA Existing Condition, in combination with other reasonably foreseeable projects. These cumulative impact determinations are summarized by region.

8.3.1.7 *Potential for Cumulative Flood Control Impacts Within the Project Study Area*

Because results from the quantitative analysis generally indicate that direct project-related impacts on flood control would be less than significant, the potential for the Yuba Accord Alternative to incrementally contribute to cumulative flood control impacts within the project study area would be minimal. The frequency and magnitude of these quantitative hydrologic changes, in concert with the other qualitative analytical considerations, are both contributing factors used to reach the overall cumulative impact conclusions discussed below for the Yuba Accord Alternative Cumulative Condition, relative to the CEQA Existing Condition.

Impact 8.3.1.7-1: Potential for significant cumulative flood control impacts within the Yuba Region

Of the projects discussed above, only the Yuba River Development Project FERC Relicensing has the potential to affect future flood control operations in the Yuba Region. While, as part of the relicensing, FERC may impose new regulatory constraints on the Yuba Project, which could affect New Bullards Bar Reservoir operations and YCWA's ability to manage flood control releases into the lower Yuba River, YCWA still would follow Corps flood control guidelines for the Yuba Project, and it is not anticipated that FERC's new conditions would significantly affect the Yuba Project's flood control operations. The overall effects on flood control in the Yuba Region, therefore, would be minor, and the impacts on flood control within the Yuba Region of the Yuba Accord Alternative Cumulative Condition, compared to the CEQA Existing Condition, would be less than significant.

Impact 8.3.1.7-2: Potential for significant cumulative flood control impacts within the CVP/SWP Upstream of the Delta Region

For the reasons discussed above, it is anticipated that the new water storage projects, new water transfer and acquisition programs, and new flood control ecosystem restoration and fisheries improvement projects discussed above would not adversely impact flood control and, therefore, would not have any cumulative impacts in the CVP/SWP Upstream of Delta Region. While changes in CVP/SWP system operations could contribute to increases in water storage volumes in some reservoirs, resulting in reductions in flood control capacities, these reservoirs still would be operated to meet the applicable Corps flood control guidelines, so any reductions in flood control capacities would be minor. The overall effects on flood control in the CVP/SWP Upstream of Delta Region, therefore, would be minor and the impacts on flood control within the CVP/SWP Upstream of Delta Region of the Yuba Accord Alternative Cumulative Condition, compared to the CEQA Existing Condition, would be less than significant.

Impact 8.3.1.7-3: Potential for significant cumulative flood control impacts within the Delta Region

For the reasons discussed above, it is anticipated that the new water storage projects, new water transfer and acquisition programs, and new flood control ecosystem restoration and fisheries improvement projects discussed above would not adversely impact flood control and, therefore, would not have any cumulative impacts in the Delta Region. While changes in CVP/SWP system operations could contribute to increases in water storage volumes in some reservoirs, resulting in reductions in flood control capacities, these reservoirs still would be operated to meet the applicable Corps flood control guidelines, so any reductions in flood control capacities would be minor. The overall effects on flood control in the CVP/SWP Upstream of Delta Region, therefore, would be minor and the impacts on flood control within the Delta Region of the Yuba Accord Alternative Cumulative Condition, compared to the CEQA Existing Condition, would be less than significant.

8.3.2 Environmental Impacts/Environmental Consequences of the Modified Flow Alternative Cumulative Condition Compared to the Existing Condition

It is anticipated that the Modified Flow Alternative Cumulative Condition will have the same potential for cumulative impacts as the Yuba Accord Cumulative Condition. Therefore, the description of the potential impacts in Section 8.3.1 also serves as the description of cumulative impacts associated with the Modified Flow Alternative. Thus, the Modified Flow Alternative Cumulative Condition would result in the following potential cumulative impacts:

- Yuba Region - Potential cumulative impacts on flood control in the Yuba Region would be less than significant.
- CVP/SWP Upstream of the Delta Region - Potential cumulative impacts on flood control in the CVP/SWP Upstream of the Delta Region would be less than significant.
- Delta Region - Potential cumulative impacts on flood control in the Delta Region would be less than significant.

8.4 Potential Conditions to Support Approval of YCWA's Water Rights Petition

No unreasonable adverse effects to flood control would occur under the Proposed Project/Action or an action alternative. Therefore, no impact avoidance measures or other protective conditions are identified for SWRCB consideration in determining whether or not to approve YCWA's petitions to implement the Yuba Accord.

8.5 Mitigation Measures/Environmental Commitments

No adverse effects would occur to flood control under the Proposed Project/Action or an action alternative and, thus, no mitigation is required.

8.6 Potentially Significant Unavoidable Impacts

There are no significant unavoidable impacts to flood control associated with the implementation of the Proposed Project/Action or an action alternative.