

San Joaquin County Amended Water Right Application 29657 South Fork American River Water Availability Study

August 27, 2003

Introduction

This memorandum documents methodology employed to determine availability of water from the South Fork American River under Amended Water Right Application 29657. The Application was amended to change the point of diversion of the South Fork water to a point on the Sacramento River. At the request of the San Joaquin County Public Works Department in association with the Northeastern San Joaquin County Groundwater Banking Authority, this analysis was conducted by the Sacramento consulting firm Saracino-Kirby-Snow under the direction of Mark S. Williamson, a registered California Civil Engineer and Dr. C. Mel Lytle, Water Resource Coordinator, San Joaquin County Public Works Water Resource Division - (209) 468-3089.

Water Right Application 29657

San Joaquin County has a pending application to appropriate water from the South Fork American River. The State Water Resources Control Board designated this Application 29657 and assigned it a priority date of February 9, 1990. An amendment to this application was filed with the SWRCB on August 12, 2003.

Amended Application 29657 seeks the right to divert for direct use up to 350 cubic feet per second (cfs) from December 1 through June 30 each year, up to 147,000 acre-feet per year (AF/yr). Diversion to storage of up to 147,000 AF/yr is also proposed. A maximum of 147,000 would be taken by direct diversion and diversion to storage during any one year.

Water to be Appropriated under Amended Application 29657 (acre-feet per year)	
Direct Diversion	147,000
Storage	147,000
Total	147,000
Maximum Diversion Rate	350 cfs
Period of Diversion or Collection:	12/1 - 6/30
Priority Date:	February 9, 1990

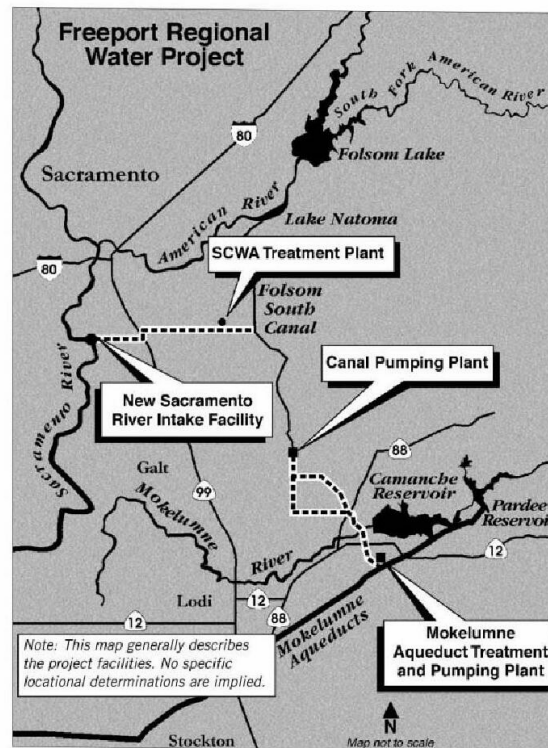
Table 1

Two alternative points of diversion were proposed in the original 1990 application:

Alternative A: Diversion from Nimbus Dam to the Folsom South Canal to storage in a new reservoir at the Clay Station site. This alternative would require extension of the Folsom South Canal into San Joaquin County and construction of Clay Station Reservoir.

Alternative B: Diversion from the South Fork American River upstream of Folsom Reservoir¹ to new reservoirs at the County Line and Clay Station sites. This alternative would require construction of a South Fork diversion structure and tunnel, County Line and Clay Station reservoirs, and conveyance between the reservoirs and into San Joaquin County.

The Amended Application 29657 moves the proposed point of diversion to the Freeport diversion site on the Sacramento River. The Sacramento County Water Agency and East Bay Municipal Utility District (EBMUD) are in the process of developing a 286 cfs diversion at the Freeport site. Of this capacity, 131 cfs would be used in most years to meet needs within Sacramento County. The other 155 cfs would be conveyed to a connection point with EBMUD's Mokelumne Aqueduct in San Joaquin County. EBMUD only needs this capacity in the one-third driest years. The capacity could be made available to San Joaquin County or other users about two-thirds of the time in average and wetter years. The planned facilities would need to be enlarged to accommodate the full diversion contemplated in the Amended Application. The draft environmental document for the Freeport Project was published August 8, 2003.



SWRCB is authorized to declare a stream fully appropriated. If a stream is declared fully appropriated, SWRCB may reject any water right application filed on that stream. If a stream has been declared fully appropriated for part of a year, the application may be modified by the Board. SWRCB has declared the American River system fully appropriated for the period from July 1 through October 31. The Amended Application would limit the period of diversion to the period from December 1 through June 30. If diverted continuously at the diversion rate of 350 cubic feet per second over the December 1 through June 30 period of diversion, there is capacity to divert up to 147,174 acre-feet (in non-leap years).

Saracino-Kirby-Snow was retained by San Joaquin County to quantify the amount of Application 29657 water that could be diverted at the Freeport site. Generally speaking, transferring the point of diversion to the Sacramento River without reapplying for a new water right (and losing the 1990 priority date) will require a showing that the water diverted from the Sacramento River at Freeport would not exceed the amount obtainable at the original point of diversion on the American River.

¹ Diversion would be from the South Fork in the SE corner of the NE quadrant of Section 31, Township 11N, Range 9E, Mt. Diablo BM in El Dorado County.

Two good indicators of water availability were developed that quantify the amount of water available under Amended Application 29657. The first examines historical availability, and the second uses DWR water supply modeling for a 2020 level of development.

In general, water is available on the South Fork during the December through June period of diversion. Flows in this period have exceeded the 350 cfs diversion rate 95 percent of the time during the most recent 50 years of gaged records.² There are several constraints that will limit the ability of San Joaquin County to utilize these flows. These constraints include:

- Development and increased utilization of senior water rights
- Instream flow requirements
- Diversion capacity limitations

Historical Flows

The United States Geological Survey maintains stream gaging stations at several key locations on the South Fork, mainstem American River, Folsom Reservoir, and the Sacramento River. Station locations and their period of record are shown on Figure 1.

Two gages have been operated just a short distance upstream of the originally-proposed point of diversion on the South Fork American River. The two gages are well correlated in the overlapping period of record, with the

Gage Number	Gage Name	Period of Record	Average Annual Flow (AF/yr)
11444500	South Fork American River near Placerville	August 1964 – September 2001	1,063,000
11445500	South Fork American River near Lotus	October 1951 – September 1995	992,000
Combined Gage	South Fork American River near diversion site	October 1951 – September 2001	1,036,000

downstream Lotus gage recording about six percent more flow as illustrated in Figure 2. The two gages have been combined and normalized for this analysis. As shown in Table 2, South Fork American River flows have averaged about 1.04 million acre-feet per year. Use of historical gage data provides a general indication of water availability, but does not reflect increased utilization of senior water rights.

Table 2

² USGS gages 11444500 and 11445500 on the South Fork American River near Placerville and Lotus, respectively, from October 1951 through September 2001 for the December through June diversion period

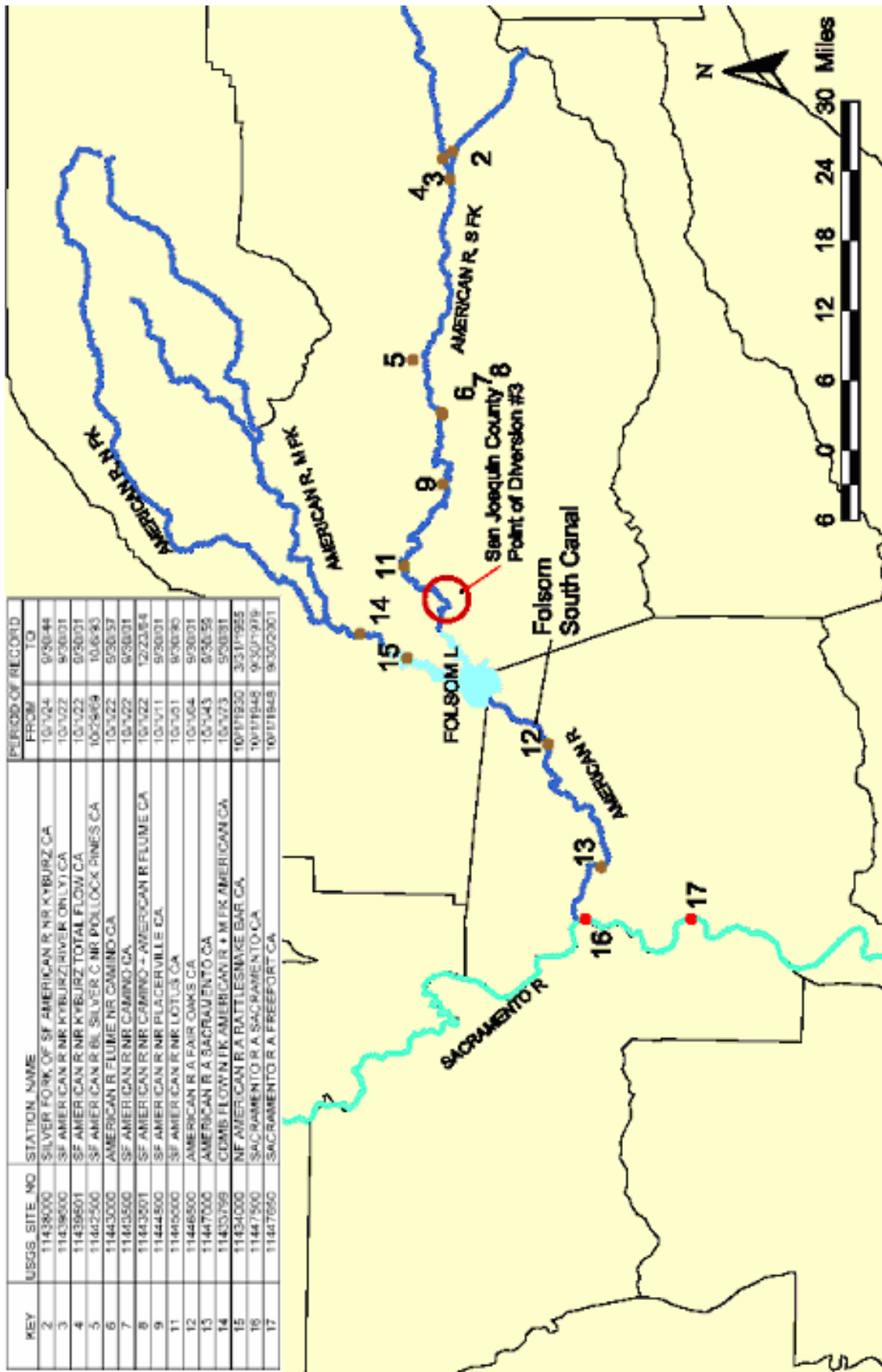


Figure 1
Date: June 2003
Prepared By: KTW

**South Fork American River- Water Rights Analysis
Gage Locations and Period of Record**
San Joaquin County Groundwater Banking Authority



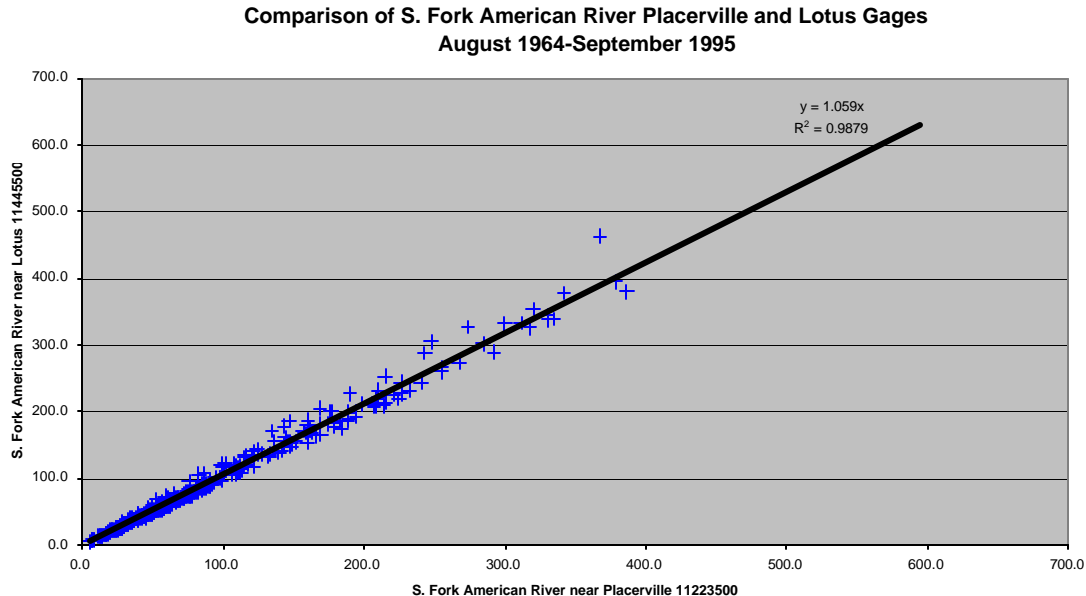


Figure 2

CalSim 2020 Simulated Flows

The CALFED/DWR/USBR Water Management/Allocation Studies Draft Benchmark Studies Assumptions, a comprehensive analysis of water development and utilization through 2020, was published by CALFED, DWR and USBR in September 2001. This document was published to support the three agencies' joint water management and water allocation studies being performed with the CalSim II model. Model simulations will be used as the basis for evaluating the benefits and impacts of a wide variety of proposed facility, regulatory, and operational alternatives identified in the CalFed Record of Decision and elsewhere.

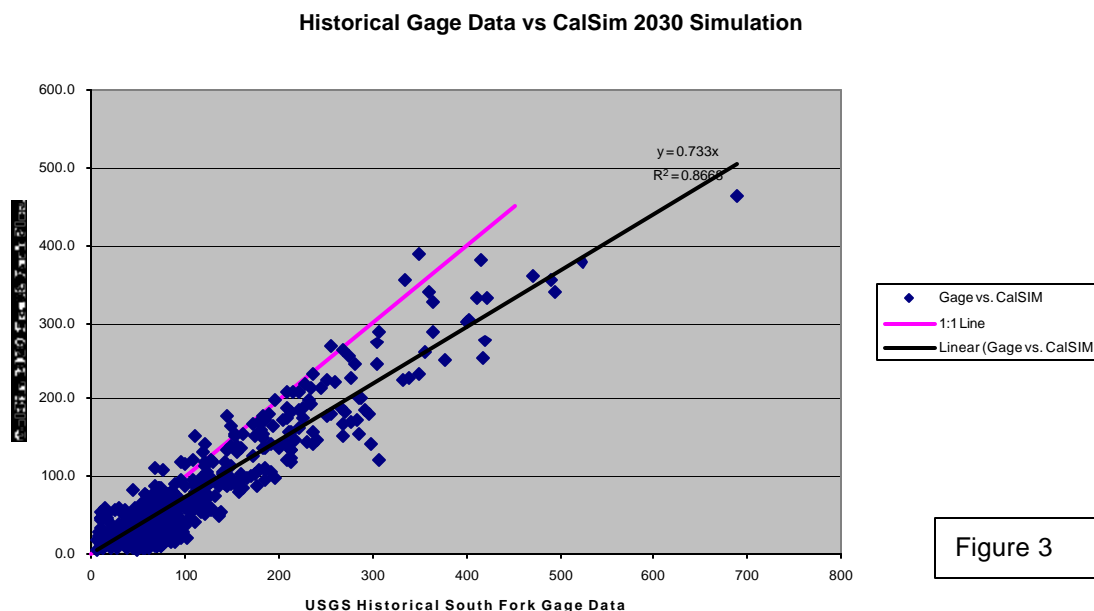
CalSim II is the replacement for the PROSIM, SANJASM and DWRSIM models. CalSim II includes a variety of model enhancements to better characterize and simulate the operations of the CVP and SWP systems, including a new hydrology developed jointly by DWR and USBR. Water diversion requirements (demand), stream accretions and depletions, rim basin inflows, irrigation efficiency, return flows, non-recoverable losses, and groundwater operation are components that make up the hydrology used in CalSim II. Sacramento Valley and tributary rim basin hydrologies are developed using a process designed to adjust the historical sequence of monthly stream flows to represent a sequence of flows at a future level of development. Adjustments to historical water supplies are determined by imposing future level land use on historical meteorological and hydrologic conditions.

CalSim II incorporates logic for evaluating Delta water quality, coordinated CVP/SWP deliveries, use of CVPIA 3406(b)(2) water, the Environmental Water Account, and a many other factors. Assumptions for the American River basin are taken from the

Sacramento Water Forum EIR projections for a 2025 level of development. Water use in the American River watershed is projected to double from 297,200 AF/yr in 2000 to 596,700 AF/yr in 2025.

CalSim II incorporates new procedures for dynamic modeling of CVPIA 3406(b)(2) water under the CalFed frameworks and Record of Decision. Per the October 5, 1999 Decision, CVPIA CVPIA 3406(b)(2) accounting procedures are based on system conditions under operations associated with SWRCB D-1485 and D-1641 regulatory requirements.

The CalSim II data represents expected utilization of American River entitlements through 2025. CalSim II assumptions and this expected utilization are evaluated over the historical period from October 1921 through September 1994. CalSim South Fork flow data are well correlated and about 27 percent drier than the historical period of overlap, as illustrated in Figure 3.



As shown in Table 3, selection of the historical hydrology or the projected 2020 CalSim hydrology does not have a significant impact on the amount of water that might be diverted under Application 29657. For both hydrologies and for various periods of record virtually the entire 147,000 AF/yr could be diverted. Pending further analysis of senior water entitlements, upstream availability does not appear to be a significant constraining factor – South Fork American River water would be available in nearly full diversion amounts if diverted at the South Fork location with adequate diversion capacity and if not constrained by in-stream flow requirements.

Analysis Period	Base Hydrology	Point of Diversion	Max Diversion Rate (cfs)	Max Dec-Jun Diversion (KAF)	Constrained by AFRP Flows	Constrained by Freeport Capacity	Average Annual Diversion (KAF/yr)
Oct51-Dec01	Historical Gage Data	SoFkAmR	350	147	No	No	144.8
Oct51-Dec94	Historical Gage Data	SoFkAmR	350	147	No	No	144.2
Oct51-Dec94	CalSim 2020	SoFkAmR	350	147	No	No	145.1
Oct21-Dec94	CalSim 2020	SoFkAmR	350	147	No	No	145.9

Table 3

Instream Flow Requirements

In-stream flow requirements for the American River below Folsom Dam³ are governed by SWRCB Decision 893 (D-893) and by discretionary releases made in conformance with the section 3406(b)(2) of the 1990 Central Valley Project Improvement Act. Diversions under Application 29657 that do not impair the ability to meet both these in-stream flow regimes would be most likely be approved by fisheries regulators, though project diversion might technically be possible if only D-893 flows are met.

D-893 requires minimum flows in the lower American River below Folsom Dam and at the H Street gage in Sacramento. A minimum of 500 cfs is required September 16 through December 31. A minimum of 250 cfs is required from January 1 through September 15. Both these flow requirements are reduced by 25 percent in critically dry years. In general, D-893 thresholds were approached in just a few months over the period of record and are not a significant constraining factor.

On October 30, 1992, President G.H.W. Bush signed into law the Reclamation Projects Authorization and Adjustment Act of 1992 (Public Law 102-575), including Title XXIV, the Central Valley Project Improvement Act (CVPIA). The CVPIA directed the Secretary of the Interior to amend previous authorizations of California's Central Valley Project to:

"include fish and wildlife protection, restoration, and mitigation as project purposes having equal priority with irrigation and domestic use and fish and

³ Bypass for Folsom and Nimbus Dams was ordered by the SWRCB's Decision 1400, but these flow requirements only apply if Auburn Dam is constructed. Flows would need to be maintained in the entire reach of the American River from Nimbus Dam to the Sacramento River for maintenance of fish and wildlife of not less than 1250 cfs from October 15 through July 14, and not less than 800 cfs from July 15 through October 14. Flows for recreational purposes would be maintained at not less than 1500 cfs from May 15 through October 14. These flows would not be cumulative. These flows are not applicable and have not been modeled.

wildlife enhancement as a project purpose equal to power generation.¹⁴

The major resulting program is known as the Anadromous Fish Restoration Program (AFRP). Required instream flows below Folsom Dam under the AFRP vary based on Folsom storage from October through February, and Folsom storage plus projected inflow through September for the months from March through September⁵. A graphic representation of these flow requirements is presented as Figure 4. AFRP flows are significantly higher than those required under D-893, with flows of up to 4500 cfs required during wet periods. Though AFRP flows are discretionary, Central Valley Project operators try to meet AFRP targets except under exceptional circumstances.

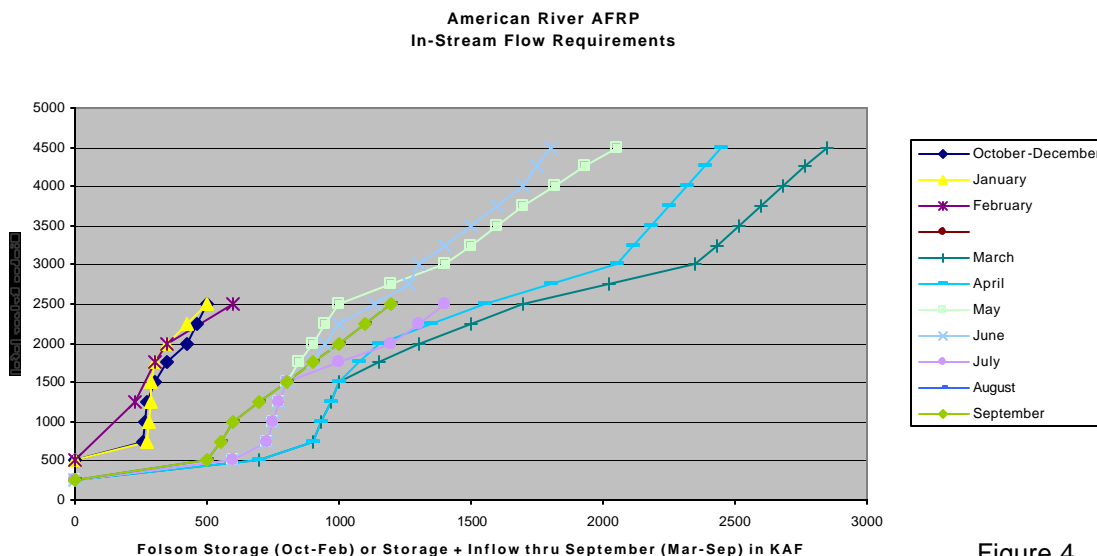


Figure 4

Instream flows in the lower Sacramento River are governed by SWRCB Decision 1641 (D-1641). Minimum Sacramento River instream flows at Rio Vista under D-1641 must be 3000 cfs in September, 4000 cfs in October, and 4500 cfs in November and December. In critically dry years the minimum drops to 3000 cfs in October and 3500 cfs in November and December. Sacramento River instream flow requirements are always met over the period of analysis and are therefore not a constraining factor.

An analysis was performed to determine periods when new South Fork diversions might be restricted because of in-stream flows below AFRP minimums. It should be emphasized that AFRP flows are dynamic, since they depend on storage in and inflows to Folsom Reservoir – upstream diversions may result in lower instream flow requirements below Folsom Dam. However, this effect will be small for the magnitude of diversions

⁴ U.S. Fish and Wildlife Service <http://www.delta.dfg.ca.gov/afrp/>

⁵ “Stability criteria” that restrict large month-to-month fluctuations that might cause fish stranding are also required. November, December and January flow objectives must be at least 80 percent of the preceding month’s flow, and February and March flow objectives must be at least 90 percent of the preceding month’s flow. The stability criteria do not apply if the preceding month’s flow is above 4500 cfs.

sought under Application 29657. Analysis of the CalSim 2020 base case shows that AFRP flows are not met in 42 percent of the months during the period of analysis, and would reduce average annual diversions to 75,100 acre-feet. This is the approximate amount that a San Joaquin County diversion from the South Fork American River would yield. AFRP flows are unlikely to be a constraining factor if South Fork water right is diverted downstream of the reach of the American River where the AFRP flows are required.

Analysis Period	Base Hydrology	Point of Diversion	Max Diversion Rate (cfs)	Max Dec-Jun Diversion (KAF)	Constrained by AFRP Flows	Constrained by Freeport Capacity	Average Annual Diversion (KAF/yr)
Oct21-Dec94	CalSim 2020	SoFkAmR	350	147	No	No	146.0
Oct21-Dec94	CalSim 2020	SoFkAmR	350	147	Yes	No	75.1

Table 4

Freeport Diversion Capacity

Of the 286 cfs planned capacity of the Freeport Diversion, EBMUD’s 155 cfs capacity and conveyance into San Joaquin County would be available about two-thirds of the time, in average and wetter years. Under its CVP contract, EBMUD is restricted to taking water at Freeport to periods when its Total System Storage⁶ is projected to drop below 500,000 acre-feet.⁷ Both the 155 cfs diversion rate and the diversion period are significant limitations on San Joaquin County’s ability to make use of Application 29657 water.

An analysis of EBMUD Total System Storage was performed using data from EBMUD’s operations model EBMUDSIM for the 2020 no-action base case.⁸ The reduction of diversion rate to 155 cfs alone would drop the potential San Joaquin County average annual diversion by two-thirds to 65,300 AF/yr. Restricting diversions to periods when EBMUD conveyance capacity is available would restrict diversions to an average of 43,600 AF/yr. This is the approximate average annual diversion that San Joaquin could expect from Amended Application 29657 utilizing planned excess EBMUD conveyance capacity.

⁶ The sum of storage at Pardee, Camanche, and five terminal reservoirs in the East Bay

⁷ March 1 projection of September 30 storage

⁸ EBMUDSIM study 6041

Analysis Period	Base Hydrology	Point of Diversion	Max Diversion Rate (cfs)	Max Dec-Jun Diversion (KAF)	Constrained by AFRP Flows	Constrained by Freeport Capacity	Average Annual Diversion (KAF/yr)
Oct21-Dec94	CalSim 2020	SoFkAmR	350	147	No	No	146.0
Oct21-Dec94	CalSim 2020	SoFkAmR	350	147	Yes	No	75.1
Oct21-Dec94	CalSim 2020	SoFkAmR	155	65.3	No	No	65.3
Oct21-Dec94	CalSim 2020	Freeport	155	65.3	No	Yes	43.6
Oct21-Dec94	CalSim 2020	Freeport	155	65.3	Yes ⁹	Yes	25.1

Table 5

Expanded Freeport Project

Potential water diversions by San Joaquin County under Amended Application 29657 could be substantially increased by enlarging the Freeport facilities being planned by Sacramento County and EBMUD, and by adding groundwater storage capacity. Two scenarios are examined:

- Making use of Sacramento County’s unused diversion capacity and enlarging the planned pipeline from the end of the Folsom South Canal to 286 cfs
- Enlarging both the planned Freeport diversion capacity and pipeline from the end of the Folsom South Canal to 350 cfs

Use of Sacramento County’s unused diversion capacity. As described in the August 2003 Freeport Project Draft EIR/EIS, Sacramento County intends to make use of its planned 85 MGD Freeport diversion capacity in a pattern following service area demands. As illustrated in Table 6, full diversion capacity will be used in June and only minimal diversions would be made in the winter months. An average of about 29 KAF/yr of unused diversion capacity could be made available to San Joaquin County at rates of up to 131 cfs. Use of this capacity to deliver water to San Joaquin County would require enlargement of the planned pipeline from the end of the Folsom South Canal (FSC) from 155 cfs to 286 cfs. Using the County’s unused

	Average SacCo Freeport Use Pattern ¹⁰		Freeport Capacity @85 MGD	Freeport Capacity Available for SJCo Dec-Jun
	KAF/mo	%	KAF/mo	KAF/mo
Oct	2.3	4.6%	8.1	
Nov	1.8	3.6%	7.8	
Dec	0.5	1.0%	8.1	7.6
Jan	0.1	0.2%	8.1	8.0
Feb	0.2	0.4%	7.4	7.2
Mar	3.8	7.6%	8.1	4.3
Apr	6.5	13.1%	7.8	1.3
May	7.7	15.5%	8.1	0.4
Jun	7.8	15.7%	7.8	0.0
Jul	7.8	15.7%	8.1	
Aug	6.8	13.7%	8.1	
Sep	4.4	8.9%	7.8	
Total	49.7	100.0%	95.3	28.8

Table 6

⁹ It is unlikely that lower American River instream flows would be applied to constrain a South Fork American River water right diverted downstream at Freeport on the Sacramento River

¹⁰ From Tables 3.2.1.2-3&4 of the Freeport Project Draft EIR/EIS, August 2003

capacity and enlarging the FSC pipeline would increase average annual supply to San Joaquin County 66 percent to about 72 KAF/yr.

Expand Freeport diversion capacity and FSC pipeline to 350 cfs. Enlarging the planned 286 cfs Freeport diversion and FSC pipeline to 350 cfs would allow greater use of water under Amended Application 29657. EBMUD has studied a diversion of this size to provide redundancy to allow EBMUD’s demands to be fully met during emergencies or planned outages of its Pardee Reservoir supply. EBMUD’s Amended CVP contract allows emergency supply at a lesser quantity. Agreements with San Joaquin County might be developed to provide additional emergency supply to EBMUD. As shown in Table 7, average annual yield with the enlarged intake and conveyance would increase to about 99 KAF/yr.

Table 7

Analysis Period	Base Hydrology	Point of Diversion	Max Diversion Rate (cfs)	Max Dec-Jun Diversion (KAF)	Constrained by AFRP Flows	Constrained by Freeport Capacity	Average Annual Diversion (KAF/yr)
Oct21-Dec94	CalSim 2020	Freeport	155	65.3	No	Yes	43.6
Oct21-Dec94	CalSim 2020	Freeport	286	120	No	Enlarged FSC Connection	72.4
Oct21-Dec94	CalSim 2020	Freeport	350	147	No	Enlarged Diversion & FSC Connection	99.3

Water Rights

Data on all water rights filings on the South Fork American River and its tributaries was obtained from the SWRCB. There are 750 available records broken down into the types shown in Table 8 below. Statements of Diversion are voluntary submissions of diversion data to document use under a riparian, pre-1914 or other use not under SWRCB jurisdiction. Of these 750 records, 610 have total diversions (direct plus diversion to storage) less than 100 acre-feet per year. Of the other records, 47 have maximum total diversions greater than 100,000 acre-feet per year. The 610 records for total diversion less than 100 AF/yr total about 6500 AF/yr, and are not considered critical to this analysis.

SWRCB Records by Type and Annual Total Diversion						
Record Type	>100,000 AF/yr	1000-100,000 AF/yr	100-1000 AF/yr	<100 AF/yr	Not Stated	Total
Application	46	29	31	466	0	572
Statement of Diversion	1	16	14	64	3	98
Federal	0	0	0	53	0	53
Stock watering	0	0	0	13	0	13
Small Domestic	0	0	0	14	0	14
Total	47	45	45	610	3	750

Table 8

Excluding water rights associated with hydroelectric power generation, an essentially non-consumptive use, there are 100 records with total diversions greater than 100 AF/yr, which are summarized in Table 9. Of the 68 applications, eight are listed as cancelled. None are listed as inactive. Of the other 60 applications, two¹¹ have priority dates after the February 9, 1990 date for Application 29657. Summary details of the remaining 58 applications and the 32 Statements of Diversion are presented in Attachment A.

SWRCB Records by Type and Annual Total Diversion Greater than 100 AF/yr and Excluding Power Generation						
Record Type	>100,000 AF/yr	1000-100,000 AF/yr	100-1000 AF/yr	Cancelled	Not Stated	Total
Application	19	12	29	8	0	68
Statement of Diversion	0	15	14	0	3	32
Federal	0	0	0	0	0	0
Stock watering	0	0	0	0	0	0
Small Domestic	0	0	0	0	0	0
Total	19	27	43	8	3	100

Table 9

Data gathered to date do not allow a comprehensive compilation of the water rights and use histories for the existing water rights holders. Many of the water applications do not have a specified maximum annual use, which results in an apparent diversion that exceeds the annual runoff of the South Fork. The recorded use history of each diversion must be extracted and analyzed in conjunction with SWRCB staff to establish a quantification of historical use to allow construction of a non-impaired or pre-development hydrology from which a full-development analysis can be conducted. Nonetheless, work performed by DWR and others for the CalSim II modeling provides an adequate basis for establishing South Fork American River availability at a 2020 level of development.

¹¹ Applications 30062 and 30453, both for Kirkwood Mountain Lake LLC for diversion from Caples Lake

Summary

Water availability under Amended Water Right Application 29657 was analyzed for diversion at the Freeport site on the Sacramento River, assuming that diversions could not exceed amounts available from the originally proposed location on the South Fork American River. Future availability was assessed using the CALFED/DWR/USBR CalSim II model for 2020 development conditions. Assumptions for demands in the American River basin are taken from the Sacramento Water Forum EIR projections for a 2025 level of development. Diversion rates of up to 350 cfs during the period from December through June were analyzed. The following conclusions are drawn from this analysis:

- Significant quantities of water are available for diversion from the South Fork American River. Instream flow requirements for the lower American River could constrain these diversions to an average of approximately 75,000 acre-feet per year.
- Significant quantities of water are available diverting the South Fork supply at the Freeport site. It is unlikely that lower American River instream flow requirements would be applied to constrain this downstream diversion.
 - The planned capacity of the Freeport diversion that could be available to San Joaquin County would constrain average annual diversions to approximately 44,000 acre-feet per year.
 - Upsizing the planned conveyance pipeline to 286 cfs would increase average annual diversions to approximately 72,000 acre-feet per year.
 - Upsizing the planned diversion and conveyance facilities to 350 cfs would increase average annual San Joaquin County diversions to 99,000 acre-feet per year.
- There are approximately 750 records for water rights filings on the South Fork American River on file at the SWRCB. Of these, 610 records are for quantities of less than 100 acre-feet per year, and aggregate to about only 6500 acre-feet per year and are not considered significant to this analysis. Excluding water rights that have been cancelled, have a lower priority date, or are associated with hydroelectric generation, there are 58 applications with priority dates higher than Amended Application 29657. The work performed by DWR and others for the CalSim II model reflects these applications at a 2020 level of development.