Appendix A
Water Balance Analysis:
Methodology, Assumptions, and Tables

APPENDIX A
WATER BALANCE ANALYSIS METHODOLOGY, ASSUMPTIONS, AND TABLES

INTRODUCTION

A water balance was developed to determine the crop water requirements for districts that could potentially receive water from the San Joaquin River Exchange Contractors Water Authority (Exchange Contractors) under the proposed water transfer program. By comparing the water requirement to contracted Central Valley Project (CVP) deliveries during wet and dry years, an estimate of any potential shortages that may exist is obtained. These potential shortages indicate the need for the water transfer program. The water balance could also be used for consumptive use calculations, but these are not included in the analysis to address the project purpose and need.

METHODOLOGY

The net irrigation requirement for a unit area is the amount of water that must be supplied by irrigation to satisfy evapotranspiration, leaching, and miscellaneous water requirements not provided by either water stored in the soil or precipitation that enters the soil (Jensen et al. 1990). In this analysis, the net irrigation requirement was estimated using the following equation (the miscellaneous water uses were considered insignificant):

$$NET_{irr} = ET_{crop} - PPT_{eff} - \Delta SW + LCH$$

where,

NET_{irr} = Net irrigation water requirement for the period considered (inches);
ET_{crop} = Total water used in evapotranspiration (inches);
PPT_{eff} = Effective rainfall (inches);
ΔSW = Change in soil water during the period (inches);
LCH = Water required for leaching (inches).

Each term is described in more detail below.

Evapotranspiration

The total evapotranspiration, ET_{crop}, for a particular crop is expressed as:

$$ET_{crop} = k_c \cdot ET_o$$

where,

k_c = Crop coefficient (unitless);

ET_o = Reference evapotranspiration (inches).

The term ET_{crop} is also referred to as the consumptive use. The crop coefficients were generally obtained from the UC Leaflets 21427, 21428, and 21454. Table 1 lists the source of the crop coefficients used for each crop, as well as adjustments, if any, made based on personal communication with Joel Zander (Reclamation 2000). The daily crop coefficients corresponding to particular growth and development stages were calculated for each crop. The monthly k_c is then obtained by averaging the daily k_c values within each month. Table 2 consists of the resulting monthly k_c values.

The monthly reference evapotranspiration was obtained from stations maintained by the California Irrigation Management Information System (CIMIS). Within the past 15 years, for most of the stations, the total annual precipitation was the lowest for calendar year 1989 and the highest for calendar year 1998. Precipitation data at representative stations within the project area were reviewed to select representative wet and dry years. Calendar year 1989 was used for dry year hydrology and 1998 was used for wet year hydrology. ET_o data were compiled for these same years from the nearest CIMIS station with available data. The station assumed to have representative ET_o data for a particular district is shown in Table 3. Table 4 shows the monthly ET_o data used in a wet year, and Table 5 shows the monthly ET_0data used in a dry year.

Effective Rainfall

Effective precipitation is the sum of precipitation intercepted by living or dry vegetation, precipitation that stagnates on soil and evaporates, precipitation lost by evaporation during plant growth, and precipitation that contributes to leaching or facilitates other agricultural operations (Dastane 1974). Effective precipitation does not include precipitation lost to surface runoff, precipitation lost to deep percolation below the root zone, or moisture remaining in the soil after the crop harvest and which is not useful for the next crop (Dastane 1974).

For this analysis, effective precipitation was based on a method developed by the U.S. Department of Agriculture-Soil Conservation Service (SCS). The SCS method uses the relation (SCS 1970):

$$r_e = (0.70917 \cdot r_t^{0.82416} - 0.11556) \cdot (10^{0.02426.u}) \cdot f$$

where,

r_e = average effective monthly rainfall (inches);
r_t = average monthly rainfall (inches);
u = average monthly consumptive use (inches); and
f = correction factor for application depth different from 3 inches, and where

$$f = (0.531747 + 0.295164 \cdot D - 0.057697 \cdot D^2 + 0.003804 \cdot D^3)$$

where D is the net depth of application during irrigation (inches).

The allowable depletion is the amount of soil water that can be used by plants without suffering yield loss due to water stress (University of California 1993). To simplify the analysis, the allowable depletion for each water district was assumed to be 3 inches. In the current analysis, the net depth of application during irrigation is approximated by the allowable depletion.

The monthly precipitation data was obtained from stations in the National Climatic Data Center (NCDC) database. As mentioned above for evapotranspiration, calendar year 1998 was assumed to be representative of wet year precipitation and calendar year 1989 was used to represent dry year precipitation. The NCDC station assumed to have representative precipitation data for a particular district is shown in Table 3. Table 6 shows the monthly precipitation data used in the wet year scenario, and Table 7 shows the monthly precipitation data used in the dry year scenario.

Carryover Soil Moisture

The soil moisture at the beginning of the year was assumed to be equal to the allowable depletion, or 3 inches. The carryover soil moisture was calculated by adding the effective precipitation to the previous month's soil moisture and subtracting the consumptive use. It was assumed that the carryover soil moisture could not be less than half the allowable depletion.

Leaching

In this study, the leaching requirement is set to be 5 percent of the total amount of irrigation water.

Irrigation Efficiency

Due to unavoidable losses, no field application of irrigation water can be 100 percent efficient. Thus, more water than is needed to satisfy net irrigation requirements must be applied. In this study, a 77 percent irrigation efficiency is assumed for all districts.

Gross Irrigation Demand

By taking into account the irrigation efficiency, the gross field irrigation requirements (NET_{gross}) may be estimated as:

$$NET_{gross} = \alpha \cdot NET_{irr}$$

where α is the irrigation efficiency.

Irrigation Deliveries

In order to provide a range for the potential need for water from the Exchange Contractors, it was assumed that in the wet year scenario, the districts would receive 100 percent of their CVP contracts for agricultural use. In the dry year scenario, it was assumed that the districts would only receive 25 percent of their total CVP contracts for agricultural use. This assumption is based on a review of historical CVP water supply allocations. In 1977, agricultural contractors received 25 percent of their supply, urban contractors received 25 to 50 percent and the Friant water users only received 25 percent of the Class 1 supply.

Crop Mix

The historical irrigated crop acreage was obtained from Reclamation for districts in the CVP Friant Division, as well as Del Puerto Water District (WD), Pacheco WD, Panoche WD, Patterson Irrigation District (ID), Plain View WD, San Benito County WD, San Luis WD, and Westlands WD. For Santa Clara Valley WD, the irrigated acreage was obtained from the Santa Clara County Department of Agriculture crop report for 2002. The determination of the crop mix assumed to be representative of existing conditions was made using the above data sources, as described in Table 8. Table 9 shows the acreage per district of each crop type included in the water balance.

RESULTS

The existing irrigation requirement was determined for nine separate agricultural districts, as well as the Friant Division as a whole. Tables 10 and 11 summarize the results. Table 10 shows the deficit in supply water after applying 100 percent of the CVP contract deliveries for the wet year scenario. Table 11 shows the deficit remaining in the dry year scenario after applying only 25 percent of the CVP contract deliveries. For the wet year scenario, the water balance results show that Patterson ID, San Benito County WD, Santa Clara Valley WD, and Westlands WD have a deficit totaling approximately 109,000 acre-feet that could potentially be met with the proposed water transfers. For the dry year scenario, all districts show deficits, with a total of approximately 4,300,000 acre-feet. The proposed water transfers could potentially meet a portion of this demand.

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Table 1
Sources for Crop Coefficients

Crop Name	Location	kc Source	Notes/Adjustments
Alfalfa	San Joaquin Vly	UC Publication 3396	constant Kc averaged over entire year
Almonds	Central Vly	UC Leaflet 21428	used kc values for deciduous orchards, c associated with leafout date 2/26, but used a leafout date of 2/20 and assumed kc values cut in half from 7/20 to 8/20.
Barley	San Joaquin Vly	UC Leaflet 21454	small grains planted 11/1 except used season end date of 5/1
Beans	San Joaquin Vly	UC Leaflet 21427	planted 5/1
Cereals, other (use barley)	San Joaquin Vly	UC Leaflet 21454	small grains planted 11/1
Citrus	Central Vly	UC Leaflet 21428	assumed a constant Kc for entire year
Corn	San Joaquin Vly	UC Leaflet 21427	planted 4/1
Cotton	San Joaquin Vly	UC Leaflet 21427	kc values and growth dates associated with a plant date of 4/16, but used a plant date of 4/10 and season end date of 10/1
Deciduous Orchard, c	Central Vly	UC Leaflet 21428	leafout date 3/1 (From UC Leaflet 21428, Deciduous Orchard, c refers to "peaches, apricots, pears, plums, almonds and pecans without a cover crop.")
Deciduous Orchard, d	Central Vly	UC Leaflet 21428	leafout date 3/1 (From UC Leaflet 21428, Deciduous Orchard, d refers to "apples, cherries, and walnuts without a cover crop.") "other nuts" were included with Deciduous Orchard, d.
Garlic/Onions	San Joaquin Vly	estimated from UC Leaflet 21427	used onions w/ A date of 10/15, B date of 11/15, C date of 01/01, E date of 05/15. Kc values were based on onions planted 9/16, however Kc1 was taken to be the average of 0.18 and 0.27 (values corresponding to A date of 09/16 and 11/16). Percent of season to date D used was 0.72.
Grain Sorghum (Milo)	San Joaquin Vly	UC Leaflet 21427	planted 5/1
Melons	San Joaquin Vly	UC Leaflet 21427	plant date of 3/16, except used season end date of 6/30
Misc. Truck/Field Crops (High)	San Joaquin Vly	UC Leaflet 21427	corn planted 4/1
Misc. Truck/Field Crops (Low)	Imperial Vly	UC Leaflet 21454	lettuce planted 8/31
Misc. Truck/Field Crops (Med)			avg. of misc. (High) and misc. (Low)
Nursery/Lettuce	Imperial Vly	UC Leaflet 21454	lettuce planted 8/31
Olives	Central Vly	UC Leaflet 21428	leafout date 3/31
Pasture (Improved)	Statewide	UC Leaflet 21427	constant kc shown for grazed pasture
Potatoes	San Joaquin Vly	UC Leaflet 21427	planted 3/1
Rice	San Joaquin Vly	UC Leaflet 21427	planted 4/1
Sugar Beets	San Joaquin Vly	UC Leaflet 21427	planted 3/16
Tomatoes (canning)	San Joaquin Vly	UC Leaflet 21427	planted 5/1
Tomatoes (fresh market)	San Joaquin Vly	UC Leaflet 21454	tomatoes planted 3/23
Vineyard/Berries (use Grapes)	San Joaquin Vly	UC Leaflet 21454	leafout date 3/15
Wheat	San Joaquin Vly	UC Leaflet 21454	small grains planted 11/1 except used season end date of 6/1

Table 2
Monthly Crop Coefficients (Kc)

Month	Alfalfa Monthly Average Kc	Almonds Monthly Average Kc	Barley Monthly Average Kc	Beans Monthly Average Kc	Cereal (use Barley) Monthly Average Kc	Citrus Monthly Average Kc	Corn Monthly Average Kc	Cotton Monthly Average Kc	Deciduous Orchard, c Monthly Average Kc	Deciduous Orchard, d Monthly Average Kc	Garlic/ Onions Monthly Average Kc	Grain Sorghum (Milo) Monthly Average Kc	Melons Monthly Average Kc
Jan	0.95	0.00	0.98	0.00	0.98	0.65	0.00	0.00	0.00	0.00	1.15	0.00	0.00
Feb	0.95	0.18	1.20	0.00	1.20	0.65	0.00	0.00	0.00	0.00	1.15	0.00	0.00
Mar	0.95	0.62	1.14	0.00	1.14	0.65	0.00	0.00	0.58	0.60	1.13	0.00	0.09
Apr	0.95	0.71	0.78	0.00	0.78	0.65	0.20	0.11	0.70	0.75	0.96	0.00	0.26
May	0.95	0.80	0.24	0.28	0.24	0.65	0.60	0.22	0.82	0.91	0.40	0.16	0.90
Jun	0.95	0.89	0.00	1.08	0.00	0.65	1.11	0.75	0.87	0.97	0.00	0.51	0.63
Jul	0.95	0.74	0.00	0.98	0.00	0.65	0.99	1.17	0.87	0.97	0.00	1.04	0.00
Aug	0.95	0.62	0.00	0.25	0.00	0.65	0.59	1.05	0.87	0.97	0.00	0.81	0.00
Sep	0.95	0.80	0.00	0.00	0.00	0.65	0.00	0.62	0.83	0.95	0.00	0.00	0.00
Oct	0.95	0.62	0.00	0.00	0.00	0.65	0.00	0.01	0.71	0.88	0.12	0.00	0.00
Nov	0.95	0.02	0.25	0.00	0.25	0.65	0.00	0.00	0.00	0.00	0.30	0.00	0.00
Dec	0.95	0.00	0.36	0.00	0.36	0.65	0.00	0.00	0.00	0.00	0.84	0.00	0.00

Month	Misc. (High) (use Corn) Monthly Average Kc	Misc. (Low) (use 8/31 Lettuce) Monthly Average Kc	Misc. (Med) (use avg. of High and Low) Monthly Average Kc	Nursery/ Lettuce Monthly Average Kc	Olives Monthly Average Kc	Pasture (Improved) Monthly Average Kc	Potatoes Monthly Average Kc	Rice Monthly Average Kc	Sugarbeets Monthly Average Kc	Tomatoes (canning) Monthly Average Kc	Tomatoes (fresh market) Monthly Average Kc	Vineyard/ Berries (use Grapes) Monthly Average Kc	Wheat Monthly Average Kc
Jan	0.00	0.00	0.00	0.00	0.00	0.90	0.00	0.00	0.00	0.00	0.00	0.00	0.98
Feb	0.00	0.00	0.00	0.00	0.00	0.90	0.00	0.00	0.00	0.00	0.00	0.00	1.20
Mar	0.00	0.00	0.00	0.00	0.02	0.90	0.58	0.00	0.08	0.00	0.02	0.17	1.20
Apr	0.20	0.00	0.10	0.00	0.62	0.90	1.01	0.95	0.27	0.00	0.08	0.46	1.09
May	0.60	0.00	0.30	0.00	0.71	0.90	1.19	1.14	0.75	0.27	0.64	0.64	0.74
Jun	1.11	0.00	0.56	0.00	0.78	0.90	0.71	1.25	1.10	0.62	1.00	0.80	0.24
Jul	0.99	0.00	0.49	0.00	0.80	0.90	0.00	1.17	1.09	1.04	0.90	0.82	0.00
Aug	0.59	0.13	0.36	0.13	0.80	0.90	0.00	1.02	1.02	0.99	0.05	0.70	0.00
Sep	0.00	0.21	0.10	0.21	0.80	0.90	0.00	0.00	0.48	0.38	0.00	0.00	0.00
Oct	0.00	0.71	0.35	0.71	0.80	0.90	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Nov	0.00	1.01	0.50	1.01	0.00	0.90	0.00	0.00	0.00	0.00	0.00	0.00	0.25
Dec	0.00	0.48	0.24	0.48	0.00	0.90	0.00	0.00	0.00	0.00	0.00	0.00	0.36

Table 3
Weather Stations Used for Reference Evapotranspiration and Precipitation Data

District	CIMIS Station with Representative Eto for Wet Year	CIMIS Station with Representative Eto for Dry Year	NCDC Station with Representative Precipitation for Wet and Dry Year Scenarios
Del Puerto WD	Modesto	Modesto	Modesto
Pacheco WD	Panoche	Firebaugh/Telles	Los Banos
Panoche WD	Firebaugh/Telles	Firebaugh/Telles	Los Banos
Patterson ID	Modesto	Modesto	Newman
Plain View WD	Manteca	Manteca	Modesto
San Benito Co WD	San Benito	San Benito	Hollister
San Luis WD	Los Banos	Los Banos	Los Banos
Santa Clara Vly WD	San Jose	San Jose	Gilroy
Westlands WD	Westlands	Mendota/Murietta USDA	Five Points 5 SSW
Friant Division Districts			
Arvin-Edison WSD	Arvin-Edison	Tehachapi	Bakersfield AP
Chowchilla WD	Los Banos	Los Banos	Madera
Delano-Earlimart ID	Famoso	McFarland/Kern Farms	Delano
Exeter ID	Visalia	Visalia	Visalia
Fresno ID	Fresno State	Fresno State	Fresno Yosemite Intl
Garfield WD	Fresno State	Fresno State	Fresno Yosemite Intl
Gravelly Ford WD	Firebaugh/Telles	Firebaugh/Telles	Madera
International WD	Fresno State	Fresno State	Fresno Yosemite Intl
Ivanhoe ID	Visalia	Visalia	Visalia
Lewis Creek WD	Visalia	Visalia	Lindsay
Lindmore ID	Visalia	Visalia	Lindsay
Lindsay-Strathmore ID	Visalia	Visalia	Lindsay
Lower Tule River ID	Visalia	Visalia	Porterville
Madera ID	Fresno State	Fresno State	Madera
Orange Cove ID	Parlier	Parlier	Lemon Cove
Porterville ID	Visalia	Visalia	Porterville
Saucelito ID	Visalia	Visalia	Porterville
Shafter-Wasco ID	Shafter/USDA	Shafter/USDA	Wasco
Southern San Joaquin MUD	Famoso	McFarland/Kern Farms	Wasco
Stone Corral ID	Lindcove	Visalia	Lemon Cove
Tea Pot Dome WD	Visalia	Visalia	Porterville
Terra Bella ID	Visalia	Visalia	Porterville
Tulare ID	Visalia	Visalia	Visalia

Table 4
Wet Year (1998) Total Monthly Reference Evapotranspiration (in)

CIMIS Station No.	CIMIS Station Name	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
125	Arvin-Edison	1.47	1.56	3.56	5.03	5.57	7.48	9	8.46	5.63	3.91	1.86	1.5	**55.0**
138	Famoso	1.26	1.23	3.18	4.59	4.76	6.26	7.97	7.32	4.92	3.20	1.50	1.18	**47.4**
7	Firebaugh/Telles	0.89	1.43	3.24	5.04	5.57	7.45	8.77	7.78	5.42	3.82	1.78	1.43	**52.6**
80	Fresno State	0.97	1.30	2.95	4.55	5.63	6.80	8.55	7.70	5.21	3.57	1.79	1.25	**50.3**
21	Kettleman	1.20	1.47	3.26	4.85	5.16	6.96	8.84	8.45	5.67	4.17	1.90	1.37	**53.3**
86	Lindcove	1.20	1.30	2.86	4.25	4.54	6.21	8.02	7.40	4.89	3.30	1.53	1.14	**46.6**
56	Los Banos	0.90	1.42	3.24	4.81	5.75	7.39	8.52	7.78	5.33	3.53	1.62	1.33	**51.6**
70	Manteca	0.70	1.21	3.08	4.21	4.51	6.58	7.93	7.19	4.75	3.38	1.56	1.25	**46.4**
71	Modesto	0.69	1.22	3.15	4.49	4.75	6.55	7.42	6.72	4.51	3.19	1.47	1.26	**45.4**
124	Panoche	0.94	1.54	3.33	5.02	5.55	7.58	8.75	7.73	5.42	3.87	1.89	1.47	**53.1**
39	Parlier	0.88	1.30	2.81	4.52	5.26	6.74	8.35	7.41	5.07	3.38	1.57	1.19	**48.5**
126	San Benito	1.27	1.39	2.85	4.26	4.51	5.26	6.91	6.82	4.73	3.48	1.75	1.51	**44.7**
69	San Jose	1.29	1.31	3.22	4.47	3.90	5.52	6.77	6.53	4.48	3.55	1.57	1.44	**44.1**
5	Shafter/USDA	1.35	1.45	3.25	4.89	5.55	7.07	8.16	7.41	5.20	3.68	1.79	1.33	**51.1**
33	Visalia	0.92	1.22	2.60	4.34	4.99	6.35	7.48	6.96	4.60	3.07	1.31	1.13	**45.0**
105	Westlands	0.91	1.34	3.01	5.01	5.60	7.25	8.55	8.07	5.41	3.90	1.81	1.39	**52.3**
	Average	**1.05**	**1.36**	**3.10**	**4.65**	**5.10**	**6.72**	**8.12**	**7.48**	**5.08**	**3.56**	**1.67**	**1.32**	**49.2**

Table 5
Dry Year (1989) Total Monthly Reference Evapotranspiration (in)

CIMIS Station No.	CIMIS Station Name	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
7	Firebaugh/Telles	1.49	1.71	3.82	5.75	7.84	8.61	8.98	7.42	5.12	3.96	2.00	1.04	**57.7**
80	Fresno State	1.09	1.53	2.92	4.79	6.77	8.19	8.97	7.30	5.02	3.47	1.77	0.78	**52.6**
21	Kettleman	1.34	1.94	4.46	6.53	7.95	8.98	9.88	8.44	5.72	4.40	2.38	1.07	**63.1**
56	Los Banos	1.63	2.35	4.32	5.56	7.64	8.71	9.36	8.14	5.37	3.90	2.01	0.76	**59.8**
70	Manteca	0.92	1.63	2.68	4.34	6.04	6.55	8.12	6.69	4.88	3.51	1.87	1.29	**48.5**
31	McFarland/Kern Farms	1.14	1.75	3.79	6.12	7.36	8.07	8.30	7.28	5.16	3.79	2.12	1.24	**56.1**
40	Mendota/Murietta USDA	1.78	2.58	4.83	7.11	8.47	8.93	9.49	7.77	5.29	4.10	2.18	1.12	**63.7**
71	Modesto	1.66	2.25	3.66	5.80	8.21	8.02	8.69	6.72	4.24	2.86	1.57	0.58	**54.3**
39	Parlier	1.13	1.66	2.97	5.29	6.89	8.10	8.42	6.92	4.73	3.27	1.81	0.93	**52.1**
126	San Benito	1.31	1.63	2.83	4.57	5.62	6.45	6.75	5.74	4.48	3.87	1.96	1.89	**47.1**
69	San Jose	1.85	2.05	3.17	5.00	6.17	6.97	7.96	6.95	5.25	3.69	2.42	1.89	**53.4**
5	Shafter/USDA	1.91	2.27	4.34	5.89	7.22	7.99	8.31	7.47	5.39	4.10	2.31	1.27	**58.5**
59	Tehachapi	2.70	2.53	4.45	7.11	7.35	8.82	10.29	8.13	6.21	4.34	4.07	3.76	**69.8**
33	Visalia	0.99	1.69	3.38	5.73	7.11	8.06	8.30	7.01	4.80	3.44	1.77	0.86	**53.1**
	Average	**1.50**	**1.97**	**3.69**	**5.69**	**7.19**	**8.03**	**8.70**	**7.28**	**5.12**	**3.76**	**2.16**	**1.32**	**56.4**

Note: All stations used 1989 ETo from CIMIS except San Benito, which used 1999.

Table 6
Wet Year (1998) Total Monthly Precipitation (in)

NCDC Station ID	NCDC Station Name	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
442	Bakersfield AP	1.32	5.36	2.19	0.87	1.33	0.37	0	0	0.31	0.24	0.46	0.55	**13.0**
2012	Corcoran Irrig Dist	1.80	4.54	2.97	0.95	1.38	0.41	0	0	0.02	0.60	0.79	0.33	**13.8**
2346	Delano	1.58	5.54	2.73	0.58	2.34	0.80	0	0	0.02	0.44	0.93	0.27	**15.2**
3083	Five Points 5 SSW	1.09	4.86	1.45	1.29	1.77	0.45	0	0	0.53	0.36	1.08	0.00	**12.9**
3257	Fresno Yosemite Intl	3.40	4.89	3.44	1.26	1.37	1.93	0	0	0.15	0.16	0.43	0.62	**17.7**
3417	Gilroy	6.88	13.18	2.33	1.77	1.53	0.04	0.02	0	0.00	0.55	2.51	1.98	**30.8**
4025	Hollister	4.84	10.54	3.14	1.96	1.83	0.09	0	0	0.08	0.54	1.83	1.00	**25.9**
4890	Lemon Cove	4.24	6.43	4.96	4.17	1.57	0.67	0	0	0.05	0.23	1.36	1.07	**24.8**
4957	Lindsay	3.74	5.84	5.15	2.63	1.33	0.37	0	0	0.05	0.44	0.82	0.97	**21.3**
5118	Los Banos	3.41	8.08	2.08	1.16	3.87	0.43	0	0	0.00	0.66	0.94	0.45	**21.1**
5233	Madera	4.22	5.69	4.26	2.03	1.38	0.74	0	0	0.88	0.19	0.34	0.95	**20.7**
5738	Modesto	3.82	8.80	1.52	1.09	3.95	0.18	0	0	0.00	1.36	1.86	0.69	**23.3**
6168	Newman	4.17	9.38	1.86	1.00	3.97	0.02	0	0	0.02	0.87	1.22	0.39	**22.9**
7077	Porterville	2.99	5.93	4.13	2.23	1.34	0.46	0	0	0.05	0.43	1.08	1.02	**19.7**
9367	Visalia	3.53	4.62	4.09	2.03	1.60	1.25	0	0	0.99	0.26	0.95	0.62	**19.9**
9452	Wasco	1.20	5.78	2.72	0.84	1.79	2.00	0	0	0.06	0.52	1.08	0.30	**16.3**
	Average	**3.3**	**6.8**	**3.1**	**1.6**	**2.0**	**0.6**	**0.0**	**0.0**	**0.2**	**0.5**	**1.1**	**0.7**	**19.9**

Table 7
Dry Year (1989) Total Monthly Precipitation (in)

NCDC Station ID	NCDC Station Name	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
442	Bakersfield AP	0.16	0.81	0.86	0	0.45	0	0	0	0.49	0.04	0.07	0	**2.9**
2012	Corcoran Irrig Dist	0.29	1.09	1.24	0.04	0.36	0	0	0	0.4	0.13	0.07	0	**3.6**
2346	Delano	0.19	1.34	0.46	0	0.55	0	0	0	0.21	0.04	0	0	**2.8**
3083	Five Points 5 SSW	0.23	1.01	0.26	0	0.07	0	0	0	0.89	0.05	0.44	0	**3.0**
3257	Fresno Yosemite Intl	0.48	1.18	2.25	0.05	0.89	0	0	0.03	1.11	0.42	0.5	0	**6.9**
3417	Gilroy	1.34	1.01	3.63	0.23	0.15	0.11	0	0	1.56	0.1	1.15	0.01	**9.3**
4025	Hollister	0.78	0.92	1.79	0.3	0.19	0	0	0.08	1.12	0.8	0.88	0.01	**6.9**
4890	Lemon Cove	0.51	1.87	2.9	0.26	0.46	0	0	0	1.14	0.17	0.57	0	**7.9**
4957	Lindsay	0.34	2.03	2.57	0.23	0.3	0	0	0	0.65	0.22	0.52	0.02	**6.9**
5118	Los Banos	0.6	0.93	0.64	0.39	0	0	0	0.12	1.42	0.85	0.28	0.01	**5.2**
5233	Madera	0.4	1.2	2.13	0.17	0.11	0	0	0.03	0.94	0	0.54	0	**5.5**
5738	Modesto	0.54	0.99	2.09	0.11	0.04	0	0	0.08	1.5	0.99	0.7	0.01	**7.1**
6168	Newman	0.42	1.21	0.83	0.05	0	0	0	0	1.81	0.42	0.35	0	**5.1**
7077	Porterville	0.26	1.76	2.03	0.34	0.27	0	0	0	0	0.22	0.37	0	**5.3**
9367	Visalia	0.18	1.4	1.94	0.08	0.29	0	0	0	0.56	0.1	0.4	0	**5.0**
9452	Wasco	0.26	1.37	0.8	0	0.27	0	0	0	0.29	0.04	0.03	0	**3.1**
	Average	**0.4**	**1.3**	**1.7**	**0.1**	**0.3**	**0.0**	**0.0**	**0.0**	**0.9**	**0.3**	**0.4**	**0.0**	**5.4**

Note: No data available in Nov 1989 for Modesto, so used precipitation from Turlock #2.

Table 8
Sources of Irrigated Acreage in Water Balance Analysis

District	Source of Irrigated Acreage	Total Irrigated Acreage Reported to the Reclamation[1]
Del Puerto WD	Average of irrigated acreage from Reclamation (1979-93, 95, 96, 99)	39,986
Friant Division	1995 Reclamation data, except Terra Bella, which used average of irrigated acreage from Reclamation (1979-92, 94, 96, 97)	850,348
Pacheco WD	Crop mix based on average of Reclamation data (1985-94, 99) with total acreage of 4900 (based on reported total acreage in March 2000 Final EA/IS Table 3.4-4)	4,900
Panoche WD	Average of irrigated acreage from Reclamation (1979-93,99)	35,073
Patterson ID	1999 Reclamation data	13,316
Plain View WD	1995 Reclamation data	4,120
San Benito Co WD	2002 Reclamation data	29,119
San Luis WD	Average of irrigated acreage from Reclamation (1979-96, 99)	45,758
Santa Clara Vly WD	2002 Crop Report from Santa Clara County Department of Agriculture	25,677
Westlands WD	1995 Reclamation data	529,050
	Total:	**1,577,348**

[1]Except as noted for SCVWD and San Benito County WD.

Table 9
Crop Acreage by District

District	Alfalfa	Almonds	Barley	Beans	Cereals, other (use barley)	Citrus	Corn	Cotton	Deciduous Orchard, c	Deciduous Orchard, d	Garlic/ Onions	Grain Sorghum (Milo)	Melons
Del Puerto WD	3,781	8,701	391	5,982	707	232	354	356	4,312	3,437	96	454	2,441
Friant Division	75,471	76,410	6,195	8,130	24,308	96,935	56,467	126,416	51,192	45,544		1,826	471
Pacheco WD	165		111	35	195		169	1,994					884
Panoche WD	2,070	136	702	1,337	892		653	14,686	127	201	187	551	2,830
Patterson WD	3,637	331		1,494	1,001		1,470		1,980	224			17
Plainview WD	972	84	115	760	936		60		289	158			
San Benito Co WD					4,205				64	6,221			
San Luis WD	2,657	2,766	1,797	1,499	604	269	595	16,350	1,860	378	341		5,417
Santa Clara Vly WD	568				4,242		1,285		608	1,177	568		734
Westlands WD	3,815	13,877	5,423	13,172	9,487	234	114	268,706	973	6,830	8,516		23,524

District	Misc. Truck/ Field Crops (High)	Misc. Truck/ Field Crops (Low)	Misc. Truck/ Field Crops (Med)	Nursery/Lettuce	Olives	Pasture (Improved)	Potatoes	Rice	Sugar Beets	Tomatoes (canning)	Tomatoes (fresh market)	Vineyard/ Berries (use Grapes)	Wheat	Total Crop Acreage
Del Puerto WD	235	1,236	1,771	53		596			433	2,881	321	66	1,152	**39,986**
Friant Division	574	26,557	2,381	1,056	12,184	12,975	16,537		2,316	512		188,768	17,124	**850,348**
Pacheco WD	194	269	103	273						409			100	**4,900**
Panoche WD	571	603	1,386	252		60		265	656	4,035	760	275	1,836	**35,073**
Patterson WD	73	140	247			647			54	1,738	263			**13,316**
Plainview WD		363		2		89			154		138			**4,120**
San Benito Co WD			13,094			1,801						3,734		**29,119**
San Luis WD	1,645	894	1,752	253		244			1,633	2,413	543	1,096	752	**45,758**
Santa Clara Vly WD		4,128	1,194	4,303		3,890				623	414	1,943		**25,677**
Westlands WD	7,560	30,552	2,887	19,148	487	604	75		5,485	83,693	4,375	6,179	13,334	**529,050**

Total: 1,577,348

Table 10
Summary Table of Water Balance Analysis
Scenario 1: Hydrology for a Wet Calendar Year, with 100% Contract Water Supply

Water District	Total Area (acres)	Existing Contracted Water Amount[1] (ac-ft)	Existing Contracted Water Amount (in)	Weighted Average Annual Crop Evapotranspiration (in)	Weighted Average Annual Gross Irrigation Requirement[2] (in)	Annual Gross Irrigation Requirement (ac-ft)	Existing Annual Irrigation Water Deficit (in)	Existing Annual Irrigation Water Deficit (ac-ft)
Del Puerto WD	39,986	140,210	42.1	25.8	26.7	89,046	0.0	0
Friant Division[3]	850,348	2,137,225	30.2	28.5	30.1	2,132,194	0.0	0
Pacheco WD	4,900	10,000	24.5	22.2	23.7	9,683	0.0	0
Panoche WD	35,073	93,904	32.1	25.6	28.0	81,829	0.0	0
Patterson ID	13,316	22,500	20.3	29.0	30.4	33,775	10.2	11,275
Plain View WD	4,120	20,600	60.0	24.4	23.8	8,176	0.0	0
San Benito Co WD	29,119	35,550	14.7	20.4	19.4	47,055	4.7	11,505
San Luis WD	45,758	124,502	32.7	26.0	28.0	106,893	0.0	0
Santa Clara Vly WD	25,677	33,100	15.5	17.7	15.7	33,510	0.2	410
Westlands WD	529,050	1,150,000	26.1	24.8	28.0	1,235,869	1.9	85,869
Total	**1,577,348**	**3,767,591**				**3,778,029**		**109,059**

Table 11
Summary Table of Water Balance Analysis
Scenario 2: Hydrology for a Dry Calendar Year, with 25% Contract Water Supply

Water District	Total Area (acres)	Existing Contracted Water Amount[1] (ac-ft)	Existing Contracted Water Amount (in)	Weighted Average Annual Crop Evapotranspiration (in)	Weighted Average Annual Gross Irrigation Requirement (in)	Annual Gross Irrigation Requirement (ac-ft)	Existing Annual Irrigation Water Deficit (in)	Existing Annual Irrigation Water Deficit (ac-ft)
Del Puerto WD	39,986	140,210	42.1	31.0	36.9	123,069	26.4	88,017
Friant Division[4]	850,348	735,750	10.4	32.5	39.6	2,805,384	37.0	2,621,447
Pacheco WD	4,900	10,000	24.5	23.9	28.7	11,719	22.6	9,219
Panoche WD	35,073	93,904	32.1	27.6	33.6	98,335	25.6	74,859
Patterson ID	13,316	22,500	20.3	34.8	42.6	47,265	37.5	41,640
Plain View WD	4,120	20,600	60.0	25.5	28.6	9,812	13.6	4,662
San Benito Co WD	29,119	35,550	14.7	21.4	23.6	57,266	19.9	48,379
San Luis WD	45,758	124,502	32.7	29.6	36.2	138,157	28.1	107,031
Santa Clara Vly WD	25,677	33,100	15.5	21.5	22.4	47,908	18.5	39,633
Westlands WD	529,050	1,150,000	26.1	28.1	35.2	1,552,933	28.7	1,265,433
Total	**1,577,348**	**2,366,116**				**4,891,849**		**4,300,320**

[1] Contracted water amounts were obtained from interim and long-term renewal contracts (USBR 2001a - 2001i, USBR 2003).
[2] Irrigation demand was increased by 5% to account for leaching, with an additional increase to account for a 77% irrigation efficiency.
[3] It was assumed that in a wet year, the Friant Division would receive 100% of both Class 1 and Class 2 deliveries.
[4] It was assumed that in a dry year, the Friant Division would receive no Class 2 deliveries and 25% of Class 1 deliveries.

Attachment A-1

Final Water Needs Assessment for Westlands Water District

United States Department of the Interior

BUREAU OF RECLAMATION
Mid-Pacific Regional Office
2800 Cottage Way
Sacramento, California 95825-1898

IN REPLY
REFER TO:

MP-410
WTR-4.00

NOV 0 2 2000

MEMORANDUM

To: Delta Division, Delta Mendota Canal, Delta Mendota and San Luis Unit, San Luis Unit Central Valley Project Contractors (See Attached List)

From: John F. Davis
Regional Resources Manager

Subject: Final Water Needs Assessments for the Central Valley Project Long-Term Contract Renewal Process

This memorandum is to inform you of the results of the water needs assessment effort performed in connection with the Central Valley Project (CVP) long-term contract renewal process. Most CVP water contractors in your division will receive similar letters. Attached are:

1. The **final** water needs assessment for your district/municipality with footnotes and column explanations accompanied by the crop consumptive use table for the year 2025, if applicable;

2. Attachment 1, a document which explains the purpose and methodology of the water needs assessments.

As part of the assessment, water transfers to other entities for agricultural, urban, and/or environmental purposes are considered a beneficial use of the contractor's water supply. Future transfers have been incorporated into the year 2025 water needs assessments if the identified transferee is projected to have an unmet demand that could be satisfied in whole, or in part, by the future transfer.

The final water needs assessment indicates that you have used CVP water beneficially in the past and confirms your future need of your current annual maximum contractual CVP supply.

We appreciate the significant effort expended on the part of most CVP contractors and consultants to make these water needs assessments as reflective of reality as possible, given the format. Although the finalization of the water needs assessments has been closely coordinated with individuals of your district/municipality and/or their consultants, there may still be questions. Please contact Tracy Slavin at (916) 978-5214 or Mary Johannis at (916) 978-5202 (TDD 978-5608) if you have any questions on the assessment or methodology.

Thank you for your assistance in making this a successful effort.

Attachments 2

cc: Mr. Steve Brown
Bookman-Edmonston Engineering
3100 Zinfandel Drive, Suite 500
Sacramento CA 95670-6026

Distribution List:

Board of Directors
Banta-Carbona Irrigation District
PO Box 299
Tracy CA 95376-0299

Board of Directors
Broadview Water
PO Box 95
Firebaugh CA 93622

Mr. Joseph Coehlo, Sr.
Coelho Family Trust
5494 West Mount Whitney Avenue
Riverdale CA 93656

Board of Directors
Del Puerto Water District
PO Box 98
Westley CA 95387

Board of Directors
James Irrigation District
PO Box 757
San Joaquin CA 93660-0757

Board of Directors
Mercy Springs Water District
52027 West Althea Avenue
Firebaugh CA 93622

Board of Directors
Pacheco Water District
52027 West Althea Avenue
Firebaugh CA 93622

Board of Directors
Panoche Water District
52027 West Althea Avenue
Firebaugh CA 93622

Board of Directors
Patterson Irrigation District
PO Box 685
Patterson CA 95363

Board of Directors
Plain View Water District
6715 South Tracy Boulevard
Tracy CA 95376

Board of Directos
San Luis Water District
PO Box 2135
Los Banos CA 93635

Board of Directors
The West Side Irrigation District
PO Box 177
Tracy CA 95378-0177

Board of Directors
Tranquillity Irrigation District
PO Box 487
Tranquillity CA 93668

Board of Directors
West Stanislaus Irrigation District
PO Box 37
Westley CA 95387

Board of Directors
Westlands Water District
PO Box 6056
Fresno CA 93703

Division: **West San Joaquin** | Water Needs Assessment | District: **WESTLANDS WD** | Date: 10/11/00

Agricultural and M&I Water Supply

Contractor's Water Supply Sources and Quantities (acre-feet)

Timeframe 1	Surface Water Supply: Reference Delivery 2	USBR Total Deliv/Max 3	SWP 4	Local 5	Local Source 6	Trsfr/Rtrn /Recycle In 7	Trsfr/ Out 8	Groundwater Supply: District 9	Private 10	Safe Yield 11	Recharge 12	Total Supply 13
1989	1,062,509	1,130,463	0	0		32,865	5,420	0	175,000		0	1,332,908
1996	0	0										0
2025	1,150,000 *	1,150,000 *	0	0		0	4,938	0	175,000		0	1,320,062

Contractor's Agricultural Water Demands

Maximum ProductiveAcres= 545,268

Timeframe 1	Crop Water Requirement (acre-feet) 15	District Irrig. Efficiency (%) 16	Effective Precip (acre-feet) 17	Reference Effective Precip (acre-ft) 18	Calculated Net Crop Water Req (acre-feet) 19	USBR Net Crop Water Req (acre-feet) 20	Average Irrigated Acres (acres) 21	Reference Irrigated Acres (acres) 22	Calculated FDR (AF/acre) 23	USBR FDR (AF/acre) 24	Conveyance Loss (acre-feet) 25	Total Ag Demand (acre-feet) 26
1989	1,150,449	75	65,249	155,765	1,446,933	1,401,883	515,000	519,216	2.81	2.70	319	1,447,252
1996	1,229,209	75	163,895	163,895	1,420,419	1,420,419	546,315	546,315	2.60	2.60		
2025	1,366,756	85	181,830	181,830	1,394,030	1,394,030	606,100	606,100	2.30	2.30	319	1,394,349

Contractor's M&I Water Demands

Timeframe 1	Residential Water Demand: Population 28	Per Capita Demand (gpcd) 29	Total Demand (acre-feet) 30	Nonresidential Water Demand: Industrial (acre-feet) 31	Comm/ Instit (acre-feet) 32	Total Demand (acre-feet) 33	Loss: Unacc /Distr (acre-feet) 34	Ref Urban Per Capita Dmd (gpcd) 35	Calc Urban Per Capita Dmd (gpcd) 36	Total M&I Demand (acre-feet) 37	Total Ag+ M&I Dmd (acre-feet) 38	Unmet Demand (acre-feet) 39
1989						0	0			0	1,447,252	114,344
1996						0	0			0	0	0
2025						0	0			0	1,394,349	74,287

Notes: In order to limit this to an assessment of agricultural water needs, M&I water demand in the amount of 5,420 AF in 1989 and 4,938 AF in 2025 are shown as transfers out.

*** Represents Maximum Contract Amount**

Water supply and demand information is for a normal hydrologic year. Crop Water Requirement includes leaching req. and cultural water but not irrigation efficiency.

☐ **Information from contractor's water management plan or data submittal for historical years. USBR reference information for future years**

☐ **Quality control check; information is either calculated by USBR staff, or from reference.**

Crop Consumptive Use

Division_Name **West San Joaquin**

District_Name WESTLANDS WD IDCON 203220

Year_Beginning 2025 **Year_Ending** 2025

Crop_Group_Number	Ave_Group_Acres	Ave_LR	Ave_ET	Ave_SE	Ave_CP	Ave_EP
Alfalfa	3,200	0.213	4.7	85	0.00	0.3
Almonds	25,400	0.202	3.3	85	0.00	0.3
Barley	5,300	0.011	1.3	85	0.00	0.3
Beans (Dry)	18,800	0.165	1.8	85	0.00	0.3
Corn (Field)	100	0.115	2.4	85	0.00	0.3
Cotton	203,400	0.027	2.6	85	0.00	0.3
Deciduous Orchard	14,000	0.203	3.8	85	0.00	0.3
Grains	9,300	0.023	1.3	85	0.00	0.3
Melons	43,100	0.035	1.2	85	0.00	0.3
Misc. Tr/Fld (High)	13,900	0.102	2.4	85	0.00	0.3
Misc. Trk/Fld (Low)	22,700	0.023	0.7	85	0.00	0.3
Misc. Trk/Fld (Med)	87,000	0.090	1.5	85	0.10	0.3
Nursery/Lettuce	24,800	0.043	0.7	85	0.25	0.3
Pasture (Improved)	500	0.063	4.5	85	0.00	0.3
Subtropical Orchard	1,100	0.121	3.2	85	0.25	0.3
Sugar Beets	1,600	0.037	3.2	85	0.00	0.3
Tomatoes	109,100	0.072	2.1	85	0.13	0.3
Vineyard	9,800	0.106	1.9	85	0.00	0.3
Wheat	13,000	0.025	2.0	85	0.00	0.3
	Total_Acres	**Total_LR**	**Total_ET**	**Total_SE**	**Total_CP**	**Total_EP**
	606,100	0.06500	2.1	85	0.05	0.3

Total_CIR	Total_FDR	Total_Crop_Water_Requirement	Gross_Crop_Water_Requirement
1.8	2.30	1,394,030	1,366,756

Appendix B
Hydrologic Effects of Water Transfers

Contents

Hydrologic Effects of Water Transfers

Temporary Water Transfer Program for the San Joaquin River Exchange Contractors Water Authority – 2005-2014

Prepared for the
San Joaquin River Exchange Contractors Water Authority

By
Daniel B. Steiner

May 2004

Hydrologic Effects of Water Transfers

Temporary Water Transfer Program for the San Joaquin River Exchange Contractors Water Authority – 2005-2014

Introduction

The San Joaquin River Exchange Contractors Water Authority (the Exchange Contractors) has proposed to annually transfer up to 130,000 acre-feet of water to Central Valley Project (CVP) water contractors and wildlife areas. The transfers will be developed by the Exchange Contractors by several means that will in effect temporarily reduce the amount of substitute water delivered by the United States Bureau of Reclamation (Reclamation) to the Exchange Contractors. These temporary reductions in the delivery of substitute water will be available to Reclamation to deliver to CVP contractors and wildlife areas. The total amount of water transferred by the Exchange Contractors will developed through a voluntary crop idling/temporary land fallowing program, up to 50,000 acre-feet in a year, and through groundwater substitution and conservation programs, up to 80,000 acre-feet in a year.

This report identifies the hydrologic elements that potentially will be affected by the proposed transfer. The hydrologic effects are analyzed for two separate perspectives: 1) the effects due to the Exchange Contractors developing the transfer water (direct effects), and 2) the combined effects of developing the transfer water, the disposition of the water, and other hydrologic-related actions taken by Reclamation in response to transfer water being provided by the Exchange Contractors. The analysis is focused on the potential hydrologic effects that may occur to the San Joaquin River.

Background

Through the contract titled Second Amended Contract for Exchange of Waters (the "exchange contract"), Reclamation provides a substitute water supply to the Central California Irrigation District (CCID), Columbia Canal Company (CCC), San Luis Canal Company (SLCC) and the Firebaugh Canal Water District (FCWD) in exchange for waters of the San Joaquin River. This water amounts to a supply not to exceed 840,000 acre-feet per year in accordance with monthly and seasonal maximum entitlements. During years defined as critical the annual supply is not to exceed 650,000 acre-feet. Reclamation must plan for and operate the CVP to meet its obligations under the exchange contract.

The Exchange Contractors have historically been capable of diverting the full amount of the exchange contract. For many years the Exchange Contractors have been investing in conservation programs that allow additional management of their water resources. These programs enable the Exchange Contractors to meet distribution capacity needs during the summer and also, at times, temporarily reduce the need for full exchange contract deliveries over the course of a year.

CVP delivery capacity from the Delta-Mendota Canal and San Luis Canal is extremely constrained due to regulatory actions affecting CVP operations. CVP South-of-Delta (SOD) deliveries are often reduced below full contract amounts. Coupled with a Central Valley Project Improvement Act (CVPIA) directive to increase firm water deliveries to wildlife areas within the San Joaquin Valley, there is an immediate and long-term need to acquire water supplies from willing sellers that access water from the Sacramento-San Joaquin Delta.

The Exchange Contractors, Reclamation and CVP agricultural contractors conducted a series of one-year transfers during the early 1990s for water developed by Exchange Contractor conservation projects. Reclamation purchased water from the Exchange Contractors for delivery to wildlife areas and water was also sold to CVP SOD contractors. The amount of water made available for the transfers generally increased with time as additional conservation projects were completed. Revenues from the transfers have been used by the Exchange Contractors to fund, among other items, additional conservation projects, drainage projects and water quality improvement projects.

Since contract-year 2000, annual transfers have been conducted under the auspices of a five-year Environmental Assessment/Initial Study. The study evaluated the potential effects of transferring up to 84,000 acre-feet of the Exchange Contractor substitute water. The water for these transfers has been developed primarily through tailwater recapture projects. Each year presents a different hydrologic and contractual circumstance. Documentation of the hydrologic effects of these transfers occurs through a forecasting and post-accounting process with Reclamation each year.

The Exchange Contractors and Reclamation desire to continue transfers, potentially with a broader range of transferees and sources of developed water. The range of potential transferees includes CVP SOD contractors (including Santa Clara Valley Water District of the San Felipe Division), wildlife areas within the San Joaquin Valley, Friant Division water contractors, and the Environmental Water Account for the purpose of offsetting potential water supply impacts to CVP SOD contractors. Sources of water to be developed by the Exchange Contractors include conservation, tailwater recapture, groundwater and voluntary crop idling/temporary land fallowing.

The transfer program would again entail water potentially being developed each year under different hydrologic and contractual circumstances. For each acre-foot of water developed by the Exchange Contractors, an in-kind amount of water will be considered acquired and backed into the CVP for Reclamation to deliver to CVP contractors or wildlife areas. Physically, for each acre-foot of water transferred, a reduction of one acre-foot diversion will occur at the delivery points of the Exchange Contractors. For purposes of accounting water delivered to the Exchange Contractors under the exchange contract, water counted as transferred appears as water delivered to the Exchange Contractors.

Overview of Program and Analysis

The transfer program envisioned by the Exchange Contractors and Reclamation is essentially consistent with the program currently in place. Each year different hydrologic circumstances, water needs and supply opportunities present themselves. Water management decisions, unique to each year, occur in terms of how much water is transferred, to which entities, and from what sources of water the entire transfer is developed. Due to the uncertainty of future hydrologic conditions and the year-to-year determined needs of the transferees, the specifics of the transfers can not be known years in advance. At best, the current year's transfer can be identified and its potential hydrologic effects can be estimated.

A broad set of analyses is needed to identify a range of potential hydrologic effects that may occur as a result of the transfers. The analyses need to provide sufficient information to identify the difference in the types and relative magnitude of hydrologic effects that may occur between exercising one source of water as compared to another, or providing the transfer water to one entity as compared to another. The results of the analyses can provide guidance for implementation strategies or measures that can lessen or avoid impacts.

The analyses presented in this report will evaluate combinations of potential sources of developed water and combinations of potential transferees. Each of these combinations will evaluate the potential hydrologic effects of developing and disposing the transfer water upon San Joaquin River hydrology. The potential changes to San Joaquin River hydrology will be identified in terms of flow and quality conditions at Vernalis, and will incorporate the relationship between flow and quality objectives at Vernalis and New Melones Reservoir operations. Potential CVP/SWP Delta water supply effects will also be identified. The analyses will evaluate potential hydrologic effects using five snapshots of hydrology, one representative of five different year-types in the San Joaquin River Basin.

Depiction of the Baseline Hydrologic Setting

A hydrologic baseline was developed to provide the setting to which the transfer program is compared. For purposes of CEQA analysis the baseline is the Existing Conditions setting, while for NEPA analysis it is the Future No Action setting. These two settings are considered equal within this analysis of San Joaquin River hydrology.

The CEQA baseline setting of the San Joaquin River represents recent hydrology and circumstances. The current hydrology of the San Joaquin River already includes some effect of water transfers by the Exchange Contractors and the delivery of a portion of that water to wildlife areas and CVP contractors. The wildlife areas' utilization of available water such as drainage return flows represents a condition that includes the existence and operation of the Grassland By-pass Project. The effects of the Grassland By-pass Project itself have been previously documented[1] by Reclamation and the Panoche Water District. Other hydrologic circumstances that depict the existing condition concern the San Joaquin River at Vernalis and the operation of New Melones Reservoir and the Sacramento-San Joaquin Delta (Delta). For each of these items, current regulatory and institutional constraints are assumed. Such constraints include Decision 1641 for Delta operations and the Interim Plan of Operations for New Melones Reservoir.

The NEPA Future No Action setting represents the San Joaquin River at a point in time in the future, similar to the circumstances that represent the Existing Conditions setting, except that there are no transfers of water from the Exchange Contractors. However, the level of recent deliveries to the wildlife areas is assumed to continue through purchases by Reclamation from entities other than the Exchange Contractors.

The following is a description of the several elements describing or affecting the baseline condition used in this analysis.

Physical Setting and Operation of the Exchange Contractors

The Exchange Contractors provide water deliveries to over 240,000 acres of irrigable land on the west-side of the San Joaquin Valley, spanning a distance roughly from the town of Mendota in the south to the town of Crows Landing in the north. The four entities of the Exchange Contractors each have separate conveyance and delivery systems operated independently although integrated within a single operation for performance under the exchange contract. These conveyance and delivery systems generally divert water from the CVP Delta Mendota Canal (DMC) and Mendota Pool, convey water to customer delivery turnouts, and at times discharge to tributaries of the San Joaquin River. Deliveries include the conveyance of water to wildlife areas.

Although unique for each entity, operations generally consist of diverting sufficient flow from the DMC and Mendota Pool to maintain relatively constant water surface elevations within the canal pools throughout the Exchange Contractors' main distribution systems. Depending on the Exchange Contractor entity, water is either directly delivered to community ditch systems of the customers from the main canal systems or water is further conveyed through entity-owned and maintained community ditch systems to ultimate points of delivery. Once delivered, the entities lose control of the water until the farmers' drainage, if any, is intercepted by district facilities.

In certain circumstances, groundwater is used to supplement the Exchange Contractors' CVP substitute water supply and to provide delivery capacity. Groundwater is also being used to improve the operational control of the distribution systems.

Exchange Contractor Deliveries

Table 1 illustrates the monthly water deliveries to the Exchange Contractors since 1984. Many factors, including flood events within the San Joaquin River Basin, affect the delivery of water during the non-summer period whereby less-than-full delivery of exchange contract entitlements may occur; however, the historical record does illustrate that the full substitute water supply entitlements are required.

As previously discussed, the Exchange Contractors have been making water available for transfers intermittently since 1993. Table 2 illustrates the amount of water transfers that has occurred through Exchange Contractor programs. These quantities of water are included as apparent deliveries to the Exchange Contractors included in Table 1. The values include all transfers of the Exchange Contractors, inclusive of transfers to CVP contractors and the wildlife areas, and district-to-district transfers on behalf of land owners who have lands in multiple districts.

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[1] FONSI approved by Reclamation, October 18, 1991, updated and approved November 3, 1995. EA/IS with Negative Declaration adopted by Panoche Water District December 26, 1990, addendum on July 13, 1995.

Table 1
Exchange Contractor Deliveries

Acre-feet													
CY	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	TOTAL
1984	5,960	44,208	52,291	82,277	119,629	135,253	153,674	142,130	64,501	35,294	2,227	0	837,444
1985	2,949	36,373	79,808	83,265	108,144	131,492	152,868	133,168	70,611	33,771	5,161	0	837,610
1986	5,786	10,215	26,549	66,491	106,329	131,734	156,748	142,758	72,260	33,418	30,346	1,291	783,925
1987	13,234	28,785	50,218	92,646	115,795	135,449	150,883	139,414	61,837	36,391	13,726	93	838,471
1988	9,935	42,829	70,600	61,574	106,265	134,164	154,120	142,195	80,996	36,389	593	0	839,660
1989	3,342	23,624	69,313	83,385	107,746	135,190	149,445	138,555	82,054	31,861	5,001	460	829,976
1990	8,600	32,964	69,419	62,354	71,888	122,902	166,373	142,584	56,997	42,120	9,058	961	786,220
1991	13,979	36,506	39,508	41,939	72,107	110,920	133,257	113,157	41,785	15,827	30,549	412	649,946
1992	4,065	13,341	56,414	54,429	79,337	109,873	125,470	106,320	41,913	19,032	20,308	1,450	631,952
1993	811	5,501	72,107	88,763	105,734	114,534	140,568	147,132	81,000	38,000	25,000	15,000	834,150
1994	6,763	24,142	76,531	56,381	55,990	125,301	145,211	110,615	30,218	28,188	12,839	62	672,241
1995	282	35,995	30,982	41,477	50,972	121,598	150,910	175,519	79,329	83,340	28,805	13,759	812,968
1996	3,399	25,499	45,415	70,430	84,085	136,503	163,583	142,760	45,810	75,830	11,299	7,517	812,130
1997	59	18,437	86,465	63,748	112,579	132,073	179,624	133,050	53,488	44,233	16,489	0	840,245
1998	1,038	3,298	38,727	19,496	29,483	90,258	163,706	162,905	84,592	33,673	14,402	4,559	646,137
1999	11,836	30,430	52,902	52,736	119,251	137,548	167,574	147,680	62,179	35,630	20,973	4,634	843,373
2000	8,196	26,805	50,474	70,088	121,938	142,483	147,991	142,834	57,772	35,497	12,879	15,123	832,080
2001	7,399	39,396	48,906	69,085	125,768	147,853	151,543	131,991	29,647	62,881	20,133	796	835,398
2002	1,908	39,225	65,058	63,889	114,824	148,718	153,196	155,077	49,156	34,045	12,168	1,658	838,922
2003	2,941	51,733	58,557	53,628	92,314	157,616	168,468	144,514	59,153	43,307	6,990	347	839,568

Values include transfer quantities that are counted as exchange contract deliveries

Table 2
Exchange Contractor Transfers

Calendar Year	Total - Acre Feet
1993	59,891
1995	27,596
1996	32,448
1997	52,160
1999	61,260
2000	65,860
2001	70,286
2002	72,048
2003	74,039

Boundary Flows of Exchange Contractors

The tailwater recapture component of the program is focused at recovering water that would otherwise exit the control of the Exchange Contractors. Water diverted by the Exchange Contractors can exit their boundaries several ways:

- Discharges from community ditches and drainage systems
- Discharges to creeks and wasteways
- Conveyance of water to other entities
- Tilewater drainage
- Evaporation and seepage

Discharges from community ditches and drainage systems. Either privately-owned or district-owned community ditches, or direct turnouts deliver water to the Exchange Contractors' customers. Once delivered from the Exchange Contractors' facilities the water is controlled by the customer. Their on-farm and community distribution and water use practices may themselves include tailwater recapture and reuse, and distribution system canal or ditch operational spills. The discharges described by this category, at times, represent flows that exit the boundaries of the Exchange Contractors and are not recaptured by the Exchange Contractors' tailwater recovery component. These flows are often captured for use on non-district lands (including the wildlife areas), downslope of the Exchange Contractors and upslope of the San Joaquin River. That water is typically fully depleted by consumptive use or evaporation and deep percolation, and can at times be the only source of water to those users.

In many other instances, the water that ultimately escapes the customers' on-farm and community systems is the water that is intercepted and reused by the Exchange Contractors' tailwater recapture program. The water that exits from community ditches and drainage systems, whether intercepted by the Exchange Contractors' facilities or not, is a function of on-farm and community system water use practices.

The component of community ditch and system discharges that is associated with the Exchange Contractors' tailwater recapture element concerns those flows that geographically occur at locations where the flows can be reintroduced into the Exchange Contractors' supply systems, or in effect reduce customer deliveries. The historical hydrologic disposition of these flows prior to the Exchange Contractors' tailwater recapture program is in some circumstances described very site specific and in other circumstances very broad in description. As an example of a site specific circumstance, prior to a tailwater recapture project within CCID, tailwater drainage from certain community systems would eventually enter CCID's Main Drain. CCID's Main Drain runs laterally along the upslope side of CCID's Main Canal, and at points such as the Main Canal's turnout to the Almond Drive and San Luis Laterals the Main Drain would siphon the community systems' drainage under the Main Canal to the laterals. These flows would occur intermittently and essentially became water serving non-district lands upslope of the wildlife areas, or become intermittent flows entering the wildlife areas. Similarly, FCWD would (in the era of 1990) allow tailwater to escape the service area where it became intermittent flow to the wildlife areas.

More difficult to identify is the amount of community system drainage that is exiting the Exchange Contractors' service area to Salt Slough and Mud Slough. The primary discharge locations of water exiting this geographical area are Sand Dam (Salt Slough), Boundary Drain (Mud Slough "South"), Mueller Weir (Arroyo/Santa Fe Canal) and Hereford Drain (Salt Slough). Flows in Hereford Drain are comprised mostly of tailwater which unless otherwise recaptured are discharged into Salt Slough. Other than Hereford Drain, the origination of flows exiting at these locations is a complicated and highly varying mixture of drainage and operational spill, described in the next section.

Discharges to creeks and wasteways. Operational spills influence flows past the Mueller Weir which is located on the western end of the SLCC's Arroyo Canal. Flows in the Arroyo Canal at this location can include CCID operational spills from the Colony Branch 4, Colony Branch 5 and the Colony Main canals. Water that overflows the Mueller Weir can be delivered into the Grassland Water District (GWD) Santa Fe Canal for use in the wildlife areas or be diverted to Mud Slough (South). Flows have been historically recorded at Mueller Weir; however, only recently (since 1998) have continuous measurements been made and the recent measurements make earlier flow estimates suspect. During recent non-drought years, flows have been estimated or recorded to range between approximately 7,000 and 11,500 acre-feet per year. A portion of this operational spill is attributable to tailwater recapture upstream of the discharge.

Discharges also occur from the Boundary Drain. Water at this location is estimated to be primarily tailwater from the SLCC and CCID "South" service areas, but can include runoff from precipitation and conveyance of San Joaquin River flood flows. Water exiting at this location joins flows in Mud Slough (South). Continuous measurements have only recently occurred at this location (since 1998). Recent non-drought flows have been estimated or recorded to range from as low as 15,000 and upward to over 50,000 acre-feet per year. Some of the flow measured at Boundary Drain can include significant contributions by rainfall runoff in the winter and spring. Mud Slough (South) flows are tributary to Salt Slough which is tributary to the San Joaquin River. Prior to reaching the San Joaquin River, flows can be diverted by wildlife area water users with appropriative rights, who also at times discharge to Mud and Salt Sloughs.

Flows exiting the Exchange Contractors' boundaries at Sand Dam are comprised of tailwater drainage from SLCC and CCID "South" service areas, operational spills, rainfall runoff, and at times conveyed flood waters of the San Joaquin River. Salt Slough upstream of Sand Dam not only intercepts tailwater drainage, operation spills and rainfall runoff, but also serves as a conveyance facility for SLCC deliveries. Flow recorded at Sand Dam includes both waters exiting Salt Slough from SLCC and waters discharging from the West Delta Drain. Flows have been recorded since 1990, but only include continuous measurement since 1998. Recent non-drought flows discharging to Salt Slough near Sand Dam have been estimated or recorded to be well over 40,000 acre-feet per year, inclusive of rainfall runoff and conveyed flood flows. Flow to Salt Slough from Sand Dam is tributary to the San Joaquin River and can be diverted to wildlife areas through appropriative rights and returned to Mud and Salt Sloughs.

During the early 1990s and prior, FCWD discharged minor amounts of tailwater to the Firebaugh Wasteway. These discharges have been estimated to have been in the order of approximately 1,000 acre-feet per year. Water discharged through the Firebaugh Wasteway would either dissipate within the channel or become an accretion to the San Joaquin River below the Mendota Pool and used for satisfaction of Exchange Contractor deliveries.

Conveyance of water to other entities. CCID and SLCC each convey water to various State and Federal wildlife areas.

Tilewater drainage. Through the early 1990s, tilewater drainage and tailwater drainage were intermingled as they left the Exchange Contractors' boundaries (e.g., discharges from FCWD and CCID to the Agatha and Camp 13 canals of GWD). Recent actions have substantially provided a separation of tailwater and tilewater drainage. It is assumed that a portion of that previously intermingled tilewater drainage continues to exit the Exchange Contractors' boundaries and is conveyed by the Grassland By-pass Project for discharge to Mud Slough (North) which is tributary to the San Joaquin River. The remainder of the tilewater drainage and tailwater drainage that would have otherwise intermingled with that tilewater drainage and would have been available to GWD is now considered as imbedded conservation within the program.

Evaporation and seepage of tailwater. Within the boundaries of the Exchange Contractors tailwater drainage could regularly pond at the lower ends of fields or pond in un-farmed sloughs and drains. This water would dissipate through evaporation, consumptive use or seep into the groundwater basin. The amount of water subject to these circumstances is measured as the amount of tailwater pumped by the Exchange Contractors' tailwater recapture projects that are geographically associated with this circumstance, with recognition of the water accounted for as spill to non-district lands. The fate of these waters is either the atmosphere or the groundwater basin.

Columbia Canal Company Operations

Unique to CCC's operations is the disposition of tailwater exiting from the entity's service area. In the case of CCC, tailwater used to exit the system through community drains or farmer drains that would flow back to the San Joaquin River below Mendota Pool. This water would join with releases from Mendota Pool for satisfaction of Exchange Contractor deliveries at Sack Dam. The amount of discharge was estimated to have been approximately 7,000 acre-feet per year. Presently, CCC recaptures all of these tailwater flows for consumptive use needs within the service area.

Groundwater Movement

Recent reviews and analysis[2] by CCID have identified the general movement of groundwater in the upper aquifers that underlie the service area of the Exchange Contractors. In general terms, groundwater was found to enter the service area from upslope areas along virtually the entire length of the Exchange Contractors' boundary. The exception to the circumstance was in the northern end of the boundary where a pumping depression had developed near an area northwest of Newman and south of Crows Landing. This depression had developed from heavy groundwater pumping in an area outside but adjacent to the Exchange Contractors during the preceding drought.

West of a north-south line, located about 3 miles west of the San Joaquin River on Highway 152, groundwater flow was primarily to the northeast or north towards the San Joaquin River. In the reach north of an east-west line passing through Gustine, water-level elevation contours on both sides of the river indicates groundwater flow into the river. A general change in direction for groundwater movement is apparent east and west of the north-south line identified above. East of this location groundwater was moving northeasterly beneath the San Joaquin River. This direction of flow is due to extensive pumping that is occurring east of the San Joaquin River in Madera County. The San Joaquin River downstream of Sack Dam and upstream of Bear Creek is normally non-flowing except during flood events. As expected and confirmed by analysis, the location of where the change in direction occurs for migrating groundwater and the point of accreting or depleting San Joaquin River will move depending on the wetness of the current and preceding years.

For additional guidance concerning the magnitude of groundwater accretion that may occur to the San Joaquin River in the vicinity of Lander Avenue, and downstream to the boundary of the Exchange

[2] Central California Irrigation District, Groundwater Conditions In and Near the Central California Irrigation District, May 1997.

Contractors, Appendix C of the SWRCB Technical Committee Report titled *"Regulation of Agricultural Drainage to the San Joaquin River"*, estimated that accretions to the river will begin approximately near the Lander Avenue bridge. For the entire length of San Joaquin River channel from Lander Avenue to its confluence with Orestimba Creek, the report estimated that an average annual accretion of 13 cfs occurs from groundwater lateral flow. This estimate includes accretion and depletion affects from both sides of the river.

Wildlife Area Operations

The operation of the wildlife areas affects the hydrology of the San Joaquin River. An analysis of wildlife management area operations is for the most part described in the documentation titled *"San Joaquin Basin Action Plan and North Grassland Area, Conveyance Facilities, Final Environmental Assessment/Initial Study",* December 1997. Subsequently, the analysis was updated in the documentation titled *"Refuge Water Supply Long-Term Water Supply Agreements, San Joaquin Basin, Final NEPA Environmental Assessment and CEQA Initial Studies",* January 2001. Recently, Reclamation updated its analysis of wildlife area operations including a water balance performed through a spreadsheet model (referred to herein as the "refuge water balance model")[3].

Salient information from the recent analysis is illustrated in Table 3. This information illustrates the results of an assumed management (including ponding operations) of a water supply for the wildlife areas adjacent to the Exchange Contractors and hydraulically connected to Mud and Salt Sloughs. For the purpose of this analysis, it is informative to evaluate the incremental change between Level 2 and Level 2/Level 4 water supplies and runoff. The Level 2 water supply and management condition is assumed to be representative of condition with no availability of Level 4 incremental supplies. The Level 2/Level 4 water management strategy is assumed to represent how managers will integrate incremental Level 4 water supplies into their total water management decisions, and the incremental change between the water management of Level 2 and Level 2/Level 4 supplies is assumed to apply linearly to any incremental water supply above Level 2 deliveries.

Table 3
Water Budgets for the Wildlife Areas Adjacent to the San Joaquin River

	Annual	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul
Level 2 and Replacement Water													
Applied Water - AF	218,677	9,940	66,279	45,720	32,920	17,876	12,055	9,939	3,600	3,914	6,182	5,096	5,156
Precipitation - Inches	9.4	0.0	0.2	0.5	1.5	1.5	1.6	1.6	1.4	0.8	0.3	0.0	0.0
ET - Inches	57.9	7.8	5.7	4.0	2.1	1.2	1.2	2.2	3.7	5.7	7.4	8.1	8.7
Percolation - Inches	17.4	2.8	2.0	1.4	1.4	1.4	1.4	1.3	1.7	2.0	2.0	0.0	0.0
Runoff - AF	120,282	3,268	24,811	8,312	24,102	14,420	9,066	20,936	13,857	1,509	0	0	0
EC of Applied Water - µmhos		1200	800	800	900	900	1000	1000	1100	1200	1000	1000	1200
EC of Runoff Water - µmhos		1325	1124	1046	1138	1130	1179	1485	2793	3906	0	0	0
Level 2, Replacement & Level 4 Water													
Applied Water - AF	299,865	27,538	69,547	46,620	34,320	18,176	13,055	11,089	6,600	7,954	30,611	18,737	15,618
Precipitation - Inches	9.4	0.0	0.2	0.5	1.5	1.5	1.6	1.6	1.4	0.8	0.3	0.0	0.0
ET - Inches	57.9	7.8	5.7	4.0	2.1	1.2	1.2	2.2	3.7	5.7	7.4	8.1	8.7
Percolation - Inches	17.4	2.8	2.0	1.4	1.4	1.4	1.4	1.3	1.7	2.0	2.0	0.0	0.0
Runoff - AF	138,649	17,052	25,562	8,232	25,389	14,720	10,066	22,086	14,010	1,533	0	0	0
EC of Applied Water - µmhos		1200	800	800	900	900	1000	1000	1100	1200	1000	1000	1200
EC of Runoff Water - µmhos		1315	1065	1029	1118	1118	1163	1448	2713	3018	0	0	0
Incremental Difference													
Applied Water - AF	81,188	17,598	3,268	900	1,400	300	1,000	1,150	3,000	4,040	24,429	13,641	10,462
Runoff - AF	18,367	13,783	751	-79	1,287	300	1,000	1,150	153	23	0	0	0
Monthly Distribution of Incremental Runoff (%)	100.0	75.0	4.1	-0.4	7.0	1.6	5.4	6.3	0.8	0.1	0.0	0.0	0.0

The Existing Conditions and Future No Action settings use recent (the average of 2002/2003) wildlife area acquisitions and deliveries to establish baseline conditions for this analysis. Table 4 reports recent deliveries to San Joaquin Valley wildlife areas.

Quantities reported for Level 2 deliveries include Replacement Water. Replacement Water is the amount of water that the San Luis Unit, Freitas and Kesterson national wildlife refuges, and Volta and Mendota wildlife management areas had historically received and used, which is more than Level 2 amounts but may be less than or equal to their incremental Level 4 amounts. Replacement Water was originally provided by groundwater and tailwater but due to water quality concerns Reclamation entered into agreements to provide Replacement Water to the wildlife areas. When willing sellers and funds are

[3] Spreadsheet provided by Reclamation, April 2004.

available, Reclamation acquires water to supplement supplies to minimize the impact to CVP contractors South of the Delta. Table 5 reports recent Reclamation acquisitions and supplies utilized to provide the recent incremental Level 4 deliveries to the wildlife areas.

Table 4
Recent San Joaquin Valley Wildlife Area Annual Deliveries

San Joaquin Valley Wildlife Areas	Level 2	Incremental Level 4	Total
San Luis NWR Complex			
San Luis Unit	19,000*	0	19,000
West Bear Creek Unit	7,207	3,082	10,289
Kesterson Unit	10,000	0	10,000
Freitas Unit	5,290*	0	5,290
East Bear Creek Unit	8,863	0	8,863
Los Banos WMA	16,670	7,280	23,950
Volta WMA	13,000*	168	13,168
Mendota WMA	27,594*	629	28,223
Grassland Resource Conservation District	125,000	47,822	172,822
North Grassland WMA			
China Island Unit	6,967	1,969	8,936
Salt Slough Unit	6,680	3,044	9,724
Kern NWR	9,950	11,700	21,650
Pixley NWR	1,280	0	1,280
Total	257,501	75,694	333,195

* Includes Replacement Water
All units in acre-feet, delivered at wildlife area boundary.
Average of 2002/2003 values.
Source: Reclamation

Table 5
Recent Supplies and Acquisitions Supporting Wildlife Area Incremental Level 4 Deliveries

Supply/Acquisition	2002	2003
Sacramento Valley	4,515	4,536
Delta-Mendota Canal Contractors	12,825	0
South of San Joaquin River	3,550	10,000
Exchange Contractors	64,500	60,000
Total	85,390	74,536

San Joaquin River Hydrology (Vernalis)

Although the baseline condition is described as being reflective of recent hydrology and circumstances, a long-term consistent depiction of the condition does not exist in recorded data for the San Joaquin River. Therefore, a depiction of flow and quality conditions for the San Joaquin River at Vernalis, by year-type, was synthesized by review of recent historical records and several computer generated simulations of San Joaquin River operations. Table 6 depicts flow conditions for the San Joaquin River at Vernalis for each of the year-types used in this analysis.

Table 6
Existing Flow Conditions at Vernalis

	Average Monthly Flow - CFS											
Year Type	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
Wet	7,500	13,600	15,700	13,600	12,000	7,400	5,100	3,100	2,500	3,600	3,000	4,600
Above Normal	5,800	7,200	6,200	5,900	4,600	2,600	2,100	2,000	1,500	2,000	1,800	2,300
Below Normal	2,300	3,200	3,300	3,700	3,700	2,100	1,900	1,500	1,200	1,900	1,700	2,200
Dry	1,900	2,600	2,300	2,700	2,200	1,800	1,400	1,100	1,000	1,700	1,600	2,100
Critical	1,300	1,700	1,600	1,800	1,500	1,300	1,000	1,000	1,000	1,500	1,400	1,500

A long-term record of water quality conditions at Vernalis consistent with the described baseline condition also does not exist. Recent historical records were reviewed and analyzed to develop a regression between monthly flow and quality at Vernalis. Table 7 reflects the results of that analysis and includes the use of the water quality objective at Vernalis during times when the regression indicated a quality that was in excess of the objective, or when it is assumed that water quality objectives at Vernalis are being met with specific releases from New Melones Reservoir.

Table 7
Existing Quality Conditions at Vernalis

Average Monthly Quality - µmhos												
Year Type	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
Wet	352	286	310	269	212	310	341	460	442	359	497	432
Above Normal	404	380	465	364	334	486	509	534	588	494	657	639
Below Normal	757	631	690	465	382	700	700	700	680	510	681	657
Dry	880	736	1,000	700	700	700	700	700	772	547	708	678
Critical	1,000	1,000	1,000	700	700	700	700	700	772	595	772	859

Note: 700 µmhos during April and May is representative of the assumed water quality during the non-pulse flow period.

New Melones Release Condition

Reclamation operates New Melones Reservoir generally in accordance with the Interim Plan of Operations (IPO). Based on a forecast of annual water supply, including reservoir storage, Reclamation allocates releases among water rights settlement holders, CVP contractors, and fish and water quality objectives. Included in the procedure are releases for water quality and flow objectives at Vernalis. Changes in the flow or quality of the San Joaquin River upstream of the Stanislaus River (upstream) can at times affect the releases from New Melones Reservoir to the lower Stanislaus River for the purpose of meeting objectives at Vernalis. A study of San Joaquin River operations previously performed for the documentation of the San Joaquin River Agreement[4] was reviewed to provide an indication of the months, by year-type, when New Melones Reservoir releases are projected to occur for either water quality or flow objectives at Vernalis. Recent records for the operation of New Melones Reservoir were also reviewed. Table 8 depicts the number of days per month that water quality releases are assumed to be required from New Melones Reservoir. The number of days assumed in this analysis reflects all the periods during which water quality releases are simulated to be required and does not limit that period if the water quality allocation under the IPO is exhausted during an earlier period.

Table 8
Periods of Water Quality Releases from New Melones Reservoir

Days												
Year Type	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
Wet	-	-	-	-	-	-	-	-	-	-	-	-
Above Normal	-	-	-	-	-	-	-	-	-	-	-	-
Below Normal	-	-	-	-	-	30	31	31	-	-	-	-
Dry	-	-	31	15	15	30	31	31	-	-	-	-
Critical	-	28	31	15	15	30	31	31	-	-	-	-

Similar to the analysis of required water quality releases from New Melones Reservoir, releases for flow objectives at Vernalis were also analyzed. Table 9 depicts the number of days per month assumed in this analysis that releases for flow objectives at Vernalis are projected to be required from New Melones Reservoir. Again, the number of days shown do not consider that during certain years the IPO does not allocate water for Vernalis flow objectives.

Table 9
Periods of Vernalis Flow Objective Releases from New Melones Reservoir

Days												
Year Type	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
Wet	-	-	-	-	-	-	-	-	-	-	-	-
Above Normal	-	-	-	-	-	30	-	-	-	-	-	-
Below Normal	-	28	-	-	-	-	-	-	-	-	-	-
Dry	-	28	-	-	-	-	-	-	-	-	-	-
Critical	-	-	-	-	-	-	-	-	-	-	-	-

Delta Conditions

The transfer program can affect inflows to the Delta from the San Joaquin River. At different times the change in inflow can increase, decrease or be neutral to the water supplies of the CVP and

[4] Acquisition of Additional Water for Meeting the San Joaquin River Agreement Flow Objectives, 2001-2010, Supplemental Environmental Impact Statement and Environmental Impact Report, USBR & SJRGA, March 13, 2001.

State Water Project (SWP), collectively referred to as the “CVP/SWP”. The potential effects (increases or decreases) to the CVP/SWP Delta water supply occur when either the Delta is in “balanced conditions” or when the Delta is in “excess conditions” and CVP/SWP exports are limited by the export/inflow ratio described by Decision 1641. Although no systematic rule can be developed to completely describe periods when each of these Delta conditions occur, review of simulated long-term operation studies of CVP/SWP operations provides guidance. Table 10 depicts the periods, by year-type, during which the Delta is assumed to be in balanced conditions. Review of simulated long-term operation studies also indicates when the export/inflow constraint of Decision 1641 controls CVP/SWP export operations during excess conditions. Table 11 depicts the periods during which it is assumed that inflow from the San Joaquin River will affect CVP/SWP export operations due to export/inflow ratio constraints.

Table 10
Assumed Periods of Delta Balanced Conditions

	Days											
Year Type	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
Wet	-	-	-	-	-	-	31	31	-	-	-	-
Above Normal	-	-	-	-	-	30	31	31	-	-	-	-
Below Normal	-	-	-	-	-	30	31	31	-	-	-	-
Dry	-	-	-	-	31	30	31	31	30	30	-	-
Critical	-	28	31	30	31	30	31	31	30	31	30	-

Table 11
Assumed Periods of Controlling Export/Inflow Constraints during Excess Conditions

	Days											
Year Type	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
Wet	-	28	-	-	-	-	-	-	-	-	-	-
Above Normal	-	28	-	-	-	-	-	-	-	-	-	-
Below Normal	-	28	-	-	-	-	-	-	-	-	-	-
Dry	-	28	31	15	-	-	-	-	-	-	-	-
Critical	-	-	-	-	-	-	-	-	-	-	-	-

Coincidental New Melones and Delta Conditions

At times a change in the flows and quality of the San Joaquin River upstream of the Stanislaus River will affect releases to the lower Stanislaus River from New Melones Reservoir. These changes in releases from New Melones Reservoir can either counteract the upstream change or compound upon the upstream change. Periods when New Melones Reservoir releases to the lower Stanislaus River (for either Vernalis water quality or flow objectives) are assumed to coincide with salient Delta conditions (either balanced or export/inflow conditions) are identified in Table 12 through Table 15.

Table 12
Periods when New Melones Water Quality Releases Coincide with Balanced Conditions

Year Type	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
Wet	-	-	-	-	-	-	-	-	-	-	-	-
Above Normal	-	-	-	-	-	-	-	-	-	-	-	-
Below Normal	-	-	-	-	-	30	31	31	-	-	-	-
Dry	-	-	-	-	15	30	31	31	-	-	-	-
Critical	-	28	31	15	15	30	31	31	-	-	-	-

Table 13
Periods when New Melones Water Quality Releases Coincide with Export/Inflow Conditions

	Days											
Year Type	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
Wet	-	-	-	-	-	-	-	-	-	-	-	-
Above Normal	-	-	-	-	-	-	-	-	-	-	-	-
Below Normal	-	-	-	-	-	-	-	-	-	-	-	-
Dry	-	-	31	15	-	-	-	-	-	-	-	-
Critical	-	-	-	-	-	-	-	-	-	-	-	-

Table 14
Periods when New Melones Vernalis Flow Releases Coincide with Balanced Conditions

	Days											
Year Type	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
Wet	-	-	-	-	-	-	-	-	-	-	-	-
Above Normal	-	-	-	-	-	30	-	-	-	-	-	-
Below Normal	-	-	-	-	-	-	-	-	-	-	-	-
Dry	-	-	-	-	-	-	-	-	-	-	-	-
Critical	-	-	-	-	-	-	-	-	-	-	-	-

Table 15
Periods when New Melones Vernalis Flow Releases Coincide with Export/Inflow Conditions

	Days											
Year Type	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
Wet	-	-	-	-	-	-	-	-	-	-	-	-
Above Normal	-	-	-	-	-	-	-	-	-	-	-	-
Below Normal	-	28	-	-	-	-	-	-	-	-	-	-
Dry	-	28	-	-	-	-	-	-	-	-	-	-
Critical	-	-	-	-	-	-	-	-	-	-	-	-

Model of Interconnected Elements

The setting described above includes the interaction between the San Joaquin River and several hydrologic elements that are the subject of the proposed transfer, some of which have hydrologic connectivity with the river and some that do not. Figure 2A diagrams the elements evaluated in this analysis from the perspective of the “Existing Conditions” setting. Illustrated are the elements of developed and delivered water. Water is developed for the program by the Exchange Contractors. The water developed for transfers by the Exchange Contractors in recent years (Existing Conditions) includes 15,000 acre-feet of water developed through reductions in seepage and evaporation of tailwater, 14,000 acre-feet of water developed through reductions of spills to non-district lands, 28,535 acre-feet of water through recovery of tailwater otherwise discharged to Mud and Salt sloughs, 6,100 acre-feet of recovered tailwater that otherwise would discharge to the San Joaquin River above Sack Dam, and 6,000 acre-feet of groundwater substitution. Water has also been developed in recent years by Reclamation for the purpose of wildlife area deliveries. This water is also shown in Figure 2A, from Sacramento Valley, San Joaquin River drainage and San Joaquin Valley non-San Joaquin River drainage sources. Delivery of the developed water is shown in Figure 2A and is identified with either Reclamation or the Exchange Contractors. Although separate quantities of delivery to the wildlife areas are identified for Reclamation and the Exchange Contractors, the net combined value is most salient to the analysis. Each value identified in Figure 2A represents the recent (Existing Conditions) value for each element. Elements that have hydrologic connectivity with the San Joaquin River are depicted with lines connected to the San Joaquin River.

Figure 2B illustrates the same elements described for the Existing Conditions setting but illustrates the conditions assumed for the Future No Action / No Project setting. As described earlier, these settings differ from the Existing Conditions setting in the assumption for the use of Exchange Contractors developed water. In the Future No Action / No Project setting, the Exchange Contractors make no water available for transfers and instead use the developed water from their own internal purposes. It is assumed that Reclamation will provide the recent level of deliveries to the wildlife areas through acquisitions from other sources. All of the Exchange Contractors water development elements that have connectivity with the San Joaquin River remain the same. Groundwater substitution pumping by the Exchange Contractors that would have been used for transfer would decrease, but this element has no connectivity with the San Joaquin River. Total deliveries of developed water to San Joaquin River connected entities remains the same. Only a slight change in San Joaquin River hydrology would occur as the result of an assumed increase in water acquisitions from San Joaquin River drainage entities to provide transfers to the wildlife areas. This effect is minimal and thus the Existing Conditions and Future No Action / No Project settings are assumed to be equal in terms of San Joaquin River hydrology.

The model described above illustrates values associated with conditions for noncritical years. A similar configuration is developed for critical years. Both the Existing Conditions setting and the Future No Action / No Project settings are assumed equal. During critical years it is assumed that the Exchange Contractors would not have provided any water for transfers, and Reclamation would have acquired only an amount of water for delivery to the wildlife areas equal to recent acquisitions (17,713 acre-feet).

Figure 2A

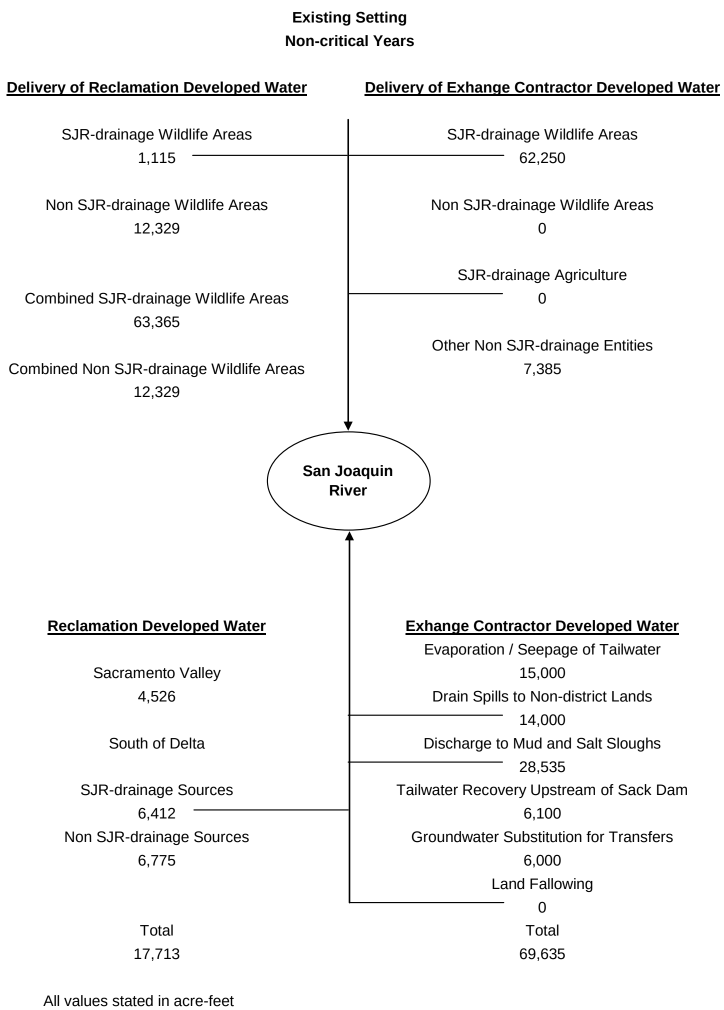
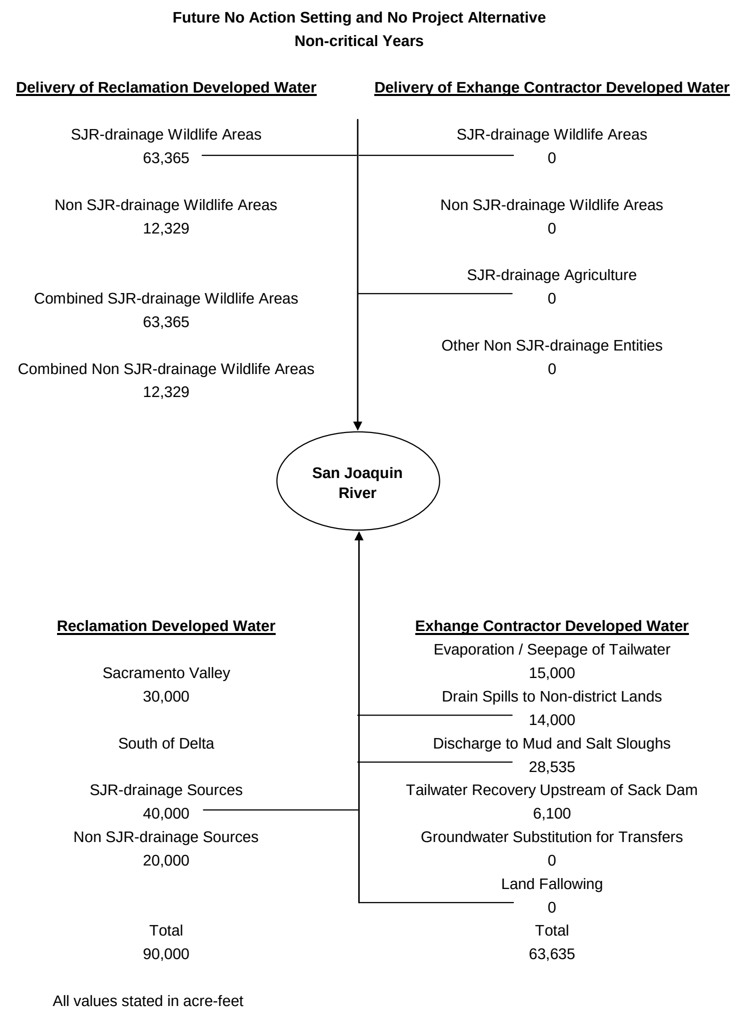


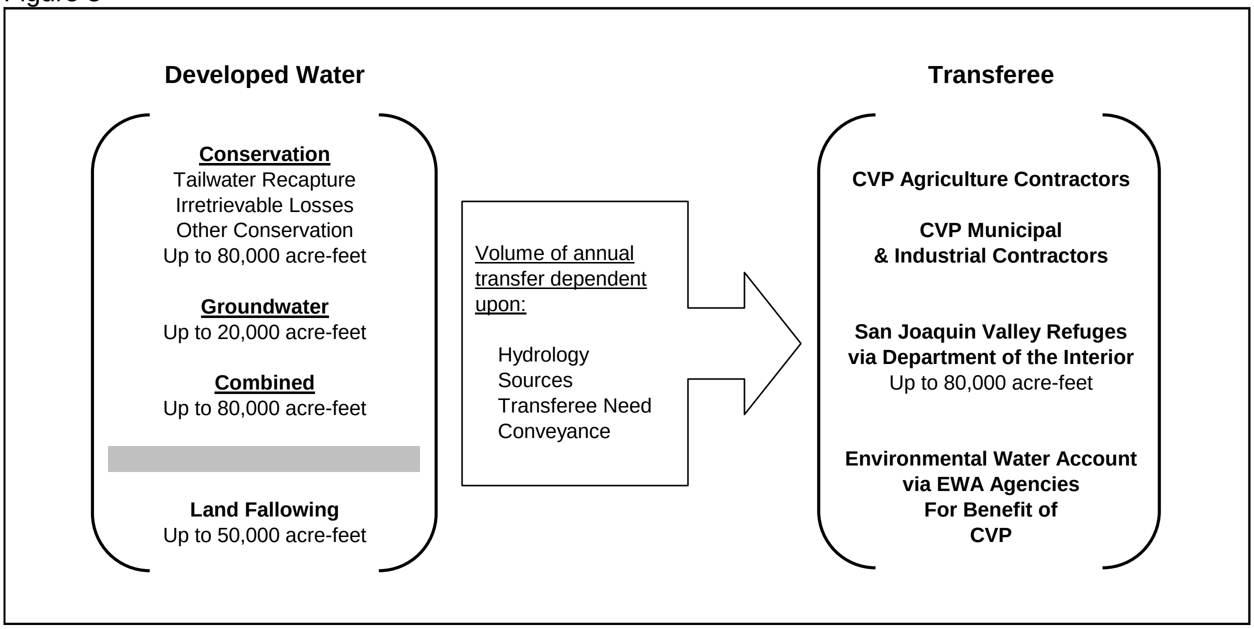
Figure 2B



Potential Alternatives of the Proposed Program

The proposed action will be dynamic from year to year, depending upon hydrologic circumstances and the ability to negotiate mutually acceptable terms between willing buyers and the Exchange Contractors. As the result of the range of potential transferees and sources of water to develop the transfer there is an endless list of potential combinations of buyers and water sources to accommodate the transfer. Figure 3 illustrates the various potential sources of water, transferees and factors that will influence the year-to-year implementation of the transfer.

Figure 3



The uncertainty of the specific combination of transferees and sources of water provides a challenge to the development of project alternatives. The uncertainty also provides a challenge to developing a hydrologic analysis that will adequately encompass the range of potential transfers that may occur. In addition to a Future No Action setting (NEPA) and No Project alternative (CEQA) (for hydrologic conditions in the San Joaquin River, synonymous with the Existing Conditions setting), three alternatives are evaluated. The three alternatives are fundamentally different from each other in terms of the size of the potential program. Other differences occur regarding the components that develop water for the transfer. The three alternatives are defined as follows:

- **Alternative 1 - 80/50:** Up to 80,000 acre-feet of water will be transferred in noncritical years and up to 50,000 acre-feet of water will be transferred in critical years. During critical years, only water from land fallowing will be available.
- **Alternative 2 - 50/50:** Up to 50,000 acre-feet of water will be transferred in all years, with water available only from land fallowing.
- **Alternative 3 - 130/50:** Up to 130,000 acre-feet of water will be transferred in noncritical years and up to 50,000 acre-feet of water will be transferred in critical years. During critical years, only transfer from land fallowing will be available.

Each Alternative can have an endless number of configurations representing combinations of transferees (and the relative amount of water transferred to each), and the sources of water (and the relative amount of water developed from each). These combinations are treated as scenarios of the fundamental alternative. In general, each alternative is evaluated from the scenario of the identity of the transferee (where the water is going) combined with a scenario of how the water is developed (e.g., from conservation, groundwater or land fallowing). The spectrum of each alternative and their scenario analyses are described in Table 16 (Alternative A, 80,000 acre-feet), Table 17 (Alternative B, 50,000 acre-feet), and Table 18 (Alternative C, 130,000 acre-feet). Each table illustrates the scenario assumptions for transferee and source volume of water by year-type. Each table illustrates the Existing Conditions setting values and then the incremental changes to those values which are applied to the model within a scenario analysis. The “A” series tables (e.g., Table 16A) provide information concerning the development of water within an alternative. The “B” series tables (e.g., Table 16B) provide information concerning the disposition of water within an alternative and also lists the values provided as input to the model.

The scenarios are crafted to develop results that will bounder the potential hydrologic effects associated with the large range of transfer decisions that may occur in a year. The analyses will also provide sufficient information to extrapolate potential hydrologic effects for other combinations of decisions not explicitly modeled. From the transferee element of an analysis, water is delivered to one of the following water user types:

- Agriculture
- Wildlife Areas (Refuges)
- Non-SJR (Out of drainage basin)

There are different hydrologic effects to the San Joaquin River associated with a water transfer to each of these potential transferees. Each has a different pattern of use, efficiency and pattern of return flows. In cases when the entity does not have hydrologic continuity with the San Joaquin River, no return flows occur.

From the source-of-water element of an analysis, water is developed from one or more of the following components:

- Conservation of evaporation and seepage of tailwater
- Conservation of discharges to non-district lands
- Groundwater
- Tailwater recovery from Mud and Salt sloughs
- Land Fallowing

Similar to the disposition of the water, the development of transfer water by each component will potentially have a different affect on the San Joaquin River. Each potential effect of the development and disposition of transfer water will be described later in this report. The following is a brief discussion of each alternative.

Alternative A – 80/50

This alternative evaluates a program that is similar to the level of implementation currently underway. For this alternative, the Exchange Contractors will provide up to 80,000 acre-feet of water during noncritical years through a combination of conservation, groundwater and land fallowing sources, and during critical years, up to 50,000 acre-feet of water may be made available through land fallowing.

Three different dispositions of transfer water are evaluated, each with unique water use efficiency and return flow characteristics.

- Refuge Focus: Delivery of water to wildlife areas with hydrologic connectivity with the San Joaquin River.
- Agriculture Focus: Delivery of water to agricultural users with hydrologic connectivity with the San Joaquin River.
- Non-SJR Focus: Delivery of water to users with no direct hydrologic connectivity with the San Joaquin River.

For each of the disposition scenarios, three different combinations of supply components are evaluated. There is flexibility in the development of 80,000 acre-feet of water for transfer during noncritical years. The Exchange Contractors have indicated the availability of up to 20,000 acre-feet of groundwater and the availability of up to 50,000 acre-feet of water from land fallowing during noncritical years. These sources of water in combination with tailwater conservation opportunities can provide

Table 16A

Existing Condition / Future No Action			Developed Water: Exchange Contractors							Developed Water: Interior				Developed Water: Combined
	Year Type	Analysis Baseline / Study	Savings from Evaporation and Seepage	Savings from Spills to NonDistrict Lands	Recovery of Discharges to Mud/Salt Slough	Recovery from Discharges Upstream of Sack Dam	Groundwater Substitution for Transfer	Crop Idling / Temprary Land Fallowing	Total Water Developed by Exchange Contractors	Sacramento Valley Sources	SJR Drainage Sources	San Joaquin Valley SJR Non Drainage Sources	Total Water Developed by Interior	Total Developed Water
	Non-critical	Existing Condition	15,000	14,000	28,535	6,100	6,000	0	69,635	4,526	6,412	6,775	17,713	87,348
	Critical		15,000	14,000	28,535	6,100	0	0	63,635	4,526	6,412	6,775	17,713	81,348
	Non-critical	Future No Action	15,000	14,000	28,535	6,100	0	0	63,635	30,000	40,000	20,000	90,000	153,635
	Critical		15,000	14,000	28,535	6,100	0	0	63,635	4,526	6,412	6,775	17,713	81,348

Alternative A 80,000 Acre-feet Delivery				Change from Existing Condition							Change from Existing Condition				Change
Delivery Focus	Developed Water Emphasis	Year Type	Study	Savings from Evaporation and Seepage	Savings from Spills to NonDistrict Lands	Recovery of Discharges to Mud/Salt Slough	Recovery from Discharges Upstream of Sack Dam	Groundwater Substitution for Transfer	Crop Idling / Temprary Land Fallowing	Total Water Developed by Exchange Contractors	Sacramento Valley Sources	SJR Drainage Sources	San Joaquin Valley SJR Non Drainage Sources	Total Water Developed by Interior	Total Developed Water
Refuge Focus	Conservation	Non-critical	A-1-1-C	-	-	15,465	900	(6,000)	-	10,365	11,730	15,262	4,062	31,054	41,419
		Critical	A-1-0-S	-	-	-	-	-	50,000	50,000	-	-	-	-	50,000
Agriculture Focus		Non-critical	A-1-2-C	-	-	15,465	900	(6,000)	-	10,365	25,474	33,588	13,225	72,287	82,652
		Critical		-	-	-	-	-	50,000	50,000	-	-	-	-	50,000
Non-SJR Focus		Non-critical	A-1-3-C	-	-	15,465	900	(6,000)	-	10,365	25,474	33,588	13,225	72,287	82,652
		Critical		-	-	-	-	-	50,000	50,000	-	-	-	-	50,000
Refuge Focus	Groundwater	Non-critical	A-1-1-C	-	-	-	-	10,365	-	10,365	11,730	15,262	4,062	31,054	41,419
		Critical	A-1-0-S	-	-	-	-	-	50,000	50,000	-	-	-	-	50,000
Agriculture Focus		Non-critical	A-2-2-C	-	-	-	-	10,365	-	10,365	25,474	33,588	13,225	72,287	82,652
		Critical		-	-	-	-	-	50,000	50,000	-	-	-	-	50,000
Non-SJR Focus		Non-critical	A-2-3-C	-	-	-	-	10,365	-	10,365	25,474	33,588	13,225	72,287	82,652
		Critical		-	-	-	-	-	50,000	50,000	-	-	-	-	50,000
Refuge Focus	Fallowing	Non-critical	A-3-1-C	-	-	-	-	(6,000)	16,365	10,365	11,730	15,262	4,062	31,054	41,419
		Critical	A-3-0-S	-	-	-	-	-	50,000	50,000	-	-	-	-	50,000
Agriculture Focus		Non-critical	A-3-2-C	-	-	-	-	(6,000)	16,365	10,365	25,474	33,588	13,225	72,287	82,652
		Critical		-	-	-	-	-	50,000	50,000	-	-	-	-	50,000
Non-SJR Focus		Non-critical	A-3-3-C	-	-	-	-	(6,000)	16,365	10,365	25,474	33,588	13,225	72,287	82,652
		Critical		-	-	-	-	-	50,000	50,000	-	-	-	-	50,000

Table 16B

Existing Condition / Future No Action				Water Deliveries											
				Exchange Contractors						Interior			Combined		
		Year Type	Analysis Baseline / Study	Wildlife Areas SJR Drainage	Wildlife Areas SJR Non Drainage	Agricultural Contractors SJR Drainage	Out-of-Drainage Basin Entities	Total from Exchange Contractor Developed Water	Wildlife Areas from Exchange Contractors	Wildlife Areas SJR Drainage	Wildlife Areas SJR Non Drainage	Wildlife Areas from Interior Developed Water	Total Deliveries to Wildlife Areas	Total Deliveries to SJR Wildlife Areas	Total Deliveries
		Non-critical	Existing Condition	62,250	0	0	7,385	69,635	62,250	1,115	12,329	13,444	75,694	63,365	83,079
		Critical		0	0	0	0	0	0	1,115	12,329	13,444	13,444	1,115	13,444
		Non-critical	Future No Action	0	0	0	0	0	0	63,365	12,329	75,694	75,694	63,365	75,694
		Critical		0	0	0	0	0	0	1,115	12,329	13,444	13,444	1,115	13,444

Alternative A 80,000 Acre-feet Delivery				Change from Existing Condition						Change from Existing Condition			Change from Existing Condition		
Delivery Focus	Developed Water Emphasis	Year Type	Study	Wildlife Areas SJR Drainage	Wildlife Areas SJR Non Drainage	Agricultural Contractors SJR Drainage	Out-of-Drainage Basin Entities	Total from Exchange Contractor Developed Water	Wildlife Areas from Exchange Contractors	Wildlife Areas SJR Drainage	Wildlife Areas SJR Non Drainage	Wildlife Areas from Interior Developed Water	Total Deliveries to Wildlife Areas	Total Deliveries to SJR Wildlife Areas	Total Deliveries
Refuge Focus	Conservation	Non-critical	A-1-1-C	1,750	-	-	(7,385)	(5,635)	1,750	16,073	9,497	25,570	27,320	17,823	19,935
		Critical	A-1-0-S	40,000	-	-	-	40,000	40,000	-	-	-	40,000	40,000	40,000
Agriculture Focus		Non-critical	A-1-2-C	(62,250)	-	80,000	(7,385)	10,365	(62,250)	62,250	-	62,250	-	-	72,615
		Critical		-	-	50,000	-	50,000	-	-	-	-	-	-	50,000
Non-SJR Focus		Non-critical	A-1-3-C	(62,250)	-	-	72,615	10,365	(62,250)	62,250	-	62,250	-	-	72,615
		Critical		-	-	-	50,000	50,000	-	-	-	-	-	-	50,000
Refuge Focus	Groundwater	Non-critical	A-1-1-C	1,750	-	-	(7,385)	(5,635)	1,750	16,073	9,497	25,570	27,320	17,823	19,935
		Critical	A-1-0-S	40,000	-	-	-	40,000	40,000	-	-	-	40,000	40,000	40,000
Agriculture Focus		Non-critical	A-2-2-C	(62,250)	-	80,000	(7,385)	10,365	(62,250)	62,250	-	62,250	-	-	72,615
		Critical		-	-	50,000	-	50,000	-	-	-	-	-	-	50,000
Non-SJR Focus		Non-critical	A-2-3-C	(62,250)	-	-	72,615	10,365	(62,250)	62,250	-	62,250	-	-	72,615
		Critical		-	-	-	50,000	50,000	-	-	-	-	-	-	50,000
Refuge Focus	Fallowing	Non-critical	A-3-1-C	1,750	-	-	(7,385)	(5,635)	1,750	16,073	9,497	25,570	27,320	17,823	19,935
		Critical	A-3-0-S	40,000	-	-	-	40,000	40,000	-	-	-	40,000	40,000	40,000
Agriculture Focus		Non-critical	A-3-2-C	(62,250)	-	80,000	(7,385)	10,365	(62,250)	62,250	-	62,250	-	-	72,615
		Critical		-	-	50,000	-	50,000	-	-	-	-	-	-	50,000
Non-SJR Focus		Non-critical	A-3-3-C	(62,250)	-	-	72,615	10,365	(62,250)	62,250	-	62,250	-	-	72,615
		Critical		-	-	-	50,000	50,000	-	-	-	-	-	-	50,000

Model Input Parameters

Delivery Focus	Developed Water Emphasis	Year Type	Study	Change in Water Developed from Evaporation and Seepage	Change in Water Developed from Spills to NonDistrict Lands	Change in Water Developed from Discharges to Mud/Salt Slough	Change in Water Developed from Dischrg Upstr of Sack Dam (Non SJR Drainage)	Change in Water Developed from Groundwater Substitution for Transfer	Change in Water Developed from Crop Idling / Temprary Land Fallowing	Change in Water Developed from Land Fallowing (Non SJR Drainage)	Change in Water Delivered to SJR Drainage Wildlife Areas	Change in Water Delivered to Non SJR Drainage Wildlife Areas	Net Change in Water Delivered to SJR Drainage Agricultural Contractors	Change in Water Acquired from Sacramento Valley Sources	Change in Water Acqrd from San Joaquin Valley Sources (Non SJR Drainage)
Refuge Focus	Conservation	Non-critical	A-1-1-C	-	-	15,465	900	(6,000)	-	-	17,823	9,497	(15,262)	11,730	4,062
		Critical	A-1-0-S	-	-	-	-	-	42,000	8,000	40,000	-	-	-	-
Agriculture Focus		Non-critical	A-1-2-C	-	-	15,465	900	(6,000)	-	-	-	-	46,412	25,474	13,225
		Critical		-	-	-	-	-	42,000	8,000	-	-	50,000	-	-
Non-SJR Focus		Non-critical	A-1-3-C	-	-	15,465	900	(6,000)	-	-	-	-	(33,588)	25,474	13,225
		Critical		-	-	-	-	-	42,000	8,000	-	-	-	-	-
Refuge Focus	Groundwater	Non-critical	A-1-1-C	-	-	-	-	10,365	-	-	17,823	9,497	(15,262)	11,730	4,062
		Critical	A-1-0-S	-	-	-	-	-	42,000	8,000	40,000	-	-	-	-
Agriculture Focus		Non-critical	A-2-2-C	-	-	-	-	10,365	-	-	-	-	46,412	25,474	13,225
		Critical		-	-	-	-	-	42,000	8,000	-	-	50,000	-	-
Non-SJR Focus		Non-critical	A-2-3-C	-	-	-	-	10,365	-	-	-	-	(33,588)	25,474	13,225
		Critical		-	-	-	-	-	42,000	8,000	-	-	-	-	-
Refuge Focus	Fallowing	Non-critical	A-3-1-C	-	-	-	-	(6,000)	13,747	2,618	17,823	9,497	(15,262)	11,730	4,062
		Critical	A-3-0-S	-	-	-	-	-	42,000	8,000	40,000	-	-	-	-
Agriculture Focus		Non-critical	A-3-2-C	-	-	-	-	(6,000)	13,747	2,618	-	-	46,412	25,474	13,225
		Critical		-	-	-	-	-	42,000	8,000	-	-	50,000	-	-
Non-SJR Focus		Non-critical	A-3-3-C	-	-	-	-	(6,000)	13,747	2,618	-	-	(33,588)	25,474	13,225
		Critical		-	-	-	-	-	42,000	8,000	-	-	-	-	-

Table 17A

Existing Condition / Future No Action	Year Type	Analysis Baseline / Study	Developed Water – Exchange Contractors: Savings from Evaporation and Seepage	Savings from Spills to NonDistrict Lands	Recovery of Discharges to Mud/Salt Slough	Recovery from Discharges Upstream of Sack Dam	Groundwater Substitution for Transfer	Crop Idling / Temprary Land Fallowing	Total Water Developed by Exchange Contractors	Interior: Sacramento Valley Sources	SJR Drainage Sources	San Joaquin Valley SJR Non Drainage Sources	Total Water Developed by Interior	Combined: Total Developed Water
	Non-critical	Existing Condition	15,000	14,000	28,535	6,100	6,000	0	69,635	4,526	6,412	6,775	17,713	87,348
	Critical		0	0	0	0	0	0	0	0	0	0	0	0
	Non-critical	Future No Action	0	0	0	0	0	0	0	0	0	0	0	0
	Critical		0	0	0	0	0	0	0	0	0	0	0	0

Alternative B 50,000 Acre-feet Delivery

Delivery Focus	Developed Water Emphasis	Year Type	Study	Change from Existing Condition: Savings from Evaporation and Seepage	Savings from Spills to NonDistrict Lands	Recovery of Discharges to Mud/Salt Slough	Recovery from Discharges Upstream of Sack Dam	Groundwater Substitution for Transfer	Crop Idling / Temprary Land Fallowing	Total Water Developed by Exchange Contractors	Change from Existing Condition: Sacramento Valley Sources	SJR Drainage Sources	San Joaquin Valley SJR Non Drainage Sources	Total Water Developed by Interior	Change: Total Developed Water
Refuge Focus	Fallowing	Non-critical	B-3-1-C	-	-	-	-	(6,000)	50,000	44,000	21,730	28,596	10,729	61,055	105,055
		Critical	B-3-0-S	-	-	-	-	-	50,000	50,000	-	-	-	-	50,000
Agriculture Focus		Non-critical	B-3-2-C	-	-	-	-	(6,000)	50,000	44,000	25,474	33,588	13,225	72,287	116,287
		Critical		-	-	-	-	-	50,000	50,000	-	-	-	-	50,000
Non-SJR Focus		Non-critical	B-3-3-C	-	-	-	-	(6,000)	50,000	44,000	25,474	33,588	13,225	72,287	116,287
		Critical		-	-	-	-	-	50,000	50,000	-	-	-	-	50,000

Table 17B

Existing Condition / Future No Action			Water Deliveries: Exchange Contractors						Interior			Combined		
	Year Type	Analysis Baseline / Study	Wildlife Areas SJR Drainage	Wildlife Areas SJR Non Drainage	Agricultural Contractors SJR Drainage	Out-of-Drainage Basin Entities	Total from Exchange Contractor Developed Water	Wildlife Areas from Exchange Contractors	Wildlife Areas SJR Drainage	Wildlife Areas SJR Non Drainage	Wildlife Areas from Interior Developed Water	Total Deliveries to Wildlife Areas	Total Deliveries to SJR Wildlife Areas	Total Deliveries
	Non-critical	Existing Condition	62,250	0	0	7,385	69,635	62,250	1,115	12,329	13,444	75,694	63,365	83,079
	Critical		0	0	0	0	0	0	0	0	0	0	0	0
	Non-critical	Future No Action	0	0	0	0	0	0	0	0	0	0	0	0
	Critical		0	0	0	0	0	0	0	0	0	0	0	0

Alternative B 50,000 Acre-feet Delivery				Change from Existing Condition						Change from Existing Condition			Change from Existing Condition		
Delivery Focus	Developed Water Emphasis	Year Type	Study	Wildlife Areas SJR Drainage	Wildlife Areas SJR Non Drainage	Agricultural Contractors SJR Drainage	Out-of-Drainage Basin Entities	Total from Exchange Contractor Developed Water	Wildlife Areas from Exchange Contractors	Wildlife Areas SJR Drainage	Wildlife Areas SJR Non Drainage	Wildlife Areas from Interior Developed Water	Total Deliveries to Wildlife Areas	Total Deliveries to SJR Wildlife Areas	Total Deliveries
Refuge Focus	Fallowing	Non-critical	B-3-1-C	(22,250)	-	-	(7,385)	(29,635)	(22,250)	40,073	9,497	49,570	27,320	17,823	19,935
		Critical	B-3-0-S	40,000	-	-	-	40,000	40,000	-	-	-	40,000	40,000	40,000
Agriculture Focus		Non-critical	B-3-2-C	(62,250)	-	50,000	(7,385)	(19,635)	(62,250)	62,250	-	62,250	-	-	42,615
		Critical		-	-	50,000	-	50,000	-	-	-	-	-	-	50,000
Non-SJR Focus		Non-critical	B-3-3-C	(62,250)	-	-	42,615	(19,635)	(62,250)	62,250	-	62,250	-	-	42,615
		Critical		-	-	-	50,000	50,000	-	-	-	-	-	-	50,000

Model Input Parameters

Delivery Focus	Developed Water Emphasis	Year Type	Study	Change in Water Developed from Evaporation and Seepage	Change in Water Developed from Spills to NonDistrict Lands	Change in Water Developed from Discharges to Mud/Salt Slough	Change in Water Developed from Dischrg Upstr of Sack Dam (Non SJR Drainage)	Change in Water Developed from Groundwater Substitution for Transfer	Change in Water Developed from Crop Idling / Temprary Land Fallowing	Change in Water Developed from Land Fallowing (Non SJR Drainage)	Change in Water Delivered to SJR Drainage Wildlife Areas	Change in Water Delivered to Non SJR Drainage Wildlife Areas	Net Change in Water Delivered to SJR Drainage Agricultural Contractors	Change in Water Acquired from Sacramento Valley Sources	Change in Water Acqrd from San Joaquin Valley Sources (Non SJR Drainage)
Refuge Focus	Fallowing	Non-critical	B-3-1-C	-	-	-	-	(6,000)	42,000	8,000	17,823	9,497	(28,596)	21,730	10,729
		Critical	B-3-0-S	-	-	-	-	-	42,000	8,000	40,000	-	-	-	-
Agriculture Focus		Non-critical	B-3-2-C	-	-	-	-	(6,000)	42,000	8,000	-	-	16,412	25,474	13,225
		Critical		-	-	-	-	-	42,000	8,000	-	-	50,000	-	-
Non-SJR Focus		Non-critical	B-3-3-C	-	-	-	-	(6,000)	42,000	8,000	-	-	(33,588)	25,474	13,225
		Critical		-	-	-	-	-	42,000	8,000	-	-	-	-	-

Table 18A

				Developed Water											
Existing Condition / Future No Action				Exchange Contractors							Interior				Combined
		Year Type	Analysis Baseline / Study	Savings from Evaporation and Seepage	Savings from Spills to NonDistrict Lands	Recovery of Discharges to Mud/Salt Slough	Recovery from Discharges Upstream of Sack Dam	Groundwater Substitution for Transfer	Crop Idling / Temprary Land Fallowing	Total Water Developed by Exchange Contractors	Sacramento Valley Sources	SJR Drainage Sources	San Joaquin Valley SJR Non Drainage Sources	Total Water Developed by Interior	Total Developed Water
		Non-critical	Existing Condition	15,000	14,000	28,535	6,100	6,000	0	69,635	4,526	6,412	6,775	17,713	87,348
		Critical		0	0	0	0	0	0	0	0	0	0	0	0
		Non-critical	Future No Action	0	0	0	0	0	0	0	0	0	0	0	0
		Critical		0	0	0	0	0	0	0	0	0	0	0	0
Alternative C 130,000 Acre-feet Delivery				Change from Existing Condition							Change from Existing Condition				Change
Delivery Focus	Developed Water Emphasis	Year Type	Study	Savings from Evaporation and Seepage	Savings from Spills to NonDistrict Lands	Recovery of Discharges to Mud/Salt Slough	Recovery from Discharges Upstream of Sack Dam	Groundwater Substitution for Transfer	Crop Idling / Temprary Land Fallowing	Total Water Developed by Exchange Contractors	Sacramento Valley Sources	SJR Drainage Sources	San Joaquin Valley SJR Non Drainage Sources	Total Water Developed by Interior	Total Developed Water
Refuge Focus	Conservation	Non-critical	C-1-1-C	-	-	15,465	900	(6,000)	50,000	60,365	11,730	15,262	4,062	31,054	91,419
		Critical	C-1-0-S	-	-	-	-	-	50,000	50,000	-	-	-	-	50,000
Agriculture Focus		Non-critical	C-1-2-C	-	-	15,465	900	(6,000)	50,000	60,365	25,474	33,588	13,225	72,287	132,652
		Critical		-	-	-	-	-	50,000	50,000	-	-	-	-	50,000
Non-SJR Focus		Non-critical	C-1-3-C	-	-	15,465	900	(6,000)	50,000	60,365	25,474	33,588	13,225	72,287	132,652
		Critical		-	-	-	-	-	50,000	50,000	-	-	-	-	50,000
Refuge Focus	Groundwater	Non-critical	C-1-1-C	-	-	-	-	10,365	50,000	60,365	11,730	15,262	4,062	31,054	91,419
		Critical	C-1-0-S	-	-	-	-	-	50,000	50,000	-	-	-	-	50,000
Agriculture Focus		Non-critical	C-2-2-C	-	-	-	-	10,365	50,000	60,365	25,474	33,588	13,225	72,287	132,652
		Critical		-	-	-	-	-	50,000	50,000	-	-	-	-	50,000
Non-SJR Focus		Non-critical	C-2-3-C	-	-	-	-	10,365	50,000	60,365	25,474	33,588	13,225	72,287	132,652
		Critical		-	-	-	-	-	50,000	50,000	-	-	-	-	50,000
Refuge Focus	Fallowing	Non-critical	C-3-1-C	-	-	15,465	900	(6,000)	50,000	60,365	11,730	15,262	4,062	31,054	91,419
		Critical	C-3-0-S	-	-	-	-	-	50,000	50,000	-	-	-	-	50,000
Agriculture Focus		Non-critical	C-3-2-C	-	-	15,465	900	(6,000)	50,000	60,365	25,474	33,588	13,225	72,287	132,652
		Critical		-	-	-	-	-	50,000	50,000	-	-	-	-	50,000
Non-SJR Focus		Non-critical	C-3-3-C	-	-	15,465	900	(6,000)	50,000	60,365	25,474	33,588	13,225	72,287	132,652
		Critical		-	-	-	-	-	50,000	50,000	-	-	-	-	50,000

Table 18B

Existing Condition / Future No Action	Year Type	Analysis Baseline / Study	Water Deliveries: Exchange Contractors: Wildlife Areas SJR Drainage	Wildlife Areas SJR Non Drainage	Agricultural Contractors SJR Drainage	Out-of-Drainage Basin Entities	Total from Exchange Contractor Developed Water	Wildlife Areas from Exchange Contractors	Interior: Wildlife Areas SJR Drainage	Wildlife Areas SJR Non Drainage	Wildlife Areas from Interior Developed Water	Combined: Total Deliveries to Wildlife Areas	Total Deliveries to SJR Wildlife Areas	Total Deliveries
	Non-critical	Existing Condition	62,250	0	0	7,385	69,635	62,250	1,115	12,329	13,444	75,694	63,365	83,079
	Critical		0	0	0	0	0	0	0	0	0	0	0	0
	Non-critical	Future No Action	0	0	0	0	0	0	0	0	0	0	0	0
	Critical		0	0	0	0	0	0	0	0	0	0	0	0

Alternative C 130,000 Acre-feet Delivery

Delivery Focus	Developed Water Emphasis	Year Type	Study	Change from Existing Condition: Wildlife Areas SJR Drainage	Wildlife Areas SJR Non Drainage	Agricultural Contractors SJR Drainage	Out-of-Drainage Basin Entities	Total from Exchange Contractor Developed Water	Wildlife Areas from Exchange Contractors	Change from Existing Condition: Wildlife Areas SJR Drainage	Wildlife Areas SJR Non Drainage	Wildlife Areas from Interior Developed Water	Change from Existing Condition: Total Deliveries to Wildlife Areas	Total Deliveries to SJR Wildlife Areas	Total Deliveries
Refuge Focus	Conservation	Non-critical	C-1-1-C	1,750	-	50,000	(7,385)	44,365	1,750	16,073	9,497	25,570	27,320	17,823	69,935
		Critical	C-1-0-S	40,000	-	-	-	40,000	40,000	-	-	-	40,000	40,000	40,000
Agriculture Focus		Non-critical	C-1-2-C	(62,250)	-	130,000	(7,385)	60,365	(62,250)	62,250	-	62,250	-	-	122,615
		Critical		-	-	50,000	-	50,000	-	-	-	-	-	-	50,000
Non-SJR Focus		Non-critical	C-1-3-C	(62,250)	-	-	122,615	60,365	(62,250)	62,250	-	62,250	-	-	122,615
		Critical		-	-	-	50,000	50,000	-	-	-	-	-	-	50,000
Refuge Focus	Groundwater	Non-critical	C-1-1-C	1,750	-	50,000	(7,385)	44,365	1,750	16,073	9,497	25,570	27,320	17,823	69,935
		Critical	C-1-0-S	40,000	-	-	-	40,000	40,000	-	-	-	40,000	40,000	40,000
Agriculture Focus		Non-critical	C-2-2-C	(62,250)	-	130,000	(7,385)	60,365	(62,250)	62,250	-	62,250	-	-	122,615
		Critical		-	-	50,000	-	50,000	-	-	-	-	-	-	50,000
Non-SJR Focus		Non-critical	C-2-3-C	(62,250)	-	-	122,615	60,365	(62,250)	62,250	-	62,250	-	-	122,615
		Critical		-	-	-	50,000	50,000	-	-	-	-	-	-	50,000
Refuge Focus	Fallowing	Non-critical	C-3-1-C	1,750	-	50,000	(7,385)	44,365	1,750	16,073	9,497	25,570	27,320	17,823	69,935
		Critical	C-3-0-S	40,000	-	-	-	40,000	40,000	-	-	-	40,000	40,000	40,000
Agriculture Focus		Non-critical	C-3-2-C	(62,250)	-	130,000	(7,385)	60,365	(62,250)	62,250	-	62,250	-	-	122,615
		Critical		-	-	50,000	-	50,000	-	-	-	-	-	-	50,000
Non-SJR Focus		Non-critical	C-3-3-C	(62,250)	-	-	122,615	60,365	(62,250)	62,250	-	62,250	-	-	122,615
		Critical		-	-	-	50,000	50,000	-	-	-	-	-	-	50,000

Model Input Parameters

Delivery Focus	Developed Water Emphasis	Year Type	Study	Change in Water Developed from Evaporation and Seepage	Change in Water Developed from Spills to NonDistrict Lands	Change in Water Developed from Discharges to Mud/Salt Slough	Change in Water Developed from Dischrg Upstr of Sack Dam (Non SJR Drainage)	Change in Water Developed from Groundwater Substitution for Transfer	Change in Water Developed from Crop Idling / Temprary Land Fallowing	Change in Water Developed from Land Fallowing (Non SJR Drainage)	Change in Water Delivered to SJR Drainage Wildlife Areas	Change in Water Delivered to Non SJR Drainage Wildlife Areas	Net Change in Water Delivered to SJR Drainage Agricultural Contractors	Change in Water Acquired from Sacramento Valley Sources	Change in Water Acqrd from San Joaquin Valley Sources (Non SJR Drainage)
Refuge Focus	Conservation	Non-critical	C-1-1-C	-	-	15,465	900	(6,000)	42,000	8,000	17,823	9,497	34,738	11,730	4,062
		Critical	C-1-0-S	-	-	-	-	-	42,000	8,000	40,000	-	-	-	-
Agriculture Focus		Non-critical	C-1-2-C	-	-	15,465	900	(6,000)	42,000	8,000	-	-	96,412	25,474	13,225
		Critical		-	-	-	-	-	42,000	8,000	-	-	50,000	-	-
Non-SJR Focus		Non-critical	C-1-3-C	-	-	15,465	900	(6,000)	42,000	8,000	-	-	(33,588)	25,474	13,225
		Critical		-	-	-	-	-	42,000	8,000	-	-	-	-	-
Refuge Focus	Groundwater	Non-critical	C-1-1-C	-	-	-	-	10,365	42,000	8,000	17,823	9,497	34,738	11,730	4,062
		Critical	C-1-0-S	-	-	-	-	-	42,000	8,000	40,000	-	-	-	-
Agriculture Focus		Non-critical	C-2-2-C	-	-	-	-	10,365	42,000	8,000	-	-	96,412	25,474	13,225
		Critical		-	-	-	-	-	42,000	8,000	-	-	50,000	-	-
Non-SJR Focus		Non-critical	C-2-3-C	-	-	-	-	10,365	42,000	8,000	-	-	(33,588)	25,474	13,225
		Critical		-	-	-	-	-	42,000	8,000	-	-	-	-	-
Refuge Focus	Fallowing	Non-critical	C-3-1-C	-	-	15,465	900	(6,000)	42,000	8,000	17,823	9,497	34,738	11,730	4,062
		Critical	C-3-0-S	-	-	-	-	-	42,000	8,000	40,000	-	-	-	-
Agriculture Focus		Non-critical	C-3-2-C	-	-	15,465	900	(6,000)	42,000	8,000	-	-	96,412	25,474	13,225
		Critical		-	-	-	-	-	42,000	8,000	-	-	50,000	-	-
Non-SJR Focus		Non-critical	C-3-3-C	-	-	15,465	900	(6,000)	42,000	8,000	-	-	(33,588)	25,474	13,225
		Critical		-	-	-	-	-	42,000	8,000	-	-	-	-	-

flexibility in the decision of transfer water source. A range of source combinations is evaluated. The first combination of supply components focuses on the conservation of tailwater. The second combination of supply components focuses on the development of groundwater. The third combination of supply components focuses on crop fallowing. During critical years only 50,000 acre-feet of water is developed for transfer, and that water is developed through land fallowing.

In the discussion of results, there are a total of twelve scenarios for Alternative A. Three scenarios, one for each focus of developed water, describe the effects of only the development of water by the Exchange Contractors. For each of these scenarios, additional results are provided to illustrate the combined effects of developing the water along with the disposition of the water. For each of the three scenarios of developed water, there are three scenarios for the disposition of the water.

Alternative B – 50/50

Alternative B evaluates a unique program of only utilizing land fallowing as the source of transfer supply. For this alternative, the Exchange Contractors will provide up to 50,000 acre-feet of water during noncritical and critical years through land fallowing.

The same three different dispositions of transfer water used for Alternative A are evaluated for this alternative. The volume of water available for transfer is limited to 50,000 acre-feet in all years. Only one supply component, land fallowing, is evaluated in this alternative. In the discussion of results, there is one illustration of source-only effects and three scenarios concerning the combined effects of the single source of water being delivered to three different scenarios of disposition.

Alternative C – 130/50

This alternative evaluates the full implementation of available water. The Exchange Contractors have identified the potential availability of up to 130,000 acre-feet of water during noncritical years, with up to 80,000 acre-feet of water made available through conservation and groundwater, and up to 50,000 acre-feet of water made available through land fallowing. During critical years, up to 50,000 acre-feet of water may be made available through land fallowing.

Because there is the limit of 80,000 acre-feet of water developed through conservation and groundwater, each scenario must include 50,000 acre-feet of water developed through land fallowing. However, there is some flexibility in the choice between tailwater conservation and the use of groundwater substitution to develop the 80,000 acre-feet. Water developed through conservation is economically more sensible than groundwater development; therefore water developed through tailwater conservation becomes the secondary focus within the land fallowing focus series of scenarios, and thus the conservation focus scenarios and land fallowing focus scenarios are the same. For the groundwater focus scenarios, substitute groundwater pumping is maximized to the extent that the tailwater conservation element is not reduced below the Existing Conditions setting value. During critical years only 50,000 acre-feet of water is developed for transfer, and that water is developed through land fallowing.

In the discussion of results, there are three scenarios concerning the development of transfer water, and for each of those scenarios three additional scenarios concerning the disposition of the developed water.

Analysis Assumptions

The potential hydrologic effects of the transfer program are evaluated through the use of a spreadsheet model. The model accounts for changes in flow in the San Joaquin River attributable to either the diminishment in flow due to the development of water for the transfer or for the accretion in flow due to the disposition of flow to a transferee. The model accounts for hydrologic processes over a fourteen-month period from January of a year through February of the following year. This length of trace reflects the nexus of the period when water will be made available by the Exchange Contractors (January through December of a year) and when the water will be utilized (the CVP's March through February delivery contractual year). All the analyses are performed with a monthly time-step, except additional consideration within the assumptions and conclusions recognizes the special hydrologic conditions that occur during April and May due to pulse flow operations.

As described previously, five different snapshots of San Joaquin River hydrology are evaluated. Each snapshot reflects a different year-type within the San Joaquin River basin: wet, above normal, below normal, dry and critical. When year-type related information is entered into the model based on historical or projected hydrologic data, the San Joaquin Valley Water Year Hydrologic Classification is used as an index of basin wetness.

The salient underlying hydrology within the model (e.g., flow and water quality at Vernalis) is described previously in the discussion of the Baseline Hydrologic Setting. Upon these parameters the hydrologic processes associated with incrementally developing or using the transfer water is layered. These processes are described below.

Hydrologic Effect of Developing Water through Tailwater Recapture

Tailwater recapture is defined as the reuse of tailwater flows in the act of reclaiming surface water from irrigated lands into a surface supply system. This can be achieved either by gravity or by low-lift pumps. The Exchange Contractors have invested in over 250 low lift stations with a total installed capacity of over 600 cfs for the primary purpose of tailwater recapture. These facilities improve the Exchange Contractors' ability to meet water delivery capacity needs and offset volumetric diversion requirements.

The exercise of the tailwater recapture facilities affects several aspects of the Exchange Contractors' operations. In summary: 1) less water will evaporate, or seep to the groundwater basin, 2) less water will be inadvertently discharged to non-district lands including Grasslands Water District (GWD), 3) less water will be discharged to Salt Slough and Mud Slough, and 4) less water will be discharged above Sack Dam.

Evaporation, or seepage to the groundwater basin. As described earlier, an inefficiency in on-farm and community system water use practice occurs when waters pond at the tail end of fields, accumulate in drainage collection sloughs, or drain to non-district lands which do not have an immediate or direct hydraulic conectivity with Mud or Salt Sloughs or the San Joaquin River. For all of the alternatives, it is estimated that 15,000 acre-feet of tailwater recapture is associated with this component which represents waters that would otherwise pond at the tail end of farms or in drainage sloughs and drains or be consumptively used or dissipate in non-district lands. Although a slight fraction of this water would evaporate to the atmosphere or be consumptively used by vegetation, it is assumed that the entire amount of this water dissipates as seepage to the groundwater basin. Further it is assumed that the recapture of this water will have no affect upon stream flows downstream of the affected area.

As described earlier, the upper aquifer of the Exchange Contractors' service area generally flows in two different directions, with the direction of flow affecting the continuity of a flow to accretion flow in the San Joaquin River. Tailwater ponding and seepage to the groundwater basin that occurs in the southeastern portion of the Exchange Contractors' service area will not have a fate of the San Joaquin River. This water could migrate to the northeast, under the San Joaquin River into Madera and Merced counties. The remainder of tailwater ponding and seepage to the groundwater basin would, in theory, migrate to the San Joaquin River at the northern boundary of the Exchange Contractors.

Also described earlier, groundwater accretions to the San Joaquin River only appear to begin at a location near Lander Avenue Bridge, and then generally increase as the river proceeds downstream. The SWRCB Technical Committee Report estimated the occurrence of accretion flow to the San Joaquin River through an analysis that considered, among other factors, the affect of groundwater water surface elevation adjacent to the river. Results of the analysis indicate the total groundwater accretion to the San Joaquin River below Lander Avenue to Orestimba Creek amounts to an annual average of 13 cfs, inclusive of groundwater accretion and depletion from both sides of the river. The effect of removing tailwater ponding within the Exchange Contractors' service area will affect the amount of water seeping to the upper groundwater basin aquifer. In theory the hydraulic gradient from the point of seepage to the river would be slightly reduced. However, in recognition of the insignificant amount of groundwater seepage to the San Joaquin River that occurs in the existing setting, the incremental affect of removing the tailwater ponding would be un-measurable.

For all the alternatives it is assumed that 15,000 acre-feet of water is developed through the conservation of flows that would otherwise evaporate or seep to the groundwater basin. This element of water is already developed and is included in the Existing Conditions setting and does not change within any of the alternatives.

Water inadvertently discharged to non-district lands. A second component of tailwater recapture is an amount of water that may have otherwise been discharged to non-district lands (e.g., particularly GWD) and used as a water supply and then partially returned to Mud and Salt Sloughs as a matter of wildlife area water management. Examples of these reduced discharges are drain spills at Almond Drive and San Luis laterals, Rice Drain, Mueller Weir, and CCID and FCWD discharges to the CCID Main Drain. A total of 14,000 acre-feet of water is estimated to be recaptured prior to escape at these locations. This water was unreliable in terms of a water supply in pattern or quantity. In a liberal view of hydrologic impact, it could be assumed that these flows will reduce the intermittent wildlife areas' supplies by an equal quantity and thus affect return flows by some fraction of the reduced supplies. The assumed relationship between wildlife area water availability associated with this component of tailwater recapture and return flows is likely overestimated since a portion of this drainage would have been used in isolated wildlife areas that do not significantly contribute to return flows (Almond Drive and San Luis laterals). Also, at times these drainage flows would likely not have become an effective water supply to the wildlife areas, but instead would have been absorbed into canal operations with a likely effect of increased percolation losses from the canals; thus, decreasing the amount of drainage flows that actually become a supply to the wildlife areas.

For all the alternatives it is assumed that 14,000 acre-feet of water is developed through the conservation of flows that would otherwise spill to non-district lands. This element of water is already developed and is included in the Existing Conditions setting and does not change within any of the alternatives.

Tailwater Discharges to Mud Slough and Salt Slough. Tailwater recapture facilities that can potentially reduce Exchange Contractor deliveries can produce in excess of 80,000 acre-feet of water in a year. The exercise of these facilities can reduce discharges at Sand Dam and Boundary Drain and other locations that have direct hydrologic connectivity with the San Joaquin River. Reductions in these discharges will reduce the amount of water flowing at points downstream. The amount of recapture and its monthly pattern may vary within each alternative and at times depends on the strategy to avoid or minimize downstream impacts. Any amount of recapture assumed within the areas draining to Sand Dam and Boundary Drain is assumed to directly reduce the flow in the San Joaquin River. Included in the Existing Conditions setting is 28,535 acre-feet of tailwater water recapture for transfer purposes. For certain scenarios the amount of tailwater recapture will increase. Table 19 shows a monthly distribution of recapture potential associated with 44,000 acre-feet of water developed through the recapture component. A scenario's incremental monthly development of this component of transfer water is proportionately distributed in a pattern reflecting the distribution shown Table 19.

Table 19
Development of Tailwater Recapture Directly Affecting Flows Tributary to the San Joaquin River

Volume - Acre-feet												
JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	TOTAL
400	3,000	3,000	5,000	6,500	6,500	6,500	6,500	4,000	2,600	-	-	44,000

Discharges upstream of Sack Dam. CCC's tailwater recapture system recovers flows that would otherwise drain back to the San Joaquin River below Mendota Pool. This water joins with releases from Mendota Pool for satisfaction of Exchange Contractor deliveries at Sack Dam. For the Existing Conditions setting the amount of recovery has been assumed to equal 6,100 acre-feet per year. For any scenario assuming incremental development of water from this source it is assumed to occur in a monthly pattern equal to the typical pattern of total deliveries to CCC. The development of this water has no impact upon downstream San Joaquin River flows.

Quality of Water Associated with Recapture Components. Flow potentially removed from the San Joaquin River through reductions in discharges at Sand Dam and Boundary Drain has an associated loading that will no longer enter the San Joaquin River. The historical record of water quality at Sand Dam and Boundary Drain maintained by SLCC is used to provide an estimate of the water quality associated with discharges at these locations. Table 20 illustrates these values, and represents an average of the water quality between the two sites. Transfer water that is assumed to be developed through this recapture component will have a water quality consistent with these values.

Table 20
Water Quality Associated with Tailwater Recapture above Sand Dam and Boundary Drain

Average Monthly Quality - µmhos												
Year Type	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
All Year Types	1,748	1,470	1,121	1,231	1,197	931	928	885	1,048	893	899	1,195

Hydrologic Effect of Developing Groundwater

The Exchange contractors have identified the annual availability of up to 20,000 acre-feet of groundwater for delivery substitution. This water will be developed for the transfer by pumping from deep wells owned and operated by the Exchange Contractors. Consistent with the earlier discussion of groundwater conditions within and adjacent to the service area of the Exchange Contractors, no hydrologic effect upon San Joaquin River flows is anticipated to occur due to providing groundwater substitution for the transfers. The water developed from this source is assumed to occur in a monthly pattern equal to a pattern typical of historical production, with recognition that in the future additional groundwater pumping may occur during the fall. Table 21 illustrates this pattern.

Table 21
Typical Distribution of Groundwater Pumping

Percent of Annual Total												
	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
All Year-types	0.0	0.0	0.0	12.5	14.0	16.5	20.0	15.0	10.0	10.0	2.0	0.0

Hydrologic Effect of Developing Crop Fallowing

The model assumes water developed by the land fallowing component will occur on a monthly pattern associated with the irrigation of cotton. Table 22 illustrates this monthly pattern, and was derived from information contained in Department of Water Resource Bulletin 113.

Table 22
Distribution of Water Developed through Land Fallowing

Percent of Annual Total												
	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
Perecent	2.1	9.3	10.3	0.7	1.4	21.3	28.9	25.4	0.7			

When transfer water is assumed to be developed through the land fallowing component, it is also assumed that removing this water from Exchange Contractor deliveries will also cause a reduction in agricultural return flows. The affect upon agricultural return flows due to an increase or decrease in supply is assumed to be a function of the month during which the change in delivery occurs, and the amount of change in delivery. Table 23 shows the monthly return flow factors assumed in this analysis for agricultural deliveries. These values are consistent with modeling assumptions currently used in the Department of Water Resources and Reclamation state-wide simulation model CALSIM II. The return flow factor is multiplied by the amount of water delivered to an entity in that month to estimate the amount of return flow to the San Joaquin River. In this case of developing water from land fallowing, the monthly return flow factor is multiplied times the distribution factor shown in Table 22 and then multiplied times the total annual water assumed to be developed through land fallowing.

Table 23
Monthly Return Flow Factor for Agricultural Deliveries

Percent of Annual Total												
	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
Percent	20.0	20.0	7.0	7.0	7.0	7.0	7.0	7.0	20.0	20.0	20.0	20.0

The water quality associated with reductions in return flows due to crop fallowing is assumed to be the same as the water quality of flows occurring at Sand Dam and Boundary Drain (Table 20). Although land fallowing may occur entirely on lands with no hydraulic connectivity with the San Joaquin River, this hydrologic analysis assumes that fallowing will occur proportionately throughout the Exchange Contractors service area.

Hydrologic Effect of Transferring Water to Wildlife Areas

The results of the refuge water balance model previously discussed are used to depict the supply/runoff flow relationship for deliveries to the wildlife areas. For wildlife areas that have hydrologic connectivity with the San Joaquin River, it is assumed that 23 percent of the wildlife areas' incremental water supply provided by a transfer returns to the river system as runoff. Table 3 above illustrates the monthly pattern of runoff that is assumed. Table 24 describes the assumed water quality associated with wildlife area incremental runoff.

Table 24
Water Quality Associated with Wildlife Area Return Flow

Average Monthly Quality - µmhos												
Year Type	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
All Year Types	1,163	1,448	2,713	3,018	-	-	-	1,315	1,065	1,029	1,118	1,118

Hydrologic Effect of Transferring Water to Agriculture

The monthly return flow factors shown in Table 23 are also used in the description of the supply/runoff relationship for transfers made to agricultural interests that have hydrologic connectivity with the San Joaquin River. Table 25 illustrates the assumed monthly pattern of deliveries assumed for transfers to CVP contractors that return flow to the San Joaquin River.

Table 25
Delivery Pattern for CVP Agricultural Contractors with Hydrologic Connectivity with the San Joaquin River

Percent of Annual Total												
	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
Percent	0.3	0.6	2.2	9.5	14.4	17.0	24.6	18.1	8.3	3.7	1.0	0.3

The water quality associated with incremental return flows from agricultural interests that receive transfer water is assumed to be equal to the source water delivered, reduced in quality by 20 percent. The source water is assumed equivalent to water available from Check 13 of the Delta-Mendota Canal. Table 26 illustrates the quality of water assumed to occur from runoff to the San Joaquin River from agricultural interests receiving transfer water.

Table 26
Water Quality Associated with Incremental Runoff from Agricultural Interests Receiving Transfer Water

Average Monthly Quality - µmhos												
Year Type	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
Wet	480	390	420	420	360	330	300	330	330	390	480	540
Above Normal	660	600	540	510	540	480	360	360	420	480	570	690
Below Normal	690	660	630	540	540	480	390	450	540	600	630	720
Dry	720	690	690	600	540	480	390	540	690	690	660	720
Critical	720	780	900	780	660	660	660	690	750	630	690	780

Hydrologic Effect of Transferring Water to Urban

There are no CVP urban entities evaluated in this analysis that have hydrologic connectivity with the San Joaquin River. The Santa Clara Valley Water District receives water from the San Felipe Division of the CVP and does not drain to the Central Valley.

Hydrologic Effect of Transferring Water to the EWA

The transfer program contemplates providing water to the EWA. These transfers are contingent upon the water being used to benefit CVP contractors. In effect, the transfer is intended to provide water to CVP SOD contractors to facilitate EWA actions in the Delta. Although not included in a scenario, it would be assumed that the volume of water provided to the EWA is allocated among CVP SOD contractors according to each classification's (e.g., agriculture with hydrologic connectivity with the San Joaquin River, agriculture without hydrologic connectivity with the San Joaquin River, urban with hydrologic connectivity with the San Joaquin River, etc.) proportionate contribution to total CVP SOD contractual entitlements. From this allocation the hydrologic affect upon San Joaquin River flows, if any, caused by transferring water to an EWA beneficiary can be estimated. The calculation of the potential hydrologic effect from an EWA beneficiary would be consistent with the procedures previously described.

The result of a review of EWA-affected CVP SOD contractual entitlements provides an assumption that 14 percent of the transfer provided to EWA will result in an incremental delivery to CVP SOD agricultural contractors with hydrologic connectivity with the San Joaquin River. The remaining 86 percent of the transfer will benefit entities without hydrologic connectivity with the San Joaquin River.

Results

The potential hydrologic effects of the proposed program greatly vary between the alternatives, and within an alternative depending upon year-type, disposition of the transfer and the source of developed water. A tabular summary of the results, by scenario, is included in Attachment 1. Each study is identified by alternative and scenario. Figure 4 illustrates the protocol for identifying the studies. For instance, Study A-1-1-C depicts Alternative 1 (80,000 acre-feet) with a source emphasis of conservation and a focus of delivery to the wildlife areas. The "C" identifier indicates that the study evaluates the combined effects of developing and delivering the water.

Figure 4

Study Identifier

A	--	1	--	1	--	C
Alternative		*Source Emphasis*		*Disposition Focus*		*Evaluated Effects*
A: 80,000 acre-feet		1: Conservation		0: Source Only		S: Source Only
B: 50,000 acre-feet		2: Groundwater		1: Wildlife Area		C: Combined
C: 130,000 acre-feet		3: Land Fallowing		2: Agriculture		
				3: Non SJR		

Study results are presented in a hierarchal format, sequentially stepping through the reporting of the development and disposition of transfer water, adjustments to New Melones Reservoir operations, and potential effects to the CVP/SWP Delta water supply. First illustrated is a section of data ("Basic Hydrologic Accounting") that shows the potential net flow effects to the San Joaquin River at a conceptual location downstream of the Exchange Contractors and those entities that might receive transfer water. Table 27 below illustrates a portion of this data. Reported first in the section of data are the sources of the transfer water (e.g., change in discharge to SJR streams) and the monthly distribution of incrementally developed water. The second area of data concerns the calculated potential affect upon San Joaquin River flows due to the exercise of each of the source-water components that have hydrologic connectivity with the San Joaquin River. Source-water components other than those directly reducing tailwater discharges to tributaries of the San Joaquin River will have less than a one-to-one (and possibly zero) effect upon San Joaquin River flows.

The third area of data illustrates the calculated effect to San Joaquin River flows caused by the return of flows from incremental deliveries to the transferees, or the acquisition of water from San Joaquin River connected entities other than the Exchange Contractors. The existence of values in this area of data depends upon the identity of assumed transferees within a scenario and whether or not the transferee has hydrologic connectivity with the San Joaquin River. The last area of data provides the potential net effect to San Joaquin River flows due to the development and disposition of transfer water. These values represent the net effect prior to any adjustment for changes in New Melones Reservoir operations in reaction to the transfer. Table 27 illustrates the presentation of results for noncritical years within the analysis. A similar section of data is also provided for the calculation of potential net flow effects during critical years.

The next section of data provided in the tabular summary of results illustrates flow and quality conditions at Vernalis, prior to and subsequent to the transfer. Table 28 provides an example of these data. Reported in this area of data are the assumed baseline Vernalis flow and quality conditions and the simulated flow and quality at Vernalis subsequent to the transfer, including the effects of changes in New Melones Reservoir operations that are simulated to occur in reaction to the changes in flow described by the "basic hydrologic accounting".

Table 27
Basic Hydrologic Accounting (Illustration from Study A-1-1-C)

All Values Relative to Baseline (Existing) Condition		Basic Hydrologic Accounting					
Water Developed - Non Critical Years		Jan	Feb	Mar	Apr	May	Jun
Change in Evaporation/Seepage to GW		0	0	0	0	0	0
Change in Drain Spills to Wildlife Areas		0	0	0	0	0	0
Change in Discharge to SJR Streams		141	1054	1054	1757	2285	2285
Change to Flows Upstream of Sack Dam		0	45	90	90	99	144
Crop Fallowing		0	0	0	0	0	0
Groundwater		0	0	0	-750	-840	-990
Total		141	1099	1144	1097	1544	1439
Effects to SJR Flows due to Developing Water - Non Critical Years							
Change in Evaporation/Seepage to GW		0	0	0	0	0	0
Change in Drain Spills to Wildlife Areas		0	0	0	0	0	0
Change in Discharge to SJR Streams		141	1054	1054	1757	2285	2285
Change to Flows Upstream of Sack Dam		0	0	0	0	0	0
Crop Fallowing		0	0	0	0	0	0
Groundwater		0	0	0	0	0	0
Total (Positive value means flow reduced)		141	1054	1054	1757	2285	2285
Return Flows from Disposition of Transfer Water - Non Critical Years							
Incremental Return from Agricultural Transferees		0	0	-23	-102	-153	-182
Incremental Return from Wildlife Area Transferees		0	0	33	5	0	0
Envirnomental Water Account Beneficiaries							
Incremental Return from Agricultural Entities		0	0	0	0	0	0
Total		0	0	10	-96	-153	-182
Net Effect to San Joaquin River Flow Before NM Adjustment	(Acre-feet)	-141	-1054	-1044	-1854	-2438	-2467
(Positive value means flow added)	(cfs)	-2	-19	-17	-31	-40	-41

Table 28
Vernalis Results (Illustration from Study A-1-1-C)

	Vernalis					
Baseline Vernalis Flow - cfs	Jan	Feb	Mar	Apr	May	Jun
Wet	7500	13600	15700	13600	12000	7400
Above Normal	5800	7200	6200	5900	4600	2600
Below Normal	2300	3200	3300	3700	3700	2100
Dry	1900	2600	2300	2700	2200	1800
Critical	1300	1700	1600	1800	1500	1300
Change in Vernalis Flow with Action - cfs						
Wet	-2	-19	-17	-31	-40	-41
Above Normal	-2	-19	-17	-31	-40	0
Below Normal	-2	0	-17	-31	-40	-54
Dry	-2	0	-18	-43	-53	-54
Critical	-3	-21	-2	0	-1	-14
With-Action Vernalis Flow - cfs						
Wet	7498	13581	15683	13569	11960	7359
Above Normal	5798	7181	6183	5869	4560	2600
Below Normal	2298	3200	3283	3669	3660	2046
Dry	1898	2600	2282	2657	2147	1746
Critical	1297	1679	1598	1800	1499	1286
Baseline Vernalis Water Quality - µmhos						
Wet	352	286	310	269	212	310
Above Normal	404	380	465	364	334	486
Below Normal	757	631	690	465	382	700
Dry	880	736	1000	700	700	700
Critical	1000	1000	1000	700	700	700
Change in Vernalis Water Quality with Action - µmhos						
Wet	0	-2	-1	-2	-3	-3
Above Normal	-1	-3	-2	-4	-7	-14
Below Normal	-1	-8	-2	-6	-8	0
Dry	-1	-10	0	-3	-4	0
Critical	-2	0	0	0	0	0
With-Action Vernalis Water Quality - µmhos						
Wet	351	284	309	267	209	307
Above Normal	404	377	464	360	327	473
Below Normal	756	623	688	459	374	700
Dry	879	725	1000	697	696	700
Critical	998	1000	1000	700	700	700

(April and May water quality values may not be reflective of split-month operations when objectives control)

The notation regarding the water quality values reported for April and May concern the modeling and calculation approach used to represent the split-month operations (pulse and non-pulse periods) that occur during that period. The results will not always reflect a correct calculation of average monthly water quality conditions.

The potential change in New Melones Reservoir storage is reported in the next section of tabular results. Table 29 illustrates the reported data. Illustrated are the changes in New Melones Reservoir storage due to changes in either water quality or flow releases attributable to the changes in flow and water quality at Vernalis resulting due to the transfers. The changes in New Melones Reservoir storage are directly equal and opposite of projected changes in releases to the lower Stanislaus River for the Vernalis flow and quality objectives.

Table 29
New Melones Reservoir Operations (Illustration from Study A-1-1-C)

						New Melones
Incremental Change in NM Storage due to WQ Release Change - Acre-feet	Jan	Feb	Mar	Apr	May	Jun
Wet	0	0	0	0	0	0
Above Normal	0	0	0	0	0	0
Below Normal	0	0	0	0	0	751
Dry	0	0	67	701	826	751
Critical	0	386	-97	-12	15	223
Incremental Change in NM Storage due to Vernalis Flow Release Change - Acre-feet						
Wet	0	0	0	0	0	0
Above Normal	0	0	0	0	0	-2467
Below Normal	0	-1054	0	0	0	0
Dry	0	-1054	0	0	0	0
Critical	0	0	0	0	0	0
Net Incremental Change in NM Storage due to Vernalis Flow & Quality Release Change - Acre-feet						
Wet	0	0	0	0	0	0
Above Normal	0	0	0	0	0	-2467
Below Normal	0	-1054	0	0	0	751
Dry	0	-1054	67	701	826	751
Critical	0	386	-97	-12	15	223

The last section of data provided in the tabular summary reports the potential change in water supply within the Delta from the perspective of CVP/SWP operations. Table 30 illustrates an example of the data using Study A-1-1-C results. The data illustrate the potential effect of the transfers upon the CVP/SWPs' Delta operations first from a perspective of flow changes attributable to the transfers during periods when changes to inflow potentially affect CVP/SWP operations. The second area of data reports the changes in New Melones Reservoir releases that occur coincidentally with the periods of potential Delta impact. The third area of data reports the potential net effect of the transfers to CVP/SWP Delta supply.

Table 30
Delta CVP/SWP Potential Effect

						CVP/SWP Delta Supply
Total Potential CVP/SWP Delta supply Impact w/o NM Adjustments - Acre-f	Jan	Feb	Mar	Apr	May	Jun
Wet	0	-369	0	0	0	0
Above Normal	0	-369	0	0	0	-2467
Below Normal	0	-369	0	0	0	-2467
Dry	0	-369	-366	-324	-2438	-2467
Critical	0	-779	-228	-9	-40	-626
New Melones Adjustments - Acre-feet (positive means increase in supply)						
Wet	0	0	0	0	0	0
Above Normal	0	0	0	0	0	2467
Below Normal	0	369	0	0	0	-751
Dry	0	369	-23	-245	-826	-751
Critical	0	-386	97	12	-15	-223
Incremental Change in CVP/SWP Delta Supply due to Action - Acre-feet						
Wet	0	-369	0	0	0	0
Above Normal	0	-369	0	0	0	0
Below Normal	0	0	0	0	0	-3218
Dry	0	0	-389	-570	-3264	-3218
Critical	0	-1165	-131	4	-55	-849

Overarching results and conclusions regarding the alternatives and the sensitivities of each alternative are described below.

Alternative A – 80/50

This alternative provides an evaluation of a level of transfer similar to the level of program currently being implemented. Up to 80,000 acre-feet of water will be transferred in noncritical years and up to 50,000 acre-feet of water will be transferred in critical years. During critical years, only land fallowing water will be available. Water would be developed through a combination of conservation (tailwater recovery and other conservation, up to 80,000 acre-feet), increased groundwater pumping (up to 20,000 acre-feet), and voluntary crop idling/temporary land fallowing (up to 50,000 acre-feet). The combination of conservation and groundwater would be no greater than 80,000 acre-feet. Water would be acquired from the Exchange Contractors, who would receive less substitution water from Reclamation.

Hydrologic Effects Due to Water Development. Three methods are proposed to develop water for transfer: conservation including tailwater recovery, groundwater substitution, and land fallowing. Each of these methods would have different effects (sometimes no effect) upon San Joaquin River flows. In this alternative, up to 80,000 acre-feet of transfer water would be developed by the Exchange Contractors. The hydrologic effect to the San Joaquin River for a portion of this water is included in the Existing Conditions / Future No Action settings (i.e., baseline condition). Also, since impacts to hydrology are stated relative to the baseline, the impacts discussed below relate to the incremental amount of water above the baseline that is developed and delivered. That is, in the Existing Conditions / Future No Action setting, the Exchange Contractors are already developing water either for existing transfers (Existing Conditions setting) or using the developed water for their own internal purposes (Future No Action setting).

For the conservation scenario, the Exchange Contractors would increase their water development by 10,365 acre-feet above the baseline, including an incremental tailwater recapture of 16,365 acre-feet during noncritical years to achieve 80,000 acre-feet of transfer water (with a commensurate reduction of 6,000 acre-feet of groundwater pumping). For the groundwater scenario, the Exchange Contractors will increase their groundwater substitution efforts by 10,365 acre-feet. To develop the full amount of transfer through a land fallowing program, the Exchange Contractors would develop 16,365 acre-feet of water from land fallowing. This occurs with a decrease in groundwater pumping of 6,000 acre-feet (compared to the baseline condition).

Simulated hydrologic effects at Vernalis resulting from each of these scenarios in each year type are shown in Table 31, which also illustrates the assumed Existing Conditions / No Action Vernalis flows. The effects of developing the water upon flows at Vernalis vary depending upon the source of the developed water and the year type. The conservation scenario exhibits the largest potential affect to Vernalis flows. The development of transfer water through tailwater recapture is assumed to have a direct 1-to-1 effect on river flow. For each acre-foot of water recaptured, an acre-foot of water is removed from the river. The monthly pattern exhibited in the effect is generally consistent with the delivery of water to the Exchange Contractors. Certain months (e.g., June of an above normal year and February in below normal and dry years) show no change in flow. This circumstance is due to the required Vernalis flow condition being maintained by New Melones Reservoir operations. During these months any change in San Joaquin River flows upstream of the Stanislaus River are assumed to be counteracted by a change in New Melones Reservoir releases. During certain other months, when New Melones Reservoir operations are maintaining required water quality conditions at Vernalis, the flow change at Vernalis is the combination of both the effects of the Exchange Contractors developing the transfer water and the counteraction by New Melones Reservoir releases to maintain the water quality condition at Vernalis. During critical years, the effect is due to a land fallowing program. For each of the water development scenarios, only land fallowing is available during critical years.

For the groundwater scenario, no effect appears at Vernalis for noncritical years. This circumstance is due to the lack of hydrologic connectivity between the Exchange Contractors groundwater pumping and San Joaquin River flows. The only effect in this scenario is during critical years, again when the effect is due to land fallowing.

For the land fallowing scenario, a relatively small effect to Vernalis flows occurs. This effect has a pattern associated with the pattern of irrigation requirements for cotton, and an assumption for surface runoff from that irrigation. The effect during critical years is associated with the full employment of 50,000 acre-feet of land fallowing.

Table 31
Vernalis Flow Conditions – Alternative A Water Development

Benchmark Vernalis Flow - cfs	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb
Wet	7500	13600	15700	13600	12000	7400	5100	3100	2500	3600	3000	4600	7500	13600
Above Normal	5800	7200	6200	5900	4600	2600	2100	2000	1500	2000	1800	2300	5800	7200
Below Normal	2300	3200	3300	3700	3700	2100	1900	1500	1200	1900	1700	2200	2300	3200
Dry	1900	2600	2300	2700	2200	1800	1400	1100	1000	1700	1600	2100	1900	2600
Critical	1300	1700	1600	1800	1500	1300	1000	1000	1000	1500	1400	1500	1300	1700

Change in Vernalis Flow with Action - cfs

A-1-0-S: 80 CONSERVATION SOURCE	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb
Wet	-2	-19	-17	-30	-37	-38	-37	-37	-24	-15	0	0	0	0
Above Normal	-2	-19	-17	-30	-37	0	-37	-37	-24	-15	0	0	0	0
Below Normal	-2	0	-17	-30	-37	-52	-50	-48	-24	-15	0	0	0	0
Dry	-2	0	-19	-42	-51	-52	-50	-48	-24	-15	0	0	0	0
Critical	-3	-21	-6	0	-1	-14	-19	-16	-1	0	0	0	0	0

A-2-0-S: 80 GROUNDWATER SOURCE	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb
Wet	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Above Normal	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Below Normal	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Dry	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Critical	-3	-21	-6	0	-1	-14	-19	-16	-1	0	0	0	0	0

A-3-0-S: 80 FALLOWING SOURCE	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb
Wet	-1	-5	-2	0	0	-3	-5	-4	0	0	0	0	0	0
Above Normal	-1	-5	-2	0	0	0	-5	-4	0	0	0	0	0	0
Below Normal	-1	0	-2	0	0	-5	-6	-5	0	0	0	0	0	0
Dry	-1	0	-2	0	0	-5	-6	-5	0	0	0	0	0	0
Critical	-3	-21	-6	0	-1	-14	-19	-16	-1	0	0	0	0	0

Water quality at Vernalis may also change due to the development of transfer water by the Exchange Contractors. Table 32 illustrates the change in water quality at Vernalis associated with the development of each of the sources of transfer water.

Table 32
Vernalis Water Quality Conditions – Alternative A Water Development

Benchmark Vernalis Water Quality - µmhos	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb
Wet	352	286	310	269	212	310	341	460	442	359	497	432	352	286
Above Normal	404	380	465	364	334	486	509	534	588	494	657	639	404	380
Below Normal	757	631	690	465	382	700	700	700	680	510	681	657	757	631
Dry	880	736	1000	700	700	700	700	700	772	547	708	678	880	736
Critical	1000	1000	1000	700	700	700	700	700	772	595	772	859	1000	1000

Change in Vernalis Water Quality with Action - µmhos

A-1-0-S: 80 CONSERVATION SOURCE	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb
Wet	0	-2	-1	-2	-3	-3	-4	-5	-6	-2	0	0	0	0
Above Normal	-1	-3	-2	-4	-7	-13	-8	-7	-7	-3	0	0	0	0
Below Normal	-1	-8	-2	-6	-8	0	0	0	-7	-3	0	0	0	0
Dry	-1	-10	0	-	-	0	0	0	-7	-3	0	0	0	0
Critical	-2	0	0	-	-	0	0	0	0	0	0	0	0	0

A-2-0-S: 80 GROUNDWATER SOURCE	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb
Wet	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Above Normal	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Below Normal	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Dry	0	0	0	-	-	0	0	0	0	0	0	0	0	0
Critical	-2	0	0	-	-	0	0	0	0	0	0	0	0	0

A-3-0-S: 80 FALLOWING SOURCE	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb
Wet	0	0	0	0	0	0	-1	-1	0	0	0	0	0	0
Above Normal	0	-1	0	0	0	-1	-1	-1	0	0	0	0	0	0
Below Normal	0	-2	0	0	0	0	0	0	0	0	0	0	0	0
Dry	0	-3	0	-	-	0	0	0	0	0	0	0	0	0
Critical	-2	0	0	-	-	0	0	0	0	0	0	0	0	0

Values for April and May during dry and critical years have been omitted from the table due to modeling limitations. During the first half of April and the later half of May of these periods, Vernalis water quality objectives are assumed to control. During transfers it is assumed that New Melones releases would continue to provide compliance with the objectives; therefore, no change in water quality would occur. During the other portions of these months, water quality would only slightly change and within a magnitude shown for the month in the other year types.

Water quality changes at Vernalis trend with the changes in flow at Vernalis. The water quality of tailwater is typically worse than the melded quality of water at Vernalis. Therefore, the removal of tailwater by the Exchange Contractors would improve water quality at Vernalis. The land fallowing program is assumed to affect the same flows that are available for tailwater recapture. There is no change in water quality for several months during below normal, dry and critical years although there would be a change in flow. These are periods when New Melones Reservoir releases are maintaining the water quality requirement at Vernalis. A change in upstream flows and associated quality will be counteracted by releases from New Melones Reservoir to maintain the water quality requirement at Vernalis.

Effects on New Melones Reservoir

New Melones Reservoir operations may be affected by the Exchange Contractors' development of transfer water due to the linkage between its operations and San Joaquin River conditions. State Water Resources Control Board (State Board) Decisions 1641 and 1422 require releases from New Melones Reservoir to maintain water quality and flow at Vernalis. The flow and quality effects of the transfer to the San Joaquin River upstream of the Stanislaus River can trigger a change in releases from New Melones Reservoir to counter such effects. The potential changes in the net releases from New Melones Reservoir, for either Vernalis water quality or flow purposes, are illustrated in Table 33. The values are depicted as a change in New Melones Reservoir storage, and are directly representative of flow changes to the lower Stanislaus River at Goodwin Reservoir. Positive values indicate an increase in storage and a decrease in flow to the lower Stanislaus River.

The changes shown in Table 33 indicate the changes that would be required to counter the effect that developing the transfer water has on maintaining Vernalis flow and quality conditions exactly at the Vernalis objective compliance level. However, when a reduction in flow is calculated, the reduction may not actually be allowed because another release objective may require the continuation of some level of that release. Modeling limitations did not allow the identification of such circumstances. Accumulated changes in New Melones Reservoir storage vary by year type and source option, but the change in storage within a year is less than 3,000 acre-feet, positive or negative.

Table 33
Storage Change in New Melones Reservoir – Alternative A Water Development

Net Incremental Change in NM Storage due to Vernalis Flow & Quality Release Change - Acre-feet

A-1-0-S: 80 CONSERVATION SOURCE

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Total
Wet	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Above Normal	0	0	0	0	0	-2285	0	0	0	0	0	0	0	0	-2285
Below Normal	0	-1054	0	0	0	813	800	650	0	0	0	0	0	0	1208
Dry	0	-1054	135	718	845	813	800	650	0	0	0	0	0	0	2906
Critical	0	386	39	8	15	223	297	213	0	0	0	0	0	0	1180

A-2-0-S: 80 GROUNDWATER SOURCE

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Total
Wet	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Above Normal	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Below Normal	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Dry	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Critical	0	386	39	8	15	223	297	213	0	0	0	0	0	0	1180

A-3-0-S: 80 FALLOWING SOURCE

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Total
Wet	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Above Normal	0	0	0	0	0	-205	0	0	0	0	0	0	0	0	-205
Below Normal	0	-255	0	0	0	73	97	70	0	0	0	0	0	0	-15
Dry	0	-255	13	3	5	73	97	70	0	0	0	0	0	0	5
Critical	0	386	39	8	15	223	297	213	0	0	0	0	0	0	1180

Changes in flows in the Lower Stanislaus River would mirror changes in New Melones Reservoir storage but in the opposite direction. For instance, a decrease in New Melones Reservoir storage results in an increase in flows in the lower Stanislaus River. The potential change in flow to the lower Stanislaus River ranges from an increase of 38 cfs during June (during an above normal year, conservation emphasis) to a decrease of up to 14 cfs during May during a dry year with the conservation emphasis. An indirect impact that may result from a change in New Melones Reservoir operations is the allocation of water to uses within the Interim Plan of Operations, including impacts to water users and for fish and water quality purposes. As described previously, the New Melones Project is generally operated according to an Interim Plan of Operations, which allocates water for various purposes according to formulae that relate to anticipated runoff and reservoir storage. A change in carry-over storage (as determined for the end of February) in comparison to the existing condition would lead to a change in allocations, higher or lower, or potentially lead to no change in allocations. The potential water supply effect to any particular use is dependent upon the magnitude of the change in storage (in a year, or accumulated over a number of years). However, given the very small changes in storage anticipated, on the order of 1,000 to 3,000 acre-feet in a year, the impact from water development alone is expected to be minor.

The majority of the effect of a change in New Melones Reservoir storage would not be realized during the current year of the transfer, but instead during the subsequent year or years when water supply allocations are subsequently determined. If the following year is dry, the previous year's effect in storage would translate to relatively small allocation changes to lower Stanislaus River purposes and potentially no change to allocations to CVP contractors. If the following year is normal or wetter, more noticeable changes to allocations would occur. In the wettest of conditions, allocations would not change.

The Exchange Contractors' development of transfer water could affect inflows to the Delta from the San Joaquin River. The change in inflow could decrease, or be neutral to, CVP/SWP Delta water supplies. The potential effects to the CVP/SWP Delta water supply occur when either the Delta is in "balanced conditions" or when the Delta is in "excess conditions" and CVP/SWP exports are limited by the export/inflow ratio described by Decision 1641. The total potential net Delta water supply balance to the CVP/SWP is shown in Table 34.

For the conservation scenario, a potential net decrease in supply is shown for each year type. The decrease in net supply ranges from more than 4,900 acre-feet in a wet and above normal year, to more than 15,000 acre-feet during a dry year. These changes occur due to the development of the transfer water and also include counteractions in New Melones Reservoir releases to changes in the river system. For example, during the summer months when the tailwater recovery component is developing water by removing tailwater from the river system, New Melones Reservoir would also decrease flow in the river system as a result of providing less dilution flows. Thus, the CVP/SWP Delta supply would be affected by the compound effect of both actions. A portion of the CVP/SWP Delta supply impact is a result of and reflective of the gains or losses in New Melones Reservoir storage. The combined net effect on the two supplies should be considered when evaluating the impacts of the proposed transfer upon the CVP/SWP.

Table 34
Delta CVP/SWP Water Supply Effect – Alternative A Water Development

Incremental Change in Project Delta Supply due to Action - Acre-feet

A-1-0-S: 80 CONSERVATION SOURCE

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Total
Wet	0	-369	0	0	0	0	-2285	-2285	0	0	0	0	0	0	-4938
Above Normal	0	-369	0	0	0	0	-2285	-2285	0	0	0	0	0	0	-4938
Below Normal	0	0	0	0	0	-3097	-3084	-2935	0	0	0	0	0	0	-9116
Dry	0	0	-416	-559	-3129	-3097	-3084	-2935	-1406	-884	0	0	0	0	-15511
Critical	0	-1165	-342	-28	-55	-849	-1146	-960	-58	0	0	0	0	0	-4604

A-2-0-S: 80 GROUNDWATER SOURCE

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Total
Wet	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Above Normal	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Below Normal	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Dry	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Critical	0	-1165	-342	-28	-55	-849	-1146	-960	-58	0	0	0	0	0	-4604

A-3-0-S: 80 FALLOWING SOURCE

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Total
Wet	0	-89	0	0	0	0	-278	-245	0	0	0	0	0	0	-612
Above Normal	0	-89	0	0	0	0	-278	-245	0	0	0	0	0	0	-612
Below Normal	0	0	0	0	0	-278	-375	-314	0	0	0	0	0	0	-967
Dry	0	0	-39	-2	-18	-278	-375	-314	-19	0	0	0	0	0	-1046
Critical	0	-1165	-342	-28	-55	-849	-1146	-960	-58	0	0	0	0	0	-4604

For the groundwater scenario there is no effect to the CVP/SWP Delta supply, commensurate with no effect at Vernalis. The effect exhibited during a critical year is actually the same effect shown for the conservation and land fallowing scenarios, and is the effect of the land fallowing program that occurs during a critical year of all the scenarios. The effect of the land fallowing scenario for all noncritical years is a decrease of about 1,000 acre-feet or less.

In summary, Vernalis flows would be reduced by any of the source scenarios the Exchange Contractors employ. Conservation efforts as the source of water for transfers create the largest effect on Vernalis flows. Groundwater and land fallowing have the least effect on Vernalis flows due to their lesser interrelationship with the river. The effect during critical years is the same for each scenario since each scenario utilizes the same land fallowing program during such a year type. Water quality at Vernalis improves in each source scenario, although only slightly. New Melones Reservoir storage (and commensurately, in the opposite direction, Goodwin releases to the Stanislaus River) typically would gain or remain neutral in all scenarios. The Delta supply for the CVP/SWP would have a potential reduction in both the conservation and land fallowing scenarios, more so for the conservation scenario. The groundwater scenario does not affect the CVP/SWP Delta supply, except during critical years when a common land fallowing program is employed in each source scenario.

Hydrologic Effects Due to Combined Water Development and Transfer. In addition to the hydrologic effects that occur due to the development of the transfer water by the Exchange Contractors, hydrologic effects would occur from the disposition of that water to transferees. Also, Reclamation may respond, relative to the Existing Condition / Future No Action setting, in reaction to the Exchange Contractors providing (or not providing) transfer water to the San Joaquin Valley wildlife areas. Such a response may be the reduction of water acquisitions by Reclamation from other entities in favor of the transfer of water from the Exchange Contractors. The results presented in this section illustrate the combined effects of the development of transfer water by the Exchange Contractors and the delivery of the water to a variety of users including those not hydraulically connected to the San Joaquin River. The effects are illustrated in groupings concerned with the disposition of the transfer water.

All Water to Wildlife Areas (Refuges)

These scenarios result in up to 80,000 acre-feet transfer to wildlife areas. Generally, combined Level 2 and Level 4 deliveries to wildlife areas would occur year-round. The pattern of wildlife area deliveries generally is largest during early fall as flood-up operations occur. During late fall and winter the level of delivery maintains ponding in the wildlife areas. Pond drawdown begins in late winter, reducing deliveries. Seasonal irrigation (for food for wildlife) requires increased deliveries in late spring and summer. Deliveries then taper off until the flood-up operation recurs.

The incremental Level 4 deliveries appear primarily as a supplemental supply for irrigation within the wildlife areas. An amount of the incremental Level 4 deliveries also appear as a supplemental supply during the flood-up operations in the late summer. Water would be delivered to the San Joaquin Valley wildlife areas through the Delta-Mendota Canal, SWP facilities, local conveyance facilities, or delivery exchange agreements.

Water may be delivered to wildlife areas within or outside of the San Joaquin River drainage basin. For deliveries to areas within the drainage basin (the subject of this section), a change in San Joaquin River flows and quality would occur, due both to the Exchange Contractors developing the transfer water and the wildlife areas use and management of the transfer water. Currently, 63,365 acre-feet are being delivered as incremental Level 4 water supply to wildlife areas draining to the San Joaquin River. Another 12,329 acre-feet are currently being delivered to wildlife areas without hydrologic connectivity with the San Joaquin River. During noncritical years, these scenarios would increase wildlife area deliveries to full Level 4 quantities (103,014 acre-feet), inclusive of an incremental delivery to wildlife areas draining to the San Joaquin River (17,823 acre-feet). The indirect effects would also include a reduction in Reclamation acquisitions from entities other than the Exchange Contractors. During critical years, an incremental delivery of 40,000 acre-feet (50,000 acre-feet of developed water reduced by 20 percent for conveyance losses) would occur.

Flow at Vernalis would occasionally change. Refuge focus scenarios would provide additional water deliveries to San Joaquin Valley wildlife areas that discharge to the San Joaquin River. Simulated hydrologic effects at Vernalis resulting from this option are shown in Table 35. Changes in flow at Vernalis range from an increase of about 200 cfs to a decrease of almost 55 cfs. During wet years, the changes in flow at Vernalis are solely the result of the net effect of the development and disposition of transfer water. For the tailwater recovery emphasis scenario, the changes in flow reflect runoff from the wildlife area transferees during the early fall and the depletion of flow during other months by the tailwater recovery component. Winter months exhibit a minor amount of increased flow due to the reduction in Reclamation acquisitions from other San Joaquin Valley sources. In other noncritical years the monthly changes generally show the same trends, except during February of dry and below normal years and June of an above normal year when New Melones Reservoir reacts to flow changes caused by the transfers to maintain the Vernalis flow at the controlling flow objective. During all but wet years the flow at Vernalis is also at times affected by water quality release changes from New Melones Reservoir.

Table 35
Vernalis Flow Conditions – Alternative A, Refuge Focus

Benchmark Vernalis Flow - cfs														
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb
Wet	7500	13600	15700	13600	12000	7400	5100	3100	2500	3600	3000	4600	7500	13600
Above Normal	5800	7200	6200	5900	4600	2600	2100	2000	1500	2000	1800	2300	5800	7200
Below Normal	2300	3200	3300	3700	3700	2100	1900	1500	1200	1900	1700	2200	2300	3200
Dry	1900	2600	2300	2700	2200	1800	1400	1100	1000	1700	1600	2100	1900	2600
Critical	1300	1700	1600	1800	1500	1300	1000	1000	1000	1500	1400	1500	1300	1700

Change in Vernalis Flow with Action - cfs														
A-1-1-C: 80 CONSERVATION REFUGE COMPOSITE														
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb
Wet	-2	-19	-17	-31	-40	-41	-41	9	-25	-17	4	1	3	4
Above Normal	-2	-19	-17	-31	-40	0	-41	9	-25	-17	4	1	3	4
Below Normal	-2	0	-17	-31	-40	-54	-52	46	-25	-17	4	1	3	0
Dry	-2	0	-18	-43	-53	-54	-52	46	-25	-17	4	1	3	0
Critical	-3	-21	-2	0	-1	-14	-19	199	5	-1	11	2	8	15
A-2-1-C: 80 GROUNDWATER REFUGE COMPOSITE														
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb
Wet	0	0	0	-2	-2	-3	-4	46	-1	-2	4	1	3	4
Above Normal	0	0	0	-2	-2	0	-4	46	-1	-2	4	1	3	4
Below Normal	0	0	0	-2	-2	-2	-2	94	-1	-2	4	1	3	0
Dry	0	0	1	-1	-2	-2	-2	93	-1	-2	4	1	3	0
Critical	-3	-21	-2	0	-1	-14	-19	199	5	-1	11	2	8	15
A-3-1-C: 80 FALLOWING REFUGE COMPOSITE														
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb
Wet	-1	-5	-1	-2	-3	-7	-9	42	-2	-2	4	1	3	4
Above Normal	-1	-5	-1	-2	-3	0	-9	42	-2	-2	4	1	3	4
Below Normal	-1	0	-1	-2	-3	-7	-8	89	-2	-2	4	1	3	0
Dry	-1	0	-1	-1	-2	-7	-8	88	-2	-2	4	1	3	0
Critical	-3	-21	-2	0	-1	-14	-19	199	5	-1	11	2	8	15

For both the groundwater emphasis scenario and the land fallowing emphasis scenario, the spring-time and summer-time reduction in Vernalis flows is less in comparison to the conservation emphasis scenario. This outcome is due to these other two source options removing less return flows from the San Joaquin River.

No change in flow at Vernalis occurs during periods when it is assumed that flow objectives control (February of below normal and dry years, June of above normal years, and during the pulse flow periods during April and May). All scenarios have the same critical year effects, since only the land fallowing element is used during critical years. With the transfer, during the VAMP pulse flow period (mid-April through mid-May) the "existing flow" condition, as defined by the San Joaquin River Agreement (SJRA), may be slightly lower in noncritical years. The flow at Vernalis during this period is the result of the procedures and targets defined by the SJRA, and would likely be the same either with or without the transfer.

The water quality at Vernalis would also change due to the transfer. Table 36 shows the change in Vernalis water quality resulting from the transfers under each source emphasis. The table also illustrates the assumed existing condition/No Action Alternative water quality condition at Vernalis. Water quality changes at Vernalis trend with the net addition (runoff) and removal (reduction in return flows) of water within the river system. Deliveries to the wildlife areas result in additional return flows to the river with worse water quality than Existing Condition / Future No Action setting water quality at Vernalis. The development of the transfer water by the Exchange Contractors removes flow in the river also with a quality worse than the Existing Condition / Future No Action setting water quality at Vernalis. During periods when the water quality objective is assumed to control New Melones releases (indicated by the

700 and 1,000 µS/cm values in Table 36), no change in water quality would occur due to the counteraction at New Melones Reservoir for transfer-related San Joaquin River flow and quality changes. During other periods, the estimated change in water quality could be within a range of 14 µS/cm improvement to a 19 µS/cm degradation. The largest degradation in water quality is anticipated to occur during August when the majority of incremental return flows from the wildlife areas are expected to occur. Although the water quality at Vernalis may at times be degraded as a result of a refuge focus transfer, it is assumed that it would be mitigated by Reclamation operating New Melones Reservoir to continue to comply with water quality objectives consistent with past practice. Therefore, the transfer would not cause any additional noncompliance instances.

Table 36
Vernalis Water Quality Conditions – Alternative A, Refuge Focus

Benchmark Vernalis Water Quality - µmhos

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb
Wet	352	286	310	269	212	310	341	460	442	359	497	432	352	286
Above Normal	404	380	465	364	334	486	509	534	588	494	657	639	404	380
Below Normal	757	631	690	465	382	700	700	700	680	510	681	657	757	631
Dry	880	736	1000	700	700	700	700	700	772	547	708	678	880	736
Critical	1000	1000	1000	700	700	700	700	700	772	595	772	859	1000	1000

Change in Vernalis Water Quality with Action - µmhos

A-1-1-C: 80 CONSERVATION REFUGE COMPOSITE

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb
Wet	0	-2	-1	-2	-3	-3	-4	9	-5	-2	1	0	0	0
Above Normal	-1	-3	-2	-4	-7	-14	-7	13	-6	-3	1	0	0	1
Below Normal	-1	-8	-2	-6	-8	0	0	0	-6	-3	1	0	1	2
Dry	-1	-10	0	-	-	0	0	0	-5	-3	1	0	1	2
Critical	-2	0	0	-	-	0	0	0	2	0	3	0	1	0

A-2-1-C: 80 GROUNDWATER REFUGE COMPOSITE

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb
Wet	0	0	0	0	0	0	0	13	1	0	1	0	0	0
Above Normal	0	0	0	0	0	-1	0	19	1	0	1	0	0	1
Below Normal	0	0	0	0	0	0	0	0	1	0	1	0	1	2
Dry	0	0	0	-	-	0	0	0	1	0	1	0	1	2
Critical	-2	0	0	-	-	0	0	0	2	0	3	0	1	0

A-3-1-C: 80 FALLOWING REFUGE COMPOSITE

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb
Wet	0	0	0	0	0	0	0	13	1	0	1	0	0	0
Above Normal	0	-1	0	0	0	-2	-1	18	1	0	1	0	0	1
Below Normal	0	-2	0	0	0	0	0	0	1	0	1	0	1	2
Dry	0	-3	0	-	-	0	0	0	1	0	1	0	1	2
Critical	-2	0	0	-	-	0	0	0	2	0	3	0	1	0

Note: Values for April and May during dry and critical years have been omitted from the table due to modeling limitations. During the first half of April and the later half of May of these periods, Vernalis water quality objectives are assumed to control. During transfers it is assumed that New Melones releases would continue to provide compliance with the objectives; therefore, no change in water quality would occur.

New Melones Reservoir operations may be affected by the refuge focus transfers due to the linkage between its operations and San Joaquin River conditions. The potential changes in the net releases from New Melones Reservoir, for either Vernalis water quality or flow purposes, are illustrated in Table 37. The values are depicted as a change in New Melones Reservoir storage, and are directly representative of flow changes to the lower Stanislaus River at Goodwin Reservoir. Positive values indicate an increase in storage and a decrease in flow to the lower Stanislaus River.

For the refuge focus scenario, an overall annual decrease in New Melones Reservoir storage during non-wet years is anticipated. This decrease could range up to about 3,000 acre-feet in noncritical years, and is the net of gains in storage due to the Exchange Contractors removing drainage from the river and additional releases required to dilute the incremental drainage released from the wildlife areas. During critical years the effects could be larger, with over 5,000 acre-feet of reduced storage. These effects are due to the direct and indirect effects of providing water through the land fallowing component.

Table 37
Storage/Flow Change in New Melones Reservoir – Alternative A, Refuge Focus

Net Incremental Change in NM Storage due to Vernalis Flow & Quality Release Change - Acre-feet

A-1-1-C: 80 CONSERVATION REFUGE COMPOSITE

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Total
Wet	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Above Normal	0	0	0	0	0	-2467	0	0	0	0	0	0	0	0	-2467
Below Normal	0	-1054	0	0	0	751	674	-2285	0	0	0	0	0	234	-1680
Dry	0	-1054	67	701	826	751	674	-2259	0	0	0	0	0	234	-59
Critical	0	386	-97	-12	15	223	297	-6209	0	0	0	0	0	-267	-5665

A-2-1-C: 80 GROUNDWATER REFUGE COMPOSITE

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Total
Wet	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Above Normal	0	0	0	0	0	-182	0	0	0	0	0	0	0	0	-182
Below Normal	0	0	0	0	0	-62	-125	-2936	0	0	0	0	0	234	-2888
Dry	0	0	-68	-17	-18	-62	-125	-2909	0	0	0	0	0	234	-2965
Critical	0	386	-97	-12	15	223	297	-6209	0	0	0	0	0	-267	-5665

A-3-1-C: 80 FALLOWING REFUGE COMPOSITE

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Total
Wet	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Above Normal	0	0	0	0	0	-387	0	0	0	0	0	0	0	0	-387
Below Normal	0	-255	0	0	0	11	-28	-2866	0	0	0	0	0	234	-2904
Dry	0	-255	-55	-14	-13	11	-28	-2839	0	0	0	0	0	234	-2960
Critical	0	386	-97	-12	15	223	297	-6209	0	0	0	0	0	-267	-5665

The transfer program to the wildlife areas could affect inflows to the Delta from the San Joaquin River. The total net Delta water supply balance to the CVP/SWP is shown in Table 38.

Table 38
Delta CVP/SWP Water Supply Effect – Alternative A, Refuge Focus

Incremental Change in Project Delta Supply due to Action - Acre-feet

A-1-1-C: 80 CONSERVATION REFUGE COMPOSITE

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Total
Wet	0	-369	0	0	0	0	-2547	548	0	0	0	0	0	82	-2286
Above Normal	0	-369	0	0	0	0	-2547	548	0	0	0	0	0	82	-2286
Below Normal	0	0	0	0	0	-3218	-3222	2833	0	0	0	0	0	0	-3606
Dry	0	0	-389	-570	-3264	-3218	-3222	2807	-1495	-1011	0	0	0	0	-10362
Critical	0	-1165	-131	4	-55	-849	-1146	12252	312	-39	634	0	0	834	10650

A-2-1-C: 80 GROUNDWATER REFUGE COMPOSITE

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Total
Wet	0	0	0	0	0	0	-263	2833	0	0	0	0	0	82	2652
Above Normal	0	0	0	0	0	0	-263	2833	0	0	0	0	0	82	2652
Below Normal	0	0	0	0	0	-120	-137	5768	0	0	0	0	0	0	5510
Dry	0	0	27	-11	-135	-120	-137	5741	-89	-127	0	0	0	0	5149
Critical	0	-1165	-131	4	-55	-849	-1146	12252	312	-39	634	0	0	834	10650

A-3-1-C: 80 FALLOWING REFUGE COMPOSITE

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Total
Wet	0	-89	0	0	0	0	-540	2588	0	0	0	0	0	82	2040
Above Normal	0	-89	0	0	0	0	-540	2588	0	0	0	0	0	82	2040
Below Normal	0	0	0	0	0	-398	-512	5454	0	0	0	0	0	0	4543
Dry	0	0	-12	-13	-153	-398	-512	5427	-108	-127	0	0	0	0	4104
Critical	0	-1165	-131	4	-55	-849	-1146	12252	312	-39	634	0	0	834	10650

For the conservation scenario, a net decrease in supply is shown for each year except a critical year (the critical year effect is the same for all source scenarios, indicative of the same land fallowing component assumed in all critical years). The decrease in net supply ranges from a little more than 2,000 acre-feet in a wet year, to more than 10,000 acre-feet during below normal and dry years. During a critical year, a gain of over 10,000 acre-feet occurs. These changes occur not only due to the development and disposition of the transfer water, but also due to the New Melones Reservoir reaction to changes in the river system. For example, during the summer months when the conservation component is developing water by removing tailwater from the river system, New Melones Reservoir would also decrease flow in the river system as a result of providing less dilution flows. Thus, the CVP/SWP Delta supply would be affected by the compound effect of both actions. A portion of the CVP/SWP Delta supply impact is a result of and reflective of the gains or losses in New Melones Reservoir storage. The combined net effect on the two supplies should be considered when evaluating the impacts of the proposed transfer upon the CVP/SWP.

For the other two source options (groundwater and land fallowing), the effect during critical years would continue to be positive to the CVP/SWP supply, and during other years the balance would switch from being negative to the CVP/SWP to a net gain in supply to the CVP/SWP.

All Water to Agriculture

The agriculture focus scenarios would result in up to 80,000 acre-feet of transfer water being provided to CVP agricultural contractors. This water could be delivered to contractors within or outside of the drainage of the San Joaquin River. Potential CVP shortages to contractors within the drainage of the San Joaquin River substantiate the potential need for the entire 80,000 acre-feet of transfer to those entities. The direct effects of the Exchange Contractors developing transfer water are combined with the effects of the CVP contractors producing increased runoff to the San Joaquin River. Additional indirect effects occur due to Reclamation acquiring additional water for delivery to the wildlife areas from entities other than the Exchange Contractors.

The water transferred to agricultural users would essentially exchange the delivery of water from the Exchange Contractors to a CVP agricultural contractor. San Joaquin River flow and quality, New Melones Reservoir release, and Delta inflows would be affected as the result of both the Exchange Contractors developing transfer water and the additional effects of the transfers.

The agriculture focus scenarios would provide additional water deliveries to San Joaquin Valley CVP agricultural contractors that discharge to the San Joaquin River. Table 39 below illustrates the potential range in flow change at Vernalis that may occur as a result of this scenario. Simulated flow changes at Vernalis range from an increase of 13 cfs to a decrease of 46 cfs. Each year-type's flow changes are unique in reason, and differ due to the program assumed to develop the transfer water. During wet years, the changes in flow at Vernalis are solely the result of the net effect of the development and disposition of transfer water. For the conservation scenario, the changes in flow mostly reflect the net result of removing runoff from the Exchange Contractors and the addition of runoff from the agricultural transferees. A lesser effect occurs within the net amount due to an increase in Reclamation acquisitions from other San Joaquin Valley sources to satisfy wildlife area deliveries. In other noncritical years the monthly changes generally show the same trends, except during February of dry and below normal years and June of an above normal year when New Melones Reservoir reacts to flow changes caused by the transfers to maintain the Vernalis flow at the controlling flow objective. During all but wet years the flow at Vernalis is also at times affected by water quality release changes from New Melones Reservoir.

Table 39
Vernalis Flow Conditions – Alternative A, Agriculture Focus

Benchmark Vernalis Flow - cfs	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb
Wet	7500	13600	15700	13600	12000	7400	5100	3100	2500	3600	3000	4600	7500	13600
Above Normal	5800	7200	6200	5900	4600	2600	2100	2000	1500	2000	1800	2300	5800	7200
Below Normal	2300	3200	3300	3700	3700	2100	1900	1500	1200	1900	1700	2200	2300	3200
Dry	1900	2600	2300	2700	2200	1800	1400	1100	1000	1700	1600	2100	1900	2600
Critical	1300	1700	1600	1800	1500	1300	1000	1000	1000	1500	1400	1500	1300	1700

Change in Vernalis Flow with Action - cfs

A-1-2-C: 80 CONSERVATION AGRICULTURE COMPOSITE	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb
Wet	-2	-19	-16	-24	-30	-29	-24	-28	-11	-9	2	0	1	1
Above Normal	-2	-19	-16	-24	-30	0	-24	-28	-11	-9	2	0	1	1
Below Normal	-2	0	-16	-24	-30	-46	-43	-42	-11	-9	2	0	1	0
Dry	-2	0	-19	-37	-44	-46	-43	-41	-11	-9	2	0	1	0
Critical	-3	-21	-4	5	7	-5	-5	-5	13	6	2	0	1	1

A-2-2-C: 80 GROUNDWATER AGRICULTURE COMPOSITE	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb
Wet	0	0	1	5	8	9	13	10	13	6	2	0	1	1
Above Normal	0	0	1	5	8	0	13	10	13	6	2	0	1	1
Below Normal	0	0	1	5	8	6	7	6	13	6	2	0	1	0
Dry	0	0	1	5	7	6	7	7	13	6	2	0	1	0
Critical	-3	-21	-4	5	7	-5	-5	-5	13	6	2	0	1	1

A-3-2-C: 80 FALLOWING AGRICULTURE COMPOSITE	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb
Wet	-1	-5	0	5	7	6	8	6	13	6	2	0	1	1
Above Normal	-1	-5	0	5	7	0	8	6	13	6	2	0	1	1
Below Normal	-1	0	0	5	7	1	1	1	13	6	2	0	1	0
Dry	-1	0	-1	5	6	1	1	2	13	6	2	0	1	0
Critical	-3	-21	-4	5	7	-5	-5	-5	13	6	2	0	1	1

For both the groundwater scenario and the land fallowing scenario, the spring-time and summer-time reduction in Vernalis flows is reversed in comparison to the conservation scenario. This outcome is due to these other two source options removing less water from the San Joaquin River. No change in flow at Vernalis occurs during periods when it is assumed that flow objectives control (February of below normal and dry years, June of above normal years, and during the pulse flow periods during April and May). All scenarios have the same critical year effects, since only land fallowing element is used during critical years. With the transfer, during the VAMP pulse flow period (mid-April through mid-May) the "existing flow" condition, as defined by the SJRA, may be slightly lower in noncritical years. The flow at Vernalis during this period is the result of the procedures and targets defined by the SJRA, and would likely be the same either with or without the transfer. The water quality at Vernalis would also change due to the transfer. Table 40 shows the change in Vernalis water quality resulting from the transfers under each source option. The table also illustrates the assumed Existing Conditions / Future No Action setting water quality condition at Vernalis.

Table 40
Vernalis Water Quality Conditions – Alternative A, Agriculture Focus

Benchmark Vernalis Water Quality - µmhos

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb
Wet	352	286	310	269	212	310	341	460	442	359	497	432	352	286
Above Normal	404	380	465	364	334	486	509	534	588	494	657	639	404	380
Below Normal	757	631	690	465	382	700	700	700	680	510	681	657	757	631
Dry	880	736	1000	700	700	700	700	700	772	547	708	678	880	736
Critical	1000	1000	1000	700	700	700	700	700	772	595	772	859	1000	1000

Change in Vernalis Water Quality with Action - µmhos

A-1-2-C: 80 CONSERVATION AGRICULTURE COMPOSITE

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb
Wet	0	-2	-1	-2	-3	-3	-4	-6	-6	-2	0	0	0	0
Above Normal	-1	-3	-2	-4	-7	-11	-8	-7	-9	-3	0	0	0	0
Below Normal	-1	-8	-2	-6	-8	0	0	0	-9	-3	0	0	0	0
Dry	-1	-10	0	-	-	0	0	0	-8	-3	0	0	0	0
Critical	-2	0	0	-	-	0	0	0	-1	0	0	0	0	0

A-2-2-C: 80 GROUNDWATER AGRICULTURE COMPOSITE

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb
Wet	0	0	0	0	0	0	0	0	-1	0	0	0	0	0
Above Normal	0	0	0	0	0	2	-1	-1	-1	0	0	0	0	0
Below Normal	0	0	0	0	0	0	0	0	-1	0	0	0	0	0
Dry	0	0	0	-	-	0	0	0	-1	0	0	0	0	0
Critical	-2	0	0	-	-	0	0	0	-1	0	0	0	0	0

A-3-2-C: 80 FALLOWING AGRICULTURE COMPOSITE

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb
Wet	0	0	0	0	0	0	-1	-1	-1	0	0	0	0	0
Above Normal	0	-1	0	0	0	0	-2	-2	-2	0	0	0	0	0
Below Normal	0	-2	0	0	0	0	0	0	-2	0	0	0	0	0
Dry	0	-3	0	-	-	0	0	0	-1	0	0	0	0	0
Critical	-2	0	0	-	-	0	0	0	-1	0	0	0	0	0

Note: Values for April and May during dry and critical years have been omitted from the table due to modeling limitations. During the first half of April and the later half of May of these periods, Vernalis water quality objectives are assumed to control. During transfers it is assumed that New Melones releases would continue to provide compliance with the objectives; therefore, no change in water quality would occur.

Water quality changes at Vernalis trend with the net addition (runoff) and removal (reduction in return flows) of water within the river system. Deliveries to the agricultural contractors generally result in additional return flows to the river at a quality better than Existing Conditions / Future No Action setting water quality at Vernalis, and the development of the transfer water by the Exchange Contractors removes flow in the river, typically with worse water quality than Existing Conditions / Future No Action setting water quality at Vernalis. During periods when the water quality objective is assumed to control New Melones releases (indicated by the 700 and 1,000 µS/cm values in Table 40), no change in water quality would occur due to the counteraction at New Melones Reservoir for transfer-related San Joaquin River flow and quality changes. During other periods, the estimated change in water quality could be within a range of 11 µS/cm improvement to about a 2 µS/cm degradation.

The analysis indicates that water quality at Vernalis would improve or be neutral with the agriculture focus scenarios under all of the source scenarios. It is assumed that Reclamation would continue to operate New Melones Reservoir to comply with water quality objectives consistent with past practice. Therefore, the transfer would not cause any additional noncompliance instances.

New Melones Reservoir operations may be affected by the transfers due to the linkage between its operations and San Joaquin River conditions. The potential changes in the net releases from New Melones Reservoir, for either Vernalis water quality or flow purposes, are illustrated in Table 41. The values are depicted as a change in New Melones Reservoir storage, and are directly representative of flow changes to the lower Stanislaus River at Goodwin Reservoir. Positive values indicate an increase in storage and a decrease in flow to the lower Stanislaus River.

Table 41
Storage/Flow Change in New Melones Reservoir – Alternative A, Agriculture Focus

Net Incremental Change in NM Storage due to Vernalis Flow & Quality Release Change - Acre-feet

A-1-2-C: 80 CONSERVATION AGRICULTURE COMPOSITE	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Total
Wet	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Above Normal	0	0	0	0	0	-1731	0	0	0	0	0	0	0	0	-1731
Below Normal	0	-1054	0	0	0	1000	1181	876	0	0	0	0	0	56	2059
Dry	0	-1054	158	742	900	1000	1181	795	0	0	0	0	0	56	3777
Critical	0	386	47	-12	30	260	350	223	0	0	0	0	0	14	1296

A-2-2-C: 80 GROUNDWATER AGRICULTURE COMPOSITE	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Total
Wet	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Above Normal	0	0	0	0	0	554	0	0	0	0	0	0	0	0	554
Below Normal	0	0	0	0	0	187	381	226	0	0	0	0	0	56	851
Dry	0	0	23	24	56	187	381	145	0	0	0	0	0	56	872
Critical	0	386	47	-12	30	260	350	223	0	0	0	0	0	14	1296

A-3-2-C: 80 FALLOWING AGRICULTURE COMPOSITE	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Total
Wet	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Above Normal	0	0	0	0	0	349	0	0	0	0	0	0	0	0	349
Below Normal	0	-255	0	0	0	260	478	296	0	0	0	0	0	56	835
Dry	0	-255	36	26	60	260	478	214	0	0	0	0	0	56	877
Critical	0	386	47	-12	30	260	350	223	0	0	0	0	0	14	1296

For the agricultural water delivery focus scenarios, an overall annual increase in New Melones Reservoir storage occurs during most years under most of the source scenarios. This increase could range up to about 4,000 acre-feet in the conservation scenario. The exception is during an above normal year in the conservation scenario when the only change in New Melones Reservoir releases is the reaction to the net removal of flow from the river during June. Critical year effects are due to the direct and indirect effects of providing water through the land fallowing component.

The transfer program to the agricultural contractors could affect inflows to the Delta from the San Joaquin River. The total net Delta water supply balance to the CVP/SWP is shown in Table 42. For the conservation emphasis, a net decrease in CVP/SWP supply is shown for each year. The decrease in net

Table 42
Delta CVP/SWP Water Supply Effect – Alternative A, Agriculture Focus

Incremental Change in Project Delta Supply due to Action - Acre-feet

A-1-2-C: 80 CONSERVATION AGRICULTURE COMPOSITE	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Total
Wet	0	-369	0	0	0	0	-1486	-1697	0	0	0	0	0	20	-3533
Above Normal	0	-369	0	0	0	0	-1486	-1697	0	0	0	0	0	20	-3533
Below Normal	0	0	0	0	0	-2731	-2666	-2573	0	0	0	0	0	0	-7971
Dry	0	0	-399	-513	-2718	-2731	-2666	-2492	-635	-550	0	0	0	0	-12705
Critical	0	-1165	-273	325	432	-289	-338	-337	773	372	100	0	0	47	-354

A-2-2-C: 80 GROUNDWATER AGRICULTURE COMPOSITE	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Total
Wet	0	0	0	0	0	0	799	587	0	0	0	0	0	20	1406
Above Normal	0	0	0	0	0	0	799	587	0	0	0	0	0	20	1406
Below Normal	0	0	0	0	0	366	418	361	0	0	0	0	0	0	1146
Dry	0	0	17	46	411	366	418	443	771	334	0	0	0	0	2806
Critical	0	-1165	-273	325	432	-289	-338	-337	773	372	100	0	0	47	-354

A-3-2-C: 80 FALLOWING AGRICULTURE COMPOSITE	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Total
Wet	0	-89	0	0	0	0	521	343	0	0	0	0	0	20	794
Above Normal	0	-89	0	0	0	0	521	343	0	0	0	0	0	20	794
Below Normal	0	0	0	0	0	88	43	47	0	0	0	0	0	0	178
Dry	0	0	-22	44	393	88	43	128	752	334	0	0	0	0	1760
Critical	0	-1165	-273	325	432	-289	-338	-337	773	372	100	0	0	47	-354

supply during noncritical years ranges from a little more than 3,500 acre-feet in a wet and above normal year to almost 13,000 acre-feet during a dry year. During a critical year, a loss of about 300 acre-feet occurs (resulting from the land fallowing program that occurs in critical years of all source scenarios). These changes occur not only due to the development and disposition of the transfer water, but also due to the New Melones Reservoir reaction to changes in the river system. The combined net effect on the two supplies should be considered when evaluating the impacts of the proposed transfer upon the CVP/SWP.

For the other two source scenarios, the effect during critical years would continue to be a slight loss to the CVP/SWP supply, and during other years the balance would switch from being negative to the CVP/SWP to a net gain in supply to the CVP/SWP.

All Water Transferred Out of Basin

A secondary scenario of water being transferred to all wildlife purposes or to all agriculture and M&I users within the drainage of the San Joaquin River is the variation of the location of where that water is delivered, including transfers for CVP EAW replacement water. Hydrologically, San Joaquin River effects due to the disposition of water would not occur when the disposition of water has no connectivity with the San Joaquin River. For purposes of estimating hydrologic effects in the San Joaquin River, it does not matter if water is delivered to urban use, agricultural use, or wildlife area use outside of the San Joaquin River drainage basin; none of this use would have any return flow effect upon the San Joaquin River. The only effect of this option would be the direct effects caused by the development of the water for the transfer and the sometimes indirect effects of Reclamation actions of maintaining wildlife area deliveries consistent with the Existing Conditions / Future No Action setting.

This out-of-basin transfer would provide up to 80,000 acre-feet of water to uses (any combination of wildlife areas, agriculture, and urban) occurring outside the drainage of the San Joaquin River. These uses could include deliveries to the two refuges that do not have hydrologic connectivity to the San Joaquin River (Pixley and Kern NWRs located in the Tulare Lake Basin), SCVWD and SBCWD (located in the San Felipe Division), CVP water contractors of the Friant Division, and the Cross-Valley Contractors of the CVP.

These scenarios would provide additional water deliveries to areas that do not discharge to the San Joaquin River. Simulated hydrologic effects at Vernalis resulting from this scenario are shown in Table 43, which also shows the assumed Existing Conditions / Future No Action setting Vernalis flows.

Table 43
Vernalis Flow Conditions – Alternative A, Out-of-Basin Transfer

Benchmark Vernalis Flow - cfs	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb
Wet	7500	13600	15700	13600	12000	7400	5100	3100	2500	3600	3000	4600	7500	13600
Above Normal	5800	7200	6200	5900	4600	2600	2100	2000	1500	2000	1800	2300	5800	7200
Below Normal	2300	3200	3300	3700	3700	2100	1900	1500	1200	1900	1700	2200	2300	3200
Dry	1900	2600	2300	2700	2200	1800	1400	1100	1000	1700	1600	2100	1900	2600
Critical	1300	1700	1600	1800	1500	1300	1000	1000	1000	1500	1400	1500	1300	1700

Change in Vernalis Flow with Action - cfs

A-1-3-C: 80 CONSERVATION OUT COMPOSITE	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb
Wet	-2	-19	-18	-33	-43	-45	-47	-44	-33	-19	-1	0	0	-1
Above Normal	-2	-19	-18	-33	-43	0	-47	-44	-33	-19	-1	0	0	-1
Below Normal	-2	0	-18	-33	-43	-57	-55	-52	-33	-19	-1	0	0	0
Dry	-2	0	-20	-45	-56	-57	-55	-53	-33	-19	-1	0	0	0
Critical	-3	-21	-6	0	-1	-14	-19	-16	-1	0	0	0	0	0

A-2-3-C: 80 GROUNDWATER OUT COMPOSITE	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb
Wet	0	0	-1	-4	-5	-7	-9	-7	-9	-4	-1	0	0	-1
Above Normal	0	0	-1	-4	-5	0	-9	-7	-9	-4	-1	0	0	-1
Below Normal	0	0	-1	-4	-5	-4	-5	-4	-9	-4	-1	0	0	0
Dry	0	0	-1	-3	-5	-4	-5	-5	-9	-4	-1	0	0	0
Critical	-3	-21	-6	0	-1	-14	-19	-16	-1	0	0	0	0	0

A-3-3-C: 80 FALLOWING OUT COMPOSITE	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb
Wet	-1	-5	-2	-4	-6	-10	-14	-11	-10	-4	-1	0	0	-1
Above Normal	-1	-5	-2	-4	-6	0	-14	-11	-10	-4	-1	0	0	-1
Below Normal	-1	0	-2	-4	-6	-9	-11	-9	-10	-4	-1	0	0	0
Dry	-1	0	-2	-4	-5	-9	-11	-10	-10	-4	-1	0	0	0
Critical	-3	-21	-6	0	-1	-14	-19	-16	-1	0	0	0	0	0

Simulated flow changes at Vernalis range from no change to a decrease of 57 cfs. A year-type's flow changes are usually unique in reason, and differ due to the program assumed to develop the transfer water. The changes in flow at Vernalis are the primarily the result of the direct effect of the development of transfer water and the effects of New Melones Reservoir reacting to Vernalis flow and quality conditions. The results also include the indirect effect of Reclamation increasing its acquisition of water supplies from entities other than the Exchange Contractors for wildlife area deliveries. The greatest potential flow differences occur for the conservation scenario. The changes in flow reflect the depletion of flow during the year by the tailwater recovery component and the reduction of runoff from entities that Reclamation acquires water for wildlife area deliveries. During February of dry and below normal years and June of an above normal year, New Melones Reservoir reacts to flow changes caused by the transfers to maintain the Vernalis flow at the controlling flow objective, which results in no flow change occurring at Vernalis. During all but wet years the flow at Vernalis is also at times affected by water quality release changes from New Melones Reservoir. During critical years, the flow change at Vernalis is always reflective of the effect of the land fallowing source of water.

For both the groundwater scenario and the land fallowing scenario, the spring-time and summer-time reduction in Vernalis flows is less in comparison to the conservation scenario. This outcome is due to these other two source options removing less return flows from the San Joaquin River. With the transfer, during the VAMP pulse flow period (mid-April through mid-May) the "existing flow" condition (as defined by the SJRA) may be slightly lower. The flow at Vernalis during this period is the result of the procedures and targets defined by the SJRA, and would likely be the same either with or without the transfer.

Water quality at Vernalis would also change due to the transfer. Table 44 shows the change in Vernalis water quality resulting from the transfers under each source scenario. The table also illustrates the assumed Existing Conditions / Future No Action setting water quality condition at Vernalis. Water quality changes at Vernalis trend with the removal (reduction in return flows) of water within the river system. The development of the transfer water by the Exchange Contractors would remove flow in the river, typically with a quality worse than the existing condition/No Action Alternative water quality at Vernalis. During periods when the water quality objective is assumed to control New Melones releases (indicated by the 700 and 1000 µS/cm values in Table 44), no change in water quality would occur due to

Table 44
Vernalis Water Quality Conditions – Alternative A, Out-of-Basin Transfer

Benchmark Vernalis Water Quality - µmhos

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb
Wet	352	286	310	269	212	310	341	460	442	359	497	432	352	286
Above Normal	404	380	465	364	334	486	509	534	588	494	657	639	404	380
Below Normal	757	631	690	465	382	700	700	700	680	510	681	657	757	631
Dry	880	736	1000	700	700	700	700	700	772	547	708	678	880	736
Critical	1000	1000	1000	700	700	700	700	700	772	595	772	859	1000	1000

Change in Vernalis Water Quality with Action - µmhos

A-1-3-C: 80 CONSERVATION OUT COMPOSITE

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb
Wet	0	-2	-1	-2	-3	-3	-4	-5	-5	-2	0	0	0	0
Above Normal	-1	-3	-2	-4	-7	-14	-7	-6	-6	-3	0	0	0	0
Below Normal	-1	-8	-2	-6	-9	0	0	0	-6	-3	0	0	0	0
Dry	-1	-10	0	-	-	0	0	0	-6	-3	0	0	0	0
Critical	-2	0	0	-	-	0	0	0	0	0	0	0	0	0

A-2-3-C: 80 GROUNDWATER OUT COMPOSITE

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb
Wet	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Above Normal	0	0	0	0	0	-1	1	1	1	0	0	0	0	0
Below Normal	0	0	0	0	0	0	0	0	1	0	0	0	0	0
Dry	0	0	0	-	-	0	0	0	1	0	0	0	0	0
Critical	-2	0	0	-	-	0	0	0	0	0	0	0	0	0

A-3-3-C: 80 FALLOWING OUT COMPOSITE

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb
Wet	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Above Normal	0	-1	0	0	0	-2	0	0	1	0	0	0	0	0
Below Normal	0	-2	0	0	0	0	0	0	1	0	0	0	0	0
Dry	0	-3	0	-	-	0	0	0	1	0	0	0	0	0
Critical	-2	0	0	-	-	0	0	0	0	0	0	0	0	0

Note: Values for April and May during dry and critical years have been omitted from the table due to modeling limitations. During the first half of April and the later half of May of these periods, Vernalis water quality objectives are assumed to control. During transfers it is assumed that New Melones releases would continue to provide compliance with the objectives; therefore, no change in water quality would occur.

the anticipated counteraction at New Melones Reservoir for transfer-related San Joaquin River flow and quality changes. During other periods, the estimated change in water quality would be an improvement, if not a nearly neutral effect in quality. The transfer would not cause any additional noncompliance instances at Vernalis.

The flow and quality effects of the transfer to the San Joaquin River upstream of the Stanislaus River could trigger a change in releases from New Melones Reservoir to counter such effects. The potential changes in the net releases from New Melones Reservoir, for either Vernalis water quality or flow purposes, are illustrated in Table 45. The values are depicted as a change in New Melones Reservoir storage, and are directly representative of flow changes to the lower Stanislaus River at Goodwin Reservoir. Positive values indicate an increase in storage and a decrease in flow to the lower Stanislaus River.

Table 45
Storage Change in New Melones Reservoir – Alternative A, Out-of-Basin Transfer

Net Incremental Change in NM Storage due to Vernalis Flow & Quality Release Change - Acre-feet

A-1-3-C: 80 CONSERVATION OUT COMPOSITE	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Total
Wet	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Above Normal	0	0	0	0	0	-2685	0	0	0	0	0	0	0	0	-2685
Below Normal	0	-1054	0	0	0	677	524	487	0	0	0	0	0	-41	593
Dry	0	-1054	118	701	804	677	524	546	0	0	0	0	0	-41	2275
Critical	0	386	39	8	15	223	297	213	0	0	0	0	0	0	1180

A-2-3-C: 80 GROUNDWATER OUT COMPOSITE	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Total
Wet	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Above Normal	0	0	0	0	0	-401	0	0	0	0	0	0	0	0	-401
Below Normal	0	0	0	0	0	-136	-276	-163	0	0	0	0	0	-41	-616
Dry	0	0	-17	-17	-40	-136	-276	-105	0	0	0	0	0	-41	-631
Critical	0	386	39	8	15	223	297	213	0	0	0	0	0	0	1180

A-3-3-C: 80 FALLOWING OUT COMPOSITE	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Total
Wet	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Above Normal	0	0	0	0	0	-606	0	0	0	0	0	0	0	0	-606
Below Normal	0	-255	0	0	0	-63	-178	-94	0	0	0	0	0	-41	-631
Dry	0	-255	-4	-14	-35	-63	-178	-35	0	0	0	0	0	-41	-626
Critical	0	386	39	8	15	223	297	213	0	0	0	0	0	0	1180

Accumulated changes in New Melones Reservoir storage vary by year type and source option. Changing releases from New Melones Reservoir would change the flow rate in the Lower Stanislaus River. The potential change in flow ranges from a reduction of up to 13 cfs during March through August (during dry years, and intermittent months in other years) to an increase of up to 45 cfs during June (during above normal years). When a reduction in flow is calculated, the reduction may not actually be allowed because another release objective may require the continuation of some level of that release. Modeling limitations did not allow the identification of such circumstances.

An indirect impact that may result from a change in New Melones Reservoir operations would be the allocation of water to uses within the Interim Plan of Operations, including impacts to water users and fish and water quality purposes. For these out-of-basin transfer scenarios, the estimated change in storage at New Melones Reservoir in a year could range between a gain of over 2,000 acre-feet (during a dry year for the conservation scenario) to a decrease in storage almost 2,700 acre-feet (during an above normal year for the conservation scenario).

The transfer program could affect inflows to the Delta from the San Joaquin River. At different times the change in inflow could increase, decrease, or be neutral to the CVP/SWP water supplies. The total net Delta water supply balance to the CVP/SWP is shown in Table 46. For the conservation scenario, a net decrease in supply is shown for each year. The decrease in net supply ranges from about 4,600 acre-feet in a critical year to more than 17,000 acre-feet during a below normal year. Within the other source scenarios the maximum potential effect of the transfer is less than 4,600 acre-feet (all source scenarios have the same imbedded critical year program utilizing land fallowing). These changes would occur due to the development of the transfer water and the indirect action of Reclamation acquiring additional supplies for wildlife area deliveries, and are compounded by the New Melones Reservoir reaction to changes in the river system. A portion of the CVP/SWP Delta supply impact is a result of and reflective of the gains or losses in New Melones Reservoir storage. The combined net effect on the two supplies should be considered when evaluating the impacts of the proposed transfer upon the CVP/SWP.

Table 46
Delta CVP/SWP Water Supply Effect – Alternative A, Out-of-Basin Transfer

Incremental Change in Project Delta Supply due to Action - Acre-feet

A-1-3-C: 80 CONSERVATION OUT COMPOSITE

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Total
Wet	0	-369	0	0	0	0	-2863	-2710	0	0	0	0	0	-14	-5956
Above Normal	0	-369	0	0	0	0	-2863	-2710	0	0	0	0	0	-14	-5956
Below Normal	0	0	0	0	0	-3363	-3387	-3196	0	0	0	0	0	0	-9946
Dry	0	0	-428	-592	-3427	-3363	-3387	-3255	-1964	-1126	0	0	0	0	-17542
Critical	0	-1165	-342	-28	-55	-849	-1146	-960	-58	0	0	0	0	0	-4604

A-2-3-C: 80 GROUNDWATER OUT COMPOSITE

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Total
Wet	0	0	0	0	0	0	-578	-425	0	0	0	0	0	-14	-1017
Above Normal	0	0	0	0	0	0	-578	-425	0	0	0	0	0	-14	-1017
Below Normal	0	0	0	0	0	-265	-302	-262	0	0	0	0	0	0	-829
Dry	0	0	-12	-33	-297	-265	-302	-320	-558	-242	0	0	0	0	-2031
Critical	0	-1165	-342	-28	-55	-849	-1146	-960	-58	0	0	0	0	0	-4604

A-3-3-C: 80 FALLOWING OUT COMPOSITE

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Total
Wet	0	-89	0	0	0	0	-856	-670	0	0	0	0	0	-14	-1629
Above Normal	0	-89	0	0	0	0	-856	-670	0	0	0	0	0	-14	-1629
Below Normal	0	0	0	0	0	-543	-677	-576	0	0	0	0	0	0	-1796
Dry	0	0	-51	-35	-316	-543	-677	-635	-577	-242	0	0	0	0	-3076
Critical	0	-1165	-342	-28	-55	-849	-1146	-960	-58	0	0	0	0	0	-4604

In summary, all scenarios of Alternative A would cause changes to flows at Vernalis. Decreases in flows would generally occur year-round with the conservation scenario except during August when deliveries to wildlife areas may create additional runoff that exceeds the reduction in flow caused by tailwater recover. For the groundwater and land fallowing scenarios, the change in flow at Vernalis is almost neutral, or a gain, regardless of the location of transfer water use (disposition). Only minor changes to water quality occur at Vernalis under any source or disposition combination. The potential change in New Melones Reservoir storage and releases to the lower Stanislaus River is variable. The range in variability is less within the agricultural and out-of-basin disposition scenarios. Deliveries to in-basin wildlife areas using conservation typically result in the potential for reductions to New Melones Reservoir storage. The conservation scenario with delivery to the refuges produces the largest change, over 5,000 acre-feet reduction in storage during a critical year. The other combinations of source and disposition lead to smaller changes and generally gains in storage or a relatively smaller decreased storage. The potential effect on water supply allocations under the Interim Plan of Operations would also vary in relation to the accumulated change in New Melones Reservoir storage. The potential CVP/SWP Delta supply effect is also variable by year type, supply source and disposition. Generally, utilizing conservation results in the greatest exposure to decreases in CVP/SWP Delta supplies. Transferring water out-of-basin also typically results in exposure to a decrease in CVP/SWP Delta supplies. In-basin utilization of transfers developed from groundwater or land fallowing typically leads to increases in CVP/SWP Delta supplies.

Alternative B – 50/50

This alternative provides an evaluation of a transfer opportunity solely reliant upon voluntary crop idling/temporary land fallowing as the source of transfer water. Up to 50,000 acre-feet of water will be transferred in any year. The Exchange Contractors would use land fallowing as the means to reduce their need for delivery of CVP substitute water. The reduction in delivery to the Exchange Contractors would be provided to any of the potential transferees.

Hydrologic Effects Due to Water Development. Only the land fallowing method of developing transfer water is evaluated in this alternative. For the land fallowing scenario, the Exchange Contractors would develop 50,000 acre-feet of water for transfer during all year types. The effect on San Joaquin River hydrology occurs as irrigated acres are reduced due to land fallowing and less runoff would occur. Of the 50,000 acre-feet to be developed, 42,000 acre-feet are assumed to have hydrologic connectivity with the San Joaquin River and the other 8,000 acre-feet are assumed to be associated with lands that do not have drainage to the San Joaquin River that affects Vernalis flows. Simulated hydrologic effects at

Vernalis resulting from this scenario in each year type are shown in Table 47, which also includes the assumed Existing Conditions / Future No Action setting Vernalis flows.

Table 47
Vernalis Flow Conditions – Alternative B Water Development

Benchmark Vernalis Flow - cfs

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb
Wet	7500	13600	15700	13600	12000	7400	5100	3100	2500	3600	3000	4600	7500	13600
Above Normal	5800	7200	6200	5900	4600	2600	2100	2000	1500	2000	1800	2300	5800	7200
Below Normal	2300	3200	3300	3700	3700	2100	1900	1500	1200	1900	1700	2200	2300	3200
Dry	1900	2600	2300	2700	2200	1800	1400	1100	1000	1700	1600	2100	1900	2600
Critical	1300	1700	1600	1800	1500	1300	1000	1000	1000	1500	1400	1500	1300	1700

Change in Vernalis Flow with Action - cfs

B-3-0-S: 50 FALLOWING SOURCE

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb
Wet	-3	-14	-5	0	-1	-11	-14	-12	-1	0	0	0	0	0
Above Normal	-3	-14	-5	0	-1	0	-14	-12	-1	0	0	0	0	0
Below Normal	-3	0	-5	0	-1	-14	-19	-16	-1	0	0	0	0	0
Dry	-3	0	-6	0	-1	-14	-19	-16	-1	0	0	0	0	0
Critical	-3	-21	-6	0	-1	-14	-19	-16	-1	0	0	0	0	0

For each acre-foot of water developed, only a small portion of that water is removed from the river. Therefore, this alternative results in a relatively small effect to Vernalis flows. This analysis assumes cotton to be representative of the crop fallowed, and therefore, the effect has a pattern associated with its irrigation. Certain months (e.g., June of an above-normal year and February in below normal and dry years) show no change in flow. This is due to the New Melones Reservoir releases required to meet flow or water quality criteria at Vernalis. During certain other months, when New Melones Reservoir operations are maintaining required water quality conditions at Vernalis, the flow change at Vernalis is the combination of both the effects of the Exchange Contractors developing the transfer water and the counteraction by New Melones Reservoir releases to maintain the water quality conditions at Vernalis.

Water quality at Vernalis may also change due to the development of transfer water by the Exchange Contractors. Table 48 shows the change in water quality at Vernalis for Alternative B. Water quality changes at Vernalis trend with the changes in flow at Vernalis. The water quality associated with the flows affected by land fallowing is assumed to have the same water quality as tailwater recapture. Since this quality is worse than the melded water quality at Vernalis, the removal of runoff by the Exchange Contractors would improve water quality at Vernalis. For those months with no change in water quality but with a change in flow, New Melones Reservoir releases are maintaining the water quality requirement at Vernalis.

Table 48
Vernalis Water Quality Conditions – Alternative B Water Development

Benchmark Vernalis Water Quality - µmhos

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb
Wet	352	286	310	269	212	310	341	460	442	359	497	432	352	286
Above Normal	404	380	465	364	334	486	509	534	588	494	657	639	404	380
Below Normal	757	631	690	465	382	700	700	700	680	510	681	657	757	631
Dry	880	736	1000	700	700	700	700	700	772	547	708	678	880	736
Critical	1000	1000	1000	700	700	700	700	700	772	595	772	859	1000	1000

Change in Vernalis Water Quality with Action - µmhos

B-3-0-S: 50 FALLOWING SOURCE

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb
Wet	-1	-1	0	0	0	-1	-2	-2	0	0	0	0	0	0
Above Normal	-1	-2	-1	0	0	-4	-3	-2	0	0	0	0	0	0
Below Normal	-1	-6	-1	0	0	0	0	0	0	0	0	0	0	0
Dry	-1	-8	0	-	-	0	0	0	0	0	0	0	0	0
Critical	-2	0	0	-	-	0	0	0	0	0	0	0	0	0

Note: Values for April and May during dry and critical years have been omitted from the table due to modeling limitations. During the first half of April and the later half of May of these periods, Vernalis water quality objectives are assumed to control. During transfers it is assumed that New Melones releases would continue to provide compliance with the objectives; therefore, no change in water quality would occur.

New Melones Reservoir operations may be affected by the Exchange Contractors' development of transfer water due to the linkage between its operations and San Joaquin River conditions. The potential changes in the net releases from New Melones Reservoir, for either Vernalis water quality or flow purposes, are shown in Table 49. The values are depicted as a change in New Melones Reservoir storage, and are directly related to changes in flow to the lower Stanislaus River at Goodwin Reservoir. Positive values indicate an increase in storage and a decrease in flow to the lower Stanislaus River.

Table 49
Change in Storage in New Melones Reservoir – Alternative B Water Development

Net Incremental Change in NM Storage due to Vernalis Flow & Quality Release Change - Acre-feet

B-3-0-S: 50 FALLOWING SOURCE

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Total
Wet	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Above Normal	0	0	0	0	0	-626	0	0	0	0	0	0	0	0	-626
Below Normal	0	-779	0	0	0	223	297	213	0	0	0	0	0	0	-47
Dry	0	-779	39	8	15	223	297	213	0	0	0	0	0	0	15
Critical	0	386	39	8	15	223	297	213	0	0	0	0	0	0	1180

The changes shown in Table 49 indicate the releases from New Melones that would be required to counter the effect of developing the transfer water on maintaining Vernalis flow and quality conditions exactly at the Vernalis objective compliance level. Accumulated changes in New Melones Reservoir storage vary by year type, but the change in storage within a year is less than 1,200 acre-feet, positive or negative. The potential changes in flow to the lower Stanislaus River mirror the changes in the New Melones storage. The change in flow ranges from an increase of 14 cfs during February (during below normal and dry years, for flow objective at Vernalis) to a decrease of up to 7 cfs during February during a critical year. However, when a reduction in flow is calculated, the reduction may not actually be allowed because another release objective may require the continuation of some level of that release. Modeling limitations did not allow the identification of such circumstances.

The development of transfer water could affect inflows to the Delta from the San Joaquin River. The total net Delta water supply balance to the CVP/SWP is shown in Table 50. The decrease in net supply ranges from about 1,900 acre-feet in a wet and above normal year, to more than 4,600 acre-feet during a critical year. These changes occur due to the development of the transfer water and also include counteractions in New Melones Reservoir releases to changes in the river system.

Table 50
Delta CVP/SWP Water Supply Effect – Alternative B Water Development

Incremental Change in Project Delta Supply due to Action - Acre-feet

B-3-0-S: 50 FALLOWING SOURCE

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	
Wet	0	-273	0	0	0	0	-849	-748	0	0	0	0	0	0	-1869
Above Normal	0	-273	0	0	0	0	-849	-748	0	0	0	0	0	0	-1869
Below Normal	0	0	0	0	0	-849	-1146	-960	0	0	0	0	0	0	-2955
Dry	0	0	-120	-6	-55	-849	-1146	-960	-58	0	0	0	0	0	-3194
Critical	0	-1165	-342	-28	-55	-849	-1146	-960	-58	0	0	0	0	0	-4604

In summary, flows in the San Joaquin River at Vernalis would be reduced by development of transfer water through land fallowing. Water quality at Vernalis improves slightly. This alternative would have a minor effect on storage in New Melones Reservoir (and commensurately Goodwin releases to the Stanislaus River). Storage could change within a range of plus or minus 1,200 acre-feet. The Delta supply for the CVP/SWP may be slightly reduced but by a minor amount, less than 5,000 acre-feet.

Hydrologic Effects Due to Combined Water Development and Transfer. In addition to the hydrologic effects that occur due to the development of the transfer water by the Exchange Contractors through land fallowing, additional hydrologic effects would occur from the disposition of that water to transferees. Also, Reclamation may respond, relative to the Existing Conditions / Future No Action setting, in reaction to the Exchange Contractors providing transfer water to the San Joaquin Valley wildlife areas. Such a response may be a reduction in water acquisitions from other entities in favor of the transfer of water from the Exchange Contractors. The results presented in this section illustrate the combination of the direct hydrologic effects of the development of transfer water by the Exchange

Contractors and the additional indirect effects that result from the circumstances just described. The effects are illustrated by category of transfer disposition.

All Water to Refuges

The refuge focus scenario would result in up to a 50,000 acre-foot transfer to wildlife areas in all years. Water would be delivered to the San Joaquin Valley wildlife areas through the Delta-Mendota Canal, SWP facilities, local conveyance facilities, or delivery exchange agreements. Water may be delivered to wildlife areas within or outside of the San Joaquin River drainage basin. For deliveries to areas within the drainage basin (the subject of this section), a change in San Joaquin River flows and quality would occur. The change would be due to the Exchange Contractors developing the transfer water (direct effects illustrated above) and as the result of the wildlife areas' use and management of the transfer water. Other indirect effects would occur due to Reclamation changing its acquisitions from entities other than the Exchange Contractors. With a transfer from the Exchange Contractors to Reclamation for delivery to wildlife areas, an incremental delivery of 17,823 acre-feet of incremental Level 4 supply would occur to wildlife areas in the drainage of the San Joaquin River during noncritical years. During critical years, an incremental delivery of 40,000 acre-feet (50,000 acre-feet of developed water, reduced 20 percent for conveyance losses) would be delivered to wildlife areas.

The refuge focus scenario would provide additional water deliveries to San Joaquin Valley wildlife areas that discharge to the San Joaquin River. Hydrologic effects at Vernalis resulting from this scenario are shown in Table 51, which also shows the Existing Conditions / Future No Action setting flows. Changes in average monthly flows at Vernalis range from an increase of almost 200 cfs (during August in a critical year) to a decrease of about 20 cfs. The changes in flow reflect the net effect of incremental runoff from the wildlife area transferees during August and subsequent fall and winter months and the slight depletion of flow during agricultural irrigation season as a result of reduced return flows associated with the reduction in irrigated acreage. During February of dry and below normal years and June of an above normal year, New Melones Reservoir reacts to flow changes caused by the transfers to maintain the Vernalis flow at the controlling flow objective. During all but wet years the flow at Vernalis is also at times affected by changes in water quality releases from New Melones Reservoir.

Table 51
Vernalis Flow Conditions – Alternative B, Refuge Focus

Benchmark Vernalis Flow - cfs

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb
Wet	7500	13600	15700	13600	12000	7400	5100	3100	2500	3600	3000	4600	7500	13600
Above Normal	5800	7200	6200	5900	4600	2600	2100	2000	1500	2000	1800	2300	5800	7200
Below Normal	2300	3200	3300	3700	3700	2100	1900	1500	1200	1900	1700	2200	2300	3200
Dry	1900	2600	2300	2700	2200	1800	1400	1100	1000	1700	1600	2100	1900	2600
Critical	1300	1700	1600	1800	1500	1300	1000	1000	1000	1500	1400	1500	1300	1700

Change in Vernalis Flow with Action - cfs

B-3-1-C: 50 FALLOWING REFUGE COMPOSITE

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb
Wet	-3	-14	-5	-3	-5	-16	-22	31	-6	-4	4	1	3	4
Above Normal	-3	-14	-5	-3	-5	0	-22	31	-6	-4	4	1	3	4
Below Normal	-3	0	-5	-3	-5	-18	-23	76	-6	-4	4	1	3	0
Dry	-3	0	-5	-3	-5	-18	-23	76	-6	-4	4	1	3	0
Critical	-3	-21	-2	0	-1	-14	-19	199	5	-1	11	2	8	15

With the transfer, during the VAMP pulse flow period (mid-April through mid-May), the "existing flow" condition (as defined by the SJRA) may be slightly lower than in the existing condition/No Action Alternative setting. The flow at Vernalis during this period is the result of the procedures and targets defined by the SJRA, and would likely be the same either with or without the transfer.

Water quality at Vernalis would also change due to the transfer. Table 52 shows the change in Vernalis water quality that would result from the transfers for this alternative. The table also shows the assumed existing condition/No Project Alternative water quality condition at Vernalis. Water quality changes at Vernalis trend with the net addition (runoff) and removal (reduction in return flows) of water within the river system. Deliveries to the wildlife areas would result in return flows to the river with worse quality than the water quality at Vernalis. The development of the transfer water by the Exchange Contractors would remove a minor amount of flow in the river, also with a quality worse than the water quality at Vernalis. During periods when the pre-transfer water quality objective is assumed to control

New Melones releases (indicated by the 700 and 1,000 µS/cm values in Table 52) no change in water quality would occur since it was assumed that Reclamation would mitigate increases with releases from New Melones Reservoir for transfer-related San Joaquin River flow and quality changes. During other periods, the estimated change in water quality could change within a range of minor improvement (8 µS/cm) to 17 µS/cm degradation.

Table 52
Vernalis Water Quality Conditions – Alternative B, Refuge Focus

Benchmark Vernalis Water Quality - µmhos

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb
Wet	352	286	310	269	212	310	341	460	442	359	497	432	352	286
Above Normal	404	380	465	364	334	486	509	534	588	494	657	639	404	380
Below Normal	757	631	690	465	382	700	700	700	680	510	681	657	757	631
Dry	880	736	1000	700	700	700	700	700	772	547	708	678	880	736
Critical	1000	1000	1000	700	700	700	700	700	772	595	772	859	1000	1000

Change in Vernalis Water Quality with Action - µmhos

B-3-1-C: 50 FALLOWING REFUGE COMPOSITE

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb
Wet	-1	-1	0	0	0	-1	-2	12	1	0	1	0	0	0
Above Normal	-1	-2	0	0	0	-5	-2	17	1	0	1	0	0	1
Below Normal	-1	-6	0	0	0	0	0	0	2	0	1	0	1	2
Dry	-1	-8	0	0	0	0	0	0	1	0	1	0	1	2
Critical	-2	0	0	0	0	0	0	0	2	0	3	0	1	0

Note: Values for April and May during dry and critical years have been omitted from the table due to modeling limitations. During the first half of April and the later half of May of these periods, Vernalis water quality objectives are assumed to control. During transfers it is assumed that New Melones releases would continue to provide compliance with the objectives; therefore, no change in water quality would occur.

Although the water quality at Vernalis may at times be degraded as a result of the transfer, it is anticipated that Reclamation would operate New Melones Reservoir to continue to comply with water quality objectives consistent with past practice. Therefore, the transfer would not cause any additional noncompliance instances.

New Melones Reservoir operations may be affected by the transfers due to the linkage between its operations and San Joaquin River conditions. The potential changes in storage in New Melones Reservoir are shown in Table 53. The values are directly related to flow changes to the lower Stanislaus River at Goodwin Reservoir. Positive values indicate an increase in storage and a decrease in flow to the lower Stanislaus River.

The changes shown in Table 53 indicate the releases from New Melones that would be required to counter the effect of developing the transfer water on maintaining Vernalis flow and quality conditions exactly at the Vernalis objective compliance level. Accumulated changes in New Melones Reservoir storage vary in magnitude by year type, but the reduction in storage within a year is less than 6,000 acre-feet. The potential change in flow to the lower Stanislaus River mirror the changes in the New Melones storage. The change in flow ranges from an increase of 101 cfs during August for water quality purposes to a decrease of up to 7 cfs during February. However, when a reduction in flow is calculated, the reduction may not actually be allowed because another release objective may require the continuation of some level of that release. Modeling limitations did not allow the identification of such circumstances.

Table 53
Change in Storage in New Melones Reservoir – Alternative B, Refuge Focus

Net Incremental Change in NM Storage due to Vernalis Flow & Quality Release Change - Acre-feet

B-3-1-C: 50 FALLOWING REFUGE COMPOSITE

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Total
Wet	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Above Normal	0	0	0	0	0	-968	0	0	0	0	0	0	0	0	-968
Below Normal	0	-779	0	0	0	107	62	-2788	0	0	0	0	0	218	-3180
Dry	0	-779	-36	-16	-19	107	62	-2738	0	0	0	0	0	218	-3200
Critical	0	386	-97	-12	15	223	297	-6209	0	0	0	0	0	-267	-5665

An indirect impact that may result from a change in New Melones Reservoir operations is the allocation of water to uses within the Interim Plan of Operations, including impacts to water users and fish and water quality purposes. For the refuge focus scenario, the estimated reduction in storage at New

Melones Reservoir in a year ranges from zero in a wet year to over 5,600 acre-feet during a critical year. The majority of the effect of a change in New Melones Reservoir storage would not be realized during the current year of the transfer, but instead during the subsequent year or years when water supply allocations are subsequently determined. If the following year is dry, the previous year's effect in storage would translate to relatively small allocation changes to lower Stanislaus River purposes and potentially no change in allocations to CVP contractors. If the following year is normal or wetter, more noticeable changes to allocations would occur. In the wettest of conditions, allocations would not change.

The transfer program could affect inflows to the Delta from the San Joaquin River. The total net Delta water supply balance to the CVP/SWP is shown in Table 54.

Table 54
Delta CVP/SWP Water Supply Effect – Alternative B, Refuge Focus

Incremental Change in Project Delta Supply due to Action - Acre-feet

B-3-1-C: 50 FALLOWING REFUGE COMPOSITE

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	
Wet	0	-273	0	0	0	0	-1341	1916	0	0	0	0	0	76	379
Above Normal	0	-273	0	0	0	0	-1341	1916	0	0	0	0	0	76	379
Below Normal	0	0	0	0	0	-1075	-1403	4704	0	0	0	0	0	0	2226
Dry	0	0	-97	-31	-309	-1075	-1403	4654	-368	-223	0	0	0	0	1149
Critical	0	-1165	-131	4	-55	-849	-1146	12252	312	-39	634	0	0	834	10650

For this alternative, a net increase in supply is shown for each year ranging from a slight increase (379 acre-feet) in wet and above normal years to over 10,000 acre-feet in a critical year. These changes would occur not only due to the development and disposition of the transfer water, but also due to the New Melones Reservoir reaction to changes in the river system. A portion of the CVP/SWP Delta supply effect is a result of and reflective of the gains or losses in New Melones Reservoir storage. The combined net effect on the two supplies should be considered when evaluating the impacts of the proposed transfer upon the CVP/SWP.

All Water to Agriculture

Each year this scenario would result in up to 50,000 acre-feet of transfer water being provided to CVP agricultural contractors that drain to the San Joaquin River. The water transferred to agricultural users would essentially exchange the delivery of water from the Exchange Contractors to a CVP agricultural contractor. For water transferred to in-basin agricultural users, the San Joaquin River, New Melones Reservoir, and Delta inflows would be affected as the result of changes in return flows from the Exchange Contractors and the transferees. Indirect effects would also occur due to Reclamation acquiring water for delivery to wildlife areas from entities other than the Exchange Contractors.

This scenario would provide additional water deliveries to San Joaquin Valley CVP agricultural contractors that discharge to the San Joaquin River. Table 55 shows the predicted changes to flows at Vernalis that may occur as a result of this scenario. Land fallowing is the only source of water for this alternative. The change in flow occurs due to reduced return flows from fallowed acreage and the addition of return flows from the transferees. Also included is the effect of Reclamation acquiring water supplies from other entities than the Exchange Contractors to provide deliveries to the wildlife areas. The net effect upon flow at Vernalis is positive in some months and negative in other months, all depending upon the timing of return flows from each component. The change in flow ranges from an increase of 13 cfs to a decrease of 21 cfs. The flow effects include the counteraction of New Melones Reservoir releases when its operations are reacting to Vernalis flow and water quality requirements.

With the transfer, during the VAMP pulse flow period (mid-April through mid-May), the "existing flow" condition would likely be almost neutral to the pre-transfer condition. The flow at Vernalis during this period is the result of the procedures and targets defined by the SJRA, and would likely be the same either with or without the transfer.

Water quality changes at Vernalis are shown in Table 56 and include the net effect of developing transfer water by the Exchange Contractors and disposing the transfer water to agricultural contractors that discharge to the San Joaquin River. The net effect also includes the effect of Reclamation acquiring water from agricultural contractors for delivery to wildlife areas. Water developed through this scenario would result in removal of return flows to the river of a quality worse than that assumed to be returned.

The effects upon water quality include the counteraction of New Melones Reservoir release operations during periods when water quality and flow objectives at Vernalis are controlling.

Table 55
Vernalis Flow Conditions – Alternative B, Agricultural Water

Benchmark Vernalis Flow - cfs

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb
Wet	7500	13600	15700	13600	12000	7400	5100	3100	2500	3600	3000	4600	7500	13600
Above Normal	5800	7200	6200	5900	4600	2600	2100	2000	1500	2000	1800	2300	5800	7200
Below Normal	2300	3200	3300	3700	3700	2100	1900	1500	1200	1900	1700	2200	2300	3200
Dry	1900	2600	2300	2700	2200	1800	1400	1100	1000	1700	1600	2100	1900	2600
Critical	1300	1700	1600	1800	1500	1300	1000	1000	1000	1500	1400	1500	1300	1700

Change in Vernalis Flow with Action - cfs

B-3-2-C: 50 FALLOWING AGRICULTURE COMPOSITE

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb
Wet	-3	-14	-5	1	2	-7	-9	-9	4	2	1	0	0	0
Above Normal	-3	-14	-5	1	2	0	-9	-9	4	2	1	0	0	0
Below Normal	-3	0	-5	1	2	-12	-16	-14	4	2	1	0	0	0
Dry	-3	0	-5	1	1	-12	-16	-13	4	2	1	0	0	0
Critical	-3	-21	-4	5	7	-5	-5	-5	13	6	2	0	1	1

Table 56
Vernalis Water Quality Conditions – Alternative B, Agriculture Focus

Benchmark Vernalis Water Quality - µmhos

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb
Wet	352	286	310	269	212	310	341	460	442	359	497	432	352	286
Above Normal	404	380	465	364	334	486	509	534	588	494	657	639	404	380
Below Normal	757	631	690	465	382	700	700	700	680	510	681	657	757	631
Dry	880	736	1000	700	700	700	700	700	772	547	708	678	880	736
Critical	1000	1000	1000	700	700	700	700	700	772	595	772	859	1000	1000

Change in Vernalis Water Quality with Action - µmhos

B-3-2-C: 50 FALLOWING AGRICULTURE COMPOSITE

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb
Wet	-1	-1	0	0	0	-1	-2	-2	0	0	0	0	0	0
Above Normal	-1	-2	-1	0	0	-3	-3	-2	-1	0	0	0	0	0
Below Normal	-1	-6	-1	0	0	0	0	0	-1	0	0	0	0	0
Dry	-1	-8	0	0	0	0	0	0	-1	0	0	0	0	0
Critical	-2	0	0	0	0	0	0	0	-1	0	0	0	0	0

Note: Values for April and May during dry and critical years have been omitted from the table due to modeling limitations. During the first half of April and the later half of May of these periods, Vernalis water quality objectives are assumed to control. During transfers it is assumed that New Melones releases would continue to provide compliance with the objectives; therefore, no change in water quality would occur.

Changes in flow and/or water quality in the San Joaquin River may result in changes to releases from New Melones Reservoir. The potential changes in storage in New Melones Reservoir due to the changes in releases are shown in Table 57. The values are directly related to flow changes to the lower Stanislaus River at Goodwin Reservoir. Positive values indicate an increase in storage and a decrease in flow to the lower Stanislaus River.

Table 57
Storage/Flow Change in New Melones Reservoir – Alternative B, Agriculture Focus

Net Incremental Change in NM Storage due to Vernalis Flow & Quality Release Change - Acre-feet

B-3-2-C: 50 FALLOWING AGRICULTURE COMPOSITE

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Total
Wet	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Above Normal	0	0	0	0	0	-431	0	0	0	0	0	0	0	0	-431
Below Normal	0	-779	0	0	0	289	432	293	0	0	0	0	0	20	254
Dry	0	-779	47	17	35	289	432	264	0	0	0	0	0	20	323
Critical	0	386	47	-12	30	260	350	223	0	0	0	0	0	14	1296

The changes shown in Table 57 indicate the releases from New Melones that would be required to counter the effect of developing the transfer water on maintaining Vernalis flow and quality conditions exactly at the Vernalis objective compliance level. Accumulated changes in New Melones Reservoir storage vary by year type, but the change in storage within a year is less than 1,300 acre-feet, positive or negative. The potential change in flow to the lower Stanislaus River mirror the changes in the New Melones storage. The changes in flow range from an increase of 14 cfs during February to a decrease of up to 7 cfs during July. However, when a reduction in flow is calculated, the reduction may not actually be allowed because another release objective may require the continuation of some level of that release. Modeling limitations did not allow the identification of such circumstances.

An indirect impact that may result from a change in New Melones Reservoir operations is the allocation of water to uses within the Interim Plan of Operations, including impacts to water users and for fish and water quality purposes. For this agriculture focus scenario, the estimated reduction in storage at New Melones Reservoir in a year ranges from zero in a wet year to a decrease of 431 acre-feet in an above normal year to an increase of over 1,200 acre-feet during a critical year. The majority of the effect of a change in New Melones Reservoir storage would not be realized during the current year of the transfer, but instead during the subsequent year or years when water supply allocations are subsequently determined. If the following year is dry, the previous year's effect in storage would translate to relatively small allocation changes to lower Stanislaus River purposes and potentially no change in allocations to CVP contractors. If the following year is normal or wetter, more noticeable changes to allocations would occur. In the wettest of conditions, allocations would not change.

The transfer program could affect inflows to the Delta from the San Joaquin River. The net change to Delta water supply balance to the CVP/SWP is shown in Table 58.

Table 58
Delta CVP/SWP Water Supply Effect – Alternative B, Agriculture Focus

Incremental Change in Project Delta Supply due to Action - Acre-feet

B-3-2-C: 50 FALLOWING AGRICULTURE COMPOSITE

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	
Wet	0	-273	0	0	0	0	-566	-540	0	0	0	0	0	7	-1372
Above Normal	0	-273	0	0	0	0	-566	-540	0	0	0	0	0	7	-1372
Below Normal	0	0	0	0	0	-720	-998	-833	0	0	0	0	0	0	-2550
Dry	0	0	-114	10	90	-720	-998	-804	215	118	0	0	0	0	-2202
Critical	0	-1165	-273	325	432	-289	-338	-337	773	372	100	0	0	47	-354

For this alternative, a net decrease in supply is shown for each year ranging from a slight decrease (354 acre-feet) in a critical year to over 2,500 acre-feet in a below normal year. These changes would occur not only due to the development and disposition of the transfer water, but also due to the New Melones Reservoir reaction to changes in the river system. A portion of the CVP/SWP Delta supply effect is a result of and reflective of the gains or losses in New Melones Reservoir storage. The combined net effect on the two supplies should be considered when evaluating the impacts of the proposed transfer upon the CVP/SWP. These changes in CVP/SWP Delta supply are minor.

All Water Transferred Out of Basin

This out-of-basin scenario provides up to 50,000 acre-feet of water each year to uses (any combination of wildlife areas, agriculture, and urban) occurring outside the drainage of the San Joaquin River. These uses could include deliveries to the two refuges that do not have hydrologic connectivity to the San Joaquin River, Pixley and Kern NWRs (located in the Tulare Lake Basin), SCVWD and SBCWD (located in the San Felipe Division), CVP water contractors of the Friant Division, and the Cross-Valley Contractors of the CVP.

The scenario would provide additional water deliveries to areas that do not discharge to the San Joaquin River. Simulated hydrologic effects at Vernalis resulting from this scenario are shown in Table 59, which also shows the Existing Conditions / Future No Action setting Vernalis flows. The effect is due to the reduced return flows from the fallowed areas and the reduction of return flows from entities providing water to Reclamation to serve the wildlife areas. Simulated flow changes at Vernalis range from no change to a decrease of 24 cfs (July). The flow effects include the counteraction of New Melones Reservoir releases when its operations are reacting to Vernalis flow and water quality requirements.

With the transfer, during the VAMP pulse flow period (mid-April through mid-May), the "existing flow" condition would likely be almost neutral to the pre-transfer condition. The flow at Vernalis during this period is the result of the procedures and targets defined by the SJRA, and would likely be the same either with or without the transfer.

Table 59
Vernalis Flow Conditions – Alternative B, Out-of-Basin Transfer

Benchmark Vernalis Flow - cfs

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb
Wet	7500	13600	15700	13600	12000	7400	5100	3100	2500	3600	3000	4600	7500	13600
Above Normal	5800	7200	6200	5900	4600	2600	2100	2000	1500	2000	1800	2300	5800	7200
Below Normal	2300	3200	3300	3700	3700	2100	1900	1500	1200	1900	1700	2200	2300	3200
Dry	1900	2600	2300	2700	2200	1800	1400	1100	1000	1700	1600	2100	1900	2600
Critical	1300	1700	1600	1800	1500	1300	1000	1000	1000	1500	1400	1500	1300	1700

Change in Vernalis Flow with Action - cfs

B-3-3-C: 50 FALLOWING OUT COMPOSITE

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb
Wet	-3	-14	-6	-4	-6	-17	-23	-19	-10	-4	-1	0	0	-1
Above Normal	-3	-14	-6	-4	-6	0	-23	-19	-10	-4	-1	0	0	-1
Below Normal	-3	0	-6	-4	-6	-19	-24	-20	-10	-4	-1	0	0	0
Dry	-3	0	-6	-4	-6	-19	-24	-21	-10	-4	-1	0	0	0
Critical	-3	-21	-6	0	-1	-14	-19	-16	-1	0	0	0	0	0

Water quality at Vernalis would also change due to the transfer. Table 60 shows the change in Vernalis water quality resulting from the transfers with this source option. The table also shows the assumed Existing Conditions / Future No Action setting water quality condition at Vernalis.

Table 60
Vernalis Water Quality Conditions – Alternative B, Out-of-Basin Transfer

Benchmark Vernalis Water Quality - µmhos

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb
Wet	352	286	310	269	212	310	341	460	442	359	497	432	352	286
Above Normal	404	380	465	364	334	486	509	534	588	494	657	639	404	380
Below Normal	757	631	690	465	382	700	700	700	680	510	681	657	757	631
Dry	880	736	1000	700	700	700	700	700	772	547	708	678	880	736
Critical	1000	1000	1000	700	700	700	700	700	772	595	772	859	1000	1000

Change in Vernalis Water Quality with Action - µmhos

B-3-3-C: 50 FALLOWING OUT COMPOSITE

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb
Wet	-1	-1	0	0	0	-1	-2	-1	0	0	0	0	0	0
Above Normal	-1	-2	-1	0	0	-5	-2	-2	1	0	0	0	0	0
Below Normal	-1	-6	-1	0	0	0	0	0	1	0	0	0	0	0
Dry	-1	-8	0	0	0	0	0	0	1	0	0	0	0	0
Critical	-2	0	0	0	0	0	0	0	0	0	0	0	0	0

Note: Values for April and May during dry and critical years have been omitted from the table due to modeling limitations. During the first half of April and the later half of May of these periods, Vernalis water quality objectives are assumed to control. During transfers it is assumed that New Melones releases would continue to provide compliance with the objectives; therefore, no change in water quality would occur.

The slight water quality changes at Vernalis trend with the removal (reduction in return flows) of water within the river system. The development of the transfer water by the Exchange Contractors would remove flow in the river, typically with a quality worse than the pre-transfer water quality at Vernalis. The decreases in return flow associated with Reclamation acquiring water for delivery to the wildlife areas have a quality typically better than the melded water quality at Vernalis. During periods when the water quality objective is assumed to control New Melones releases (indicated by the 700 and 1,000 µS/cm values in Table 60), no change in water quality would occur due to the anticipated compensation at New Melones Reservoir for transfer-related San Joaquin River flow and quality changes. During other periods, the estimated change in water quality would be a minor improvement in quality. The transfer would not cause any additional noncompliance instances at Vernalis.

The flow and quality effects of the transfer to the San Joaquin River upstream of the Stanislaus River could trigger a change in releases from New Melones Reservoir to counter such effects. The changes in storage in New Melones Reservoir due to these releases are shown in Table 61. The values are directly related to changes in flow to the lower Stanislaus River at Goodwin Reservoir. Positive values indicate an increase in storage and a decrease in flow to the lower Stanislaus River. The changes shown in Table 61 indicate the releases from New Melones that would be required to counter the effect of developing the transfer water on maintaining Vernalis flow and quality conditions exactly at the Vernalis objective compliance level. Accumulated changes in New Melones Reservoir storage vary by year type but the change in storage within a year is less than 1,200 acre-feet, positive or negative. The potential change in flow to the lower Stanislaus River mirror the changes in the New Melones storage. The changes in flow range from an increase of 17 cfs during June to a decrease of up to 7 cfs during February. However, when a reduction in flow is calculated, the reduction may not actually be allowed because another release objective may require the continuation of some level of that release. Modeling limitations did not allow the identification of such circumstances.

Table 61
Change in Storage in New Melones Reservoir, Alternative B, Out-of-Basin Transfer

Net Incremental Change in NM Storage due to Vernalis Flow & Quality Release Change - Acre-feet

B-3-3-C: 50 FALLOWING OUT COMPOSITE

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Total
Wet	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Above Normal	0	0	0	0	0	-1027	0	0	0	0	0	0	0	0	-1027
Below Normal	0	-779	0	0	0	87	21	49	0	0	0	0	0	-41	-662
Dry	0	-779	22	-9	-25	87	21	108	0	0	0	0	0	-41	-616
Critical	0	386	39	8	15	223	297	213	0	0	0	0	0	0	1180

An indirect impact that may result from a change in New Melones Reservoir operations is the allocation of water to uses within the Interim Plan of Operations, including impacts to water users and for fish and water quality purposes. For this scenario, the estimated change in storage at New Melones Reservoir in a year could range between a minor gain of over 1,000 acre-feet (during a critical year) to a decrease in storage of about 1,000 acre-feet during an above normal year. The effect to water supply allocations would be minor.

The transfer program could affect inflows to the Delta from the San Joaquin River. The net change in Delta water supply balance to the CVP/SWP is shown in Table 62.

Table 62
Delta CVP/SWP Water Supply Effect – Alternative B, Out-of-Basin Transfer

Incremental Change in Project Delta Supply due to Action - Acre-feet

B-3-3-C: 50 FALLOWING OUT COMPOSITE

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	
Wet	0	-273	0	0	0	0	-1427	-1173	0	0	0	0	0	-14	-2886
Above Normal	0	-273	0	0	0	0	-1427	-1173	0	0	0	0	0	-14	-2886
Below Normal	0	0	0	0	0	-1114	-1448	-1222	0	0	0	0	0	0	-3784
Dry	0	0	-132	-40	-353	-1114	-1448	-1281	-616	-242	0	0	0	0	-5225
Critical	0	-1165	-342	-28	-55	-849	-1146	-960	-58	0	0	0	0	0	-4604

For this out-of-basin scenario, a net decrease in supply is shown for each year. The decrease in net supply ranges from about 2,900 acre-feet in a wet year to about 5,200 acre-feet during a dry year. These changes occur due to the development of the transfer water and the acquisition by Reclamation of wildlife water, and are compounded by the New Melones Reservoir reaction to changes in the river system. A portion of the CVP/SWP Delta supply effect is a result of and reflective of the gains or losses in New Melones Reservoir storage. These changes are minor relative to the CVP/SWP Delta water supply.

In summary concerning the combined effects among Alternative B scenarios, all scenarios of this alternative would typically cause a reduction to flows at Vernalis, though they are minor and estimated to be less than 25 cfs. An exception is with the disposition of transfer water to the wildlife areas, where an increase in flow at Vernalis ranges from 30 to 200 cfs. This circumstance is primarily due to wildlife area return flows and the additional releases required from New Melones Reservoir to compensate for the additional loading associated with those flows. None of the scenarios under Alternative B would result in a significant change in water quality at Vernalis. Water quality would be neutral to the Existing Conditions / Future No Action setting when New Melones Reservoir reacts to changes in San Joaquin River water quality due to the transfers. Otherwise, water quality at Vernalis would slightly improve with the overall exception during August when water quality at Vernalis is not controlling New Melones Reservoir releases. The potential change in New Melones Reservoir storage and releases to the lower Stanislaus River varies among the disposition scenarios. The effect at New Melones Reservoir is normally a decrease in storage when delivering transfer water to the wildlife areas. The other delivery scenarios have a varying effect upon storage, positive and negative depending upon year type. The potential for reductions to storage is smaller when delivering to agriculture or out-of-basin. The potential effect on water supply allocations under the Interim Plan of Operations would also vary in relation to the accumulated change in New Melones Reservoir storage. The potential CVP/SWP Delta supply effect is almost always opposite to the effect at New Melones Reservoir. The CVP/SWP Delta supply shows an increase for the wildlife area delivery scenario and a small potential risk to water supply for the other two delivery scenarios. The effect is minor.

Alternative C – 130/50

This alternative provides the greatest amount of transfer opportunity. Up to 130,000 acre-feet of water will be transferred in noncritical years and up to 50,000 acre-feet of water will be transferred in critical years. During critical years, only water from land fallowing will be available. Alternative C would consist of up to 130,000 acre-feet of water being developed from all sources in noncritical years. This water would be developed through a variety of sources including up to 80,000 acre-feet from conservation, 20,000 acre-feet from groundwater, and 50,000 acre-feet from land fallowing. The combination of conservation sources (including tailwater recovery) and groundwater would not exceed 80,000 acre-feet. During critical years, up to 50,000 acre-feet of water would be developed from land fallowing. Water would be acquired from the Exchange Contractors, who would receive less substitute surface water directly from Reclamation. The transfer water would be provided to any of the potential transferees.

Hydrologic Effects Due to Water Development. Three methods are proposed to develop water for transfer, conservation including tailwater recovery, groundwater substitution, and land fallowing. Each of these methods would have different effects (sometimes no effect) upon San Joaquin River flows. In this alternative, up to 130,000 acre-feet of transfer water would be developed by the Exchange Contractors' action. The hydrologic effect to the San Joaquin River for a certain amount of this water is currently included in the Existing Condition / Future No Action setting, to which the full potential action is compared. In the Existing Conditions / Future No Action setting the Exchange Contractors already develop this water either for existing transfers (Existing Condition setting) or are utilizing the developed water for their own internal purposes (Future No Action setting).

For the conservation scenarios, the Exchange Contractors would increase their tailwater recapture efforts by 16,365 acre-feet during noncritical years to achieve 80,000 acre-feet of transfer water through conservation efforts. They would also develop 50,000 acre-feet of water through land fallowing, for a total developed transfer of 130,000 acre-feet in noncritical years. For the groundwater scenarios, the Exchange Contractors will increase their groundwater substitution efforts by 10,365 acre-feet to reach 16,365 acre-feet of substitute groundwater pumping. This substitute groundwater pumping, supplemented with 63,635 acre-feet of conservation (Existing Conditions / Future No Action setting) and 50,000 acre-feet of crop idling/land fallowing develops 130,000 acre-feet in noncritical years. The land fallowing scenario is identical to the conservation scenario, maximizing land fallowing and then supplementing the program through conservation for a developed transfer of 130,000 acre-feet. During critical years, only the land fallowing program is available, for a total of 50,000 acre-feet of developed water.

Simulated hydrologic effects at Vernalis resulting from each of these scenarios in each year type are shown in Table 63, which also shows the assumed Existing Conditions / Future No Action setting Vernalis flows. The effects of developing the water upon flows at Vernalis vary depending upon the source of the developed water and the year type. The conservation/land fallowing scenarios have a greater potential to affect Vernalis flows than the groundwater scenario. This is because there are no return flow effects from groundwater and increased pumping does not reduce return flows as is the case for conservation. Certain months (e.g., June of an above normal year and February in below normal and dry years) show no change in flow under any source scenario. This is due to the required Vernalis flow condition being maintained by New Melones Reservoir operations. During these months any change in San Joaquin River flows upstream of the Stanislaus River are assumed to be counteracted by a change in New Melones Reservoir releases. During certain other months, when New Melones Reservoir operations are maintaining required water quality conditions at Vernalis, the flow change at Vernalis is the combination of both the effects of the Exchange Contractors developing the transfer water and the counteraction by New Melones Reservoir releases to maintain the water quality conditions at Vernalis. During critical years, the effect is due to a land fallowing program. For each of the water development scenarios, only land fallowing is available during critical years.

Table 63
Vernalis Flow Conditions – Alternative C Water Development

Benchmark Vernalis Flow - cfs

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb
Wet	7500	13600	15700	13600	12000	7400	5100	3100	2500	3600	3000	4600	7500	13600
Above Normal	5800	7200	6200	5900	4600	2600	2100	2000	1500	2000	1800	2300	5800	7200
Below Normal	2300	3200	3300	3700	3700	2100	1900	1500	1200	1900	1700	2200	2300	3200
Dry	1900	2600	2300	2700	2200	1800	1400	1100	1000	1700	1600	2100	1900	2600
Critical	1300	1700	1600	1800	1500	1300	1000	1000	1000	1500	1400	1500	1300	1700

Change in Vernalis Flow with Action - cfs

C-1-0-S: 130 CONSERVATION SOURCE

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb
Wet	-5	-33	-22	-30	-38	-49	-51	-49	-25	-15	0	0	0	0
Above Normal	-5	-33	-22	-30	-38	0	-51	-49	-25	-15	0	0	0	0
Below Normal	-5	0	-22	-30	-38	-66	-69	-63	-25	-15	0	0	0	0
Dry	-5	0	-25	-42	-52	-66	-69	-63	-25	-15	0	0	0	0
Critical	-3	-21	-6	0	-1	-14	-19	-16	-1	0	0	0	0	0

C-2-0-S: 130 GROUNDWATER SOURCE

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb
Wet	-3	-14	-5	0	-1	-11	-14	-12	-1	0	0	0	0	0
Above Normal	-3	-14	-5	0	-1	0	-14	-12	-1	0	0	0	0	0
Below Normal	-3	0	-5	0	-1	-14	-19	-16	-1	0	0	0	0	0
Dry	-3	0	-6	0	-1	-14	-19	-16	-1	0	0	0	0	0
Critical	-3	-21	-6	0	-1	-14	-19	-16	-1	0	0	0	0	0

C-3-0-S: 130 FALLOWING SOURCE

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb
Wet	-5	-33	-22	-30	-38	-49	-51	-49	-25	-15	0	0	0	0
Above Normal	-5	-33	-22	-30	-38	0	-51	-49	-25	-15	0	0	0	0
Below Normal	-5	0	-22	-30	-38	-66	-69	-63	-25	-15	0	0	0	0
Dry	-5	0	-25	-42	-52	-66	-69	-63	-25	-15	0	0	0	0
Critical	-3	-21	-6	0	-1	-14	-19	-16	-1	0	0	0	0	0

Water quality at Vernalis may also change due to the development of transfer water by the Exchange Contractors. Table 64 shows the change in water quality at Vernalis associated with the

Table 64
Vernalis Water Quality Conditions – Alternative C Water Development

Benchmark Vernalis Water Quality - µmhos

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb
Wet	352	286	310	269	212	310	341	460	442	359	497	432	352	286
Above Normal	404	380	465	364	334	486	509	534	588	494	657	639	404	380
Below Normal	757	631	690	465	382	700	700	700	680	510	681	657	757	631
Dry	880	736	1000	700	700	700	700	700	772	547	708	678	880	736
Critical	1000	1000	1000	700	700	700	700	700	772	595	772	859	1000	1000

Change in Vernalis Water Quality with Action - µmhos

C-1-0-S: 130 CONSERVATION SOURCE

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb
Wet	-1	-3	-1	-2	-3	-4	-6	-7	-6	-2	0	0	0	0
Above Normal	-1	-5	-2	-4	-7	-17	-10	-9	-8	-3	0	0	0	0
Below Normal	-2	-15	-3	-6	-8	0	0	0	-8	-3	0	0	0	0
Dry	-2	-18	0	-	-	0	0	0	-7	-3	0	0	0	0
Critical	-2	0	0	-	-	0	0	0	0	0	0	0	0	0

C-2-0-S: 130 GROUNDWATER SOURCE

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb
Wet	-1	-1	0	0	0	-1	-2	-2	0	0	0	0	0	0
Above Normal	-1	-2	-1	0	0	-4	-3	-2	0	0	0	0	0	0
Below Normal	-1	-6	-1	0	0	0	0	0	0	0	0	0	0	0
Dry	-1	-8	0	0	0	0	0	0	0	0	0	0	0	0
Critical	-2	0	0	0	0	0	0	0	0	0	0	0	0	0

C-3-0-S: 130 FALLOWING SOURCE

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb
Wet	-1	-3	-1	-2	-3	-4	-6	-7	-6	-2	0	0	0	0
Above Normal	-1	-5	-2	-4	-7	-17	-10	-9	-8	-3	0	0	0	0
Below Normal	-2	-15	-3	-6	-8	0	0	0	-8	-3	0	0	0	0
Dry	-2	-18	0	-	-	0	0	0	-7	-3	0	0	0	0
Critical	-2	0	0	-	-	0	0	0	0	0	0	0	0	0

Note: Values for April and May during dry and critical years have been omitted from the table due to modeling limitations. During the first half of April and the later half of May of these periods, Vernalis water quality objectives are assumed to control. During transfers it is assumed that New Melones releases would continue to provide compliance with the objectives; therefore, no change in water quality would occur.

development of each of the sources of transfer water. Water quality changes at Vernalis trend with the changes in flow at Vernalis. The water quality of tailwater is typically worse than the melded quality of water at Vernalis. Therefore, the removal of tailwater by the Exchange Contractors would improve water quality at Vernalis. The land fallowing program is assumed to affect the same flows that are available for tailwater recapture. Water developed through groundwater has no affect upon San Joaquin River flow or quality; therefore water quality show a smaller improvement through the groundwater source scenario. Several months during below normal, dry and critical years show no change in water quality although there is a change in flow. These are periods when New Melones Reservoir releases are maintaining the water quality requirement at Vernalis. A change in upstream flows and associated quality would be counteracted by releases from New Melones Reservoir to maintain the water quality requirement at Vernalis.

New Melones Reservoir operations may be affected by the Exchange Contractors' development of transfer water due to the linkage between its operations and San Joaquin River conditions. The potential changes in storage in New Melones Reservoir due to the releases from New Melones Reservoir, for either Vernalis water quality or flow purposes, are shown in Table 65. The values are directly related to flow changes to the lower Stanislaus River at Goodwin Reservoir. Positive values indicate an increase in storage and a decrease in flow to the lower Stanislaus River.

Table 65
Storage/Flow Change in New Melones Reservoir – Alternative C Water Development

Net Incremental Change in NM Storage due to Vernalis Flow & Quality Release Change - Acre-feet

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Total
C-1-0-S: 130 CONSERVATION SOURCE															
Wet	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Above Normal	0	0	0	0	0	-2911	0	0	0	0	0	0	0	0	-2911
Below Normal	0	-1834	0	0	0	1036	1097	863	0	0	0	0	0	0	1161
Dry	0	-1834	173	726	860	1036	1097	863	0	0	0	0	0	0	2921
Critical	0	386	39	8	15	223	297	213	0	0	0	0	0	0	1180
C-2-0-S: 130 GROUNDWATER SOURCE															
Wet	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Above Normal	0	0	0	0	0	-626	0	0	0	0	0	0	0	0	-626
Below Normal	0	-779	0	0	0	223	297	213	0	0	0	0	0	0	-47
Dry	0	-779	39	8	15	223	297	213	0	0	0	0	0	0	15
Critical	0	386	39	8	15	223	297	213	0	0	0	0	0	0	1180
C-3-0-S: 130 FALLOWING SOURCE															
Wet	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Above Normal	0	0	0	0	0	-2911	0	0	0	0	0	0	0	0	-2911
Below Normal	0	-1834	0	0	0	1036	1097	863	0	0	0	0	0	0	1161
Dry	0	-1834	173	726	860	1036	1097	863	0	0	0	0	0	0	2921
Critical	0	386	39	8	15	223	297	213	0	0	0	0	0	0	1180

The changes shown in Table 65 indicate the releases from New Melones that would be required to counter the effect of developing the transfer water on maintaining Vernalis flow and quality conditions exactly at the Vernalis objective compliance level. Accumulated changes in New Melones Reservoir storage vary by year type, but the change in storage within a year is less than 3,000 acre-feet, positive or negative. The potential change in flow to the lower Stanislaus River mirror the changes in the New Melones storage. The changes in flow range from an increase of 49 cfs during June (during an above normal year, conservation/land fallowing scenarios) to a decrease of up to 18 cfs during July during dry and below normal years. However, when a reduction in flow is calculated, the reduction may not actually be allowed because another release objective may require the continuation of some level of that release. Modeling limitations did not allow the identification of such circumstances.

The majority of the effect of a change in New Melones Reservoir storage would not be realized during the current year of the transfer, but instead during the subsequent year or years when water supply allocations are subsequently determined. If the following year is dry, the previous year's effect in storage would translate to relatively small allocation changes to lower Stanislaus River purposes and potentially no change to allocations to CVP contractors. If the following year is normal or wetter, more noticeable changes to allocations would occur. In the wettest of conditions, allocations would not change.

The Exchange Contractors' development of transfer water could affect inflows to the Delta from the San Joaquin River. The simulated change in net Delta water supply balance to the CVP/SWP is shown in Table 66.

Table 66
Delta CVP/SWP Water Supply Effect – Alternative C Water Development

Incremental Change in Project Delta Supply due to Action - Acre-feet

C-1-0-S: 130 CONSERVATION SOURCE

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Total
Wet	0	-642	0	0	0	0	-3133	-3032	0	0	0	0	0	0	-6807
Above Normal	0	-642	0	0	0	0	-3133	-3032	0	0	0	0	0	0	-6807
Below Normal	0	0	0	0	0	-3947	-4230	-3895	0	0	0	0	0	0	-12072
Dry	0	0	-536	-565	-3185	-3947	-4230	-3895	-1464	-884	0	0	0	0	-18706
Critical	0	-1165	-342	-28	-55	-849	-1146	-960	-58	0	0	0	0	0	-4604

C-2-0-S: 130 GROUNDWATER SOURCE

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Total
Wet	0	-273	0	0	0	0	-849	-748	0	0	0	0	0	0	-1869
Above Normal	0	-273	0	0	0	0	-849	-748	0	0	0	0	0	0	-1869
Below Normal	0	0	0	0	0	-849	-1146	-960	0	0	0	0	0	0	-2955
Dry	0	0	-120	-6	-55	-849	-1146	-960	-58	0	0	0	0	0	-3194
Critical	0	-1165	-342	-28	-55	-849	-1146	-960	-58	0	0	0	0	0	-4604

C-3-0-S: 130 FALLOWING SOURCE

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Total
Wet	0	-642	0	0	0	0	-3133	-3032	0	0	0	0	0	0	-6807
Above Normal	0	-642	0	0	0	0	-3133	-3032	0	0	0	0	0	0	-6807
Below Normal	0	0	0	0	0	-3947	-4230	-3895	0	0	0	0	0	0	-12072
Dry	0	0	-536	-565	-3185	-3947	-4230	-3895	-1464	-884	0	0	0	0	-18706
Critical	0	-1165	-342	-28	-55	-849	-1146	-960	-58	0	0	0	0	0	-4604

For each of the source scenarios a potential net decrease in CVP/SWP Delta supply is shown for each year type. The decrease in net supply ranges from more than 4,600 acre-feet in a critical year (common to each scenario because only land fallowing occurs), to more than 18,000 acre-feet during a dry year. These changes occur due to the development of the transfer water and also include counteractions in New Melones Reservoir releases in reaction to changes in the river system. A portion of the CVP/SWP Delta supply effect is a result of and reflective of the gains or losses in New Melones Reservoir storage. The combined net effect on the two supplies should be considered when evaluating the impacts of the proposed transfer upon the CVP/SWP.

In summary, Vernalis flows would be reduced by any of the source scenarios the Exchange Contractors employ, although the reductions would be minor. The conservation/land fallowing scenarios create the largest affect on Vernalis flows. The effect during critical years is the same for each scenario since each scenario utilizes the same land fallowing program during such a year type. Water quality at Vernalis improves slightly with each source scenario, commensurate with the amount of tailwater removed through conservation and land fallowing. New Melones Reservoir storage (and commensurately, in the opposite direction, Goodwin releases to the Stanislaus River), typically would gain or remain neutral in all scenarios. The effects to Delta supply for the CVP/SWP would cause a potential for reduction in all scenarios, and less for the groundwater scenario.

Hydrologic Effects Due to Combined Water Development and Transfer. In addition to the hydrologic effects that occur due to the development of the transfer water by the Exchange Contractors, additional hydrologic effects would occur from the disposition of that water to transferees. Also, Reclamation may respond, relative to the Existing Conditions / Future No Action setting in reaction to the Exchange Contractors providing or not providing transfer water to the San Joaquin Valley wildlife areas. Such a response may be the reduction of water acquisitions from other entities in favor of the transfer of water from the Exchange Contractors. The results presented in this section illustrate the combination of the direct hydrologic effects of the development of transfer water by the Exchange Contractors and the additional effects that result from the circumstances just described. The effects are illustrated in groupings concerned with the disposition of the transfer water.

All Water to Refuges

During noncritical years, this scenario would result in up to 80,000 acre-feet transfer to wildlife areas. Water would be delivered to the San Joaquin Valley wildlife habitat areas through Delta-Mendota Canal, local conveyance facilities, or delivery exchange agreements. The remainder of the transfer (50,000 acre-feet) is assumed to be delivered to agricultural contractors. During critical years, 50,000 acre-feet of water would be developed through land fallowing. During these years, 40,000 acre-feet (50,000 acre-feet of developed water reduced 20 percent for conveyance losses) will be delivered to the wildlife areas.

Water may be delivered to wildlife areas and agricultural contractors within or outside of the San Joaquin River drainage basin. For deliveries to areas within the drainage basin (the subject of this section), a change in San Joaquin River flows and quality would occur, due both to the Exchange Contractors developing the transfer water and the wildlife areas/agricultural contractors' use and management of the transfer water. Indirect effects would also include the change in Reclamation acquisitions for the wildlife areas.

The refuge focus scenarios would provide additional water deliveries to San Joaquin Valley wildlife areas that discharge to the San Joaquin River. Hydrologic effects at Vernalis resulting from this option are shown in Table 67, which also shows the assumed Existing Conditions / Future No Action setting flows. Flow changes at Vernalis range from an increase of about 200 cfs to a decrease of 64 cfs. During wet years, the changes in flow at Vernalis are solely the result of the net effect of the development and disposition of transfer water. For the conservation/land fallowing scenarios, the changes in flow reflect runoff from the wildlife area transferees during the early fall and the depletion of flow during other months by the conservation and land fallowing programs. Winter months exhibit a minor amount of increased flow due to wildlife area and agricultural contractor return flows slightly exceeding the reduction in return flows caused by Reclamation acquisitions from other San Joaquin Valley sources. In other noncritical years the monthly changes generally show the same trends, except during February of dry and below normal years and June of an above normal year when New Melones Reservoir reacts to flow changes caused by the transfers to maintain the Vernalis flow at the controlling flow objective. During all but wet years the flow at Vernalis is also at times affected by water quality release changes from New Melones Reservoir.

Table 67
Vernalis Flow Conditions – Alternative C, Refuge Focus

Benchmark Vernalis Flow - cfs

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb
Wet	7500	13600	15700	13600	12000	7400	5100	3100	2500	3600	3000	4600	7500	13600
Above Normal	5800	7200	6200	5900	4600	2600	2100	2000	1500	2000	1800	2300	5800	7200
Below Normal	2300	3200	3300	3700	3700	2100	1900	1500	1200	1900	1700	2200	2300	3200
Dry	1900	2600	2300	2700	2200	1800	1400	1100	1000	1700	1600	2100	1900	2600
Critical	1300	1700	1600	1800	1500	1300	1000	1000	1000	1500	1400	1500	1300	1700

Change in Vernalis Flow with Action - cfs

C-1-1-C: 130 CONSERVATION REFUGE COMPOSITE

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb
Wet	-5	-33	-21	-26	-32	-42	-41	7	-12	-11	6	1	4	5
Above Normal	-5	-33	-21	-26	-32	0	-41	7	-12	-11	6	1	4	5
Below Normal	-5	0	-21	-26	-32	-62	-64	37	-12	-11	6	1	4	0
Dry	-5	0	-23	-38	-47	-62	-64	38	-12	-11	6	1	4	0
Critical	-3	-21	-2	0	-1	-14	-19	199	5	-1	11	2	8	15

C-2-1-C: 130 GROUNDWATER REFUGE COMPOSITE

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb
Wet	-3	-14	-4	4	5	-4	-4	44	11	4	6	1	4	5
Above Normal	-3	-14	-4	4	5	0	-4	44	11	4	6	1	4	5
Below Normal	-3	0	-4	4	5	-10	-14	85	11	4	6	1	4	0
Dry	-3	0	-3	3	4	-10	-14	85	11	4	6	1	4	0
Critical	-3	-21	-2	0	-1	-14	-19	199	5	-1	11	2	8	15

C-3-1-C: 130 FALLOWING REFUGE COMPOSITE

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb
Wet	-5	-33	-21	-26	-32	-42	-41	7	-12	-11	6	1	4	5
Above Normal	-5	-33	-21	-26	-32	0	-41	7	-12	-11	6	1	4	5
Below Normal	-5	0	-21	-26	-32	-62	-64	37	-12	-11	6	1	4	0
Dry	-5	0	-23	-38	-47	-62	-64	38	-12	-11	6	1	4	0
Critical	-3	-21	-2	0	-1	-14	-19	199	5	-1	11	2	8	15

For the groundwater scenario, the spring-time and summer-time effect of reduced tailwater returns in Vernalis flows is less in comparison to the other two source scenarios. This outcome is due to these groundwater source option removing less (no) return flows from the San Joaquin River. No change in flow at Vernalis occurs during periods when it is assumed that flow objectives control (February of below normal and dry years, June of above normal years, and during the pulse flow periods during April and May). All scenarios have the same critical year effects, since only the land fallowing component is used during critical years. With the transfer, during the VAMP pulse flow period (mid-April through mid-

May) the “existing flow” condition, as defined by the SJRA, may be slightly lower in noncritical years. The flow at Vernalis during this period is the result of the procedures and targets defined by the SJRA, and would likely be the same either with or without the transfer.

Water quality at Vernalis would also change due to the transfer. Table 68 shows the change in Vernalis water quality resulting from the transfers under each source option. The table also provides the assumed Existing Conditions / Future No Action setting water quality condition at Vernalis.

Table 68
Vernalis Water Quality Conditions – Alternative C, Refuge Focus

Benchmark Vernalis Water Quality - µmhos

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb
Wet	352	286	310	269	212	310	341	460	442	359	497	432	352	286
Above Normal	404	380	465	364	334	486	509	534	588	494	657	639	404	380
Below Normal	757	631	690	465	382	700	700	700	680	510	681	657	757	631
Dry	880	736	1000	700	700	700	700	700	772	547	708	678	880	736
Critical	1000	1000	1000	700	700	700	700	700	772	595	772	859	1000	1000

Change in Vernalis Water Quality with Action - µmhos

C-1-1-C: 130 CONSERVATION REFUGE COMPOSITE

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb
Wet	-1	-3	-1	-2	-3	-4	-6	6	-6	-2	1	0	0	0
Above Normal	-1	-5	-2	-4	-7	-15	-11	10	-8	-3	1	0	0	1
Below Normal	-2	-15	-3	-6	-8	0	0	0	-8	-3	1	0	1	2
Dry	-2	-18	0	-3	-	-	0	0	-7	-3	1	0	0	3
Critical	-2	0	0	0	-	-	0	0	2	0	3	0	1	0

C-2-1-C: 130 GROUNDWATER REFUGE COMPOSITE

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb
Wet	-1	-1	0	0	0	-1	-2	11	0	0	1	0	0	0
Above Normal	-1	-2	0	0	0	-2	-3	16	-1	0	1	0	0	1
Below Normal	-1	-6	0	0	0	0	0	0	-1	0	1	0	1	2
Dry	-1	-8	0	0	0	0	0	0	0	0	1	0	0	3
Critical	-2	0	0	0	0	0	0	0	2	0	3	0	1	0

C-3-1-C: 130 FALLOWING REFUGE COMPOSITE

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb
Wet	-1	-3	-1	-2	-3	-4	-6	6	-6	-2	1	0	0	0
Above Normal	-1	-5	-2	-4	-7	-15	-11	10	-8	-3	1	0	0	1
Below Normal	-2	-15	-3	-6	-8	0	0	0	-8	-3	1	0	1	2
Dry	-2	-18	0	-3	-	-	0	0	-7	-3	1	0	0	3
Critical	-2	0	0	0	-	-	0	0	2	0	3	0	1	0

Note: Values for April and May during dry and critical years have been omitted from the table due to modeling limitations. During the first half of April and the later half of May of these periods, Vernalis water quality objectives are assumed to control. During transfers it is assumed that New Melones releases would continue to provide compliance with the objectives; therefore, no change in water quality would occur.

Water quality changes at Vernalis trend with the net addition (runoff) and removal (reduction in return flows) of water within the river system. Deliveries to the wildlife areas result in additional return flows to the river with a water quality worse than Existing Conditions / Future No Action setting water quality at Vernalis. The development of the transfer water by the Exchange Contractors removes flow in the river, typically also with a quality worse than the existing condition/No Action Alternative water quality at Vernalis. During periods when the water quality objective is assumed to control New Melones releases (indicated by the 700 and 1,000 µS/cm values in Table 68) no change in water quality would occur due to the counteraction at New Melones Reservoir for transfer-related San Joaquin River flow and quality changes. During other periods, the estimated change in water quality could be within a range of 18 µS/cm improvement to a 16 µS/cm degradation. The slight degradation in water quality is anticipated to occur during August when the majority of incremental return flows from the wildlife areas are expected to occur and water quality is not controlling operations for Vernalis. Although the water quality at Vernalis may at times be degraded as a result of the transfer, it is assumed that it would be mitigated by Reclamation operating New Melones Reservoir to continue to comply with water quality objectives consistent with past practice. Therefore, the transfer would not cause any additional noncompliance instances.

New Melones Reservoir operations may be affected by the transfers due to the linkage between its operations and San Joaquin River conditions. The potential changes in New Melones storage due to the net releases from New Melones Reservoir, for either Vernalis water quality or flow purposes, are shown in Table 69. The values are directly related to flow changes to the lower Stanislaus River at Goodwin Reservoir. Positive values indicate an increase in storage and a decrease in flow to the lower Stanislaus River.

Table 69
Changes to Storage in New Melones Reservoir – Alternative C, Refuge Focus

Net Incremental Change in NM Storage due to Vernalis Flow & Quality Release Change - Acre-feet

C-1-1-C: 130 CONSERVATION REFUGE COMPOSITE

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Total
Wet	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Above Normal	0	0	0	0	0	-2496	0	0	0	0	0	0	0	0	-2496
Below Normal	0	-1834	0	0	0	1176	1382	-1829	0	0	0	0	0	295	-811
Dry	0	-1834	130	735	901	1176	1382	-1890	0	0	0	0	0	295	895
Critical	0	386	-97	-12	15	223	297	-6209	0	0	0	0	0	-267	-5665

C-2-1-C: 130 GROUNDWATER REFUGE COMPOSITE

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Total
Wet	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Above Normal	0	0	0	0	0	-212	0	0	0	0	0	0	0	0	-212
Below Normal	0	-779	0	0	0	363	582	-2479	0	0	0	0	0	295	-2019
Dry	0	-779	-4	17	57	363	582	-2540	0	0	0	0	0	295	-2011
Critical	0	386	-97	-12	15	223	297	-6209	0	0	0	0	0	-267	-5665

C-3-1-C: 130 FALLOWING REFUGE COMPOSITE

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Total
Wet	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Above Normal	0	0	0	0	0	-2496	0	0	0	0	0	0	0	0	-2496
Below Normal	0	-1834	0	0	0	1176	1382	-1829	0	0	0	0	0	295	-811
Dry	0	-1834	130	735	901	1176	1382	-1890	0	0	0	0	0	295	895
Critical	0	386	-97	-12	15	223	297	-6209	0	0	0	0	0	-267	-5665

For the refuge focus scenarios, an annual decrease in New Melones Reservoir storage is anticipated for above normal, below normal and critical years. This decrease could range up to about 5,600 acre-feet in critical years. Critical year effects are due to the direct and indirect effects of providing water through the land fallowing element. Flow changes in the Stanislaus River would range between an increase of 101 cfs for water quality purposes to a decrease (common to the critical year land fallowing program) of 22 cfs. However, when a reduction in flow is calculated, the reduction may not actually be allowed because another release objective may require the continuation of some level of that release. Modeling limitations did not allow the identification of such circumstances.

The majority of the effect of a change in New Melones Reservoir storage would not be realized during the current year of the transfer, but instead during the subsequent year or years when water supply allocations are subsequently determined. If the following year is dry, the previous year’s effect in storage would translate to relatively small allocation changes to lower Stanislaus River purposes and potentially no change to allocations to CVP contractors. If the following year is normal or wetter, more noticeable changes to allocations would occur. In the wettest of conditions, allocations would not change.

The transfer program to the wildlife areas could affect inflows to the Delta from the San Joaquin River. The change in net Delta water supply balance to the CVP/SWP is shown in Table 70. For the

Table 70
Delta CVP/SWP Water Supply Effect – Alternative C, Refuge Focus

Incremental Change in Project Delta Supply due to Action - Acre-feet

C-1-1-C: 130 CONSERVATION REFUGE COMPOSITE

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Total
Wet	0	-642	0	0	0	0	-2535	433	0	0	0	0	0	103	-2641
Above Normal	0	-642	0	0	0	0	-2535	433	0	0	0	0	0	103	-2641
Below Normal	0	0	0	0	0	-3672	-3917	2262	0	0	0	0	0	0	-5327
Dry	0	0	-490	-527	-2877	-3672	-3917	2323	-722	-651	0	0	0	0	-10533
Critical	0	-1165	-131	4	-55	-849	-1146	12252	312	-39	634	0	0	834	10650

C-2-1-C: 130 GROUNDWATER REFUGE COMPOSITE

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Total
Wet	0	-273	0	0	0	0	-251	2718	0	0	0	0	0	103	2297
Above Normal	0	-273	0	0	0	0	-251	2718	0	0	0	0	0	103	2297
Below Normal	0	0	0	0	0	-575	-833	5197	0	0	0	0	0	0	3789
Dry	0	0	-74	32	252	-575	-833	5258	684	233	0	0	0	0	4978
Critical	0	-1165	-131	4	-55	-849	-1146	12252	312	-39	634	0	0	834	10650

C-3-1-C: 130 FALLOWING REFUGE COMPOSITE

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Total
Wet	0	-642	0	0	0	0	-2535	433	0	0	0	0	0	103	-2641
Above Normal	0	-642	0	0	0	0	-2535	433	0	0	0	0	0	103	-2641
Below Normal	0	0	0	0	0	-3672	-3917	2262	0	0	0	0	0	0	-5327
Dry	0	0	-490	-527	-2877	-3672	-3917	2323	-722	-651	0	0	0	0	-10533
Critical	0	-1165	-131	4	-55	-849	-1146	12252	312	-39	634	0	0	834	10650

conservation and land fallowing scenarios, a net decrease in supply is shown for each year except a critical year (the critical year effect is the same for all source scenarios, indicative of the land fallowing program). The decrease in net supply ranges from a about 2,600 acre-feet in a wet year, to about 10,000 acre-feet during a dry year. During a critical year, a gain of over 10,000 acre-feet occurs. With the groundwater scenario, a gain in CVP/SWP Delta water supply occurs each year. The changes occur not only due to the development and disposition of the transfer water, but also due to the New Melones Reservoir reaction to changes in the river system. A portion of the CVP/SWP Delta supply effect is a result of and reflective of the gains or losses in New Melones Reservoir storage. The combined net effect on the two supplies should be considered when evaluating the impacts of the proposed transfer upon the CVP/SWP.

All Water to Agriculture

These scenarios would result in up to 130,000 acre-feet of transfer water being provided to CVP agricultural contractors. This water could be delivered to contractors within or outside of the drainage of the San Joaquin River. Potential CVP shortages to contractors within the drainage of the San Joaquin River substantiate the potential need for the entire 130,000 acre-feet of transfer to those entities. The direct effects of the Exchange Contractors developing transfer water are combined with the additional effects of the CVP contractors producing increased runoff to the San Joaquin River. Addition indirect effects occur due to Reclamation acquiring additional water for delivery to the wildlife areas from entities other than the Exchange Contractors.

The water transferred to agricultural users would essentially exchange the delivery of water from the Exchange Contractors to a CVP agricultural contractor. San Joaquin River flow and quality, New Melones Reservoir release, and Delta inflows would be affected as the result of the Exchange Contractors developing transfer water and the indirect effects of the transfers.

The agricultural water scenarios would provide additional water deliveries to San Joaquin Valley CVP agricultural contractors that discharge to the San Joaquin River. Table 71 shows the potential range in flow change at Vernalis that may occur as a result of these scenarios. Changes in flow at Vernalis

Table 71
Vernalis Flow Conditions – Alternative C, Agriculture Focus

Benchmark Vernalis Flow - cfs

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb
Wet	7500	13600	15700	13600	12000	7400	5100	3100	2500	3600	3000	4600	7500	13600
Above Normal	5800	7200	6200	5900	4600	2600	2100	2000	1500	2000	1800	2300	5800	7200
Below Normal	2300	3200	3300	3700	3700	2100	1900	1500	1200	1900	1700	2200	2300	3200
Dry	1900	2600	2300	2700	2200	1800	1400	1100	1000	1700	1600	2100	1900	2600
Critical	1300	1700	1600	1800	1500	1300	1000	1000	1000	1500	1400	1500	1300	1700

Change in Vernalis Flow with Action - cfs

C-1-2-C: 130 CONSERVATION AGRICULTURE COMPOSITE

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb
Wet	-5	-33	-20	-19	-22	-30	-24	-29	2	-3	3	1	1	2
Above Normal	-5	-33	-20	-19	-22	0	-24	-29	2	-3	3	1	1	2
Below Normal	-5	0	-20	-19	-22	-54	-55	-51	2	-3	3	1	1	0
Dry	-5	0	-23	-32	-38	-54	-55	-48	2	-3	3	1	1	0
Critical	-3	-21	-4	5	7	-5	-5	-5	13	6	2	0	1	1

C-2-2-C: 130 GROUNDWATER AGRICULTURE COMPOSITE

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb
Wet	-3	-14	-3	10	15	9	13	8	26	12	3	1	1	2
Above Normal	-3	-14	-3	10	15	0	13	8	26	12	3	1	1	2
Below Normal	-3	0	-3	10	15	-1	-5	-3	26	12	3	1	1	0
Dry	-3	0	-4	9	13	-1	-5	-1	26	12	3	1	1	0
Critical	-3	-21	-4	5	7	-5	-5	-5	13	6	2	0	1	1

C-3-2-C: 130 FALLOWING AGRICULTURE COMPOSITE

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb
Wet	-5	-33	-20	-19	-22	-30	-24	-29	2	-3	3	1	1	2
Above Normal	-5	-33	-20	-19	-22	0	-24	-29	2	-3	3	1	1	2
Below Normal	-5	0	-20	-19	-22	-54	-55	-51	2	-3	3	1	1	0
Dry	-5	0	-23	-32	-38	-54	-55	-48	2	-3	3	1	1	0
Critical	-3	-21	-4	5	7	-5	-5	-5	13	6	2	0	1	1

range from an increase of 26 cfs to a decrease of 55 cfs. During wet years, the changes in flow at Vernalis are solely the result of the net effect of the development and disposition of transfer water. For the conservation/land fallowing scenarios, the changes in flow mostly reflect the net result of removing runoff from the Exchange Contractors and the addition of runoff from the agricultural transferees. A smaller effect occurs due to an increase in Reclamation acquisitions from other San Joaquin Valley sources to satisfy wildlife area deliveries. For the groundwater scenario, less reduction in flow due to the removal of return flows occurs. In other noncritical years the monthly changes generally show the same trends, except during February of dry and below normal years and June of an above normal year when New Melones Reservoir reacts to flow changes caused by the transfers to maintain the Vernalis flow at the controlling flow objective. During all but wet years the flow at Vernalis is also at times affected by water quality release changes from New Melones Reservoir.

No change in flow at Vernalis occurs during periods when it is assumed that flow objectives control (February of below normal and dry years, June of above normal years, and during the pulse flow periods during April and May). All scenarios have the same critical year effects, owing to the circumstance that only the land fallowing element is employed during critical years. With the transfer, during the VAMP pulse flow period (mid-April through mid-May) the "existing flow" condition, as defined by the SJRA, may be slightly lower in noncritical years. The flow at Vernalis during this period is the result of the procedures and targets defined by the SJRA, and would likely be the same either with or without the transfer.

Water quality at Vernalis would also change due to the transfer. Table 72 shows the change in Vernalis water quality resulting from the transfers under each source option. The table also provides the

Table 72
Vernalis Water Quality Conditions – Alternative C, Agriculture Focus

Benchmark Vernalis Water Quality - µmhos	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb
Wet	352	286	310	269	212	310	341	460	442	359	497	432	352	286
Above Normal	404	380	465	364	334	486	509	534	588	494	657	639	404	380
Below Normal	757	631	690	465	382	700	700	700	680	510	681	657	757	631
Dry	880	736	1000	700	700	700	700	700	772	547	708	678	880	736
Critical	1000	1000	1000	700	700	700	700	700	772	595	772	859	1000	1000
Change in Vernalis Water Quality with Action - µmhos														
C-1-2-C: 130 CONSERVATION AGRICULTURE COMPOSITE														
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb
Wet	-1	-3	-1	-2	-3	-4	-6	-8	-7	-2	0	0	0	0
Above Normal	-1	-5	-2	-4	-6	-13	-12	-11	-11	-3	0	0	0	0
Below Normal	-2	-15	-3	-6	-8	0	0	0	-11	-2	0	0	0	0
Dry	-2	-18	0	-3	-	-	0	0	-9	-2	0	0	0	1
Critical	-2	0	0	0	-	-	0	0	-1	0	0	0	0	0
C-2-2-C: 130 GROUNDWATER AGRICULTURE COMPOSITE														
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb
Wet	-1	-1	0	0	0	-1	-2	-2	-1	0	0	0	0	0
Above Normal	-1	-2	0	0	1	0	-5	-4	-3	0	0	0	0	0
Below Normal	-1	-6	-1	0	1	0	0	0	-3	1	0	0	0	0
Dry	-1	-8	0	0	-1	0	0	0	-2	1	0	0	0	1
Critical	-2	0	0	0	0	0	0	0	-1	0	0	0	0	0
C-3-2-C: 130 FALLOWING AGRICULTURE COMPOSITE														
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb
Wet	-1	-3	-1	-2	-3	-4	-6	-8	-7	-2	0	0	0	0
Above Normal	-1	-5	-2	-4	-6	-13	-12	-11	-11	-3	0	0	0	0
Below Normal	-2	-15	-3	-6	-8	0	0	0	-11	-2	0	0	0	0
Dry	-2	-18	0	-3	-	-	0	0	-9	-2	0	0	0	1
Critical	-2	0	0	0	-	-	0	0	-1	0	0	0	0	0

Note: Values for April and May during dry and critical years have been omitted from the table due to modeling limitations. During the first half of April and the later half of May of these periods, Vernalis water quality objectives are assumed to control. During transfers it is assumed that New Melones releases would continue to provide compliance with the objectives; therefore, no change in water quality would occur.

assumed Existing Conditions / Future No Action setting water quality condition at Vernalis. Water quality changes at Vernalis trend with the net addition (runoff) and removal (reduction in return flows) of water within the river system. Deliveries to the agricultural contractors result in additional return flows to the river at a quality better than Existing Conditions / Future No Action setting water quality at Vernalis. The development of the transfer water by the Exchange Contractors removes flow in the river, typically with a quality worse than the Existing Conditions / Future No Action setting water quality at Vernalis. During periods when the water quality objective is assumed to control New Melones releases (indicated by the 700 and 1,000 µS/cm values in Table 72) no change in water quality would occur due to the counteraction at New Melones Reservoir for transfer-related San Joaquin River flow and quality changes. During other periods, the estimated change in water quality could be within a range of 18 µS/cm improvement to a

1 µS/cm degradation. The analysis indicates that water quality at Vernalis will almost always improve or be neutral with this scenario with all the source scenarios. It is assumed that Reclamation will continue to operate New Melones Reservoir to comply with water quality objectives consistent with past practice. Therefore, the transfer would not cause any additional noncompliance instances.

New Melones Reservoir operations may be affected by the transfers due to the linkage between its operations and San Joaquin River conditions. The potential changes in the net releases from New Melones Reservoir, for either Vernalis water quality or flow purposes, are illustrated in Table 73. The values are directly related to flow changes to the lower Stanislaus River at Goodwin Reservoir. Positive values indicate an increase in storage and a decrease in flow to the lower Stanislaus River.

Table 73
Storage/Flow Change in New Melones Reservoir – Alternative C, Agriculture Focus

Net Incremental Change in NM Storage due to Vernalis Flow & Quality Release Change - Acre-feet

C-1-2-C: 130 CONSERVATION AGRICULTURE COMPOSITE

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Total
Wet	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Above Normal	0	0	0	0	0	-1760	0	0	0	0	0	0	0	0	-1760
Below Normal	0	-1834	0	0	0	1425	1888	1332	0	0	0	0	0	117	2928
Dry	0	-1834	222	776	975	1425	1888	1163	0	0	0	0	0	117	4732
Critical	0	386	47	-12	30	260	350	223	0	0	0	0	0	14	1296

C-2-2-C: 130 GROUNDWATER AGRICULTURE COMPOSITE

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Total
Wet	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Above Normal	0	0	0	0	0	524	0	0	0	0	0	0	0	0	524
Below Normal	0	-779	0	0	0	612	1088	682	0	0	0	0	0	117	1720
Dry	0	-779	87	58	130	612	1088	513	0	0	0	0	0	117	1826
Critical	0	386	47	-12	30	260	350	223	0	0	0	0	0	14	1296

C-3-2-C: 130 FALLOWING AGRICULTURE COMPOSITE

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Total
Wet	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Above Normal	0	0	0	0	0	-1760	0	0	0	0	0	0	0	0	-1760
Below Normal	0	-1834	0	0	0	1425	1888	1332	0	0	0	0	0	117	2928
Dry	0	-1834	222	776	975	1425	1888	1163	0	0	0	0	0	117	4732
Critical	0	386	47	-12	30	260	350	223	0	0	0	0	0	14	1296

For the agricultural water delivery scenario, an overall annual increase in New Melones Reservoir storage occurs during most years of the scenarios. This increase could range up to about 4,700 acre-feet. The exception is during an above normal year when the only change in New Melones Reservoir releases is the reaction to the net removal of flow from the river during June. Critical year effects are due to the direct and indirect effects of providing water through the land fallowing element. Changes to flow in the Stanislaus River would range between an increase of 33 cfs to a decrease of 31 cfs. However, when a reduction in flow is calculated, the reduction may not actually be allowed because another release objective may require the continuation of some level of that release. Modeling limitations did not allow the identification of such circumstances.

The majority of the effect of a change in New Melones Reservoir storage would not be realized during the current year of the transfer, but instead during the subsequent year or years when water supply allocations are subsequently determined. If the following year is dry, the previous year’s effect in storage would translate to relatively small allocation changes to lower Stanislaus River purposes and potentially no change to allocations to CVP contractors. If the following year is normal or wetter, more noticeable changes to allocations would occur. In the wettest of conditions, allocations would not change.

The transfer program to the agricultural contractors could affect inflows to the Delta from the San Joaquin River. The change in net Delta water supply balance to the CVP/SWP is shown in Table 74. For the conservation/land fallowing scenarios, a net decrease in supply is shown for each year. The decrease in net supply during noncritical years for these scenarios ranges from about 3,900 acre-feet in a wet and above normal year to almost 13,000 acre-feet during a dry year. During a critical year, a loss of about 300 acre-feet occurs (resulting from the land fallowing program that occurs in critical years of all source scenarios). For the groundwater scenario, the CVP/SWP Delta supply is essentially neutral or gains each year. The changes occur not only due to the development and disposition of the transfer water, but also due to the New Melones Reservoir reaction to changes in the river system. The combined net effect on the two supplies should be considered when evaluating the impacts of the proposed transfer upon the CVP/SWP.

Table 74
Delta CVP/SWP Water Supply Effect – Alternative C, Agriculture Focus

Incremental Change in Project Delta Supply due to Action - Acre-feet

C-1-2-C: 130 CONSERVATION AGRICULTURE COMPOSITE

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Total
Wet	0	-642	0	0	0	0	-1474	-1812	0	0	0	0	0	41	-3887
Above Normal	0	-642	0	0	0	0	-1474	-1812	0	0	0	0	0	41	-3887
Below Normal	0	0	0	0	0	-3186	-3362	-3144	0	0	0	0	0	0	-9692
Dry	0	0	-501	-470	-2331	-3186	-3362	-2976	138	-190	0	0	0	0	-12877
Critical	0	-1165	-273	325	432	-289	-338	-337	773	372	100	0	0	47	-354

C-2-2-C: 130 GROUNDWATER AGRICULTURE COMPOSITE

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Total
Wet	0	-273	0	0	0	0	811	472	0	0	0	0	0	41	1051
Above Normal	0	-273	0	0	0	0	811	472	0	0	0	0	0	41	1051
Below Normal	0	0	0	0	0	-88	-278	-210	0	0	0	0	0	0	-576
Dry	0	0	-85	89	798	-88	-278	-41	1544	695	0	0	0	0	2634
Critical	0	-1165	-273	325	432	-289	-338	-337	773	372	100	0	0	47	-354

C-3-2-C: 130 FALLOWING AGRICULTURE COMPOSITE

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Total
Wet	0	-642	0	0	0	0	-1474	-1812	0	0	0	0	0	41	-3887
Above Normal	0	-642	0	0	0	0	-1474	-1812	0	0	0	0	0	41	-3887
Below Normal	0	0	0	0	0	-3186	-3362	-3144	0	0	0	0	0	0	-9692
Dry	0	0	-501	-470	-2331	-3186	-3362	-2976	138	-190	0	0	0	0	-12877
Critical	0	-1165	-273	325	432	-289	-338	-337	773	372	100	0	0	47	-354

All Water Transferred Out of Basin

A variation to transferring all water to wildlife purposes or all agriculture users is transfers to the entities outside of the drainage of the San Joaquin River. Hydrologically, San Joaquin River effects would occur differently when the disposition of water has no connectivity with the San Joaquin River. For purposes of estimating hydrologic effects in the San Joaquin River, it does not matter if water is delivered to urban use, agricultural use, or wildlife area use outside of the San Joaquin River drainage basin; none of this use would have any return flow effect upon the San Joaquin River. The only effect of this option would be the direct effects caused by the development of the water for the transfer and the sometimes indirect effects of Reclamation actions of maintaining wildlife area deliveries consistent with the Existing Conditions / Future No Action setting. The out-of-basin scenarios would provide up to 130,000 acre-feet of water to uses (any combination of wildlife areas, agriculture, and urban) occurring outside the drainage of the San Joaquin River. These uses could include deliveries to the two refuges that do not have hydrologic connectivity to the San Joaquin River, Pixley and Kern NWRs (located in the Tulare Lake Basin), SCVWD and SBCWD (located in the San Felipe Division), CVP water contractors of the Friant Division, and the Cross-Valley Contractors of the CVP.

The out-of-basin scenarios would provide additional water deliveries to areas that do not discharge to the San Joaquin River. Hydrologic effects at Vernalis resulting from this scenario are shown in Table 75, which also provides the assumed Existing Conditions / Future No Action setting Vernalis flows. Changes in flow at Vernalis range from no change to a decrease of 74 cfs. The changes in flow at Vernalis are primarily the result of the direct effect of the development of transfer water and the effects of New Melones Reservoir reacting to Vernalis flow and quality conditions. The results also include the indirect effect of Reclamation increasing its acquisition of water supplies from entities other than the Exchange Contractors for wildlife area deliveries. The greatest potential flow differences occur for the conservation/land fallowing scenarios. The changes in flow reflect the reduction in return flow during the year by the conservation and crop idling/land fallowing components and the reduction of runoff from entities that Reclamation acquires water for wildlife area deliveries. During February of dry and below normal years and June of an above normal year, New Melones Reservoir reacts to flow changes caused by the transfers to maintain the Vernalis flow at the controlling flow objective, which results in no flow change occurring at Vernalis. During all but wet years the flow at Vernalis is also at times affected by water quality release changes from New Melones Reservoir. During critical years, the flow change at Vernalis is always reflective of the effect of the crop idling/land fallowing source of water.

With the transfer, during the VAMP pulse flow period (mid-April through mid-May) the “existing flow” condition (as defined by the SJRA) may be slightly lower. The flow at Vernalis during this period is the result of the procedures and targets defined by the SJRA, and would likely be the same either with or without the transfer.

Table 75
Vernalis Flow Conditions – Alternative C, Out-of-Basin Transfer

Benchmark Vernalis Flow - cfs

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb
Wet	7500	13600	15700	13600	12000	7400	5100	3100	2500	3600	3000	4600	7500	13600
Above Normal	5800	7200	6200	5900	4600	2600	2100	2000	1500	2000	1800	2300	5800	7200
Below Normal	2300	3200	3300	3700	3700	2100	1900	1500	1200	1900	1700	2200	2300	3200
Dry	1900	2600	2300	2700	2200	1800	1400	1100	1000	1700	1600	2100	1900	2600
Critical	1300	1700	1600	1800	1500	1300	1000	1000	1000	1500	1400	1500	1300	1700

Change in Vernalis Flow with Action - cfs

C-1-3-C: 130 CONSERVATION OUT COMPOSITE

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb
Wet	-5	-33	-23	-34	-43	-56	-60	-56	-34	-19	-1	0	0	-1
Above Normal	-5	-33	-23	-34	-43	0	-60	-56	-34	-19	-1	0	0	-1
Below Normal	-5	0	-23	-34	-43	-71	-74	-68	-34	-19	-1	0	0	0
Dry	-5	0	-25	-46	-57	-71	-74	-69	-34	-19	-1	0	0	0
Critical	-3	-21	-6	0	-1	-14	-19	-16	-1	0	0	0	0	0

C-2-3-C: 130 GROUNDWATER OUT COMPOSITE

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb
Wet	-3	-14	-6	-4	-6	-17	-23	-19	-10	-4	-1	0	0	-1
Above Normal	-3	-14	-6	-4	-6	0	-23	-19	-10	-4	-1	0	0	-1
Below Normal	-3	0	-6	-4	-6	-19	-24	-20	-10	-4	-1	0	0	0
Dry	-3	0	-6	-4	-6	-19	-24	-21	-10	-4	-1	0	0	0
Critical	-3	-21	-6	0	-1	-14	-19	-16	-1	0	0	0	0	0

C-3-3-C: 130 FALLOWING OUT COMPOSITE

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb
Wet	-5	-33	-23	-34	-43	-56	-60	-56	-34	-19	-1	0	0	-1
Above Normal	-5	-33	-23	-34	-43	0	-60	-56	-34	-19	-1	0	0	-1
Below Normal	-5	0	-23	-34	-43	-71	-74	-68	-34	-19	-1	0	0	0
Dry	-5	0	-25	-46	-57	-71	-74	-69	-34	-19	-1	0	0	0
Critical	-3	-21	-6	0	-1	-14	-19	-16	-1	0	0	0	0	0

Water quality at Vernalis would also change due to the transfer. Table 76 illustrates the change in Vernalis water quality that results from the transfers under each source scenario. The table also provides the assumed Existing Conditions / Future No Action setting water quality condition at Vernalis.

Table 76
Vernalis Water Quality Conditions – Alternative C, Out-of-Basin Transfer

Benchmark Vernalis Water Quality - µmhos

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb
Wet	352	286	310	269	212	310	341	460	442	359	497	432	352	286
Above Normal	404	380	465	364	334	486	509	534	588	494	657	639	404	380
Below Normal	757	631	690	465	382	700	700	700	680	510	681	657	757	631
Dry	880	736	1000	700	700	700	700	700	772	547	708	678	880	736
Critical	1000	1000	1000	700	700	700	700	700	772	595	772	859	1000	1000

Change in Vernalis Water Quality with Action - µmhos

C-1-3-C: 130 CONSERVATION OUT COMPOSITE

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb
Wet	-1	-3	-1	-2	-3	-4	-6	-7	-6	-2	0	0	0	0
Above Normal	-1	-5	-2	-5	-7	-18	-10	-8	-7	-3	0	0	0	0
Below Normal	-2	-15	-3	-6	-9	0	0	0	-7	-3	0	0	0	0
Dry	-2	-18	0	-3	-	-	0	0	-6	-3	0	0	0	0
Critical	-2	0	0	0	-	-	0	0	0	0	0	0	0	0

C-2-3-C: 130 GROUNDWATER OUT COMPOSITE

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb
Wet	-1	-1	0	0	0	-1	-2	-1	0	0	0	0	0	0
Above Normal	-1	-2	-1	0	0	-5	-2	-2	1	0	0	0	0	0
Below Normal	-1	-6	-1	0	0	0	0	0	1	0	0	0	0	0
Dry	-1	-8	0	0	0	0	0	0	1	0	0	0	0	0
Critical	-2	0	0	0	0	0	0	0	0	0	0	0	0	0

C-3-3-C: 130 FALLOWING OUT COMPOSITE

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb
Wet	-1	-3	-1	-2	-3	-4	-6	-7	-6	-2	0	0	0	0
Above Normal	-1	-5	-2	-5	-7	-18	-10	-8	-7	-3	0	0	0	0
Below Normal	-2	-15	-3	-6	-9	0	0	0	-7	-3	0	0	0	0
Dry	-2	-18	0	-3	-	-	0	0	-6	-3	0	0	0	0
Critical	-2	0	0	0	-	-	0	0	0	0	0	0	0	0

Note: Values for April and May during dry and critical years have been omitted from the table due to modeling limitations. During the first half of April and the later half of May of these periods, Vernalis water quality objectives are assumed to control. During transfers it is assumed that New Melones releases would continue to provide compliance with the objectives; therefore, no change in water quality would occur.

Water quality changes at Vernalis trend with the removal (reduction in return flows) of water within the river system. The development of the transfer water by the Exchange Contractors would remove flow in the river, typically with a quality worse than the Existing Conditions/ Future No Action setting water quality at Vernalis. Removal of return flows due to land fallowing will also remove flow of lesser quality. During periods when the water quality objective is assumed to control New Melones releases (indicated by the 700 and 1000 µS/cm values in Table 76), no change in water quality would occur due to the anticipated counteraction at New Melones Reservoir for transfer-related San Joaquin River flow and quality changes. During other periods, the estimated change in water quality would be a slight improvement. if not a neutral effect in quality. The changes to water quality are minor and would not cause any additional noncompliance instances at Vernalis.

The flow and quality effects of the transfer to the San Joaquin River upstream of the Stanislaus River could trigger a change in releases from New Melones Reservoir to counter such effects. The potential changes in storage in New Melones due to the net releases from New Melones Reservoir, for either Vernalis water quality or flow purposes, are shown in Table 77. The values are directly related to flow changes to the lower Stanislaus River at Goodwin Reservoir. Positive values indicate an increase in storage and a decrease in flow to the lower Stanislaus River.

The changes shown in Table 77 indicate the releases from New Melones that would be required to counter the effect of developing the transfer water on maintaining Vernalis flow and quality conditions exactly at the Vernalis objective compliance level. Accumulated changes in New Melones Reservoir storage vary by year type but the change in storage within a year is less than about 3,000 acre-feet, positive or negative. The potential change in flow to the lower Stanislaus River mirror the changes in the New Melones storage. The changes in flow range from an increase of up to 56 cfs during June (during an above normal year) to a decrease of up to 15 cfs during March through August. However, when a reduction in flow is calculated, the reduction may not actually be allowed because another release objective may require the continuation of some level of that release. Modeling limitations did not allow the identification of such circumstances.

An indirect impact that may result from a change in New Melones Reservoir operations would be the allocation of water to uses within the Interim Plan of Operations, including impacts to water users and the fish and water quality purposes. For this scenario, the estimated change in storage at New Melones Reservoir in a year could range between a gain of over 2,000 acre-feet during a dry year, to a decrease in storage of 3,300 acre-feet during an above normal year. These changes are minor.

Table 77
Changes in Storage in New Melones Reservoir – Alternative C, Out-of-Basin Transfer

Net Incremental Change in NM Storage due to Vernalis Flow & Quality Release Change - Acre-feet

C-1-3-C: 130 CONSERVATION OUT COMPOSITE	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Total
Wet	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Above Normal	0	0	0	0	0	-3312	0	0	0	0	0	0	0	0	-3312
Below Normal	0	-1834	0	0	0	900	821	700	0	0	0	0	0	-41	546
Dry	0	-1834	156	709	819	900	821	758	0	0	0	0	0	-41	2290
Critical	0	386	39	8	15	223	297	213	0	0	0	0	0	0	1180

C-2-3-C: 130 GROUNDWATER OUT COMPOSITE	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Total
Wet	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Above Normal	0	0	0	0	0	-1027	0	0	0	0	0	0	0	0	-1027
Below Normal	0	-779	0	0	0	87	21	49	0	0	0	0	0	-41	-662
Dry	0	-779	22	-9	-25	87	21	108	0	0	0	0	0	-41	-616
Critical	0	386	39	8	15	223	297	213	0	0	0	0	0	0	1180

C-3-3-C: 130 FALLOWING OUT COMPOSITE	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Total
Wet	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Above Normal	0	0	0	0	0	-3312	0	0	0	0	0	0	0	0	-3312
Below Normal	0	-1834	0	0	0	900	821	700	0	0	0	0	0	-41	546
Dry	0	-1834	156	709	819	900	821	758	0	0	0	0	0	-41	2290
Critical	0	386	39	8	15	223	297	213	0	0	0	0	0	0	1180

The transfer program could affect inflows to the Delta from the San Joaquin River, and could decrease the CVP/SWP water supplies. The change in net Delta water supply balance to the CVP/SWP is shown in Table 78.

Table 78
Delta CVP/SWP Water Supply Effect – Alternative C, Out-of-Basin Transfer

Incremental Change in Project Delta Supply due to Action - Acre-feet

C-1-3-C: 130 CONSERVATION OUT COMPOSITE

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Total
Wet	0	-642	0	0	0	0	-3711	-3457	0	0	0	0	0	-14	-7825
Above Normal	0	-642	0	0	0	0	-3711	-3457	0	0	0	0	0	-14	-7825
Below Normal	0	0	0	0	0	-4212	-4532	-4157	0	0	0	0	0	0	-12901
Dry	0	0	-548	-598	-3482	-4212	-4532	-4216	-2022	-1126	0	0	0	0	-20736
Critical	0	-1165	-342	-28	-55	-849	-1146	-960	-58	0	0	0	0	0	-4604

C-2-3-C: 130 GROUNDWATER OUT COMPOSITE

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Total
Wet	0	-273	0	0	0	0	-1427	-1173	0	0	0	0	0	-14	-2886
Above Normal	0	-273	0	0	0	0	-1427	-1173	0	0	0	0	0	-14	-2886
Below Normal	0	0	0	0	0	-1114	-1448	-1222	0	0	0	0	0	0	-3784
Dry	0	0	-132	-40	-353	-1114	-1448	-1281	-616	-242	0	0	0	0	-5225
Critical	0	-1165	-342	-28	-55	-849	-1146	-960	-58	0	0	0	0	0	-4604

C-3-3-C: 130 FALLOWING OUT COMPOSITE

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Total
Wet	0	-642	0	0	0	0	-3711	-3457	0	0	0	0	0	-14	-7825
Above Normal	0	-642	0	0	0	0	-3711	-3457	0	0	0	0	0	-14	-7825
Below Normal	0	0	0	0	0	-4212	-4532	-4157	0	0	0	0	0	0	-12901
Dry	0	0	-548	-598	-3482	-4212	-4532	-4216	-2022	-1126	0	0	0	0	-20736
Critical	0	-1165	-342	-28	-55	-849	-1146	-960	-58	0	0	0	0	0	-4604

For each scenario, a net decrease in supply is shown for each year. The decrease in net supply ranges from about 2,900 acre-feet with the groundwater scenario to more than 20,000 acre-feet during a dry year for the conservation/land fallowing scenarios. The groundwater scenario affects the Delta supply to a lesser degree, approximately 5,200 acre-feet or less. All source options have the same critical year program utilizing land fallowing. These changes would occur due to the development of the transfer water and the indirect action of Reclamation acquiring additional supplies for wildlife area deliveries, and are compounded by the New Melones Reservoir reaction to changes in the river system. A portion of the CVP/SWP Delta supply effect is a result of and reflective of the gains or losses in New Melones Reservoir storage. The combined net effect on the two supplies should be considered when evaluating the impacts of the proposed transfer upon the CVP/SWP.

In summary of the combined effects among Alternative C scenarios, all scenarios of this alternative would cause changes to flows at Vernalis. The groundwater scenario is most neutral to Vernalis flow. For the wildlife area water scenarios, flow during August is expected to increase at Vernalis due to the combination of incremental return flows from the wildlife areas and the reaction of New Melones Reservoir release to maintain water quality at Vernalis. The fall and follow-on winter conditions are generally the same under all scenarios. Water quality at Vernalis would also change due to the transfers. These potential changes are nearly the same between comparable scenarios with an improvement or neutrality in water quality expected. The exception would be in the wildlife area water scenario during August when some degradation may occur when water quality is not controlling operations at New Melones Reservoir. All of the potential changes are minor. The potential change in New Melones Reservoir storage and releases to the lower Stanislaus River varies among the scenarios. The wildlife area water scenario poses the greatest potential for reductions to storage due to the potential releases to counteract flow and quality effects of the transfer, in particular the incremental return flows of the wildlife areas. The potential effect to water supply allocations under the Interim Plan of Operations would also vary in relation to the accumulated change in New Melones Reservoir storage, but no major changes in allocation are expected. The potential CVP/SWP Delta supply effect is also variable by delivery scenario.

General Conclusions and Summary of Results

The results of the analyses vary significantly by size of program, components of supply, disposition of transfer and year-type. Very few conclusions can be made regarding an alternative or configuration that will be superior in terms of minimizing potential hydrologic effects across the entire range of hydrologic conditions. Also, recognizing that an effect at New Melones Reservoir will at times provide an opposite affect in the Delta supply a question rises as to what characteristics constitute a superior configuration. The following conclusions and observations are provided:

- The results indicate that no one alternative or configuration is best in all circumstances. Consistent with the performance of the current program being implemented, the best strategy appears to be one that is flexible in establishing size, transferees and sources of water.

- The potential effects to New Melones Reservoir and Delta supply are very dependent upon assumptions for the periods when water and flow objectives at Vernalis affect New Melones Reservoir operations and when the Delta is in a balanced or export/inflow controlling condition. For each year-type there will actually be variations of hydrologic circumstances (e.g., times when the objectives either control or do not control) that are not illustrated in the modeling. These different circumstances will lead to different results.

- Developing water from tailwater recapture and land fallowing components will normally have a hydrologic effect to the San Joaquin River, more so for the tailwater recapture component. Each of these components has the potential to remove flows from the San Joaquin River with an associated water quality worse than objectives at Vernalis. The development of the groundwater component included in this analysis is neutral to the San Joaquin River.

- Transferring water to entities with hydrologic continuity with the San Joaquin River will also create a hydrologic effect to the San Joaquin River. The assumed management of incremental supply for each transferee indicates that a greater amount of runoff will return from a transfer to the wildlife areas than from a transfer to agriculture. Runoff from the wildlife areas is assumed, at times, to be of a quality in excess of objectives at Vernalis.

- At times when releases to the lower Stanislaus River from New Melones Reservoir are partially controlled by water quality or flow objectives at Vernalis, changes in the flow and quality of the San Joaquin River due to the development and disposition of transfer water can cause changes to the release of water to the lower Stanislaus River, sometimes higher releases and sometimes lower releases.

- Water quality at Vernalis during months when water quality does not affect New Melones Reservoir operations will at times change due to the transfer, sometimes water quality will improve and sometimes water quality will worsen, but the change is relatively minor to the assumed Existing Conditions setting.

- Although not explicitly modeled, transfers to Santa Clara Valley Water District, Friant Division contractors, or wildlife areas and CVP SOD contractors generally south of Mendota Pool will have the same neutral effect on flows in the San Joaquin River.

The results of the analyses in terms of potential New Melones Reservoir storage effects and potential CVP/SWP Delta supply effects are illustrated in Figures 5 through 12. The illustrations represent the results separately for the water development-only analyses and the combined, composite effect analyses for each alternative.

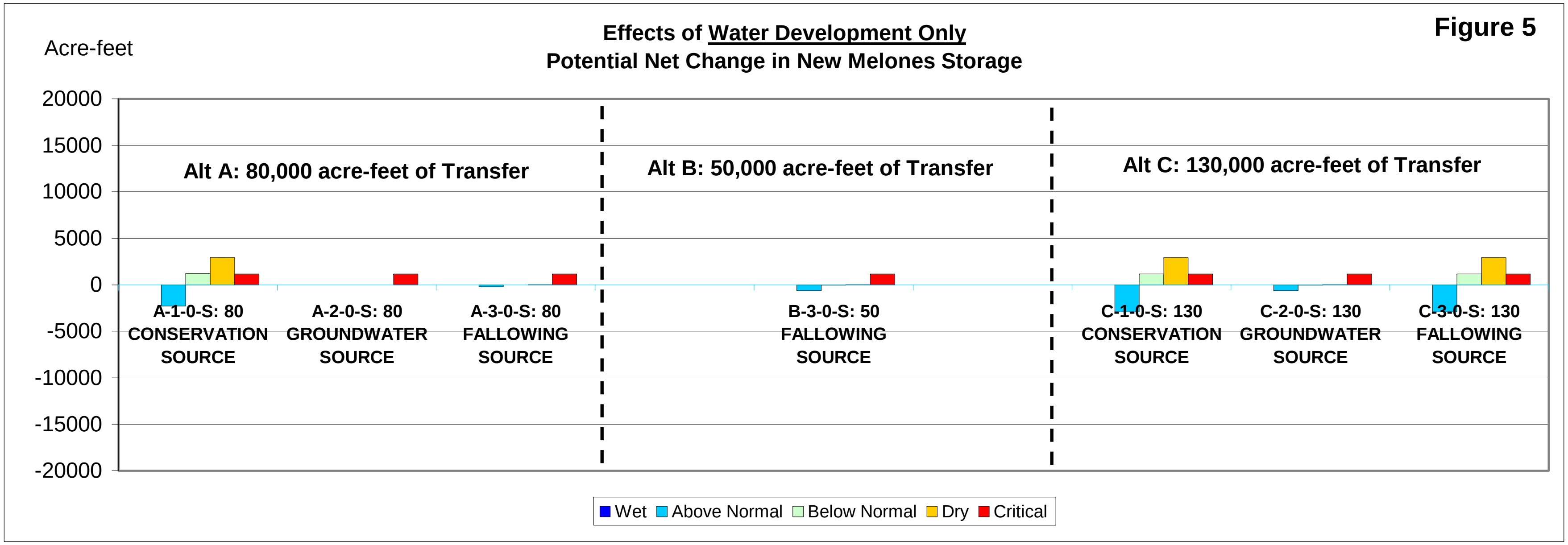


Figure 5
Effects of Water Development Only
Potential Net Change in New Melones Storage
Acre-feet
20000
15000
10000
5000
0
-5000
-10000
-15000
-20000
Alt A: 80,000 acre-feet of Transfer
Alt B: 50,000 acre-feet of Transfer
Alt C: 130,000 acre-feet of Transfer
A-1-0-S: 80 CONSERVATION SOURCE
A-2-0-S: 80 GROUNDWATER SOURCE
A-3-0-S: 80 FALLOWING SOURCE
B-3-0-S: 50 FALLOWING SOURCE
C-1-0-S: 130 CONSERVATION SOURCE
C-2-0-S: 130 GROUNDWATER SOURCE
C-3-0-S: 130 FALLOWING SOURCE
Wet
Above Normal
Below Normal
Dry
Critical

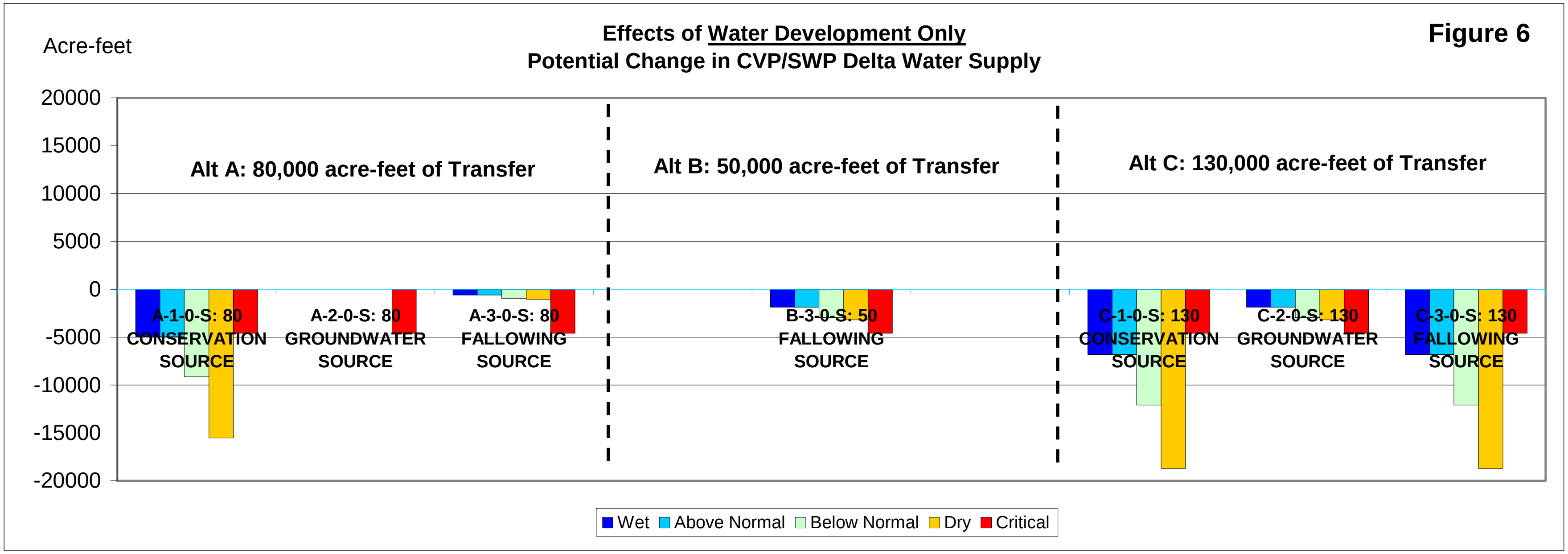


Figure 6
Effects of Water Development Only
Potential Change in CVP/SWP Delta Water Supply
Acre-feet
20000
15000
10000
5000
0
-5000
-10000
-15000
-20000
Alt A: 80,000 acre-feet of Transfer
Alt B: 50,000 acre-feet of Transfer
Alt C: 130,000 acre-feet of Transfer
A-1-0-S: 80 CONSERVATION SOURCE
A-2-0-S: 80 GROUNDWATER SOURCE
A-3-0-S: 80 FALLOWING SOURCE
B-3-0-S: 50 FALLOWING SOURCE
C-1-0-S: 130 CONSERVATION SOURCE
C-2-0-S: 130 GROUNDWATER SOURCE
C-3-0-S: 130 FALLOWING SOURCE
Wet
Above Normal
Below Normal
Dry
Critical

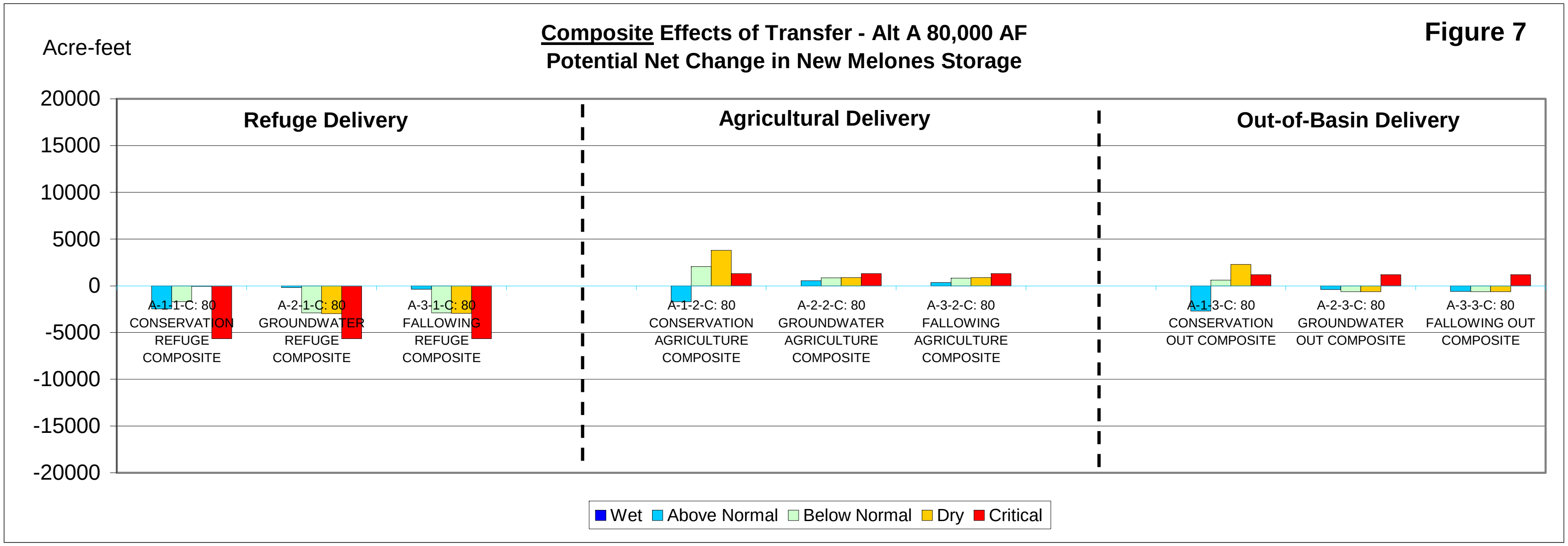


Figure 7
Composite Effects of Transfer - Alt A 80,000 AF
Potential Net Change in New Melones Storage
Acre-feet
20000
15000
10000
5000
0
-5000
-10000
-15000
-20000
Refuge Delivery
Agricultural Delivery
Out-of-Basin Delivery
A-1-1-C: 80 CONSERVATION REFUGE COMPOSITE
A-2-1-C: 80 GROUNDWATER REFUGE COMPOSITE
A-3-1-C: 80 FALLOWING REFUGE COMPOSITE
A-1-2-C: 80 CONSERVATION AGRICULTURE COMPOSITE
A-2-2-C: 80 GROUNDWATER AGRICULTURE COMPOSITE
A-3-2-C: 80 FALLOWING AGRICULTURE COMPOSITE
A-1-3-C: 80 CONSERVATION OUT COMPOSITE
A-2-3-C: 80 GROUNDWATER OUT COMPOSITE
A-3-3-C: 80 FALLOWING OUT COMPOSITE
Wet
Above Normal
Below Normal
Dry
Critical

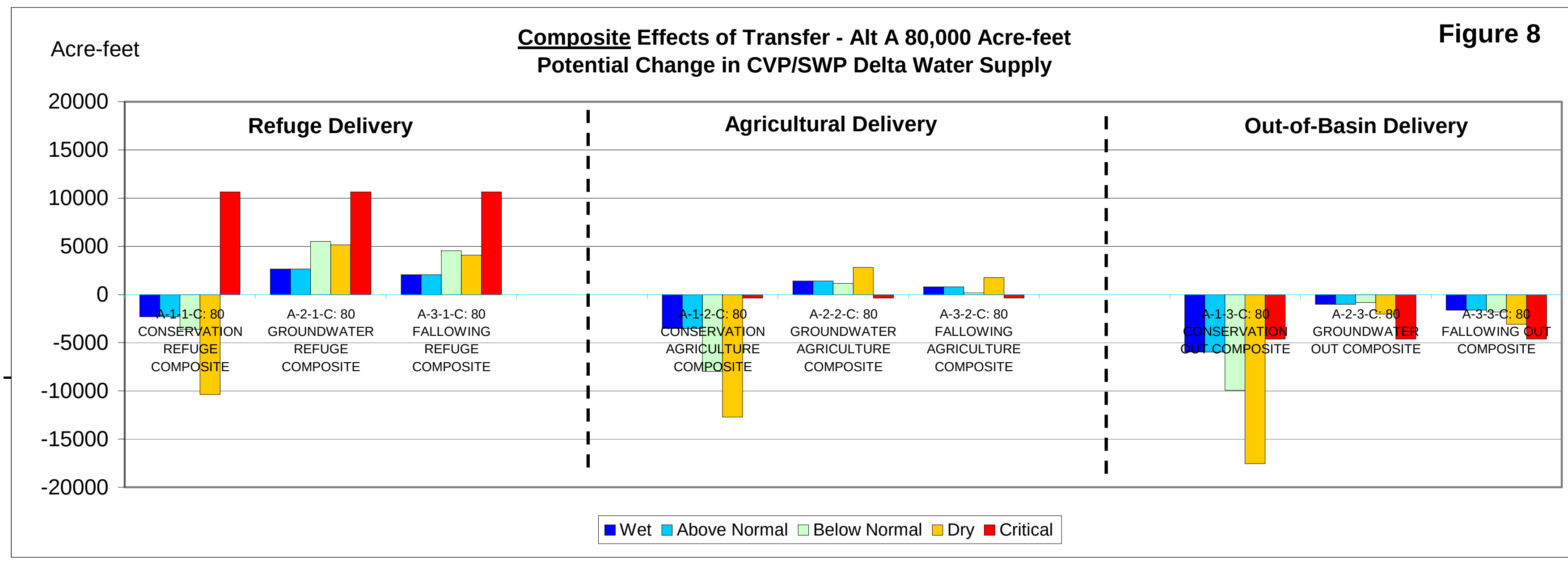


Figure 8
Composite Effects of Transfer - Alt A 80,000 Acre-feet
Potential Change in CVP/SWP Delta Water Supply
Acre-feet
20000
15000
10000
5000
0
-5000
-10000
-15000
-20000
Refuge Delivery
Agricultural Delivery
Out-of-Basin Delivery
A-1-1-C: 80 CONSERVATION REFUGE COMPOSITE
A-2-1-C: 80 GROUNDWATER REFUGE COMPOSITE
A-3-1-C: 80 FALLOWING REFUGE COMPOSITE
A-1-2-C: 80 CONSERVATION AGRICULTURE COMPOSITE
A-2-2-C: 80 GROUNDWATER AGRICULTURE COMPOSITE
A-3-2-C: 80 FALLOWING AGRICULTURE COMPOSITE
A-1-3-C: 80 CONSERVATION OUT COMPOSITE
A-2-3-C: 80 GROUNDWATER OUT COMPOSITE
A-3-3-C: 80 FALLOWING OUT COMPOSITE
Wet
Above Normal
Below Normal
Dry
Critical

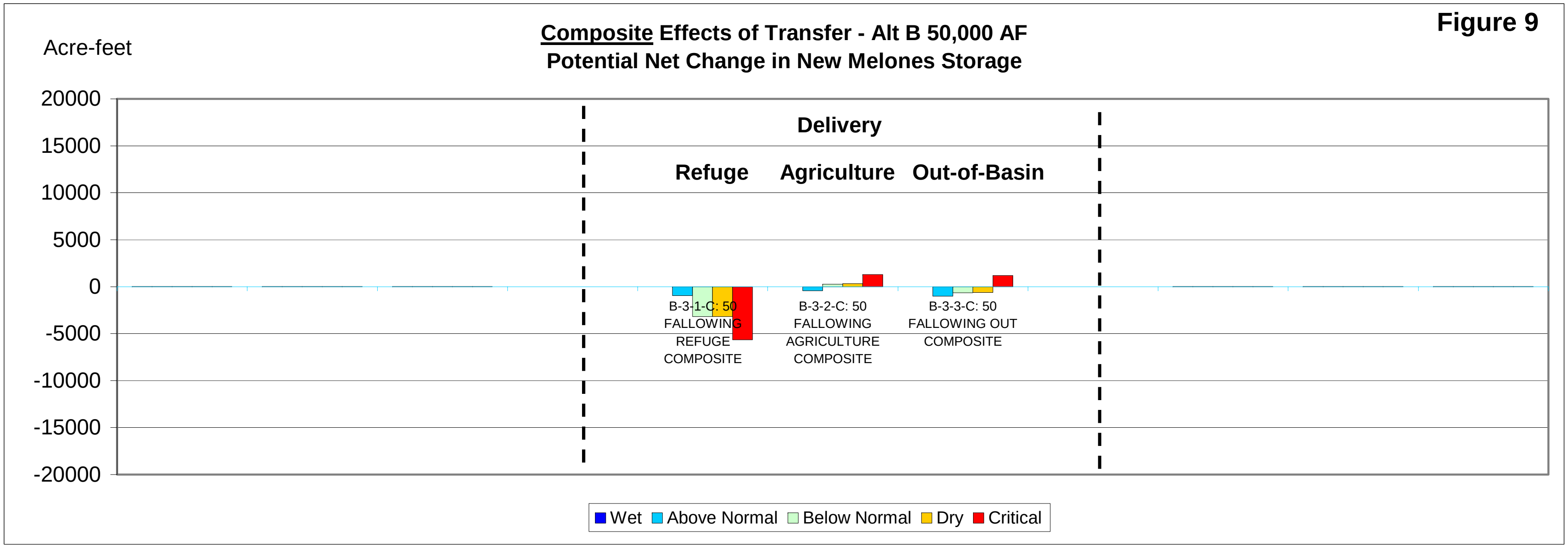


Figure 9
Acre-feet
Composite Effects of Transfer - Alt B 50,000 AF
Potential Net Change in New Melones Storage
20000
15000
10000
5000
0
-5000
-10000
-15000
-20000
Delivery
Refuge
Agriculture
Out-of-Basin
B-3-1-C: 50 FALLOWING REFUGE COMPOSITE
B-3-2-C: 50 FALLOWING AGRICULTURE COMPOSITE
B-3-3-C: 50 FALLOWING OUT COMPOSITE
Wet
Above Normal
Below Normal
Dry
Critical

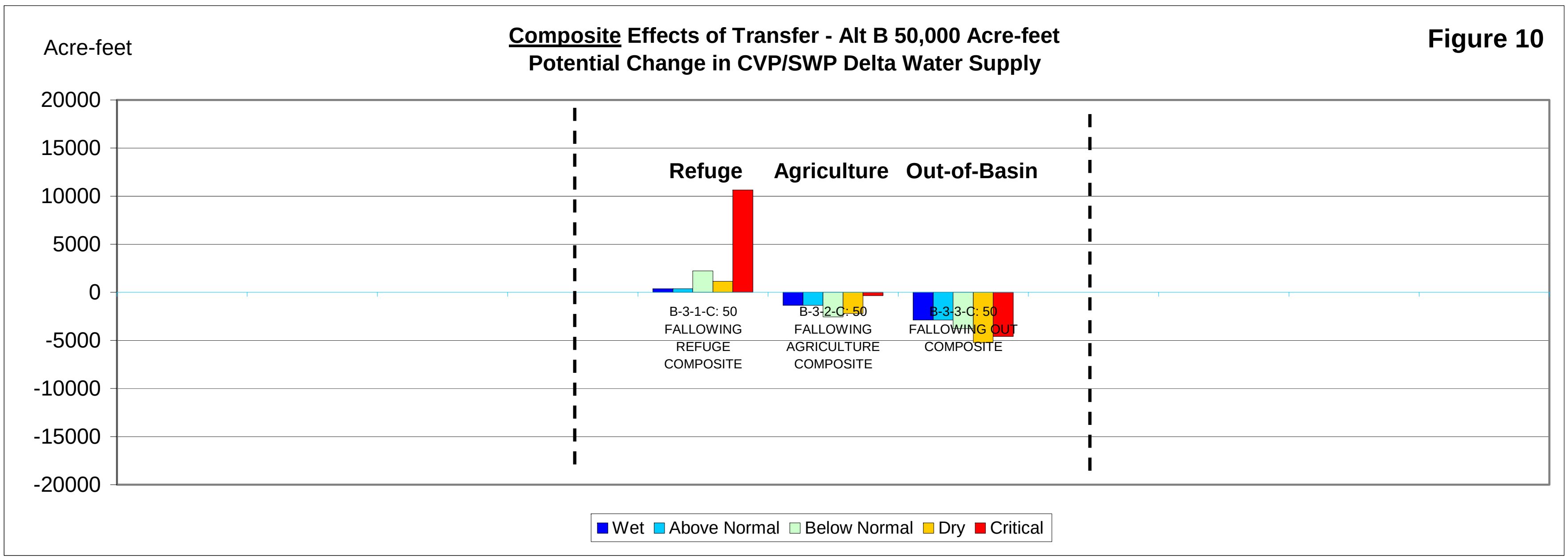


Figure 10
Acre-feet
Composite Effects of Transfer - Alt B 50,000 Acre-feet
Potential Change in CVP/SWP Delta Water Supply
20000
15000
10000
5000
0
-5000
-10000
-15000
-20000
Refuge
Agriculture
Out-of-Basin
B-3-1-C: 50 FALLOWING REFUGE COMPOSITE
B-3-2-C: 50 FALLOWING AGRICULTURE COMPOSITE
B-3-3-C: 50 FALLOWING OUT COMPOSITE
Wet
Above Normal
Below Normal
Dry
Critical

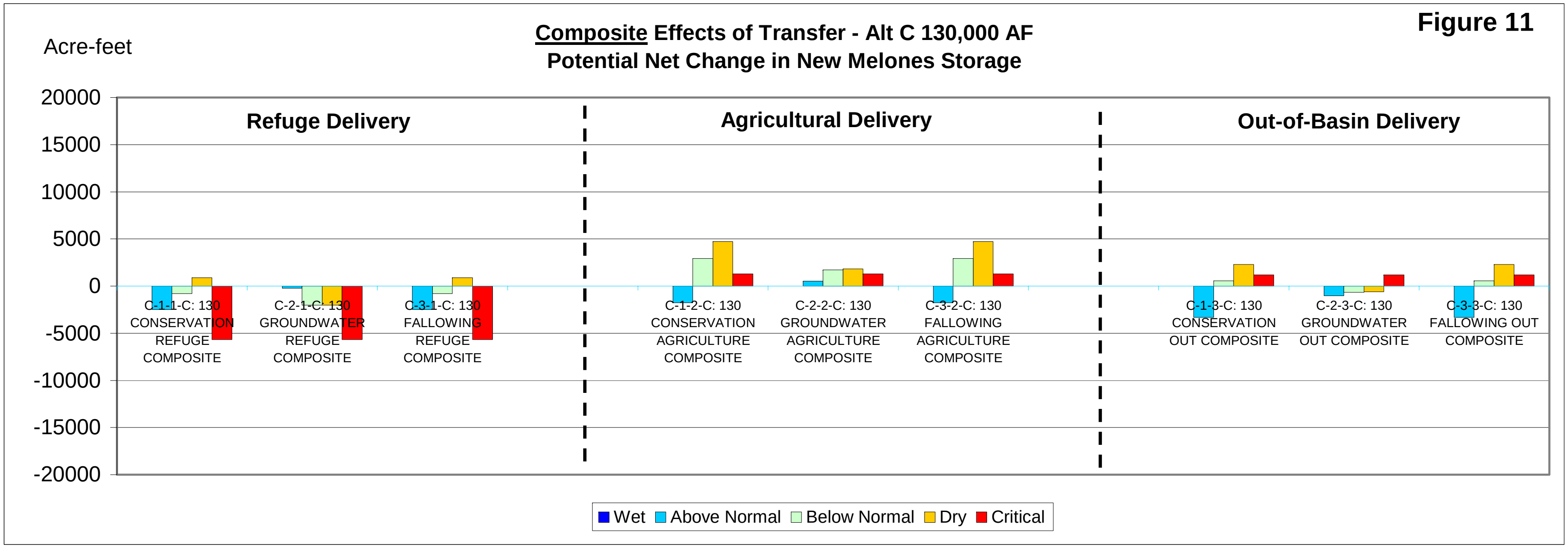


Figure 11
Acre-feet
Composite Effects of Transfer - Alt C 130,000 AF
Potential Net Change in New Melones Storage
20000
15000
10000
5000
0
-5000
-10000
-15000
-20000
Refuge Delivery
Agricultural Delivery
Out-of-Basin Delivery
C-1-1-C: 130 CONSERVATION REFUGE COMPOSITE
C-2-1-C: 130 GROUNDWATER REFUGE COMPOSITE
C-3-1-C: 130 FALLOWING REFUGE COMPOSITE
C-1-2-C: 130 CONSERVATION AGRICULTURE COMPOSITE
C-2-2-C: 130 GROUNDWATER AGRICULTURE COMPOSITE
C-3-2-C: 130 FALLOWING AGRICULTURE COMPOSITE
C-1-3-C: 130 CONSERVATION OUT COMPOSITE
C-2-3-C: 130 GROUNDWATER OUT COMPOSITE
C-3-3-C: 130 FALLOWING OUT COMPOSITE
Wet
Above Normal
Below Normal
Dry
Critical

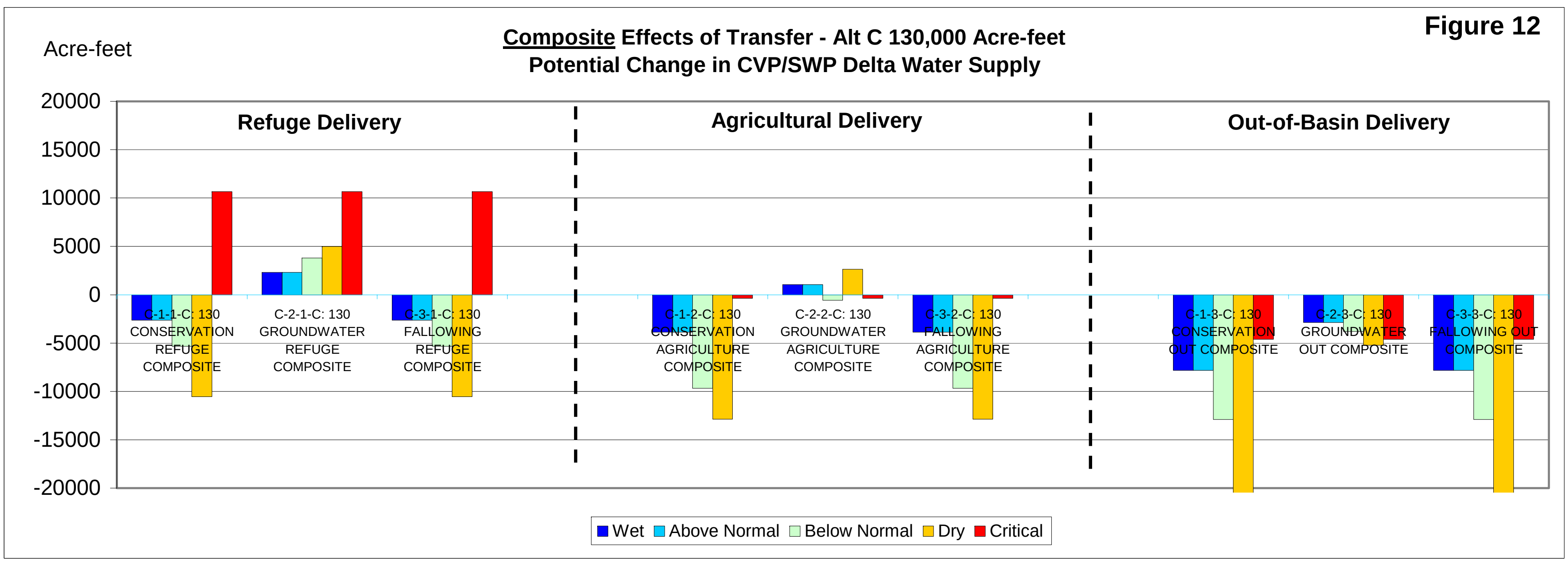


Figure 12
Acre-feet
Composite Effects of Transfer - Alt C 130,000 Acre-feet
Potential Change in CVP/SWP Delta Water Supply
20000
15000
10000
5000
0
-5000
-10000
-15000
-20000
Refuge Delivery
Agricultural Delivery
Out-of-Basin Delivery
C-1-1-C: 130 CONSERVATION REFUGE COMPOSITE
C-2-1-C: 130 GROUNDWATER REFUGE COMPOSITE
C-3-1-C: 130 FALLOWING REFUGE COMPOSITE
C-1-2-C: 130 CONSERVATION AGRICULTURE COMPOSITE
C-2-2-C: 130 GROUNDWATER AGRICULTURE COMPOSITE
C-3-2-C: 130 FALLOWING AGRICULTURE COMPOSITE
C-1-3-C: 130 CONSERVATION OUT COMPOSITE
C-2-3-C: 130 GROUNDWATER OUT COMPOSITE
C-3-3-C: 130 FALLOWING OUT COMPOSITE
Wet
Above Normal
Below Normal
Dry
Critical

Attachment 1
Summary Results for Scenarios

Study: A-1-0-S: 80 CONSERVATION SOURCE — Water Development and Disposition Assumptions

All Values Relative to Benchmark (Existing) Condition

Disposition Non-Crit	Disposition Crit		SJR Continuity Non-Crit	SJR Continuity Crit		SJR Non-Continuity Non-Crit	SJR Non-Continuity Crit	
0	0	Agriculture-SJRc	0	0	Conservation of Evaporation/Seepage to GW-SJRc	0	0	Conservation of Evaporation/Seepage to GW-SJRnc
0	0	Wildlife Areas-SJRc	0	0	Conservation of Drain Spills to Wildlife Areas-SJRc	0	0	Conservation of Drain Spills to Wildlife Areas-SJRnc
0	0	Urban-SJRc	-6000	0	Groundwater-SJRc	0	0	Groundwater-SJRnc
0	0	Agriculture-SJRnc	15465	0	Tailwater Recapture-SJRc	900	0	Tailwater Recapture-SJRnc
0	0	Wildlife Areas-SJRnc	0	42000	Fallowing -SJRc	0	8000	Fallowing-SJRnc
0	0	Urban-SJRnc	Non-Crit	Crit			Non-Crit	Crit
0	0	EWA	10365	50000	Total Developed Water:	Total Disposition:	0	0

All Values Relative to Benchmark (Existing) Condition — Basic Hydrologic Accounting

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Total
Water Developed - Non Critical Years															
Change in Evaporation/Seepage to GW	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Change in Drain Spills to Wildlife Areas	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Change in Discharge to SJR Streams	141	1054	1054	1757	2285	2285	2285	2285	1406	914	0	0	0	0	15,465
Change to Flows Upstream of Sack Dam	0	45	90	90	99	144	162	162	72	27	9	0	0	0	900
Crop Fallowing	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Groundwater	0	0	0	-750	-840	-990	-1200	-900	-600	-600	-120	0	0	0	-6,000
Total	141	1099	1144	1097	1544	1439	1247	1547	878	341	-111	0	0	0	10,365
Effects to SJR Flows due to Developing Water - Non Critical Years															
Change in Evaporation/Seepage to GW	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Change in Drain Spills to Wildlife Areas	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Change in Discharge to SJR Streams	141	1054	1054	1757	2285	2285	2285	2285	1406	914	0	0	0	0	15,465
Change to Flows Upstream of Sack Dam	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Crop Fallowing	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Groundwater	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total (Positive value means flow reduced)	141	1054	1054	1757	2285	2285	2285	2285	1406	914	0	0	0	0	15,465
Return Flows from Disposition of Transfer Water - Non Critical Years															
Incremental Return from Agricultural Transferees	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Incremental Return from Wildlife Area Transferees	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Envirnomental Water Account Beneficiaries															
Incremental Return from Agricultural Entities	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Net Effect to San Joaquin River Flow Before NM Adjustment (Acre-feet)	-141	-1054	-1054	-1757	-2285	-2285	-2285	-2285	-1406	-914	0	0	0	0	-15,465
(Positive value means flow added) (cfs)	-2	-19	-17	-30	-37	-38	-37	-37	-24	-15	0	0	0	0	0
Water Developed - Critical Years															
Change in Evaporation/Seepage to GW	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Change in Drain Spills to Wildlife Areas	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Change in Discharge to SJR Streams	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Change to Flows Upstream of Sack Dam	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Crop Fallowing	1031	4639	5155	344	687	10653	14433	12715	344	0	0	0	0	0	50,000
Groundwater	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	1031	4639	5155	344	687	10653	14433	12715	344	0	0	0	0	0	50,000
Effects to SJR Flows due to Developing Water - Critical Years															
Change in Evaporation/Seepage to GW	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Change in Drain Spills to Wildlife Areas	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Change in Discharge to SJR Streams	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Change to Flows Upstream of Sack Dam	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Crop Fallowing	173	779	303	20	40	626	849	748	58	0	0	0	0	0	3,597
Groundwater	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total (Positive value means flow reduced)	173	779	303	20	40	626	849	748	58	0	0	0	0	0	3,597
Return Flows from Disposition of Transfer Water - Critical Years															
Incremental Return from Agricultural Transferees	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Incremental Return from Wildlife Area Transferees	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Envirnomental Water Account Beneficiaries															
Incremental Return from Agricultural Entities	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Net Effect to San Joaquin River Flow Before NM Adjustment (Acre-feet)	-173	-779	-303	-20	-40	-626	-849	-748	-58	0	0	0	0	0	-3,597
(Positive value means flow added) (cfs)	-3	-14	-5	0	-1	-11	-14	-12	-1	0	0	0	0	0	0

Vernalis

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb
Benchmark Vernalis Flow - cfs														
Wet	7500	13600	15700	13600	12000	7400	5100	3100	2500	3600	3000	4600	7500	13600
Above Normal	5800	7200	6200	5900	4600	2600	2100	2000	1500	2000	1800	2300	5800	7200
Below Normal	2300	3200	3300	3700	3700	2100	1900	1500	1200	1900	1700	2200	2300	3200
Dry	1900	2600	2300	2700	2200	1800	1400	1100	1000	1700	1600	2100	1900	2600
Critical	1300	1700	1600	1800	1500	1300	1000	1000	1000	1500	1400	1500	1300	1700
Change in Vernalis Flow with Action - cfs														
Wet	-2	-19	-17	-30	-37	-38	-37	-37	-24	-15	0	0	0	0
Above Normal	-2	-19	-17	-30	-37	0	-37	-37	-24	-15	0	0	0	0
Below Normal	-2	0	-17	-30	-37	-52	-50	-48	-24	-15	0	0	0	0
Dry	-2	0	-19	-42	-51	-52	-50	-48	-24	-15	0	0	0	0
Critical	-3	-21	-6	0	-1	-14	-19	-16	-1	0	0	0	0	0
With-Action Vernalis Flow - cfs														
Wet	7498	13581	15683	13570	11963	7362	5063	3063	2476	3585	3000	4600	7500	13600
Above Normal	5798	7181	6183	5870	4563	2600	2063	1963	1476	1985	1800	2300	5800	7200
Below Normal	2298	3200	3283	3670	3663	2048	1850	1452	1176	1885	1700	2200	2300	3200
Dry	1898	2600	2281	2658	2149	1748	1350	1052	976	1685	1600	2100	1900	2600
Critical	1297	1679	1594	1800	1499	1286	981	984	999	1500	1400	1500	1300	1700
Benchmark Vernalis Water Quality - mmhos (April and May values may not be reflective of split-month operations when objectives control)														
Wet	352	286	310	269	212	310	341	460	442	359	497	432	352	286
Above Normal	404	380	465	364	334	486	509	534	588	494	657	639	404	380
Below Normal	757	631	690	465	382	700	700	700	680	510	681	657	757	631
Dry	880	736	1000	700	700	700	700	700	772	547	708	678	880	736
Critical	1000	1000	1000	700	700	700	700	700	772	595	772	859	1000	1000
Change in Vernalis Water Quality with Action - mmhos (April and May values may not be reflective of split-month operations when objectives control)														
Wet	0	-2	-1	-2	-3	-3	-4	-5	-6	-2	0	0	0	0
Above Normal	-1	-3	-2	-4	-7	-13	-8	-7	-7	-3	0	0	0	0
Below Normal	-1	-8	-2	-6	-8	0	0	0	-7	-3	0	0	0	0
Dry	-1	-10	0	-3	-4	0	0	0	-7	-3	0	0	0	0
Critical	-2	0	0	0	0	0	0	0	0	0	0	0	0	0
With-Action Vernalis Water Quality - mmhos (April and May values may not be reflective of split-month operations when objectives control)														
Wet	351	284	309	267	209	307	337	455	436	357	497	432	352	286
Above Normal	404	377	463	360	327	473	502	527	581	491	657	639	404	380
Below Normal	756	623	688	459	374	700	700	700	673	507	681	657	757	631
Dry	879	725	1000	697	696	700	700	700	765	544	708	678	880	736
Critical	998	1000	1000	700	700	700	700	700	771	595	772	859	1000	1000

New Melones

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Total
Incremental Change in NM Storage due to WQ Release Change - Acre-feet															
Wet	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Above Normal	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Below Normal	0	0	0	0	0	813	800	650	0	0	0	0	0	0	2,263
Dry	0	0	135	718	845	813	800	650	0	0	0	0	0	0	3,960
Critical	0	386	39	8	15	223	297	213	0	0	0	0	0	0	1,180
Incremental Change in NM Storage due to Vernalis Flow Release Change - Acre-feet															
Wet	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Above Normal	0	0	0	0	0	-2285	0	0	0	0	0	0	0	0	-2,285
Below Normal	0	-1054	0	0	0	0	0	0	0	0	0	0	0	0	-1,054
Dry	0	-1054	0	0	0	0	0	0	0	0	0	0	0	0	-1,054
Critical	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Net Incremental Change in NM Storage due to Vernalis Flow & Quality Release Change - Acre-feet															
Wet	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Above Normal	0	0	0	0	0	-2285	0	0	0	0	0	0	0	0	-2,285
Below Normal	0	-1054	0	0	0	813	800	650	0	0	0	0	0	0	1,208
Dry	0	-1054	135	718	845	813	800	650	0	0	0	0	0	0	2,906
Critical	0	386	39	8	15	223	297	213	0	0	0	0	0	0	1,180

Project Delta Supply

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Total
Total Potential Delta supply Impact w/o NM Adjustments - Acre-feet															
Wet	0	-369	0	0	0	0	-2285	-2285	0	0	0	0	0	0	-4,938
Above Normal	0	-369	0	0	0	-2285	-2285	-2285	0	0	0	0	0	0	-7,223
Below Normal	0	-369	0	0	0	-2285	-2285	-2285	0	0	0	0	0	0	-7,223
Dry	0	-369	-369	-308	-2285	-2285	-2285	-2285	-1406	-884	0	0	0	0	-12,474
Critical	0	-779	-303	-20	-40	-626	-849	-748	-58	0	0	0	0	0	-3,424
New Melones Adjustments - Acre-feet (positive means increase in supply)															
Wet	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Above Normal	0	0	0	0	0	2285	0	0	0	0	0	0	0	0	2,285
Below Normal	0	369	0	0	0	-813	-800	-650	0	0	0	0	0	0	-1,894
Dry	0	369	-47	-251	-845	-813	-800	-650	0	0	0	0	0	0	-3,037
Critical	0	-386	-39	-8	-15	-223	-297	-213	0	0	0	0	0	0	-1,180
Incremental Change in Project Delta Supply due to Action - Acre-feet															
Wet	0	-369	0	0	0	0	-2285	-2285	0	0	0	0	0	0	-4,938
Above Normal	0	-369	0	0	0	0	-2285	-2285	0	0	0	0	0	0	-4,938
Below Normal	0	0	0	0	0	-3097	-3084	-2935	0	0	0	0	0	0	-9,116
Dry	0	0	-416	-559	-3129	-3097	-3084	-2935	-1406	-884	0	0	0	0	-15,511
Critical	0	-1165	-342	-28	-55	-849	-1146	-960	-58	0	0	0	0	0	-4,604

Study: A-1-1-C: 80 CONSERVATION REFUGE COMPOSITE — **Water Development and Disposition Assumptions**

All Values Relative to Benchmark (Existing) Condition

Disposition Non-Crit	Crit		SJR Continuity Non-Crit	Crit		SJR Non-Continuity Non-Crit	Crit	
-15262	0	Agriculture-SJRc	0	0	Conservation of Evaporation/Seepage to GW-SJRc	0	0	Conservation of Evaporation/Seepage to GW-SJRnc
17823	40000	Wildlife Areas-SJRc	0	0	Conservation of Drain Spills to Wildlife Areas-SJRc	0	0	Conservation of Drain Spills to Wildlife Areas-SJRnc
0	0	Urban-SJRc	-6000	0	Groundwater-SJRc	0	0	Groundwater-SJRnc
-7385	0	Agriculture-SJRnc	15465	0	Tailwater Recapture-SJRc	900	0	Tailwater Recapture-SJRnc
9497	0	Wildlife Areas-SJRnc	0	42000	Fallowing -SJRc	0	8000	Fallowing-SJRnc
0	0	Urban-SJRnc						
0	0	EWA						

	Non-Crit	Crit
Total Developed Water:	10365	50000
Total Disposition:	4673	40000

All Values Relative to Benchmark (Existing) Condition — Basic Hydrologic Accounting

		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Total
Water Developed - Non Critical Years																
Change in Evaporation/Seepage to GW		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Change in Drain Spills to Wildlife Areas		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Change in Discharge to SJR Streams		141	1054	1054	1757	2285	2285	2285	2285	1406	914	0	0	0	0	15,465
Change to Flows Upstream of Sack Dam		0	45	90	90	99	144	162	162	72	27	9	0	0	0	900
Crop Fallowing		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Groundwater		0	0	0	-750	-840	-990	-1200	-900	-600	-600	-120	0	0	0	-6,000
Total		141	1099	1144	1097	1544	1439	1247	1547	878	341	-111	0	0	0	10,365
Effects to SJR Flows due to Developing Water - Non Critical Years																
Change in Evaporation/Seepage to GW		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Change in Drain Spills to Wildlife Areas		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Change in Discharge to SJR Streams		141	1054	1054	1757	2285	2285	2285	2285	1406	914	0	0	0	0	15,465
Change to Flows Upstream of Sack Dam		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Crop Fallowing		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Groundwater		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total (Positive value means flow reduced)		141	1054	1054	1757	2285	2285	2285	2285	1406	914	0	0	0	0	15,465
Return Flows from Disposition of Transfer Water - Non Critical Years																
Incremental Return from Agricultural Transferees		0	0	-23	-102	-153	-182	-263	-193	-254	-114	-31	-8	-10	-18	-1,351
Incremental Return from Wildlife Area Transferees		0	0	33	5	0	0	0	3026	165	-17	282	66	220	252	4,032
Envirnomental Water Account Beneficiaries																
Incremental Return from Agricultural Entities		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total		0	0	10	-96	-153	-182	-263	2833	-89	-131	252	58	209	234	2,682
Net Effect to San Joaquin River Flow Before NM Adjustment	(Acre-feet)	-141	-1054	-1044	-1854	-2438	-2467	-2547	548	-1495	-1045	252	58	209	234	-12,783
(Positive value means flow added)	(cfs)	-2	-19	-17	-31	-40	-41	-41	9	-25	-17	4	1	3	4	0
Water Developed - Critical Years																
Change in Evaporation/Seepage to GW		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Change in Drain Spills to Wildlife Areas		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Change in Discharge to SJR Streams		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Change to Flows Upstream of Sack Dam		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Crop Fallowing		1031	4639	5155	344	687	10653	14433	12715	344	0	0	0	0	0	50,000
Groundwater		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total		1031	4639	5155	344	687	10653	14433	12715	344	0	0	0	0	0	50,000
Effects to SJR Flows due to Developing Water - Critical Years																
Change in Evaporation/Seepage to GW		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Change in Drain Spills to Wildlife Areas		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Change in Discharge to SJR Streams		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Change to Flows Upstream of Sack Dam		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Crop Fallowing		173	779	303	20	40	626	849	748	58	0	0	0	0	0	3,597
Groundwater		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total (Positive value means flow reduced)		173	779	303	20	40	626	849	748	58	0	0	0	0	0	3,597
Return Flows from Disposition of Transfer Water - Critical Years																
Incremental Return from Agricultural Transferees		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Incremental Return from Wildlife Area Transferees		0	0	75	11	0	0	0	6791	370	-39	634	148	493	567	9,049
Envirnomental Water Account Beneficiaries																
Incremental Return from Agricultural Entities		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total		0	0	75	11	0	0	0	6791	370	-39	634	148	493	567	9,049
Net Effect to San Joaquin River Flow Before NM Adjustment	(Acre-feet)	-173	-779	-228	-9	-40	-626	-849	6043	312	-39	634	148	493	567	5,453
(Positive value means flow added)	(cfs)	-3	-14	-4	0	-1	-11	-14	98	5	-1	11	2	8	10	0

Vernalis

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb
Benchmark Vernalis Flow - cfs														
Wet	7500	13600	15700	13600	12000	7400	5100	3100	2500	3600	3000	4600	7500	13600
Above Normal	5800	7200	6200	5900	4600	2600	2100	2000	1500	2000	1800	2300	5800	7200
Below Normal	2300	3200	3300	3700	3700	2100	1900	1500	1200	1900	1700	2200	2300	3200
Dry	1900	2600	2300	2700	2200	1800	1400	1100	1000	1700	1600	2100	1900	2600
Critical	1300	1700	1600	1800	1500	1300	1000	1000	1000	1500	1400	1500	1300	1700
Change in Vernalis Flow with Action - cfs														
Wet	-2	-19	-17	-31	-40	-41	-41	9	-25	-17	4	1	3	4
Above Normal	-2	-19	-17	-31	-40	0	-41	9	-25	-17	4	1	3	4
Below Normal	-2	0	-17	-31	-40	-54	-52	46	-25	-17	4	1	3	0
Dry	-2	0	-18	-43	-53	-54	-52	46	-25	-17	4	1	3	0
Critical	-3	-21	-2	0	-1	-14	-19	199	5	-1	11	2	8	15
With-Action Vernalis Flow - cfs														
Wet	7498	13581	15683	13569	11960	7359	5059	3109	2475	3583	3004	4601	7503	13604
Above Normal	5798	7181	6183	5869	4560	2600	2059	2009	1475	1983	1804	2301	5803	7204
Below Normal	2298	3200	3283	3669	3660	2046	1848	1546	1175	1883	1704	2201	2303	3200
Dry	1898	2600	2282	2657	2147	1746	1348	1146	975	1683	1604	2101	1903	2600
Critical	1297	1679	1598	1800	1499	1286	981	1199	1005	1499	1411	1502	1308	1715
Benchmark Vernalis Water Quality - mmhos (April and May values may not be reflective of split-month operations when objectives control)														
Wet	352	286	310	269	212	310	341	460	442	359	497	432	352	286
Above Normal	404	380	465	364	334	486	509	534	588	494	657	639	404	380
Below Normal	757	631	690	465	382	700	700	700	680	510	681	657	757	631
Dry	880	736	1000	700	700	700	700	700	772	547	708	678	880	736
Critical	1000	1000	1000	700	700	700	700	700	772	595	772	859	1000	1000
Change in Vernalis Water Quality with Action - mmhos (April and May values may not be reflective of split-month operations when objectives control)														
Wet	0	-2	-1	-2	-3	-3	-4	9	-5	-2	1	0	0	0
Above Normal	-1	-3	-2	-4	-7	-14	-7	13	-6	-3	1	0	0	1
Below Normal	-1	-8	-2	-6	-8	0	0	0	-6	-3	1	0	1	2
Dry	-1	-10	0	-3	-4	0	0	0	-5	-3	1	0	1	2
Critical	-2	0	0	0	0	0	0	0	2	0	3	0	1	0
With-Action Vernalis Water Quality - mmhos (April and May values may not be reflective of split-month operations when objectives control)														
Wet	351	284	309	267	209	307	337	469	437	357	498	432	352	286
Above Normal	404	377	464	360	327	473	502	546	582	491	659	639	405	381
Below Normal	756	623	688	459	374	700	700	700	674	507	682	658	757	633
Dry	879	725	1000	697	696	700	700	700	766	544	709	678	880	738
Critical	998	1000	1000	700	700	700	700	700	773	595	775	859	1001	1000

New Melones

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Total
Incremental Change in NM Storage due to WQ Release Change - Acre-feet															
Wet	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Above Normal	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Below Normal	0	0	0	0	0	751	674	-2285	0	0	0	0	0	0	-860
Dry	0	0	67	701	826	751	674	-2259	0	0	0	0	0	0	761
Critical	0	386	-97	-12	15	223	297	-6209	0	0	0	0	0	-267	-5,665
Incremental Change in NM Storage due to Vernalis Flow Release Change - Acre-feet															
Wet	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Above Normal	0	0	0	0	0	-2467	0	0	0	0	0	0	0	0	-2,467
Below Normal	0	-1054	0	0	0	0	0	0	0	0	0	0	0	234	-820
Dry	0	-1054	0	0	0	0	0	0	0	0	0	0	0	234	-820
Critical	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Net Incremental Change in NM Storage due to Vernalis Flow & Quality Release Change - Acre-feet															
Wet	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Above Normal	0	0	0	0	0	-2467	0	0	0	0	0	0	0	0	-2,467
Below Normal	0	-1054	0	0	0	751	674	-2285	0	0	0	0	0	234	-1,680
Dry	0	-1054	67	701	826	751	674	-2259	0	0	0	0	0	234	-59
Critical	0	386	-97	-12	15	223	297	-6209	0	0	0	0	0	-267	-5,665

Project Delta Supply

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Total
Total Potential Delta supply Impact w/o NM Adjustments - Acre-feet															
Wet	0	-369	0	0	0	0	-2547	548	0	0	0	0	0	82	-2,286
Above Normal	0	-369	0	0	0	-2467	-2547	548	0	0	0	0	0	82	-4,753
Below Normal	0	-369	0	0	0	-2467	-2547	548	0	0	0	0	0	82	-4,753
Dry	0	-369	-366	-324	-2438	-2467	-2547	548	-1495	-1011	0	0	0	82	-10,387
Critical	0	-779	-228	-9	-40	-626	-849	6043	312	-39	634	0	0	567	4,985
New Melones Adjustments - Acre-feet (positive means increase in supply)															
Wet	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Above Normal	0	0	0	0	0	2467	0	0	0	0	0	0	0	0	2,467
Below Normal	0	369	0	0	0	-751	-674	2285	0	0	0	0	0	-82	1,147
Dry	0	369	-23	-245	-826	-751	-674	2259	0	0	0	0	0	-82	25
Critical	0	-386	97	12	-15	-223	-297	6209	0	0	0	0	0	267	5,665
Incremental Change in Project Delta Supply due to Action - Acre-feet															
Wet	0	-369	0	0	0	0	-2547	548	0	0	0	0	0	82	-2,286
Above Normal	0	-369	0	0	0	0	-2547	548	0	0	0	0	0	82	-2,286
Below Normal	0	0	0	0	0	-3218	-3222	2833	0	0	0	0	0	0	-3,606
Dry	0	0	-389	-570	-3264	-3218	-3222	2807	-1495	-1011	0	0	0	0	-10,362
Critical	0	-1165	-131	4	-55	-849	-1146	12252	312	-39	634	0	0	834	10,650

Study: A-1-2-C: 80 CONSERVATION AGRICULTURE COMPOSITE — Water Development and Disposition Assumptions

All Values Relative to Benchmark (Existing) Condition

Disposition Non-Crit	Disposition Crit	Disposition	SJR Continuity Non-Crit	SJR Continuity Crit	SJR Continuity	SJR Non-Continuity Non-Crit	SJR Non-Continuity Crit	SJR Non-Continuity
46412	50000	Agriculture-SJRc	0	0	Conservation of Evaporation/Seepage to GW-SJRc	0	0	Conservation of Evaporation/Seepage to GW-SJRnc
0	0	Wildlife Areas-SJRc	0	0	Conservation of Drain Spills to Wildlife Areas-SJRc	0	0	Conservation of Drain Spills to Wildlife Areas-SJRnc
0	0	Urban-SJRc	-6000	0	Groundwater-SJRc	0	0	Groundwater-SJRnc
-7385	0	Agriculture-SJRnc	15465	0	Tailwater Recapture-SJRc	900	0	Tailwater Recapture-SJRnc
0	0	Wildlife Areas-SJRnc	0	42000	Fallowing -SJRc	0	8000	Fallowing-SJRnc
0	0	Urban-SJRnc						
0	0	EWA						
			10365	50000	Total Developed Water	39027	50000	Total Disposition

All Values Relative to Benchmark (Existing) Condition — Basic Hydrologic Accounting

		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Total
Water Developed - Non Critical Years																
Change in Evaporation/Seepage to GW		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Change in Drain Spills to Wildlife Areas		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Change in Discharge to SJR Streams		141	1054	1054	1757	2285	2285	2285	2285	1406	914	0	0	0	0	15,465
Change to Flows Upstream of Sack Dam		0	45	90	90	99	144	162	162	72	27	9	0	0	0	900
Crop Fallowing		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Groundwater		0	0	0	-750	-840	-990	-1200	-900	-600	-600	-120	0	0	0	-6,000
Total		141	1099	1144	1097	1544	1439	1247	1547	878	341	-111	0	0	0	10,365
Effects to SJR Flows due to Developing Water - Non Critical Years																
Change in Evaporation/Seepage to GW		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Change in Drain Spills to Wildlife Areas		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Change in Discharge to SJR Streams		141	1054	1054	1757	2285	2285	2285	2285	1406	914	0	0	0	0	15,465
Change to Flows Upstream of Sack Dam		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Crop Fallowing		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Groundwater		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total (Positive value means flow reduced)		141	1054	1054	1757	2285	2285	2285	2285	1406	914	0	0	0	0	15,465
Return Flows from Disposition of Transfer Water - Non Critical Years																
Incremental Return from Agricultural Transferees		0	0	71	309	467	554	799	587	771	345	93	23	32	56	4,107
Incremental Return from Wildlife Area Transferees		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Envirnomental Water Account Beneficiaries																
Incremental Return from Agricultural Entities		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total		0	0	71	309	467	554	799	587	771	345	93	23	32	56	4,107
Net Effect to San Joaquin River Flow Before NM Adjustment	(Acre-feet)	-141	-1054	-983	-1449	-1818	-1731	-1486	-1697	-635	-568	93	23	32	56	-11,358
(Positive value means flow added)	(cfs)	-2	-19	-16	-24	-30	-29	-24	-28	-11	-9	2	0	1	1	0
Water Developed - Critical Years																
Change in Evaporation/Seepage to GW		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Change in Drain Spills to Wildlife Areas		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Change in Discharge to SJR Streams		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Change to Flows Upstream of Sack Dam		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Crop Fallowing		1031	4639	5155	344	687	10653	14433	12715	344	0	0	0	0	0	50,000
Groundwater		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total		1031	4639	5155	344	687	10653	14433	12715	344	0	0	0	0	0	50,000
Effects to SJR Flows due to Developing Water - Critical Years																
Change in Evaporation/Seepage to GW		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Change in Drain Spills to Wildlife Areas		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Change in Discharge to SJR Streams		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Change to Flows Upstream of Sack Dam		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Crop Fallowing		173	779	303	20	40	626	849	748	58	0	0	0	0	0	3,597
Groundwater		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total (Positive value means flow reduced)		173	779	303	20	40	626	849	748	58	0	0	0	0	0	3,597
Return Flows from Disposition of Transfer Water - Critical Years																
Incremental Return from Agricultural Transferees		0	0	77	333	503	597	861	633	831	372	100	25	34	61	4,425
Incremental Return from Wildlife Area Transferees		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Envirnomental Water Account Beneficiaries																
Incremental Return from Agricultural Entities		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total		0	0	77	333	503	597	861	633	831	372	100	25	34	61	4,425
Net Effect to San Joaquin River Flow Before NM Adjustment	(Acre-feet)	-173	-779	-226	312	462	-30	12	-115	773	372	100	25	34	61	828
(Positive value means flow added)	(cfs)	-3	-14	-4	5	8	0	0	-2	13	6	2	0	1	1	0

Vernalis

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb
Benchmark Vernalis Flow - cfs														
Wet	7500	13600	15700	13600	12000	7400	5100	3100	2500	3600	3000	4600	7500	13600
Above Normal	5800	7200	6200	5900	4600	2600	2100	2000	1500	2000	1800	2300	5800	7200
Below Normal	2300	3200	3300	3700	3700	2100	1900	1500	1200	1900	1700	2200	2300	3200
Dry	1900	2600	2300	2700	2200	1800	1400	1100	1000	1700	1600	2100	1900	2600
Critical	1300	1700	1600	1800	1500	1300	1000	1000	1000	1500	1400	1500	1300	1700
Change in Vernalis Flow with Action - cfs														
Wet	-2	-19	-16	-24	-30	-29	-24	-28	-11	-9	2	0	1	1
Above Normal	-2	-19	-16	-24	-30	0	-24	-28	-11	-9	2	0	1	1
Below Normal	-2	0	-16	-24	-30	-46	-43	-42	-11	-9	2	0	1	0
Dry	-2	0	-19	-37	-44	-46	-43	-41	-11	-9	2	0	1	0
Critical	-3	-21	-4	5	7	-5	-5	-5	13	6	2	0	1	1
With-Action Vernalis Flow - cfs														
Wet	7498	13581	15684	13576	11970	7371	5076	3072	2489	3591	3002	4600	7501	13601
Above Normal	5798	7181	6184	5876	4570	2600	2076	1972	1489	1991	1802	2300	5801	7201
Below Normal	2298	3200	3284	3676	3670	2054	1857	1458	1189	1891	1702	2200	2301	3200
Dry	1898	2600	2281	2663	2156	1754	1357	1059	989	1691	1602	2100	1901	2600
Critical	1297	1679	1596	1805	1507	1295	995	995	1013	1506	1402	1500	1301	1701
Benchmark Vernalis Water Quality - mmhos (April and May values may not be reflective of split-month operations when objectives control)														
Wet	352	286	310	269	212	310	341	460	442	359	497	432	352	286
Above Normal	404	380	465	364	334	486	509	534	588	494	657	639	404	380
Below Normal	757	631	690	465	382	700	700	700	680	510	681	657	757	631
Dry	880	736	1000	700	700	700	700	700	772	547	708	678	880	736
Critical	1000	1000	1000	700	700	700	700	700	772	595	772	859	1000	1000
Change in Vernalis Water Quality with Action - mmhos (April and May values may not be reflective of split-month operations when objectives control)														
Wet	0	-2	-1	-2	-3	-3	-4	-6	-6	-2	0	0	0	0
Above Normal	-1	-3	-2	-4	-7	-11	-8	-7	-9	-3	0	0	0	0
Below Normal	-1	-8	-2	-6	-8	0	0	0	-9	-3	0	0	0	0
Dry	-1	-10	0	-3	-5	0	0	0	-8	-3	0	0	0	0
Critical	-2	0	0	0	0	0	0	0	-1	0	0	0	0	0
With-Action Vernalis Water Quality - mmhos (April and May values may not be reflective of split-month operations when objectives control)														
Wet	351	284	309	267	209	307	337	455	435	357	497	432	352	286
Above Normal	404	377	463	360	327	475	501	526	580	491	657	639	404	380
Below Normal	756	623	688	459	374	700	700	700	671	507	681	657	757	632
Dry	879	725	1000	697	695	700	700	700	764	545	707	678	880	736
Critical	998	1000	1000	700	700	700	700	700	771	595	772	859	1000	1000

New Melones

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Total
Incremental Change in NM Storage due to WQ Release Change - Acre-feet															
Wet	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Above Normal	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Below Normal	0	0	0	0	0	1000	1181	876	0	0	0	0	0	0	3,057
Dry	0	0	158	742	900	1000	1181	795	0	0	0	0	0	0	4,776
Critical	0	386	47	-12	30	260	350	223	0	0	0	0	0	14	1,296
Incremental Change in NM Storage due to Vernalis Flow Release Change - Acre-feet															
Wet	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Above Normal	0	0	0	0	0	-1731	0	0	0	0	0	0	0	0	-1,731
Below Normal	0	-1054	0	0	0	0	0	0	0	0	0	0	0	56	-998
Dry	0	-1054	0	0	0	0	0	0	0	0	0	0	0	56	-998
Critical	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Net Incremental Change in NM Storage due to Vernalis Flow & Quality Release Change - Acre-feet															
Wet	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Above Normal	0	0	0	0	0	-1731	0	0	0	0	0	0	0	0	-1,731
Below Normal	0	-1054	0	0	0	1000	1181	876	0	0	0	0	0	56	2,059
Dry	0	-1054	158	742	900	1000	1181	795	0	0	0	0	0	56	3,777
Critical	0	386	47	-12	30	260	350	223	0	0	0	0	0	14	1,296

Project Delta Supply

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Total
Total Potential Delta supply Impact w/o NM Adjustments - Acre-feet															
Wet	0	-369	0	0	0	0	-1486	-1697	0	0	0	0	0	20	-3,533
Above Normal	0	-369	0	0	0	-1731	-1486	-1697	0	0	0	0	0	20	-5,263
Below Normal	0	-369	0	0	0	-1731	-1486	-1697	0	0	0	0	0	20	-5,263
Dry	0	-369	-344	-254	-1818	-1731	-1486	-1697	-635	-550	0	0	0	20	-8,864
Critical	0	-779	-226	312	462	-30	12	-115	773	372	100	0	0	61	942
New Melones Adjustments - Acre-feet (positive means increase in supply)															
Wet	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Above Normal	0	0	0	0	0	1731	0	0	0	0	0	0	0	0	1,731
Below Normal	0	369	0	0	0	-1000	-1181	-876	0	0	0	0	0	-20	-2,708
Dry	0	369	-55	-260	-900	-1000	-1181	-795	0	0	0	0	0	-20	-3,841
Critical	0	-386	-47	12	-30	-260	-350	-223	0	0	0	0	0	-14	-1,296
Incremental Change in Project Delta Supply due to Action - Acre-feet															
Wet	0	-369	0	0	0	0	-1486	-1697	0	0	0	0	0	20	-3,533
Above Normal	0	-369	0	0	0	0	-1486	-1697	0	0	0	0	0	20	-3,533
Below Normal	0	0	0	0	0	-2731	-2666	-2573	0	0	0	0	0	0	-7,971
Dry	0	0	-399	-513	-2718	-2731	-2666	-2492	-635	-550	0	0	0	0	-12,705
Critical	0	-1165	-273	325	432	-289	-338	-337	773	372	100	0	0	47	-354

Study: A-1-3-C: 80 CONSERVATION OUT COMPOSITE — Water Development and Disposition Assumptions

All Values Relative to Benchmark (Existing) Condition

Disposition Non-Crit	Disposition Crit	Disposition	SJR Continuity Non-Crit	SJR Continuity Crit	SJR Continuity	SJR Non-Continuity Non-Crit	SJR Non-Continuity Crit	SJR Non-Continuity
-33588	0	Agriculture-SJRc	0	0	Conservation of Evaporation/Seepage to GW-SJRc	0	0	Conservation of Evaporation/Seepage to GW-SJRnc
0	0	Wildlife Areas-SJRc	0	0	Conservation of Drain Spills to Wildlife Areas-SJRc	0	0	Conservation of Drain Spills to Wildlife Areas-SJRnc
0	0	Urban-SJRc	-6000	0	Groundwater-SJRc	0	0	Groundwater-SJRnc
72615	50000	Agriculture-SJRnc	15465	0	Tailwater Recapture-SJRc	900	0	Tailwater Recapture-SJRnc
0	0	Wildlife Areas-SJRnc	0	42000	Fallowing -SJRc	0	8000	Fallowing-SJRnc
0	0	Urban-SJRnc						
0	0	EWA	10365	50000	Total Developed Water:	39027	50000	Total Disposition:

All Values Relative to Benchmark (Existing) Condition — Basic Hydrologic Accounting

		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Total
Water Developed - Non Critical Years																
Change in Evaporation/Seepage to GW		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Change in Drain Spills to Wildlife Areas		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Change in Discharge to SJR Streams		141	1054	1054	1757	2285	2285	2285	2285	1406	914	0	0	0	0	15,465
Change to Flows Upstream of Sack Dam		0	45	90	90	99	144	162	162	72	27	9	0	0	0	900
Crop Fallowing		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Groundwater		0	0	0	-750	-840	-990	-1200	-900	-600	-600	-120	0	0	0	-6,000
Total		141	1099	1144	1097	1544	1439	1247	1547	878	341	-111	0	0	0	10,365
Effects to SJR Flows due to Developing Water - Non Critical Years																
Change in Evaporation/Seepage to GW		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Change in Drain Spills to Wildlife Areas		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Change in Discharge to SJR Streams		141	1054	1054	1757	2285	2285	2285	2285	1406	914	0	0	0	0	15,465
Change to Flows Upstream of Sack Dam		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Crop Fallowing		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Groundwater		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total (Positive value means flow reduced)		141	1054	1054	1757	2285	2285	2285	2285	1406	914	0	0	0	0	15,465
Return Flows from Disposition of Transfer Water - Non Critical Years																
Incremental Return from Agricultural Transferees		0	0	-52	-223	-338	-401	-578	-425	-558	-250	-67	-17	-23	-41	-2,972
Incremental Return from Wildlife Area Transferees		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Envirnomental Water Account Beneficiaries																
Incremental Return from Agricultural Entities		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total		0	0	-52	-223	-338	-401	-578	-425	-558	-250	-67	-17	-23	-41	-2,972
Net Effect to San Joaquin River Flow Before NM Adjustment	(Acre-feet)	-141	-1054	-1106	-1981	-2622	-2685	-2863	-2710	-1964	-1164	-67	-17	-23	-41	-18,437
(Positive value means flow added)	(cfs)	-2	-19	-18	-33	-43	-45	-47	-44	-33	-19	-1	0	0	-1	0
Water Developed - Critical Years																
Change in Evaporation/Seepage to GW		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Change in Drain Spills to Wildlife Areas		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Change in Discharge to SJR Streams		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Change to Flows Upstream of Sack Dam		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Crop Fallowing		1031	4639	5155	344	687	10653	14433	12715	344	0	0	0	0	0	50,000
Groundwater		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total		1031	4639	5155	344	687	10653	14433	12715	344	0	0	0	0	0	50,000
Effects to SJR Flows due to Developing Water - Critical Years																
Change in Evaporation/Seepage to GW		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Change in Drain Spills to Wildlife Areas		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Change in Discharge to SJR Streams		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Change to Flows Upstream of Sack Dam		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Crop Fallowing		173	779	303	20	40	626	849	748	58	0	0	0	0	0	3,597
Groundwater		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total (Positive value means flow reduced)		173	779	303	20	40	626	849	748	58	0	0	0	0	0	3,597
Return Flows from Disposition of Transfer Water - Critical Years																
Incremental Return from Agricultural Transferees		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Incremental Return from Wildlife Area Transferees		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Envirnomental Water Account Beneficiaries																
Incremental Return from Agricultural Entities		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Net Effect to San Joaquin River Flow Before NM Adjustment	(Acre-feet)	-173	-779	-303	-20	-40	-626	-849	-748	-58	0	0	0	0	0	-3,597
(Positive value means flow added)	(cfs)	-3	-14	-5	0	-1	-11	-14	-12	-1	0	0	0	0	0	0

Vernalis

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb
Benchmark Vernalis Flow - cfs														
Wet	7500	13600	15700	13600	12000	7400	5100	3100	2500	3600	3000	4600	7500	13600
Above Normal	5800	7200	6200	5900	4600	2600	2100	2000	1500	2000	1800	2300	5800	7200
Below Normal	2300	3200	3300	3700	3700	2100	1900	1500	1200	1900	1700	2200	2300	3200
Dry	1900	2600	2300	2700	2200	1800	1400	1100	1000	1700	1600	2100	1900	2600
Critical	1300	1700	1600	1800	1500	1300	1000	1000	1000	1500	1400	1500	1300	1700
Change in Vernalis Flow with Action - cfs														
Wet	-2	-19	-18	-33	-43	-45	-47	-44	-33	-19	-1	0	0	-1
Above Normal	-2	-19	-18	-33	-43	0	-47	-44	-33	-19	-1	0	0	-1
Below Normal	-2	0	-18	-33	-43	-57	-55	-52	-33	-19	-1	0	0	0
Dry	-2	0	-20	-45	-56	-57	-55	-53	-33	-19	-1	0	0	0
Critical	-3	-21	-6	0	-1	-14	-19	-16	-1	0	0	0	0	0
With-Action Vernalis Flow - cfs														
Wet	7498	13581	15682	13567	11957	7355	5053	3056	2467	3581	2999	4600	7500	13599
Above Normal	5798	7181	6182	5867	4557	2600	2053	1956	1467	1981	1799	2300	5800	7199
Below Normal	2298	3200	3282	3667	3657	2043	1845	1448	1167	1881	1699	2200	2300	3200
Dry	1898	2600	2280	2655	2144	1743	1345	1047	967	1681	1599	2100	1900	2600
Critical	1297	1679	1594	1800	1499	1286	981	984	999	1500	1400	1500	1300	1700
Benchmark Vernalis Water Quality - mmhos (April and May values may not be reflective of split-month operations when objectives control)														
Wet	352	286	310	269	212	310	341	460	442	359	497	432	352	286
Above Normal	404	380	465	364	334	486	509	534	588	494	657	639	404	380
Below Normal	757	631	690	465	382	700	700	700	680	510	681	657	757	631
Dry	880	736	1000	700	700	700	700	700	772	547	708	678	880	736
Critical	1000	1000	1000	700	700	700	700	700	772	595	772	859	1000	1000
Change in Vernalis Water Quality with Action - mmhos (April and May values may not be reflective of split-month operations when objectives control)														
Wet	0	-2	-1	-2	-3	-3	-4	-5	-5	-2	0	0	0	0
Above Normal	-1	-3	-2	-4	-7	-14	-7	-6	-6	-3	0	0	0	0
Below Normal	-1	-8	-2	-6	-9	0	0	0	-6	-3	0	0	0	0
Dry	-1	-10	0	-3	-4	0	0	0	-6	-3	0	0	0	0
Critical	-2	0	0	0	0	0	0	0	0	0	0	0	0	0
With-Action Vernalis Water Quality - mmhos (April and May values may not be reflective of split-month operations when objectives control)														
Wet	351	284	309	266	209	307	337	455	436	357	497	432	352	286
Above Normal	404	377	463	360	326	472	502	527	582	491	657	639	404	380
Below Normal	756	623	688	459	373	700	700	700	674	506	681	657	757	631
Dry	879	725	1000	697	696	700	700	700	766	544	708	678	880	736
Critical	998	1000	1000	700	700	700	700	700	771	595	772	859	1000	1000

New Melones

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Total
Incremental Change in NM Storage due to WQ Release Change - Acre-feet															
Wet	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Above Normal	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Below Normal	0	0	0	0	0	677	524	487	0	0	0	0	0	0	1,688
Dry	0	0	118	701	804	677	524	546	0	0	0	0	0	0	3,370
Critical	0	386	39	8	15	223	297	213	0	0	0	0	0	0	1,180
Incremental Change in NM Storage due to Vernalis Flow Release Change - Acre-feet															
Wet	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Above Normal	0	0	0	0	0	-2685	0	0	0	0	0	0	0	0	-2,685
Below Normal	0	-1054	0	0	0	0	0	0	0	0	0	0	0	-41	-1,095
Dry	0	-1054	0	0	0	0	0	0	0	0	0	0	0	-41	-1,095
Critical	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Net Incremental Change in NM Storage due to Vernalis Flow & Quality Release Change - Acre-feet															
Wet	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Above Normal	0	0	0	0	0	-2685	0	0	0	0	0	0	0	0	-2,685
Below Normal	0	-1054	0	0	0	677	524	487	0	0	0	0	0	-41	593
Dry	0	-1054	118	701	804	677	524	546	0	0	0	0	0	-41	2,275
Critical	0	386	39	8	15	223	297	213	0	0	0	0	0	0	1,180

Project Delta Supply

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Total
Total Potential Delta supply Impact w/o NM Adjustments - Acre-feet															
Wet	0	-369	0	0	0	0	-2863	-2710	0	0	0	0	0	-14	-5,956
Above Normal	0	-369	0	0	0	-2685	-2863	-2710	0	0	0	0	0	-14	-8,641
Below Normal	0	-369	0	0	0	-2685	-2863	-2710	0	0	0	0	0	-14	-8,641
Dry	0	-369	-387	-347	-2622	-2685	-2863	-2710	-1964	-1126	0	0	0	-14	-15,087
Critical	0	-779	-303	-20	-40	-626	-849	-748	-58	0	0	0	0	0	-3,424
New Melones Adjustments - Acre-feet (positive means increase in supply)															
Wet	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Above Normal	0	0	0	0	0	2685	0	0	0	0	0	0	0	0	2,685
Below Normal	0	369	0	0	0	-677	-524	-487	0	0	0	0	0	14	-1,305
Dry	0	369	-41	-245	-804	-677	-524	-546	0	0	0	0	0	14	-2,454
Critical	0	-386	-39	-8	-15	-223	-297	-213	0	0	0	0	0	0	-1,180
Incremental Change in Project Delta Supply due to Action - Acre-feet															
Wet	0	-369	0	0	0	0	-2863	-2710	0	0	0	0	0	-14	-5,956
Above Normal	0	-369	0	0	0	0	-2863	-2710	0	0	0	0	0	-14	-5,956
Below Normal	0	0	0	0	0	-3363	-3387	-3196	0	0	0	0	0	0	-9,946
Dry	0	0	-428	-592	-3427	-3363	-3387	-3255	-1964	-1126	0	0	0	0	-17,542
Critical	0	-1165	-342	-28	-55	-849	-1146	-960	-58	0	0	0	0	0	-4,604

Study: A-2-1-C: 80 GROUNDWATER REFUGE COMPOSITE — Water Development and Disposition Assumptions

All Values Relative to Benchmark (Existing) Condition

Disposition Non-Crit	Crit		SJR Continuity Non-Crit	Crit		SJR Non-Continuity Non-Crit	Crit	
-15262	0	Agriculture-SJRc	0	0	Conservation of Evaporation/Seepage to GW-SJRc	0	0	Conservation of Evaporation/Seepage to GW-SJRnc
17823	40000	Wildlife Areas-SJRc	0	0	Conservation of Drain Spills to Wildlife Areas-SJRc	0	0	Conservation of Drain Spills to Wildlife Areas-SJRnc
0	0	Urban-SJRc	10365	0	Groundwater-SJRc	0	0	Groundwater-SJRnc
-7385	0	Agriculture-SJRnc	0	0	Tailwater Recapture-SJRc	0	0	Tailwater Recapture-SJRnc
9497	0	Wildlife Areas-SJRnc	0	42000	Fallowing -SJRc	0	8000	Fallowing-SJRnc
0	0	Urban-SJRnc						
0	0	EWA						
			Total Developed Water:	Non-Crit 10365	Crit 50000	Total Disposition:	Non-Crit 4673	Crit 40000

All Values Relative to Benchmark (Existing) Condition — Basic Hydrologic Accounting

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Total
Water Developed - Non Critical Years															
Change in Evaporation/Seepage to GW	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Change in Drain Spills to Wildlife Areas	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Change in Discharge to SJR Streams	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Change to Flows Upstream of Sack Dam	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Crop Fallowing	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Groundwater	0	0	0	1296	1451	1710	2073	1555	1037	1037	207	0	0	0	10,365
Total	0	0	0	1296	1451	1710	2073	1555	1037	1037	207	0	0	0	10,365
Effects to SJR Flows due to Developing Water - Non Critical Years															
Change in Evaporation/Seepage to GW	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Change in Drain Spills to Wildlife Areas	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Change in Discharge to SJR Streams	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Change to Flows Upstream of Sack Dam	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Crop Fallowing	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Groundwater	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total (Positive value means flow reduced)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Return Flows from Disposition of Transfer Water - Non Critical Years															
Incremental Return from Agricultural Transferees	0	0	-23	-102	-153	-182	-263	-193	-254	-114	-31	-8	-10	-18	-1,351
Incremental Return from Wildlife Area Transferees	0	0	33	5	0	0	0	3026	165	-17	282	66	220	252	4,032
Envirnomental Water Account Beneficiaries															
Incremental Return from Agricultural Entities	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	0	10	-96	-153	-182	-263	2833	-89	-131	252	58	209	234	2,682
Net Effect to San Joaquin River Flow Before NM Adjustment (Acre-feet)	0	0	10	-96	-153	-182	-263	2833	-89	-131	252	58	209	234	2,682
(Positive value means flow added) (cfs)	0	0	0	-2	-2	-3	-4	46	-1	-2	4	1	3	4	0
Water Developed - Critical Years															
Change in Evaporation/Seepage to GW	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Change in Drain Spills to Wildlife Areas	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Change in Discharge to SJR Streams	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Change to Flows Upstream of Sack Dam	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Crop Fallowing	1031	4639	5155	344	687	10653	14433	12715	344	0	0	0	0	0	50,000
Groundwater	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	1031	4639	5155	344	687	10653	14433	12715	344	0	0	0	0	0	50,000
Effects to SJR Flows due to Developing Water - Critical Years															
Change in Evaporation/Seepage to GW	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Change in Drain Spills to Wildlife Areas	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Change in Discharge to SJR Streams	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Change to Flows Upstream of Sack Dam	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Crop Fallowing	173	779	303	20	40	626	849	748	58	0	0	0	0	0	3,597
Groundwater	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total (Positive value means flow reduced)	173	779	303	20	40	626	849	748	58	0	0	0	0	0	3,597
Return Flows from Disposition of Transfer Water - Critical Years															
Incremental Return from Agricultural Transferees	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Incremental Return from Wildlife Area Transferees	0	0	75	11	0	0	0	6791	370	-39	634	148	493	567	9,049
Envirnomental Water Account Beneficiaries															
Incremental Return from Agricultural Entities	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	0	75	11	0	0	0	6791	370	-39	634	148	493	567	9,049
Net Effect to San Joaquin River Flow Before NM Adjustment (Acre-feet)	-173	-779	-228	-9	-40	-626	-849	6043	312	-39	634	148	493	567	5,453
(Positive value means flow added) (cfs)	-3	-14	-4	0	-1	-11	-14	98	5	-1	11	2	8	10	0

Vernalis

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb
Benchmark Vernalis Flow - cfs														
Wet	7500	13600	15700	13600	12000	7400	5100	3100	2500	3600	3000	4600	7500	13600
Above Normal	5800	7200	6200	5900	4600	2600	2100	2000	1500	2000	1800	2300	5800	7200
Below Normal	2300	3200	3300	3700	3700	2100	1900	1500	1200	1900	1700	2200	2300	3200
Dry	1900	2600	2300	2700	2200	1800	1400	1100	1000	1700	1600	2100	1900	2600
Critical	1300	1700	1600	1800	1500	1300	1000	1000	1000	1500	1400	1500	1300	1700
Change in Vernalis Flow with Action - cfs														
Wet	0	0	0	-2	-2	-3	-4	46	-1	-2	4	1	3	4
Above Normal	0	0	0	-2	-2	0	-4	46	-1	-2	4	1	3	4
Below Normal	0	0	0	-2	-2	-2	-2	94	-1	-2	4	1	3	0
Dry	0	0	1	-1	-2	-2	-2	93	-1	-2	4	1	3	0
Critical	-3	-21	-2	0	-1	-14	-19	199	5	-1	11	2	8	15
With-Action Vernalis Flow - cfs														
Wet	7500	13600	15700	13598	11998	7397	5096	3146	2499	3598	3004	4601	7503	13604
Above Normal	5800	7200	6200	5898	4598	2600	2096	2046	1499	1998	1804	2301	5803	7204
Below Normal	2300	3200	3300	3698	3698	2098	1898	1594	1199	1898	1704	2201	2303	3200
Dry	1900	2600	2301	2699	2198	1798	1398	1193	999	1698	1604	2101	1903	2600
Critical	1297	1679	1598	1800	1499	1286	981	1199	1005	1499	1411	1502	1308	1715
Benchmark Vernalis Water Quality - mmhos (April and May values may not be reflective of split-month operations when objectives control)														
Wet	352	286	310	269	212	310	341	460	442	359	497	432	352	286
Above Normal	404	380	465	364	334	486	509	534	588	494	657	639	404	380
Below Normal	757	631	690	465	382	700	700	700	680	510	681	657	757	631
Dry	880	736	1000	700	700	700	700	700	772	547	708	678	880	736
Critical	1000	1000	1000	700	700	700	700	700	772	595	772	859	1000	1000
Change in Vernalis Water Quality with Action - mmhos (April and May values may not be reflective of split-month operations when objectives control)														
Wet	0	0	0	0	0	0	0	13	1	0	1	0	0	0
Above Normal	0	0	0	0	0	-1	0	19	1	0	1	0	0	1
Below Normal	0	0	0	0	0	0	0	0	1	0	1	0	1	2
Dry	0	0	0	0	0	0	0	0	1	0	1	0	1	2
Critical	-2	0	0	0	0	0	0	0	2	0	3	0	1	0
With-Action Vernalis Water Quality - mmhos (April and May values may not be reflective of split-month operations when objectives control)														
Wet	352	286	310	269	212	310	341	474	443	359	498	432	352	286
Above Normal	404	380	465	364	334	486	510	553	590	494	659	639	405	381
Below Normal	757	631	691	465	382	700	700	700	681	510	682	658	757	633
Dry	880	736	1000	700	700	700	700	700	773	547	709	678	880	738
Critical	998	1000	1000	700	700	700	700	700	773	595	775	859	1001	1000

New Melones

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Total
Incremental Change in NM Storage due to WQ Release Change - Acre-feet															
Wet	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Above Normal	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Below Normal	0	0	0	0	0	-62	-125	-2936	0	0	0	0	0	0	-3,122
Dry	0	0	-68	-17	-18	-62	-125	-2909	0	0	0	0	0	0	-3,199
Critical	0	386	-97	-12	15	223	297	-6209	0	0	0	0	0	-267	-5,665
Incremental Change in NM Storage due to Vernalis Flow Release Change - Acre-feet															
Wet	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Above Normal	0	0	0	0	0	-182	0	0	0	0	0	0	0	0	-182
Below Normal	0	0	0	0	0	0	0	0	0	0	0	0	0	234	234
Dry	0	0	0	0	0	0	0	0	0	0	0	0	0	234	234
Critical	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Net Incremental Change in NM Storage due to Vernalis Flow & Quality Release Change - Acre-feet															
Wet	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Above Normal	0	0	0	0	0	-182	0	0	0	0	0	0	0	0	-182
Below Normal	0	0	0	0	0	-62	-125	-2936	0	0	0	0	0	234	-2,888
Dry	0	0	-68	-17	-18	-62	-125	-2909	0	0	0	0	0	234	-2,965
Critical	0	386	-97	-12	15	223	297	-6209	0	0	0	0	0	-267	-5,665

Project Delta Supply

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Total
Total Potential Delta supply Impact w/o NM Adjustments - Acre-feet															
Wet	0	0	0	0	0	0	-263	2833	0	0	0	0	0	82	2,652
Above Normal	0	0	0	0	0	-182	-263	2833	0	0	0	0	0	82	2,470
Below Normal	0	0	0	0	0	-182	-263	2833	0	0	0	0	0	82	2,470
Dry	0	0	4	-17	-153	-182	-263	2833	-89	-127	0	0	0	82	2,088
Critical	0	-779	-228	-9	-40	-626	-849	6043	312	-39	634	0	0	567	4,985
New Melones Adjustments - Acre-feet (positive means increase in supply)															
Wet	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Above Normal	0	0	0	0	0	182	0	0	0	0	0	0	0	0	182
Below Normal	0	0	0	0	0	62	125	2936	0	0	0	0	0	-82	3,041
Dry	0	0	24	6	18	62	125	2909	0	0	0	0	0	-82	3,062
Critical	0	-386	97	12	-15	-223	-297	6209	0	0	0	0	0	267	5,665
Incremental Change in Project Delta Supply due to Action - Acre-feet															
Wet	0	0	0	0	0	0	-263	2833	0	0	0	0	0	82	2,652
Above Normal	0	0	0	0	0	0	-263	2833	0	0	0	0	0	82	2,652
Below Normal	0	0	0	0	0	-120	-137	5768	0	0	0	0	0	0	5,510
Dry	0	0	27	-11	-135	-120	-137	5741	-89	-127	0	0	0	0	5,149
Critical	0	-1165	-131	4	-55	-849	-1146	12252	312	-39	634	0	0	834	10,650

Study: A-2-2-C: 80 GROUNDWATER AGRICULTURE COMPOSITE — **Water Development and Disposition Assumptions**

All Values Relative to Benchmark (Existing) Condition

Disposition Non-Crit	Crit		SJR Continuity Non-Crit	Crit		SJR Non-Continuity Non-Crit	Crit	
46412	50000	Agriculture-SJRc	0	0	Conservation of Evaporation/Seepage to GW-SJRc	0	0	Conservation of Evaporation/Seepage to GW-SJRnc
0	0	Wildlife Areas-SJRc	0	0	Conservation of Drain Spills to Wildlife Areas-SJRc	0	0	Conservation of Drain Spills to Wildlife Areas-SJRnc
0	0	Urban-SJRc	10365	0	Groundwater-SJRc	0	0	Groundwater-SJRnc
-7385	0	Agriculture-SJRnc	0	0	Tailwater Recapture-SJRc	0	0	Tailwater Recapture-SJRnc
0	0	Wildlife Areas-SJRnc	0	42000	Fallowing -SJRc	0	8000	Fallowing-SJRnc
0	0	Urban-SJRnc						
0	0	EWA						

	Non-Crit	Crit
Total Developed Water:	10365	50000
Total Disposition:	39027	50000

All Values Relative to Benchmark (Existing) Condition — Basic Hydrologic Accounting

		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Total
Water Developed - Non Critical Years																
Change in Evaporation/Seepage to GW		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Change in Drain Spills to Wildlife Areas		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Change in Discharge to SJR Streams		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Change to Flows Upstream of Sack Dam		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Crop Fallowing		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Groundwater		0	0	0	1296	1451	1710	2073	1555	1037	1037	207	0	0	0	10,365
Total		0	0	0	1296	1451	1710	2073	1555	1037	1037	207	0	0	0	10,365
Effects to SJR Flows due to Developing Water - Non Critical Years																
Change in Evaporation/Seepage to GW		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Change in Drain Spills to Wildlife Areas		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Change in Discharge to SJR Streams		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Change to Flows Upstream of Sack Dam		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Crop Fallowing		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Groundwater		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total (Positive value means flow reduced)		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Return Flows from Disposition of Transfer Water - Non Critical Years																
Incremental Return from Agricultural Transferees		0	0	71	309	467	554	799	587	771	345	93	23	32	56	4,107
Incremental Return from Wildlife Area Transferees		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Envirnomental Water Account Beneficiaries																
Incremental Return from Agricultural Entities		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total		0	0	71	309	467	554	799	587	771	345	93	23	32	56	4,107
Net Effect to San Joaquin River Flow Before NM Adjustment	(Acre-feet)	0	0	71	309	467	554	799	587	771	345	93	23	32	56	4,107
(Positive value means flow added)	(cfs)	0	0	1	5	8	9	13	10	13	6	2	0	1	1	0
Water Developed - Critical Years																
Change in Evaporation/Seepage to GW		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Change in Drain Spills to Wildlife Areas		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Change in Discharge to SJR Streams		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Change to Flows Upstream of Sack Dam		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Crop Fallowing		1031	4639	5155	344	687	10653	14433	12715	344	0	0	0	0	0	50,000
Groundwater		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total		1031	4639	5155	344	687	10653	14433	12715	344	0	0	0	0	0	50,000
Effects to SJR Flows due to Developing Water - Critical Years																
Change in Evaporation/Seepage to GW		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Change in Drain Spills to Wildlife Areas		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Change in Discharge to SJR Streams		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Change to Flows Upstream of Sack Dam		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Crop Fallowing		173	779	303	20	40	626	849	748	58	0	0	0	0	0	3,597
Groundwater		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total (Positive value means flow reduced)		173	779	303	20	40	626	849	748	58	0	0	0	0	0	3,597
Return Flows from Disposition of Transfer Water - Critical Years																
Incremental Return from Agricultural Transferees		0	0	77	333	503	597	861	633	831	372	100	25	34	61	4,425
Incremental Return from Wildlife Area Transferees		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Envirnomental Water Account Beneficiaries																
Incremental Return from Agricultural Entities		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total		0	0	77	333	503	597	861	633	831	372	100	25	34	61	4,425
Net Effect to San Joaquin River Flow Before NM Adjustment	(Acre-feet)	-173	-779	-226	312	462	-30	12	-115	773	372	100	25	34	61	828
(Positive value means flow added)	(cfs)	-3	-14	-4	5	8	0	0	-2	13	6	2	0	1	1	0

Vernalis

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb
Benchmark Vernalis Flow - cfs														
Wet	7500	13600	15700	13600	12000	7400	5100	3100	2500	3600	3000	4600	7500	13600
Above Normal	5800	7200	6200	5900	4600	2600	2100	2000	1500	2000	1800	2300	5800	7200
Below Normal	2300	3200	3300	3700	3700	2100	1900	1500	1200	1900	1700	2200	2300	3200
Dry	1900	2600	2300	2700	2200	1800	1400	1100	1000	1700	1600	2100	1900	2600
Critical	1300	1700	1600	1800	1500	1300	1000	1000	1000	1500	1400	1500	1300	1700
Change in Vernalis Flow with Action - cfs														
Wet	0	0	1	5	8	9	13	10	13	6	2	0	1	1
Above Normal	0	0	1	5	8	0	13	10	13	6	2	0	1	1
Below Normal	0	0	1	5	8	6	7	6	13	6	2	0	1	0
Dry	0	0	1	5	7	6	7	7	13	6	2	0	1	0
Critical	-3	-21	-4	5	7	-5	-5	-5	13	6	2	0	1	1
With-Action Vernalis Flow - cfs														
Wet	7500	13600	15701	13605	12008	7409	5113	3110	2513	3606	3002	4600	7501	13601
Above Normal	5800	7200	6201	5905	4608	2600	2113	2010	1513	2006	1802	2300	5801	7201
Below Normal	2300	3200	3301	3705	3708	2106	1907	1506	1213	1906	1702	2200	2301	3200
Dry	1900	2600	2301	2705	2207	1806	1407	1107	1013	1706	1602	2100	1901	2600
Critical	1297	1679	1596	1805	1507	1295	995	995	1013	1506	1402	1500	1301	1701
Benchmark Vernalis Water Quality - mmhos (April and May values may not be reflective of split-month operations when objectives control)														
Wet	352	286	310	269	212	310	341	460	442	359	497	432	352	286
Above Normal	404	380	465	364	334	486	509	534	588	494	657	639	404	380
Below Normal	757	631	690	465	382	700	700	700	680	510	681	657	757	631
Dry	880	736	1000	700	700	700	700	700	772	547	708	678	880	736
Critical	1000	1000	1000	700	700	700	700	700	772	595	772	859	1000	1000
Change in Vernalis Water Quality with Action - mmhos (April and May values may not be reflective of split-month operations when objectives control)														
Wet	0	0	0	0	0	0	0	0	-1	0	0	0	0	0
Above Normal	0	0	0	0	0	2	-1	-1	-1	0	0	0	0	0
Below Normal	0	0	0	0	0	0	0	0	-1	0	0	0	0	0
Dry	0	0	0	0	0	0	0	0	-1	0	0	0	0	0
Critical	-2	0	0	0	0	0	0	0	-1	0	0	0	0	0
With-Action Vernalis Water Quality - mmhos (April and May values may not be reflective of split-month operations when objectives control)														
Wet	352	286	310	269	212	310	341	460	441	359	497	432	352	286
Above Normal	404	380	465	365	334	488	508	533	587	494	657	639	404	380
Below Normal	757	631	690	465	382	700	700	700	679	510	681	657	757	632
Dry	880	736	1000	700	700	700	700	700	771	548	707	678	880	736
Critical	998	1000	1000	700	700	700	700	700	771	595	772	859	1000	1000

New Melones

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Total
Incremental Change in NM Storage due to WQ Release Change - Acre-feet															
Wet	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Above Normal	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Below Normal	0	0	0	0	0	187	381	226	0	0	0	0	0	0	794
Dry	0	0	23	24	56	187	381	145	0	0	0	0	0	0	816
Critical	0	386	47	-12	30	260	350	223	0	0	0	0	0	14	1,296
Incremental Change in NM Storage due to Vernalis Flow Release Change - Acre-feet															
Wet	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Above Normal	0	0	0	0	0	554	0	0	0	0	0	0	0	0	554
Below Normal	0	0	0	0	0	0	0	0	0	0	0	0	0	56	56
Dry	0	0	0	0	0	0	0	0	0	0	0	0	0	56	56
Critical	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Net Incremental Change in NM Storage due to Vernalis Flow & Quality Release Change - Acre-feet															
Wet	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Above Normal	0	0	0	0	0	554	0	0	0	0	0	0	0	0	554
Below Normal	0	0	0	0	0	187	381	226	0	0	0	0	0	56	851
Dry	0	0	23	24	56	187	381	145	0	0	0	0	0	56	872
Critical	0	386	47	-12	30	260	350	223	0	0	0	0	0	14	1,296

Project Delta Supply

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Total
Total Potential Delta supply Impact w/o NM Adjustments - Acre-feet															
Wet	0	0	0	0	0	0	799	587	0	0	0	0	0	20	1,406
Above Normal	0	0	0	0	0	554	799	587	0	0	0	0	0	20	1,960
Below Normal	0	0	0	0	0	554	799	587	0	0	0	0	0	20	1,960
Dry	0	0	25	54	467	554	799	587	771	334	0	0	0	20	3,611
Critical	0	-779	-226	312	462	-30	12	-115	773	372	100	0	0	61	942
New Melones Adjustments - Acre-feet (positive means increase in supply)															
Wet	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Above Normal	0	0	0	0	0	-554	0	0	0	0	0	0	0	0	-554
Below Normal	0	0	0	0	0	-187	-381	-226	0	0	0	0	0	-20	-814
Dry	0	0	-8	-8	-56	-187	-381	-145	0	0	0	0	0	-20	-805
Critical	0	-386	-47	12	-30	-260	-350	-223	0	0	0	0	0	-14	-1,296
Incremental Change in Project Delta Supply due to Action - Acre-feet															
Wet	0	0	0	0	0	0	799	587	0	0	0	0	0	20	1,406
Above Normal	0	0	0	0	0	0	799	587	0	0	0	0	0	20	1,406
Below Normal	0	0	0	0	0	366	418	361	0	0	0	0	0	0	1,146
Dry	0	0	17	46	411	366	418	443	771	334	0	0	0	0	2,806
Critical	0	-1165	-273	325	432	-289	-338	-337	773	372	100	0	0	47	-354

Study: A-2-3-C: 80 GROUNDWATER OUT COMPOSITE — Water Development and Disposition Assumptions

All Values Relative to Benchmark (Existing) Condition

Disposition Non-Crit	Disposition Crit		SJR Continuity Non-Crit	SJR Continuity Crit		SJR Non-Continuity Non-Crit	SJR Non-Continuity Crit	
-33588	0	Agriculture-SJRc	0	0	Conservation of Evaporation/Seepage to GW-SJRc	0	0	Conservation of Evaporation/Seepage to GW-SJRnc
0	0	Wildlife Areas-SJRc	0	0	Conservation of Drain Spills to Wildlife Areas-SJRc	0	0	Conservation of Drain Spills to Wildlife Areas-SJRnc
0	0	Urban-SJRc	10365	0	Groundwater-SJRc	0	0	Groundwater-SJRnc
72615	50000	Agriculture-SJRnc	0	0	Tailwater Recapture-SJRc	0	0	Tailwater Recapture-SJRnc
0	0	Wildlife Areas-SJRnc	0	42000	Fallowing -SJRc	0	8000	Fallowing-SJRnc
0	0	Urban-SJRnc						
0	0	EWA						

	Non-Crit	Crit
Total Developed Water:	10365	50000
Total Disposition:	39027	50000

All Values Relative to Benchmark (Existing) Condition — Basic Hydrologic Accounting

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Total
Water Developed - Non Critical Years															
Change in Evaporation/Seepage to GW	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Change in Drain Spills to Wildlife Areas	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Change in Discharge to SJR Streams	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Change to Flows Upstream of Sack Dam	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Crop Fallowing	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Groundwater	0	0	0	1296	1451	1710	2073	1555	1037	1037	207	0	0	0	10,365
Total	0	0	0	1296	1451	1710	2073	1555	1037	1037	207	0	0	0	10,365
Effects to SJR Flows due to Developing Water - Non Critical Years															
Change in Evaporation/Seepage to GW	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Change in Drain Spills to Wildlife Areas	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Change in Discharge to SJR Streams	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Change to Flows Upstream of Sack Dam	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Crop Fallowing	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Groundwater	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total (Positive value means flow reduced)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Return Flows from Disposition of Transfer Water - Non Critical Years															
Incremental Return from Agricultural Transferees	0	0	-52	-223	-338	-401	-578	-425	-558	-250	-67	-17	-23	-41	-2,972
Incremental Return from Wildlife Area Transferees	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Envirnomental Water Account Beneficiaries															
Incremental Return from Agricultural Entities	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	0	-52	-223	-338	-401	-578	-425	-558	-250	-67	-17	-23	-41	-2,972
Net Effect to San Joaquin River Flow Before NM Adjustment (Acre-feet)	0	0	-52	-223	-338	-401	-578	-425	-558	-250	-67	-17	-23	-41	-2,972
(Positive value means flow added) (cfs)	0	0	-1	-4	-5	-7	-9	-7	-9	-4	-1	0	0	-1	0
Water Developed - Critical Years															
Change in Evaporation/Seepage to GW	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Change in Drain Spills to Wildlife Areas	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Change in Discharge to SJR Streams	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Change to Flows Upstream of Sack Dam	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Crop Fallowing	1031	4639	5155	344	687	10653	14433	12715	344	0	0	0	0	0	50,000
Groundwater	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	1031	4639	5155	344	687	10653	14433	12715	344	0	0	0	0	0	50,000
Effects to SJR Flows due to Developing Water - Critical Years															
Change in Evaporation/Seepage to GW	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Change in Drain Spills to Wildlife Areas	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Change in Discharge to SJR Streams	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Change to Flows Upstream of Sack Dam	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Crop Fallowing	173	779	303	20	40	626	849	748	58	0	0	0	0	0	3,597
Groundwater	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total (Positive value means flow reduced)	173	779	303	20	40	626	849	748	58	0	0	0	0	0	3,597
Return Flows from Disposition of Transfer Water - Critical Years															
Incremental Return from Agricultural Transferees	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Incremental Return from Wildlife Area Transferees	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Envirnomental Water Account Beneficiaries															
Incremental Return from Agricultural Entities	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Net Effect to San Joaquin River Flow Before NM Adjustment (Acre-feet)	-173	-779	-303	-20	-40	-626	-849	-748	-58	0	0	0	0	0	-3,597
(Positive value means flow added) (cfs)	-3	-14	-5	0	-1	-11	-14	-12	-1	0	0	0	0	0	0

Vernalis

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb
Benchmark Vernalis Flow - cfs														
Wet	7500	13600	15700	13600	12000	7400	5100	3100	2500	3600	3000	4600	7500	13600
Above Normal	5800	7200	6200	5900	4600	2600	2100	2000	1500	2000	1800	2300	5800	7200
Below Normal	2300	3200	3300	3700	3700	2100	1900	1500	1200	1900	1700	2200	2300	3200
Dry	1900	2600	2300	2700	2200	1800	1400	1100	1000	1700	1600	2100	1900	2600
Critical	1300	1700	1600	1800	1500	1300	1000	1000	1000	1500	1400	1500	1300	1700
Change in Vernalis Flow with Action - cfs														
Wet	0	0	-1	-4	-5	-7	-9	-7	-9	-4	-1	0	0	-1
Above Normal	0	0	-1	-4	-5	0	-9	-7	-9	-4	-1	0	0	-1
Below Normal	0	0	-1	-4	-5	-4	-5	-4	-9	-4	-1	0	0	0
Dry	0	0	-1	-3	-5	-4	-5	-5	-9	-4	-1	0	0	0
Critical	-3	-21	-6	0	-1	-14	-19	-16	-1	0	0	0	0	0
With-Action Vernalis Flow - cfs														
Wet	7500	13600	15699	13596	11995	7393	5091	3093	2491	3596	2999	4600	7500	13599
Above Normal	5800	7200	6199	5896	4595	2600	2091	1993	1491	1996	1799	2300	5800	7199
Below Normal	2300	3200	3299	3696	3695	2096	1895	1496	1191	1896	1699	2200	2300	3200
Dry	1900	2600	2299	2697	2195	1796	1395	1095	991	1696	1599	2100	1900	2600
Critical	1297	1679	1594	1800	1499	1286	981	984	999	1500	1400	1500	1300	1700
Benchmark Vernalis Water Quality - mmhos (April and May values may not be reflective of split-month operations when objectives control)														
Wet	352	286	310	269	212	310	341	460	442	359	497	432	352	286
Above Normal	404	380	465	364	334	486	509	534	588	494	657	639	404	380
Below Normal	757	631	690	465	382	700	700	700	680	510	681	657	757	631
Dry	880	736	1000	700	700	700	700	700	772	547	708	678	880	736
Critical	1000	1000	1000	700	700	700	700	700	772	595	772	859	1000	1000
Change in Vernalis Water Quality with Action - mmhos (April and May values may not be reflective of split-month operations when objectives control)														
Wet	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Above Normal	0	0	0	0	0	-1	1	1	1	0	0	0	0	0
Below Normal	0	0	0	0	0	0	0	0	1	0	0	0	0	0
Dry	0	0	0	0	0	0	0	0	1	0	0	0	0	0
Critical	-2	0	0	0	0	0	0	0	0	0	0	0	0	0
With-Action Vernalis Water Quality - mmhos (April and May values may not be reflective of split-month operations when objectives control)														
Wet	352	286	310	269	212	310	341	461	442	359	497	432	352	286
Above Normal	404	380	465	364	334	485	510	534	589	494	657	639	404	380
Below Normal	757	631	690	465	382	700	700	700	681	510	681	657	757	631
Dry	880	736	1000	700	700	700	700	700	773	547	708	678	880	736
Critical	998	1000	1000	700	700	700	700	700	771	595	772	859	1000	1000

New Melones

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Total
Incremental Change in NM Storage due to WQ Release Change - Acre-feet															
Wet	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Above Normal	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Below Normal	0	0	0	0	0	-136	-276	-163	0	0	0	0	0	0	-575
Dry	0	0	-17	-17	-40	-136	-276	-105	0	0	0	0	0	0	-590
Critical	0	386	39	8	15	223	297	213	0	0	0	0	0	0	1,180
Incremental Change in NM Storage due to Vernalis Flow Release Change - Acre-feet															
Wet	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Above Normal	0	0	0	0	0	-401	0	0	0	0	0	0	0	0	-401
Below Normal	0	0	0	0	0	0	0	0	0	0	0	0	0	-41	-41
Dry	0	0	0	0	0	0	0	0	0	0	0	0	0	-41	-41
Critical	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Net Incremental Change in NM Storage due to Vernalis Flow & Quality Release Change - Acre-feet															
Wet	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Above Normal	0	0	0	0	0	-401	0	0	0	0	0	0	0	0	-401
Below Normal	0	0	0	0	0	-136	-276	-163	0	0	0	0	0	-41	-616
Dry	0	0	-17	-17	-40	-136	-276	-105	0	0	0	0	0	-41	-631
Critical	0	386	39	8	15	223	297	213	0	0	0	0	0	0	1,180

Project Delta Supply

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Total
Total Potential Delta supply Impact w/o NM Adjustments - Acre-feet															
Wet	0	0	0	0	0	0	-578	-425	0	0	0	0	0	-14	-1,017
Above Normal	0	0	0	0	0	-401	-578	-425	0	0	0	0	0	-14	-1,418
Below Normal	0	0	0	0	0	-401	-578	-425	0	0	0	0	0	-14	-1,418
Dry	0	0	-18	-39	-338	-401	-578	-425	-558	-242	0	0	0	-14	-2,613
Critical	0	-779	-303	-20	-40	-626	-849	-748	-58	0	0	0	0	0	-3,424
New Melones Adjustments - Acre-feet (positive means increase in supply)															
Wet	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Above Normal	0	0	0	0	0	401	0	0	0	0	0	0	0	0	401
Below Normal	0	0	0	0	0	136	276	163	0	0	0	0	0	14	589
Dry	0	0	6	6	40	136	276	105	0	0	0	0	0	14	582
Critical	0	-386	-39	-8	-15	-223	-297	-213	0	0	0	0	0	0	-1,180
Incremental Change in Project Delta Supply due to Action - Acre-feet															
Wet	0	0	0	0	0	0	-578	-425	0	0	0	0	0	-14	-1,017
Above Normal	0	0	0	0	0	0	-578	-425	0	0	0	0	0	-14	-1,017
Below Normal	0	0	0	0	0	-265	-302	-262	0	0	0	0	0	0	-829
Dry	0	0	-12	-33	-297	-265	-302	-320	-558	-242	0	0	0	0	-2,031
Critical	0	-1165	-342	-28	-55	-849	-1146	-960	-58	0	0	0	0	0	-4,604

Study: A-3-1-C: 80 FALLOWING REFUGE COMPOSITE

Water Development and Disposition Assumptions

All Values Relative to Benchmark (Existing) Condition

Disposition Non-Crit	Crit		SJR Continuity Non-Crit	Crit		SJR Non-Continuity Non-Crit	Crit	
-15262	0	Agriculture-SJRc	0	0	Conservation of Evaporation/Seepage to GW-SJRc	0	0	Conservation of Evaporation/Seepage to GW-SJRnc
17823	40000	Wildlife Areas-SJRc	0	0	Conservation of Drain Spills to Wildlife Areas-SJRc	0	0	Conservation of Drain Spills to Wildlife Areas-SJRnc
0	0	Urban-SJRc	-6000	0	Groundwater-SJRc	0	0	Groundwater-SJRnc
-7385	0	Agriculture-SJRnc	0	0	Tailwater Recapture-SJRc	0	0	Tailwater Recapture-SJRnc
9497	0	Wildlife Areas-SJRnc	13747	42000	Fallowing -SJRc	2618	8000	Fallowing-SJRnc
0	0	Urban-SJRnc						
0	0	EWA						

	Non-Crit	Crit
Total Developed Water:	10365	50000
Total Disposition:	4673	40000

All Values Relative to Benchmark (Existing) Condition

Basic Hydrologic Accounting

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Total
Water Developed - Non Critical Years															
Change in Evaporation/Seepage to GW	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Change in Drain Spills to Wildlife Areas	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Change in Discharge to SJR Streams	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Change to Flows Upstream of Sack Dam	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Crop Fallowing	337	1518	1687	112	225	3487	4724	4162	112	0	0	0	0	0	16,365
Groundwater	0	0	0	-750	-840	-990	-1200	-900	-600	-600	-120	0	0	0	-6,000
Total	337	1518	1687	-638	-615	2497	3524	3262	-488	-600	-120	0	0	0	10,365
Effects to SJR Flows due to Developing Water - Non Critical Years															
Change in Evaporation/Seepage to GW	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Change in Drain Spills to Wildlife Areas	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Change in Discharge to SJR Streams	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Change to Flows Upstream of Sack Dam	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Crop Fallowing	57	255	99	7	13	205	278	245	19	0	0	0	0	0	1,177
Groundwater	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total (Positive value means flow reduced)	57	255	99	7	13	205	278	245	19	0	0	0	0	0	1,177
Return Flows from Disposition of Transfer Water - Non Critical Years															
Incremental Return from Agricultural Transferees	0	0	-23	-102	-153	-182	-263	-193	-254	-114	-31	-8	-10	-18	-1,351
Incremental Return from Wildlife Area Transferees	0	0	33	5	0	0	0	3026	165	-17	282	66	220	252	4,032
Envirnomental Water Account Beneficiaries															
Incremental Return from Agricultural Entities	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	0	10	-96	-153	-182	-263	2833	-89	-131	252	58	209	234	2,682
Net Effect to San Joaquin River Flow Before NM Adjustment (Acre-feet)	-57	-255	-89	-103	-167	-387	-540	2588	-108	-131	252	58	209	234	1,504
(Positive value means flow added) (cfs)	-1	-5	-1	-2	-3	-7	-9	42	-2	-2	4	1	3	4	0
Water Developed - Critical Years															
Change in Evaporation/Seepage to GW	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Change in Drain Spills to Wildlife Areas	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Change in Discharge to SJR Streams	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Change to Flows Upstream of Sack Dam	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Crop Fallowing	1031	4639	5155	344	687	10653	14433	12715	344	0	0	0	0	0	50,000
Groundwater	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	1031	4639	5155	344	687	10653	14433	12715	344	0	0	0	0	0	50,000
Effects to SJR Flows due to Developing Water - Critical Years															
Change in Evaporation/Seepage to GW	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Change in Drain Spills to Wildlife Areas	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Change in Discharge to SJR Streams	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Change to Flows Upstream of Sack Dam	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Crop Fallowing	173	779	303	20	40	626	849	748	58	0	0	0	0	0	3,597
Groundwater	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total (Positive value means flow reduced)	173	779	303	20	40	626	849	748	58	0	0	0	0	0	3,597
Return Flows from Disposition of Transfer Water - Critical Years															
Incremental Return from Agricultural Transferees	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Incremental Return from Wildlife Area Transferees	0	0	75	11	0	0	0	6791	370	-39	634	148	493	567	9,049
Envirnomental Water Account Beneficiaries															
Incremental Return from Agricultural Entities	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	0	75	11	0	0	0	6791	370	-39	634	148	493	567	9,049
Net Effect to San Joaquin River Flow Before NM Adjustment (Acre-feet)	-173	-779	-228	-9	-40	-626	-849	6043	312	-39	634	148	493	567	5,453
(Positive value means flow added) (cfs)	-3	-14	-4	0	-1	-11	-14	98	5	-1	11	2	8	10	0

Vernalis

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb
Benchmark Vernalis Flow - cfs														
Wet	7500	13600	15700	13600	12000	7400	5100	3100	2500	3600	3000	4600	7500	13600
Above Normal	5800	7200	6200	5900	4600	2600	2100	2000	1500	2000	1800	2300	5800	7200
Below Normal	2300	3200	3300	3700	3700	2100	1900	1500	1200	1900	1700	2200	2300	3200
Dry	1900	2600	2300	2700	2200	1800	1400	1100	1000	1700	1600	2100	1900	2600
Critical	1300	1700	1600	1800	1500	1300	1000	1000	1000	1500	1400	1500	1300	1700
Change in Vernalis Flow with Action - cfs														
Wet	-1	-5	-1	-2	-3	-7	-9	42	-2	-2	4	1	3	4
Above Normal	-1	-5	-1	-2	-3	0	-9	42	-2	-2	4	1	3	4
Below Normal	-1	0	-1	-2	-3	-7	-8	89	-2	-2	4	1	3	0
Dry	-1	0	-1	-1	-2	-7	-8	88	-2	-2	4	1	3	0
Critical	-3	-21	-2	0	-1	-14	-19	199	5	-1	11	2	8	15
With-Action Vernalis Flow - cfs														
Wet	7499	13595	15699	13598	11997	7393	5091	3142	2498	3598	3004	4601	7503	13604
Above Normal	5799	7195	6199	5898	4597	2600	2091	2042	1498	1998	1804	2301	5803	7204
Below Normal	2299	3200	3299	3698	3697	2093	1892	1589	1198	1898	1704	2201	2303	3200
Dry	1899	2600	2299	2699	2198	1793	1392	1188	998	1698	1604	2101	1903	2600
Critical	1297	1679	1598	1800	1499	1286	981	1199	1005	1499	1411	1502	1308	1715
Benchmark Vernalis Water Quality - mmhos (April and May values may not be reflective of split-month operations when objectives control)														
Wet	352	286	310	269	212	310	341	460	442	359	497	432	352	286
Above Normal	404	380	465	364	334	486	509	534	588	494	657	639	404	380
Below Normal	757	631	690	465	382	700	700	700	680	510	681	657	757	631
Dry	880	736	1000	700	700	700	700	700	772	547	708	678	880	736
Critical	1000	1000	1000	700	700	700	700	700	772	595	772	859	1000	1000
Change in Vernalis Water Quality with Action - mmhos (April and May values may not be reflective of split-month operations when objectives control)														
Wet	0	0	0	0	0	0	0	13	1	0	1	0	0	0
Above Normal	0	-1	0	0	0	-2	-1	18	1	0	1	0	0	1
Below Normal	0	-2	0	0	0	0	0	0	1	0	1	0	1	2
Dry	0	-3	0	0	0	0	0	0	1	0	1	0	1	2
Critical	-2	0	0	0	0	0	0	0	2	0	3	0	1	0
With-Action Vernalis Water Quality - mmhos (April and May values may not be reflective of split-month operations when objectives control)														
Wet	352	285	310	269	212	310	341	473	442	359	498	432	352	286
Above Normal	404	380	465	364	334	485	509	552	590	494	659	639	405	381
Below Normal	756	629	691	465	382	700	700	700	681	510	682	658	757	633
Dry	879	733	1000	700	700	700	700	700	773	547	709	678	880	738
Critical	998	1000	1000	700	700	700	700	700	773	595	775	859	1001	1000

New Melones

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Total
Incremental Change in NM Storage due to WQ Release Change - Acre-feet															
Wet	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Above Normal	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Below Normal	0	0	0	0	0	11	-28	-2866	0	0	0	0	0	0	-2,883
Dry	0	0	-55	-14	-13	11	-28	-2839	0	0	0	0	0	0	-2,939
Critical	0	386	-97	-12	15	223	297	-6209	0	0	0	0	0	-267	-5,665
Incremental Change in NM Storage due to Vernalis Flow Release Change - Acre-feet															
Wet	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Above Normal	0	0	0	0	0	-387	0	0	0	0	0	0	0	0	-387
Below Normal	0	-255	0	0	0	0	0	0	0	0	0	0	0	234	-21
Dry	0	-255	0	0	0	0	0	0	0	0	0	0	0	234	-21
Critical	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Net Incremental Change in NM Storage due to Vernalis Flow & Quality Release Change - Acre-feet															
Wet	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Above Normal	0	0	0	0	0	-387	0	0	0	0	0	0	0	0	-387
Below Normal	0	-255	0	0	0	11	-28	-2866	0	0	0	0	0	234	-2,904
Dry	0	-255	-55	-14	-13	11	-28	-2839	0	0	0	0	0	234	-2,960
Critical	0	386	-97	-12	15	223	297	-6209	0	0	0	0	0	-267	-5,665

Project Delta Supply

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Total
Total Potential Delta supply Impact w/o NM Adjustments - Acre-feet															
Wet	0	-89	0	0	0	0	-540	2588	0	0	0	0	0	82	2,040
Above Normal	0	-89	0	0	0	-387	-540	2588	0	0	0	0	0	82	1,653
Below Normal	0	-89	0	0	0	-387	-540	2588	0	0	0	0	0	82	1,653
Dry	0	-89	-31	-18	-167	-387	-540	2588	-108	-127	0	0	0	82	1,203
Critical	0	-779	-228	-9	-40	-626	-849	6043	312	-39	634	0	0	567	4,985
New Melones Adjustments - Acre-feet (positive means increase in supply)															
Wet	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Above Normal	0	0	0	0	0	387	0	0	0	0	0	0	0	0	387
Below Normal	0	89	0	0	0	-11	28	2866	0	0	0	0	0	-82	2,890
Dry	0	89	19	5	13	-11	28	2839	0	0	0	0	0	-82	2,901
Critical	0	-386	97	12	-15	-223	-297	6209	0	0	0	0	0	267	5,665
Incremental Change in Project Delta Supply due to Action - Acre-feet															
Wet	0	-89	0	0	0	0	-540	2588	0	0	0	0	0	82	2,040
Above Normal	0	-89	0	0	0	0	-540	2588	0	0	0	0	0	82	2,040
Below Normal	0	0	0	0	0	-398	-512	5454	0	0	0	0	0	0	4,543
Dry	0	0	-12	-13	-153	-398	-512	5427	-108	-127	0	0	0	0	4,104
Critical	0	-1165	-131	4	-55	-849	-1146	12252	312	-39	634	0	0	834	10,650

Study: A-3-2-C: 80 FALLOWING AGRICULTURE COMPOSITE — Water Development and Disposition Assumptions

All Values Relative to Benchmark (Existing) Condition

Disposition Non-Crit	Disposition Crit		SJR Continuity Non-Crit	SJR Continuity Crit		SJR Non-Continuity Non-Crit	SJR Non-Continuity Crit	
46412	50000	Agriculture-SJRc	0	0	Conservation of Evaporation/Seepage to GW-SJRc	0	0	Conservation of Evaporation/Seepage to GW-SJRnc
0	0	Wildlife Areas-SJRc	0	0	Conservation of Drain Spills to Wildlife Areas-SJRc	0	0	Conservation of Drain Spills to Wildlife Areas-SJRnc
0	0	Urban-SJRc	-6000	0	Groundwater-SJRc	0	0	Groundwater-SJRnc
-7385	0	Agriculture-SJRnc	0	0	Tailwater Recapture-SJRc	0	0	Tailwater Recapture-SJRnc
0	0	Wildlife Areas-SJRnc	13747	42000	Fallowing -SJRc	2618	8000	Fallowing-SJRnc
0	0	Urban-SJRnc						
0	0	EWA						

	Non-Crit	Crit
Total Developed Water:	10365	50000
Total Disposition:	39027	50000

All Values Relative to Benchmark (Existing) Condition — Basic Hydrologic Accounting

Water Developed - Non Critical Years	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Total
Change in Evaporation/Seepage to GW	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Change in Drain Spills to Wildlife Areas	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Change in Discharge to SJR Streams	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Change to Flows Upstream of Sack Dam	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Crop Fallowing	337	1518	1687	112	225	3487	4724	4162	112	0	0	0	0	0	16,365
Groundwater	0	0	0	-750	-840	-990	-1200	-900	-600	-600	-120	0	0	0	-6,000
Total	337	1518	1687	-638	-615	2497	3524	3262	-488	-600	-120	0	0	0	10,365
Effects to SJR Flows due to Developing Water - Non Critical Years															
Change in Evaporation/Seepage to GW	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Change in Drain Spills to Wildlife Areas	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Change in Discharge to SJR Streams	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Change to Flows Upstream of Sack Dam	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Crop Fallowing	57	255	99	7	13	205	278	245	19	0	0	0	0	0	1,177
Groundwater	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total (Positive value means flow reduced)	57	255	99	7	13	205	278	245	19	0	0	0	0	0	1,177
Return Flows from Disposition of Transfer Water - Non Critical Years															
Incremental Return from Agricultural Transferees	0	0	71	309	467	554	799	587	771	345	93	23	32	56	4,107
Incremental Return from Wildlife Area Transferees	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Envirnomental Water Account Beneficiaries															
Incremental Return from Agricultural Entities	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	0	71	309	467	554	799	587	771	345	93	23	32	56	4,107
Net Effect to San Joaquin River Flow Before NM Adjustment (Acre-feet)	-57	-255	-28	302	453	349	521	343	752	345	93	23	32	56	2,930
(Positive value means flow added) (cfs)	-1	-5	0	5	7	6	8	6	13	6	2	0	1	1	0

Water Developed - Critical Years	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Total
Change in Evaporation/Seepage to GW	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Change in Drain Spills to Wildlife Areas	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Change in Discharge to SJR Streams	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Change to Flows Upstream of Sack Dam	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Crop Fallowing	1031	4639	5155	344	687	10653	14433	12715	344	0	0	0	0	0	50,000
Groundwater	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	1031	4639	5155	344	687	10653	14433	12715	344	0	0	0	0	0	50,000
Effects to SJR Flows due to Developing Water - Critical Years															
Change in Evaporation/Seepage to GW	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Change in Drain Spills to Wildlife Areas	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Change in Discharge to SJR Streams	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Change to Flows Upstream of Sack Dam	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Crop Fallowing	173	779	303	20	40	626	849	748	58	0	0	0	0	0	3,597
Groundwater	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total (Positive value means flow reduced)	173	779	303	20	40	626	849	748	58	0	0	0	0	0	3,597
Return Flows from Disposition of Transfer Water - Critical Years															
Incremental Return from Agricultural Transferees	0	0	77	333	503	597	861	633	831	372	100	25	34	61	4,425
Incremental Return from Wildlife Area Transferees	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Envirnomental Water Account Beneficiaries															
Incremental Return from Agricultural Entities	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	0	77	333	503	597	861	633	831	372	100	25	34	61	4,425
Net Effect to San Joaquin River Flow Before NM Adjustment (Acre-feet)	-173	-779	-226	312	462	-30	12	-115	773	372	100	25	34	61	828
(Positive value means flow added) (cfs)	-3	-14	-4	5	8	0	0	-2	13	6	2	0	1	1	0

Vernalis

Benchmark Vernalis Flow - cfs	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb
Wet	7500	13600	15700	13600	12000	7400	5100	3100	2500	3600	3000	4600	7500	13600
Above Normal	5800	7200	6200	5900	4600	2600	2100	2000	1500	2000	1800	2300	5800	7200
Below Normal	2300	3200	3300	3700	3700	2100	1900	1500	1200	1900	1700	2200	2300	3200
Dry	1900	2600	2300	2700	2200	1800	1400	1100	1000	1700	1600	2100	1900	2600
Critical	1300	1700	1600	1800	1500	1300	1000	1000	1000	1500	1400	1500	1300	1700
Change in Vernalis Flow with Action - cfs														
Wet	-1	-5	0	5	7	6	8	6	13	6	2	0	1	1
Above Normal	-1	-5	0	5	7	0	8	6	13	6	2	0	1	1
Below Normal	-1	0	0	5	7	1	1	1	13	6	2	0	1	0
Dry	-1	0	-1	5	6	1	1	2	13	6	2	0	1	0
Critical	-3	-21	-4	5	7	-5	-5	-5	13	6	2	0	1	1
With-Action Vernalis Flow - cfs														
Wet	7499	13595	15700	13605	12007	7406	5108	3106	2513	3606	3002	4600	7501	13601
Above Normal	5799	7195	6200	5905	4607	2600	2108	2006	1513	2006	1802	2300	5801	7201
Below Normal	2299	3200	3300	3705	3707	2101	1901	1501	1213	1906	1702	2200	2301	3200
Dry	1899	2600	2299	2705	2206	1801	1401	1102	1013	1706	1602	2100	1901	2600
Critical	1297	1679	1596	1805	1507	1295	995	995	1013	1506	1402	1500	1301	1701
Benchmark Vernalis Water Quality - mmhos (April and May values may not be reflective of split-month operations when objectives control)														
Wet	352	286	310	269	212	310	341	460	442	359	497	432	352	286
Above Normal	404	380	465	364	334	486	509	534	588	494	657	639	404	380
Below Normal	757	631	690	465	382	700	700	700	680	510	681	657	757	631
Dry	880	736	1000	700	700	700	700	700	772	547	708	678	880	736
Critical	1000	1000	1000	700	700	700	700	700	772	595	772	859	1000	1000
Change in Vernalis Water Quality with Action - mmhos (April and May values may not be reflective of split-month operations when objectives control)														
Wet	0	0	0	0	0	0	-1	-1	-1	0	0	0	0	0
Above Normal	0	-1	0	0	0	0	-2	-2	-2	0	0	0	0	0
Below Normal	0	-2	0	0	0	0	0	0	-2	0	0	0	0	0
Dry	0	-3	0	0	0	0	0	0	-1	0	0	0	0	0
Critical	-2	0	0	0	0	0	0	0	-1	0	0	0	0	0
With-Action Vernalis Water Quality - mmhos (April and May values may not be reflective of split-month operations when objectives control)														
Wet	352	285	310	269	212	310	341	459	441	359	497	432	352	286
Above Normal	404	380	465	365	334	487	508	532	587	494	657	639	404	380
Below Normal	756	629	690	465	382	700	700	700	678	510	681	657	757	632
Dry	879	733	1000	700	700	700	700	700	771	548	707	678	880	736
Critical	998	1000	1000	700	700	700	700	700	771	595	772	859	1000	1000

New Melones

Incremental Change in NM Storage due to WQ Release Change - Acre-feet	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Total
Wet	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Above Normal	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Below Normal	0	0	0	0	0	260	478	296	0	0	0	0	0	0	1,034
Dry	0	0	36	26	60	260	478	214	0	0	0	0	0	0	1,076
Critical	0	386	47	-12	30	260	350	223	0	0	0	0	0	14	1,296
Incremental Change in NM Storage due to Vernalis Flow Release Change - Acre-feet															
Wet	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Above Normal	0	0	0	0	0	349	0	0	0	0	0	0	0	0	349
Below Normal	0	-255	0	0	0	0	0	0	0	0	0	0	0	56	-199
Dry	0	-255	0	0	0	0	0	0	0	0	0	0	0	56	-199
Critical	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Net Incremental Change in NM Storage due to Vernalis Flow & Quality Release Change - Acre-feet															
Wet	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Above Normal	0	0	0	0	0	349	0	0	0	0	0	0	0	0	349
Below Normal	0	-255	0	0	0	260	478	296	0	0	0	0	0	56	835
Dry	0	-255	36	26	60	260	478	214	0	0	0	0	0	56	877
Critical	0	386	47	-12	30	260	350	223	0	0	0	0	0	14	1,296

Project Delta Supply

Total Potential Delta supply Impact w/o NM Adjustments - Acre-feet	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Total
Wet	0	-89	0	0	0	0	521	343	0	0	0	0	0	20	794
Above Normal	0	-89	0	0	0	349	521	343	0	0	0	0	0	20	1,143
Below Normal	0	-89	0	0	0	349	521	343	0	0	0	0	0	20	1,143
Dry	0	-89	-10	53	453	349	521	343	752	334	0	0	0	20	2,726
Critical	0	-779	-226	312	462	-30	12	-115	773	372	100	0	0	61	942
New Melones Adjustments - Acre-feet (positive means increase in supply)															
Wet	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Above Normal	0	0	0	0	0	-349	0	0	0	0	0	0	0	0	-349
Below Normal	0	89	0	0	0	-260	-478	-296	0	0	0	0	0	-20	-965
Dry	0	89	-13	-9	-60	-260	-478	-214	0	0	0	0	0	-20	-965
Critical	0	-386	-47	12	-30	-260	-350	-223	0	0	0	0	0	-14	-1,296
Incremental Change in Project Delta Supply due to Action - Acre-feet															
Wet	0	-89	0	0	0	0	521	343	0	0	0	0	0	20	794
Above Normal	0	-89	0	0	0	0	521	343	0	0	0	0	0	20	794
Below Normal	0	0	0	0	0	88	43	47	0	0	0	0	0	0	178
Dry	0	0	-22	44	393	88	43	128	752	334	0	0	0	0	1,760
Critical	0	-1165	-273	325	432	-289	-338	-337	773	372	100	0	0	47	-354

Study: A-3-3-C: 80 FALLOWING OUT COMPOSITE — Water Development and Disposition Assumptions

All Values Relative to Benchmark (Existing) Condition

Disposition Non-Crit	Crit		SJR Continuity Non-Crit	Crit		SJR Non-Continuity Non-Crit	Crit	
-33588	0	Agriculture-SJRc	0	0	Conservation of Evaporation/Seepage to GW-SJRc	0	0	Conservation of Evaporation/Seepage to GW-SJRnc
0	0	Wildlife Areas-SJRc	0	0	Conservation of Drain Spills to Wildlife Areas-SJRc	0	0	Conservation of Drain Spills to Wildlife Areas-SJRnc
0	0	Urban-SJRc	-6000	0	Groundwater-SJRc	0	0	Groundwater-SJRnc
72615	50000	Agriculture-SJRnc	0	0	Tailwater Recapture-SJRc	0	0	Tailwater Recapture-SJRnc
0	0	Wildlife Areas-SJRnc	13747	42000	Fallowing -SJRc	2618	8000	Fallowing-SJRnc
0	0	Urban-SJRnc						
0	0	EWA						

	Non-Crit	Crit
Total Developed Water:	10365	50000
Total Disposition:	39027	50000

All Values Relative to Benchmark (Existing) Condition — Basic Hydrologic Accounting

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Total
Water Developed - Non Critical Years															
Change in Evaporation/Seepage to GW	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Change in Drain Spills to Wildlife Areas	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Change in Discharge to SJR Streams	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Change to Flows Upstream of Sack Dam	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Crop Fallowing	337	1518	1687	112	225	3487	4724	4162	112	0	0	0	0	0	16,365
Groundwater	0	0	0	-750	-840	-990	-1200	-900	-600	-600	-120	0	0	0	-6,000
Total	337	1518	1687	-638	-615	2497	3524	3262	-488	-600	-120	0	0	0	10,365
Effects to SJR Flows due to Developing Water - Non Critical Years															
Change in Evaporation/Seepage to GW	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Change in Drain Spills to Wildlife Areas	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Change in Discharge to SJR Streams	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Change to Flows Upstream of Sack Dam	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Crop Fallowing	57	255	99	7	13	205	278	245	19	0	0	0	0	0	1,177
Groundwater	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total (Positive value means flow reduced)	57	255	99	7	13	205	278	245	19	0	0	0	0	0	1,177
Return Flows from Disposition of Transfer Water - Non Critical Years															
Incremental Return from Agricultural Transferees	0	0	-52	-223	-338	-401	-578	-425	-558	-250	-67	-17	-23	-41	-2,972
Incremental Return from Wildlife Area Transferees	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Envirnomental Water Account Beneficiaries															
Incremental Return from Agricultural Entities	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	0	-52	-223	-338	-401	-578	-425	-558	-250	-67	-17	-23	-41	-2,972
Net Effect to San Joaquin River Flow Before NM Adjustment (Acre-feet)	-57	-255	-151	-230	-351	-606	-856	-670	-577	-250	-67	-17	-23	-41	-4,150
(Positive value means flow added) (cfs)	-1	-5	-2	-4	-6	-10	-14	-11	-10	-4	-1	0	0	-1	0
Water Developed - Critical Years															
Change in Evaporation/Seepage to GW	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Change in Drain Spills to Wildlife Areas	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Change in Discharge to SJR Streams	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Change to Flows Upstream of Sack Dam	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Crop Fallowing	1031	4639	5155	344	687	10653	14433	12715	344	0	0	0	0	0	50,000
Groundwater	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	1031	4639	5155	344	687	10653	14433	12715	344	0	0	0	0	0	50,000
Effects to SJR Flows due to Developing Water - Critical Years															
Change in Evaporation/Seepage to GW	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Change in Drain Spills to Wildlife Areas	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Change in Discharge to SJR Streams	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Change to Flows Upstream of Sack Dam	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Crop Fallowing	173	779	303	20	40	626	849	748	58	0	0	0	0	0	3,597
Groundwater	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total (Positive value means flow reduced)	173	779	303	20	40	626	849	748	58	0	0	0	0	0	3,597
Return Flows from Disposition of Transfer Water - Critical Years															
Incremental Return from Agricultural Transferees	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Incremental Return from Wildlife Area Transferees	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Envirnomental Water Account Beneficiaries															
Incremental Return from Agricultural Entities	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Net Effect to San Joaquin River Flow Before NM Adjustment (Acre-feet)	-173	-779	-303	-20	-40	-626	-849	-748	-58	0	0	0	0	0	-3,597
(Positive value means flow added) (cfs)	-3	-14	-5	0	-1	-11	-14	-12	-1	0	0	0	0	0	0

Vernalis

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb
Benchmark Vernalis Flow - cfs														
Wet	7500	13600	15700	13600	12000	7400	5100	3100	2500	3600	3000	4600	7500	13600
Above Normal	5800	7200	6200	5900	4600	2600	2100	2000	1500	2000	1800	2300	5800	7200
Below Normal	2300	3200	3300	3700	3700	2100	1900	1500	1200	1900	1700	2200	2300	3200
Dry	1900	2600	2300	2700	2200	1800	1400	1100	1000	1700	1600	2100	1900	2600
Critical	1300	1700	1600	1800	1500	1300	1000	1000	1000	1500	1400	1500	1300	1700
Change in Vernalis Flow with Action - cfs														
Wet	-1	-5	-2	-4	-6	-10	-14	-11	-10	-4	-1	0	0	-1
Above Normal	-1	-5	-2	-4	-6	0	-14	-11	-10	-4	-1	0	0	-1
Below Normal	-1	0	-2	-4	-6	-9	-11	-9	-10	-4	-1	0	0	0
Dry	-1	0	-2	-4	-5	-9	-11	-10	-10	-4	-1	0	0	0
Critical	-3	-21	-6	0	-1	-14	-19	-16	-1	0	0	0	0	0
With-Action Vernalis Flow - cfs														
Wet	7499	13595	15698	13596	11994	7390	5086	3089	2490	3596	2999	4600	7500	13599
Above Normal	5799	7195	6198	5896	4594	2600	2086	1989	1490	1996	1799	2300	5800	7199
Below Normal	2299	3200	3298	3696	3694	2091	1889	1491	1190	1896	1699	2200	2300	3200
Dry	1899	2600	2298	2696	2195	1791	1389	1090	990	1696	1599	2100	1900	2600
Critical	1297	1679	1594	1800	1499	1286	981	984	999	1500	1400	1500	1300	1700
Benchmark Vernalis Water Quality - mmhos (April and May values may not be reflective of split-month operations when objectives control)														
Wet	352	286	310	269	212	310	341	460	442	359	497	432	352	286
Above Normal	404	380	465	364	334	486	509	534	588	494	657	639	404	380
Below Normal	757	631	690	465	382	700	700	700	680	510	681	657	757	631
Dry	880	736	1000	700	700	700	700	700	772	547	708	678	880	736
Critical	1000	1000	1000	700	700	700	700	700	772	595	772	859	1000	1000
Change in Vernalis Water Quality with Action - mmhos (April and May values may not be reflective of split-month operations when objectives control)														
Wet	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Above Normal	0	-1	0	0	0	-2	0	0	1	0	0	0	0	0
Below Normal	0	-2	0	0	0	0	0	0	1	0	0	0	0	0
Dry	0	-3	0	0	0	0	0	0	1	0	0	0	0	0
Critical	-2	0	0	0	0	0	0	0	0	0	0	0	0	0
With-Action Vernalis Water Quality - mmhos (April and May values may not be reflective of split-month operations when objectives control)														
Wet	352	285	310	269	212	310	341	460	442	359	497	432	352	286
Above Normal	404	380	465	364	333	484	509	533	589	494	657	639	404	380
Below Normal	756	629	690	465	382	700	700	700	681	510	681	657	757	631
Dry	879	733	1000	700	700	700	700	700	772	547	708	678	880	736
Critical	998	1000	1000	700	700	700	700	700	771	595	772	859	1000	1000

New Melones

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Total
Incremental Change in NM Storage due to WQ Release Change - Acre-feet															
Wet	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Above Normal	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Below Normal	0	0	0	0	0	-63	-178	-94	0	0	0	0	0	0	-335
Dry	0	0	-4	-14	-35	-63	-178	-35	0	0	0	0	0	0	-330
Critical	0	386	39	8	15	223	297	213	0	0	0	0	0	0	1,180
Incremental Change in NM Storage due to Vernalis Flow Release Change - Acre-feet															
Wet	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Above Normal	0	0	0	0	0	-606	0	0	0	0	0	0	0	0	-606
Below Normal	0	-255	0	0	0	0	0	0	0	0	0	0	0	-41	-296
Dry	0	-255	0	0	0	0	0	0	0	0	0	0	0	-41	-296
Critical	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Net Incremental Change in NM Storage due to Vernalis Flow & Quality Release Change - Acre-feet															
Wet	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Above Normal	0	0	0	0	0	-606	0	0	0	0	0	0	0	0	-606
Below Normal	0	-255	0	0	0	-63	-178	-94	0	0	0	0	0	-41	-631
Dry	0	-255	-4	-14	-35	-63	-178	-35	0	0	0	0	0	-41	-626
Critical	0	386	39	8	15	223	297	213	0	0	0	0	0	0	1,180

Project Delta Supply

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Total
Total Potential Delta supply Impact w/o NM Adjustments - Acre-feet															
Wet	0	-89	0	0	0	0	-856	-670	0	0	0	0	0	-14	-1,629
Above Normal	0	-89	0	0	0	-606	-856	-670	0	0	0	0	0	-14	-2,235
Below Normal	0	-89	0	0	0	-606	-856	-670	0	0	0	0	0	-14	-2,235
Dry	0	-89	-53	-40	-351	-606	-856	-670	-577	-242	0	0	0	-14	-3,498
Critical	0	-779	-303	-20	-40	-626	-849	-748	-58	0	0	0	0	0	-3,424
New Melones Adjustments - Acre-feet (positive means increase in supply)															
Wet	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Above Normal	0	0	0	0	0	606	0	0	0	0	0	0	0	0	606
Below Normal	0	89	0	0	0	63	178	94	0	0	0	0	0	14	439
Dry	0	89	1	5	35	63	178	35	0	0	0	0	0	14	422
Critical	0	-386	-39	-8	-15	-223	-297	-213	0	0	0	0	0	0	-1,180
Incremental Change in Project Delta Supply due to Action - Acre-feet															
Wet	0	-89	0	0	0	0	-856	-670	0	0	0	0	0	-14	-1,629
Above Normal	0	-89	0	0	0	0	-856	-670	0	0	0	0	0	-14	-1,629
Below Normal	0	0	0	0	0	-543	-677	-576	0	0	0	0	0	0	-1,796
Dry	0	0	-51	-35	-316	-543	-677	-635	-577	-242	0	0	0	0	-3,076
Critical	0	-1165	-342	-28	-55	-849	-1146	-960	-58	0	0	0	0	0	-4,604

Study: B-3-0-S: 50 FALLOWING SOURCE — Water Development and Disposition Assumptions

All Values Relative to Benchmark (Existing) Condition

Disposition Non-Crit	Crit		SJR Continuity Non-Crit	Crit		SJR Non-Continuity Non-Crit	Crit	
0	0	Agriculture-SJRc	0	0	Conservation of Evaporation/Seepage to GW-SJRc	0	0	Conservation of Evaporation/Seepage to GW-SJRnc
0	0	Wildlife Areas-SJRc	0	0	Conservation of Drain Spills to Wildlife Areas-SJRc	0	0	Conservation of Drain Spills to Wildlife Areas-SJRnc
0	0	Urban-SJRc	-6000	0	Groundwater-SJRc	0	0	Groundwater-SJRnc
0	0	Agriculture-SJRnc	0	0	Tailwater Recapture-SJRc	0	0	Tailwater Recapture-SJRnc
0	0	Wildlife Areas-SJRnc	42000	42000	Fallowing -SJRc	8000	8000	Fallowing-SJRnc
0	0	Urban-SJRnc						
0	0	EWA						

	Non-Crit	Crit
Total Developed Water:	44000	50000
Total Disposition:	0	0

All Values Relative to Benchmark (Existing) Condition — Basic Hydrologic Accounting

Water Developed - Non Critical Years	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Total
Change in Evaporation/Seepage to GW	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Change in Drain Spills to Wildlife Areas	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Change in Discharge to SJR Streams	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Change to Flows Upstream of Sack Dam	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Crop Fallowing	1031	4639	5155	344	687	10653	14433	12715	344	0	0	0	0	0	50,000
Groundwater	0	0	0	-750	-840	-990	-1200	-900	-600	-600	-120	0	0	0	-6,000
Total	1031	4639	5155	-406	-153	9663	13233	11815	-256	-600	-120	0	0	0	44,000
Effects to SJR Flows due to Developing Water - Non Critical Years															
Change in Evaporation/Seepage to GW	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Change in Drain Spills to Wildlife Areas	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Change in Discharge to SJR Streams	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Change to Flows Upstream of Sack Dam	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Crop Fallowing	173	779	303	20	40	626	849	748	58	0	0	0	0	0	3,597
Groundwater	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total (Positive value means flow reduced)	173	779	303	20	40	626	849	748	58	0	0	0	0	0	3,597
Return Flows from Disposition of Transfer Water - Non Critical Years															
Incremental Return from Agricultural Transferees	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Incremental Return from Wildlife Area Transferees	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Envirnomental Water Account Beneficiaries															
Incremental Return from Agricultural Entities	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Net Effect to San Joaquin River Flow Before NM Adjustment (Acre-feet)	-173	-779	-303	-20	-40	-626	-849	-748	-58	0	0	0	0	0	-3,597
(Positive value means flow added) (cfs)	-3	-14	-5	0	-1	-11	-14	-12	-1	0	0	0	0	0	0

Water Developed - Critical Years	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Total
Change in Evaporation/Seepage to GW	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Change in Drain Spills to Wildlife Areas	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Change in Discharge to SJR Streams	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Change to Flows Upstream of Sack Dam	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Crop Fallowing	1031	4639	5155	344	687	10653	14433	12715	344	0	0	0	0	0	50,000
Groundwater	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	1031	4639	5155	344	687	10653	14433	12715	344	0	0	0	0	0	50,000
Effects to SJR Flows due to Developing Water - Critical Years															
Change in Evaporation/Seepage to GW	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Change in Drain Spills to Wildlife Areas	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Change in Discharge to SJR Streams	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Change to Flows Upstream of Sack Dam	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Crop Fallowing	173	779	303	20	40	626	849	748	58	0	0	0	0	0	3,597
Groundwater	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total (Positive value means flow reduced)	173	779	303	20	40	626	849	748	58	0	0	0	0	0	3,597
Return Flows from Disposition of Transfer Water - Critical Years															
Incremental Return from Agricultural Transferees	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Incremental Return from Wildlife Area Transferees	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Envirnomental Water Account Beneficiaries															
Incremental Return from Agricultural Entities	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Net Effect to San Joaquin River Flow Before NM Adjustment (Acre-feet)	-173	-779	-303	-20	-40	-626	-849	-748	-58	0	0	0	0	0	-3,597
(Positive value means flow added) (cfs)	-3	-14	-5	0	-1	-11	-14	-12	-1	0	0	0	0	0	0

Vernalis

Benchmark Vernalis Flow - cfs	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb
Wet	7500	13600	15700	13600	12000	7400	5100	3100	2500	3600	3000	4600	7500	13600
Above Normal	5800	7200	6200	5900	4600	2600	2100	2000	1500	2000	1800	2300	5800	7200
Below Normal	2300	3200	3300	3700	3700	2100	1900	1500	1200	1900	1700	2200	2300	3200
Dry	1900	2600	2300	2700	2200	1800	1400	1100	1000	1700	1600	2100	1900	2600
Critical	1300	1700	1600	1800	1500	1300	1000	1000	1000	1500	1400	1500	1300	1700
Change in Vernalis Flow with Action - cfs														
Wet	-3	-14	-5	0	-1	-11	-14	-12	-1	0	0	0	0	0
Above Normal	-3	-14	-5	0	-1	0	-14	-12	-1	0	0	0	0	0
Below Normal	-3	0	-5	0	-1	-14	-19	-16	-1	0	0	0	0	0
Dry	-3	0	-6	0	-1	-14	-19	-16	-1	0	0	0	0	0
Critical	-3	-21	-6	0	-1	-14	-19	-16	-1	0	0	0	0	0
With-Action Vernalis Flow - cfs														
Wet	7497	13586	15695	13600	11999	7389	5086	3088	2499	3600	3000	4600	7500	13600
Above Normal	5797	7186	6195	5900	4599	2600	2086	1988	1499	2000	1800	2300	5800	7200
Below Normal	2297	3200	3295	3700	3699	2086	1881	1484	1199	1900	1700	2200	2300	3200
Dry	1897	2600	2294	2700	2199	1786	1381	1084	999	1700	1600	2100	1900	2600
Critical	1297	1679	1594	1800	1499	1286	981	984	999	1500	1400	1500	1300	1700
Benchmark Vernalis Water Quality - mmhos (April and May values may not be reflective of split-month operations when objectives control)														
Wet	352	286	310	269	212	310	341	460	442	359	497	432	352	286
Above Normal	404	380	465	364	334	486	509	534	588	494	657	639	404	380
Below Normal	757	631	690	465	382	700	700	700	680	510	681	657	757	631
Dry	880	736	1000	700	700	700	700	700	772	547	708	678	880	736
Critical	1000	1000	1000	700	700	700	700	700	772	595	772	859	1000	1000
Change in Vernalis Water Quality with Action - mmhos (April and May values may not be reflective of split-month operations when objectives control)														
Wet	-1	-1	0	0	0	-1	-2	-2	0	0	0	0	0	0
Above Normal	-1	-2	-1	0	0	-4	-3	-2	0	0	0	0	0	0
Below Normal	-1	-6	-1	0	0	0	0	0	0	0	0	0	0	0
Dry	-1	-8	0	0	0	0	0	0	0	0	0	0	0	0
Critical	-2	0	0	0	0	0	0	0	0	0	0	0	0	0
With-Action Vernalis Water Quality - mmhos (April and May values may not be reflective of split-month operations when objectives control)														
Wet	351	284	310	269	212	310	340	459	441	359	497	432	352	286
Above Normal	404	378	465	364	334	483	507	531	588	494	657	639	404	380
Below Normal	756	625	690	465	382	700	700	700	680	510	681	657	757	631
Dry	878	728	1000	700	700	700	700	700	771	547	708	678	880	736
Critical	998	1000	1000	700	700	700	700	700	771	595	772	859	1000	1000

New Melones

Incremental Change in NM Storage due to WQ Release Change - Acre-feet	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Total
Wet	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Above Normal	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Below Normal	0	0	0	0	0	223	297	213	0	0	0	0	0	0	733
Dry	0	0	39	8	15	223	297	213	0	0	0	0	0	0	795
Critical	0	386	39	8	15	223	297	213	0	0	0	0	0	0	1,180
Incremental Change in NM Storage due to Vernalis Flow Release Change - Acre-feet															
Wet	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Above Normal	0	0	0	0	0	-626	0	0	0	0	0	0	0	0	-626
Below Normal	0	-779	0	0	0	0	0	0	0	0	0	0	0	0	-779
Dry	0	-779	0	0	0	0	0	0	0	0	0	0	0	0	-779
Critical	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Net Incremental Change in NM Storage due to Vernalis Flow & Quality Release Change - Acre-feet															
Wet	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Above Normal	0	0	0	0	0	-626	0	0	0	0	0	0	0	0	-626
Below Normal	0	-779	0	0	0	223	297	213	0	0	0	0	0	0	-47
Dry	0	-779	39	8	15	223	297	213	0	0	0	0	0	0	15
Critical	0	386	39	8	15	223	297	213	0	0	0	0	0	0	1,180

Project Delta Supply

Total Potential Delta supply Impact w/o NM Adjustments - Acre-feet	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Total
Wet	0	-273	0	0	0	0	-849	-748	0	0	0	0	0	0	-1,869
Above Normal	0	-273	0	0	0	-626	-849	-748	0	0	0	0	0	0	-2,495
Below Normal	0	-273	0	0	0	-626	-849	-748	0	0	0	0	0	0	-2,495
Dry	0	-273	-106	-4	-40	-626	-849	-748	-58	0	0	0	0	0	-2,703
Critical	0	-779	-303	-20	-40	-626	-849	-748	-58	0	0	0	0	0	-3,424
New Melones Adjustments - Acre-feet (positive means increase in supply)															
Wet	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Above Normal	0	0	0	0	0	626	0	0	0	0	0	0	0	0	626
Below Normal	0	273	0	0	0	-223	-297	-213	0	0	0	0	0	0	-460
Dry	0	273	-14	-3	-15	-223	-297	-213	0	0	0	0	0	0	-491
Critical	0	-386	-39	-8	-15	-223	-297	-213	0	0	0	0	0	0	-1,180
Incremental Change in Project Delta Supply due to Action - Acre-feet															
Wet	0	-273	0	0	0	0	-849	-748	0	0	0	0	0	0	-1,869
Above Normal	0	-273	0	0	0	0	-849	-748	0	0	0	0	0	0	-1,869
Below Normal	0	0	0	0	0	-849	-1146	-960	0	0	0	0	0	0	-2,955
Dry	0	0	-120	-6	-55	-849	-1146	-960	-58	0	0	0	0	0	-3,194
Critical	0	-1165	-342	-28	-55	-849	-1146	-960	-58	0	0	0	0	0	-4,604

Study: B-3-1-C: 50 FALLOWING REFUGE COMPOSITE

Water Development and Disposition Assumptions

All Values Relative to Benchmark (Existing) Condition

Disposition

Non-Crit	Crit	
-28596	0	Agriculture-SJRc
17823	40000	Wildlife Areas-SJRc
0	0	Urban-SJRc
-7385	0	Agriculture-SJRnc
9497	0	Wildlife Areas-SJRnc
0	0	Urban-SJRnc
0	0	EWA

SJR Continuity

Non-Crit	Crit	
0	0	Conservation of Evaporation/Seepage to GW-SJRc
0	0	Conservation of Drain Spills to Wildlife Areas-SJRc
-6000	0	Groundwater-SJRc
0	0	Tailwater Recapture-SJRc
42000	42000	Fallowing -SJRc

Total Developed Water: Non-Crit 44000, Crit 50000

SJR Non-Continuity

Non-Crit	Crit	
0	0	Conservation of Evaporation/Seepage to GW-SJRnc
0	0	Conservation of Drain Spills to Wildlife Areas-SJRnc
0	0	Groundwater-SJRnc
0	0	Tailwater Recapture-SJRnc
8000	8000	Fallowing-SJRnc

Total Disposition: Non-Crit -8661, Crit 40000

All Values Relative to Benchmark (Existing) Condition

Basic Hydrologic Accounting

		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Total
Water Developed - Non Critical Years																
Change in Evaporation/Seepage to GW		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Change in Drain Spills to Wildlife Areas		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Change in Discharge to SJR Streams		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Change to Flows Upstream of Sack Dam		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Crop Fallowing		1031	4639	5155	344	687	10653	14433	12715	344	0	0	0	0	0	50,000
Groundwater		0	0	0	-750	-840	-990	-1200	-900	-600	-600	-120	0	0	0	-6,000
Total		1031	4639	5155	-406	-153	9663	13233	11815	-256	-600	-120	0	0	0	44,000
Effects to SJR Flows due to Developing Water - Non Critical Years																
Change in Evaporation/Seepage to GW		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Change in Drain Spills to Wildlife Areas		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Change in Discharge to SJR Streams		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Change to Flows Upstream of Sack Dam		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Crop Fallowing		173	779	303	20	40	626	849	748	58	0	0	0	0	0	3,597
Groundwater		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total (Positive value means flow reduced)		173	779	303	20	40	626	849	748	58	0	0	0	0	0	3,597
Return Flows from Disposition of Transfer Water - Non Critical Years																
Incremental Return from Agricultural Transferees		0	0	-44	-190	-287	-341	-492	-362	-475	-213	-57	-14	-19	-35	-2,531
Incremental Return from Wildlife Area Transferees		0	0	33	5	0	0	0	3026	165	-17	282	66	220	252	4,032
Envirnomental Water Account Beneficiaries																
Incremental Return from Agricultural Entities		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total		0	0	-10	-185	-287	-341	-492	2664	-310	-230	225	51	200	218	1,501
Net Effect to San Joaquin River Flow Before NM Adjustment	(Acre-feet)	-173	-779	-314	-205	-328	-968	-1341	1916	-368	-230	225	51	200	218	-2,095
(Positive value means flow added)	(cfs)	-3	-14	-5	-3	-5	-16	-22	31	-6	-4	4	1	3	4	0
Water Developed - Critical Years																
Change in Evaporation/Seepage to GW		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Change in Drain Spills to Wildlife Areas		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Change in Discharge to SJR Streams		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Change to Flows Upstream of Sack Dam		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Crop Fallowing		1031	4639	5155	344	687	10653	14433	12715	344	0	0	0	0	0	50,000
Groundwater		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total		1031	4639	5155	344	687	10653	14433	12715	344	0	0	0	0	0	50,000
Effects to SJR Flows due to Developing Water - Critical Years																
Change in Evaporation/Seepage to GW		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Change in Drain Spills to Wildlife Areas		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Change in Discharge to SJR Streams		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Change to Flows Upstream of Sack Dam		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Crop Fallowing		173	779	303	20	40	626	849	748	58	0	0	0	0	0	3,597
Groundwater		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total (Positive value means flow reduced)		173	779	303	20	40	626	849	748	58	0	0	0	0	0	3,597
Return Flows from Disposition of Transfer Water - Critical Years																
Incremental Return from Agricultural Transferees		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Incremental Return from Wildlife Area Transferees		0	0	75	11	0	0	0	6791	370	-39	634	148	493	567	9,049
Envirnomental Water Account Beneficiaries																
Incremental Return from Agricultural Entities		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total		0	0	75	11	0	0	0	6791	370	-39	634	148	493	567	9,049
Net Effect to San Joaquin River Flow Before NM Adjustment	(Acre-feet)	-173	-779	-228	-9	-40	-626	-849	6043	312	-39	634	148	493	567	5,453
(Positive value means flow added)	(cfs)	-3	-14	-4	0	-1	-11	-14	98	5	-1	11	2	8	10	0

Vernalis

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb
Benchmark Vernalis Flow - cfs														
Wet	7500	13600	15700	13600	12000	7400	5100	3100	2500	3600	3000	4600	7500	13600
Above Normal	5800	7200	6200	5900	4600	2600	2100	2000	1500	2000	1800	2300	5800	7200
Below Normal	2300	3200	3300	3700	3700	2100	1900	1500	1200	1900	1700	2200	2300	3200
Dry	1900	2600	2300	2700	2200	1800	1400	1100	1000	1700	1600	2100	1900	2600
Critical	1300	1700	1600	1800	1500	1300	1000	1000	1000	1500	1400	1500	1300	1700
Change in Vernalis Flow with Action - cfs														
Wet	-3	-14	-5	-3	-5	-16	-22	31	-6	-4	4	1	3	4
Above Normal	-3	-14	-5	-3	-5	0	-22	31	-6	-4	4	1	3	4
Below Normal	-3	0	-5	-3	-5	-18	-23	76	-6	-4	4	1	3	0
Dry	-3	0	-5	-3	-5	-18	-23	76	-6	-4	4	1	3	0
Critical	-3	-21	-2	0	-1	-14	-19	199	5	-1	11	2	8	15
With-Action Vernalis Flow - cfs														
Wet	7497	13586	15695	13597	11995	7384	5078	3131	2494	3596	3004	4601	7503	13604
Above Normal	5797	7186	6195	5897	4595	2600	2078	2031	1494	1996	1804	2301	5803	7204
Below Normal	2297	3200	3295	3697	3695	2082	1877	1576	1194	1896	1704	2201	2303	3200
Dry	1897	2600	2295	2697	2195	1782	1377	1176	994	1696	1604	2101	1903	2600
Critical	1297	1679	1598	1800	1499	1286	981	1199	1005	1499	1411	1502	1308	1715
Benchmark Vernalis Water Quality - mmhos (April and May values may not be reflective of split-month operations when objectives control)														
Wet	352	286	310	269	212	310	341	460	442	359	497	432	352	286
Above Normal	404	380	465	364	334	486	509	534	588	494	657	639	404	380
Below Normal	757	631	690	465	382	700	700	700	680	510	681	657	757	631
Dry	880	736	1000	700	700	700	700	700	772	547	708	678	880	736
Critical	1000	1000	1000	700	700	700	700	700	772	595	772	859	1000	1000
Change in Vernalis Water Quality with Action - mmhos (April and May values may not be reflective of split-month operations when objectives control)														
Wet	-1	-1	0	0	0	-1	-2	12	1	0	1	0	0	0
Above Normal	-1	-2	0	0	0	-5	-2	17	1	0	1	0	0	1
Below Normal	-1	-6	0	0	0	0	0	0	2	0	1	0	1	2
Dry	-1	-8	0	0	0	0	0	0	1	0	1	0	1	2
Critical	-2	0	0	0	0	0	0	0	2	0	3	0	1	0
With-Action Vernalis Water Quality - mmhos (April and May values may not be reflective of split-month operations when objectives control)														
Wet	351	284	310	269	212	310	340	472	442	359	498	432	352	286
Above Normal	404	378	465	364	333	482	507	551	590	494	659	639	405	381
Below Normal	756	625	690	465	382	700	700	700	682	509	682	658	757	633
Dry	878	728	1000	700	700	700	700	700	773	547	709	678	880	738
Critical	998	1000	1000	700	700	700	700	700	773	595	775	859	1001	1000

New Melones

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Total
Incremental Change in NM Storage due to WQ Release Change - Acre-feet															
Wet	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Above Normal	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Below Normal	0	0	0	0	0	107	62	-2788	0	0	0	0	0	0	-2,618
Dry	0	0	-36	-16	-19	107	62	-2738	0	0	0	0	0	0	-2,639
Critical	0	386	-97	-12	15	223	297	-6209	0	0	0	0	0	-267	-5,665
Incremental Change in NM Storage due to Vernalis Flow Release Change - Acre-feet															
Wet	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Above Normal	0	0	0	0	0	-968	0	0	0	0	0	0	0	0	-968
Below Normal	0	-779	0	0	0	0	0	0	0	0	0	0	0	218	-562
Dry	0	-779	0	0	0	0	0	0	0	0	0	0	0	218	-562
Critical	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Net Incremental Change in NM Storage due to Vernalis Flow & Quality Release Change - Acre-feet															
Wet	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Above Normal	0	0	0	0	0	-968	0	0	0	0	0	0	0	0	-968
Below Normal	0	-779	0	0	0	107	62	-2788	0	0	0	0	0	218	-3,180
Dry	0	-779	-36	-16	-19	107	62	-2738	0	0	0	0	0	218	-3,200
Critical	0	386	-97	-12	15	223	297	-6209	0	0	0	0	0	-267	-5,665

Project Delta Supply

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Total
Total Potential Delta supply Impact w/o NM Adjustments - Acre-feet															
Wet	0	-273	0	0	0	0	-1341	1916	0	0	0	0	0	76	379
Above Normal	0	-273	0	0	0	-968	-1341	1916	0	0	0	0	0	76	-589
Below Normal	0	-273	0	0	0	-968	-1341	1916	0	0	0	0	0	76	-589
Dry	0	-273	-110	-36	-328	-968	-1341	1916	-368	-223	0	0	0	76	-1,653
Critical	0	-779	-228	-9	-40	-626	-849	6043	312	-39	634	0	0	567	4,985
New Melones Adjustments - Acre-feet (positive means increase in supply)															
Wet	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Above Normal	0	0	0	0	0	968	0	0	0	0	0	0	0	0	968
Below Normal	0	273	0	0	0	-107	-62	2788	0	0	0	0	0	-76	2,815
Dry	0	273	13	5	19	-107	-62	2738	0	0	0	0	0	-76	2,802
Critical	0	-386	97	12	-15	-223	-297	6209	0	0	0	0	0	267	5,665
Incremental Change in Project Delta Supply due to Action - Acre-feet															
Wet	0	-273	0	0	0	0	-1341	1916	0	0	0	0	0	76	379
Above Normal	0	-273	0	0	0	0	-1341	1916	0	0	0	0	0	76	379
Below Normal	0	0	0	0	0	-1075	-1403	4704	0	0	0	0	0	0	2,226
Dry	0	0	-97	-31	-309	-1075	-1403	4654	-368	-223	0	0	0	0	1,149
Critical	0	-1165	-131	4	-55	-849	-1146	12252	312	-39	634	0	0	834	10,650

Study: B-3-2-C: 50 FALLOWING AGRICULTURE COMPOSITE — Water Development and Disposition Assumptions

All Values Relative to Benchmark (Existing) Condition

Disposition Non-Crit	Crit		SJR Continuity Non-Crit	Crit		SJR Non-Continuity Non-Crit	Crit	
16412	50000	Agriculture-SJRc	0	0	Conservation of Evaporation/Seepage to GW-SJRc	0	0	Conservation of Evaporation/Seepage to GW-SJRnc
0	0	Wildlife Areas-SJRc	0	0	Conservation of Drain Spills to Wildlife Areas-SJRc	0	0	Conservation of Drain Spills to Wildlife Areas-SJRnc
0	0	Urban-SJRc	-6000	0	Groundwater-SJRc	0	0	Groundwater-SJRnc
-7385	0	Agriculture-SJRnc	0	0	Tailwater Recapture-SJRc	0	0	Tailwater Recapture-SJRnc
0	0	Wildlife Areas-SJRnc	42000	42000	Fallowing -SJRc	8000	8000	Fallowing-SJRnc
0	0	Urban-SJRnc						
0	0	EWA						

	Non-Crit	Crit
Total Developed Water:	44000	50000
Total Disposition:	9027	50000

All Values Relative to Benchmark (Existing) Condition — Basic Hydrologic Accounting

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Total
Water Developed - Non Critical Years															
Change in Evaporation/Seepage to GW	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Change in Drain Spills to Wildlife Areas	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Change in Discharge to SJR Streams	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Change to Flows Upstream of Sack Dam	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Crop Fallowing	1031	4639	5155	344	687	10653	14433	12715	344	0	0	0	0	0	50,000
Groundwater	0	0	0	-750	-840	-990	-1200	-900	-600	-600	-120	0	0	0	-6,000
Total	1031	4639	5155	-406	-153	9663	13233	11815	-256	-600	-120	0	0	0	44,000
Effects to SJR Flows due to Developing Water - Non Critical Years															
Change in Evaporation/Seepage to GW	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Change in Drain Spills to Wildlife Areas	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Change in Discharge to SJR Streams	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Change to Flows Upstream of Sack Dam	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Crop Fallowing	173	779	303	20	40	626	849	748	58	0	0	0	0	0	3,597
Groundwater	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total (Positive value means flow reduced)	173	779	303	20	40	626	849	748	58	0	0	0	0	0	3,597
Return Flows from Disposition of Transfer Water - Non Critical Years															
Incremental Return from Agricultural Transferees	0	0	25	109	165	196	282	208	273	122	33	8	11	20	1,452
Incremental Return from Wildlife Area Transferees	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Envirnomental Water Account Beneficiaries															
Incremental Return from Agricultural Entities	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	0	25	109	165	196	282	208	273	122	33	8	11	20	1,452
Net Effect to San Joaquin River Flow Before NM Adjustment (Acre-feet)	-173	-779	-278	89	125	-431	-566	-540	215	122	33	8	11	20	-2,144
(Positive value means flow added) (cfs)	-3	-14	-5	1	2	-7	-9	-9	4	2	1	0	0	0	0
Water Developed - Critical Years															
Change in Evaporation/Seepage to GW	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Change in Drain Spills to Wildlife Areas	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Change in Discharge to SJR Streams	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Change to Flows Upstream of Sack Dam	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Crop Fallowing	1031	4639	5155	344	687	10653	14433	12715	344	0	0	0	0	0	50,000
Groundwater	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	1031	4639	5155	344	687	10653	14433	12715	344	0	0	0	0	0	50,000
Effects to SJR Flows due to Developing Water - Critical Years															
Change in Evaporation/Seepage to GW	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Change in Drain Spills to Wildlife Areas	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Change in Discharge to SJR Streams	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Change to Flows Upstream of Sack Dam	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Crop Fallowing	173	779	303	20	40	626	849	748	58	0	0	0	0	0	3,597
Groundwater	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total (Positive value means flow reduced)	173	779	303	20	40	626	849	748	58	0	0	0	0	0	3,597
Return Flows from Disposition of Transfer Water - Critical Years															
Incremental Return from Agricultural Transferees	0	0	77	333	503	597	861	633	831	372	100	25	34	61	4,425
Incremental Return from Wildlife Area Transferees	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Envirnomental Water Account Beneficiaries															
Incremental Return from Agricultural Entities	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	0	77	333	503	597	861	633	831	372	100	25	34	61	4,425
Net Effect to San Joaquin River Flow Before NM Adjustment (Acre-feet)	-173	-779	-226	312	462	-30	12	-115	773	372	100	25	34	61	828
(Positive value means flow added) (cfs)	-3	-14	-4	5	8	0	0	-2	13	6	2	0	1	1	0

Vernalis

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb
Benchmark Vernalis Flow - cfs														
Wet	7500	13600	15700	13600	12000	7400	5100	3100	2500	3600	3000	4600	7500	13600
Above Normal	5800	7200	6200	5900	4600	2600	2100	2000	1500	2000	1800	2300	5800	7200
Below Normal	2300	3200	3300	3700	3700	2100	1900	1500	1200	1900	1700	2200	2300	3200
Dry	1900	2600	2300	2700	2200	1800	1400	1100	1000	1700	1600	2100	1900	2600
Critical	1300	1700	1600	1800	1500	1300	1000	1000	1000	1500	1400	1500	1300	1700
Change in Vernalis Flow with Action - cfs														
Wet	-3	-14	-5	1	2	-7	-9	-9	4	2	1	0	0	0
Above Normal	-3	-14	-5	1	2	0	-9	-9	4	2	1	0	0	0
Below Normal	-3	0	-5	1	2	-12	-16	-14	4	2	1	0	0	0
Dry	-3	0	-5	1	1	-12	-16	-13	4	2	1	0	0	0
Critical	-3	-21	-4	5	7	-5	-5	-5	13	6	2	0	1	1
With-Action Vernalis Flow - cfs														
Wet	7497	13586	15695	13601	12002	7393	5091	3091	2504	3602	3001	4600	7500	13600
Above Normal	5797	7186	6195	5901	4602	2600	2091	1991	1504	2002	1801	2300	5800	7200
Below Normal	2297	3200	3295	3701	3702	2088	1884	1486	1204	1902	1701	2200	2300	3200
Dry	1897	2600	2295	2701	2201	1788	1384	1087	1004	1702	1601	2100	1900	2600
Critical	1297	1679	1596	1805	1507	1295	995	995	1013	1506	1402	1500	1301	1701
Benchmark Vernalis Water Quality - mmhos (April and May values may not be reflective of split-month operations when objectives control)														
Wet	352	286	310	269	212	310	341	460	442	359	497	432	352	286
Above Normal	404	380	465	364	334	486	509	534	588	494	657	639	404	380
Below Normal	757	631	690	465	382	700	700	700	680	510	681	657	757	631
Dry	880	736	1000	700	700	700	700	700	772	547	708	678	880	736
Critical	1000	1000	1000	700	700	700	700	700	772	595	772	859	1000	1000
Change in Vernalis Water Quality with Action - mmhos (April and May values may not be reflective of split-month operations when objectives control)														
Wet	-1	-1	0	0	0	-1	-2	-2	0	0	0	0	0	0
Above Normal	-1	-2	-1	0	0	-3	-3	-2	-1	0	0	0	0	0
Below Normal	-1	-6	-1	0	0	0	0	0	-1	0	0	0	0	0
Dry	-1	-8	0	0	0	0	0	0	-1	0	0	0	0	0
Critical	-2	0	0	0	0	0	0	0	-1	0	0	0	0	0
With-Action Vernalis Water Quality - mmhos (April and May values may not be reflective of split-month operations when objectives control)														
Wet	351	284	310	269	212	310	340	459	441	359	497	432	352	286
Above Normal	404	378	465	364	334	483	506	531	588	494	657	639	404	380
Below Normal	756	625	690	465	382	700	700	700	679	510	681	657	757	631
Dry	878	728	1000	700	700	700	700	700	771	547	708	678	880	736
Critical	998	1000	1000	700	700	700	700	700	771	595	772	859	1000	1000

New Melones

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Total
Incremental Change in NM Storage due to WQ Release Change - Acre-feet															
Wet	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Above Normal	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Below Normal	0	0	0	0	0	289	432	293	0	0	0	0	0	0	1,014
Dry	0	0	47	17	35	289	432	264	0	0	0	0	0	0	1,083
Critical	0	386	47	-12	30	260	350	223	0	0	0	0	0	14	1,296
Incremental Change in NM Storage due to Vernalis Flow Release Change - Acre-feet															
Wet	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Above Normal	0	0	0	0	0	-431	0	0	0	0	0	0	0	0	-431
Below Normal	0	-779	0	0	0	0	0	0	0	0	0	0	0	20	-759
Dry	0	-779	0	0	0	0	0	0	0	0	0	0	0	20	-759
Critical	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Net Incremental Change in NM Storage due to Vernalis Flow & Quality Release Change - Acre-feet															
Wet	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Above Normal	0	0	0	0	0	-431	0	0	0	0	0	0	0	0	-431
Below Normal	0	-779	0	0	0	289	432	293	0	0	0	0	0	20	254
Dry	0	-779	47	17	35	289	432	264	0	0	0	0	0	20	323
Critical	0	386	47	-12	30	260	350	223	0	0	0	0	0	14	1,296

Project Delta Supply

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Total
Total Potential Delta supply Impact w/o NM Adjustments - Acre-feet															
Wet	0	-273	0	0	0	0	-566	-540	0	0	0	0	0	7	-1,372
Above Normal	0	-273	0	0	0	-431	-566	-540	0	0	0	0	0	7	-1,803
Below Normal	0	-273	0	0	0	-431	-566	-540	0	0	0	0	0	7	-1,803
Dry	0	-273	-97	16	125	-431	-566	-540	215	118	0	0	0	7	-1,426
Critical	0	-779	-226	312	462	-30	12	-115	773	372	100	0	0	61	942
New Melones Adjustments - Acre-feet (positive means increase in supply)															
Wet	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Above Normal	0	0	0	0	0	431	0	0	0	0	0	0	0	0	431
Below Normal	0	273	0	0	0	-289	-432	-293	0	0	0	0	0	-7	-748
Dry	0	273	-16	-6	-35	-289	-432	-264	0	0	0	0	0	-7	-776
Critical	0	-386	-47	12	-30	-260	-350	-223	0	0	0	0	0	-14	-1,296
Incremental Change in Project Delta Supply due to Action - Acre-feet															
Wet	0	-273	0	0	0	0	-566	-540	0	0	0	0	0	7	-1,372
Above Normal	0	-273	0	0	0	0	-566	-540	0	0	0	0	0	7	-1,372
Below Normal	0	0	0	0	0	-720	-998	-833	0	0	0	0	0	0	-2,550
Dry	0	0	-114	10	90	-720	-998	-804	215	118	0	0	0	0	-2,202
Critical	0	-1165	-273	325	432	-289	-338	-337	773	372	100	0	0	47	-354

Study: B-3-3-C: 50 FALLOWING OUT COMPOSITE — Water Development and Disposition Assumptions

All Values Relative to Benchmark (Existing) Condition

Non-Crit	Crit	Disposition	Non-Crit	Crit	SJR Continuity	Non-Crit	Crit	SJR Non-Continuity
-33588	0	Agriculture-SJRc	0	0	Conservation of Evaporation/Seepage to GW-SJRc	0	0	Conservation of Evaporation/Seepage to GW-SJRnc
0	0	Wildlife Areas-SJRc	0	0	Conservation of Drain Spills to Wildlife Areas-SJRc	0	0	Conservation of Drain Spills to Wildlife Areas-SJRnc
0	0	Urban-SJRc	-6000	0	Groundwater-SJRc	0	0	Groundwater-SJRnc
42615	50000	Agriculture-SJRnc	0	0	Tailwater Recapture-SJRc	0	0	Tailwater Recapture-SJRnc
0	0	Wildlife Areas-SJRnc	42000	42000	Fallowing -SJRc	8000	8000	Fallowing-SJRnc
0	0	Urban-SJRnc						
0	0	EWA						

	Non-Crit	Crit
Total Developed Water:	44000	50000
Total Disposition:	9027	50000

All Values Relative to Benchmark (Existing) Condition — Basic Hydrologic Accounting

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Total
Water Developed - Non Critical Years															
Change in Evaporation/Seepage to GW	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Change in Drain Spills to Wildlife Areas	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Change in Discharge to SJR Streams	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Change to Flows Upstream of Sack Dam	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Crop Fallowing	1031	4639	5155	344	687	10653	14433	12715	344	0	0	0	0	0	50,000
Groundwater	0	0	0	-750	-840	-990	-1200	-900	-600	-600	-120	0	0	0	-6,000
Total	1031	4639	5155	-406	-153	9663	13233	11815	-256	-600	-120	0	0	0	44,000
Effects to SJR Flows due to Developing Water - Non Critical Years															
Change in Evaporation/Seepage to GW	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Change in Drain Spills to Wildlife Areas	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Change in Discharge to SJR Streams	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Change to Flows Upstream of Sack Dam	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Crop Fallowing	173	779	303	20	40	626	849	748	58	0	0	0	0	0	3,597
Groundwater	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total (Positive value means flow reduced)	173	779	303	20	40	626	849	748	58	0	0	0	0	0	3,597
Return Flows from Disposition of Transfer Water - Non Critical Years															
Incremental Return from Agricultural Transferees	0	0	-52	-223	-338	-401	-578	-425	-558	-250	-67	-17	-23	-41	-2,972
Incremental Return from Wildlife Area Transferees	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Envirnomental Water Account Beneficiaries															
Incremental Return from Agricultural Entities	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	0	-52	-223	-338	-401	-578	-425	-558	-250	-67	-17	-23	-41	-2,972
Net Effect to San Joaquin River Flow Before NM Adjustment (Acre-feet)	-173	-779	-355	-244	-378	-1027	-1427	-1173	-616	-250	-67	-17	-23	-41	-6,569
(Positive value means flow added) (cfs)	-3	-14	-6	-4	-6	-17	-23	-19	-10	-4	-1	0	0	-1	0
Water Developed - Critical Years															
Change in Evaporation/Seepage to GW	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Change in Drain Spills to Wildlife Areas	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Change in Discharge to SJR Streams	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Change to Flows Upstream of Sack Dam	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Crop Fallowing	1031	4639	5155	344	687	10653	14433	12715	344	0	0	0	0	0	50,000
Groundwater	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	1031	4639	5155	344	687	10653	14433	12715	344	0	0	0	0	0	50,000
Effects to SJR Flows due to Developing Water - Critical Years															
Change in Evaporation/Seepage to GW	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Change in Drain Spills to Wildlife Areas	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Change in Discharge to SJR Streams	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Change to Flows Upstream of Sack Dam	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Crop Fallowing	173	779	303	20	40	626	849	748	58	0	0	0	0	0	3,597
Groundwater	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total (Positive value means flow reduced)	173	779	303	20	40	626	849	748	58	0	0	0	0	0	3,597
Return Flows from Disposition of Transfer Water - Critical Years															
Incremental Return from Agricultural Transferees	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Incremental Return from Wildlife Area Transferees	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Envirnomental Water Account Beneficiaries															
Incremental Return from Agricultural Entities	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Net Effect to San Joaquin River Flow Before NM Adjustment (Acre-feet)	-173	-779	-303	-20	-40	-626	-849	-748	-58	0	0	0	0	0	-3,597
(Positive value means flow added) (cfs)	-3	-14	-5	0	-1	-11	-14	-12	-1	0	0	0	0	0	0

Vernalis

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb
Benchmark Vernalis Flow - cfs														
Wet	7500	13600	15700	13600	12000	7400	5100	3100	2500	3600	3000	4600	7500	13600
Above Normal	5800	7200	6200	5900	4600	2600	2100	2000	1500	2000	1800	2300	5800	7200
Below Normal	2300	3200	3300	3700	3700	2100	1900	1500	1200	1900	1700	2200	2300	3200
Dry	1900	2600	2300	2700	2200	1800	1400	1100	1000	1700	1600	2100	1900	2600
Critical	1300	1700	1600	1800	1500	1300	1000	1000	1000	1500	1400	1500	1300	1700
Change in Vernalis Flow with Action - cfs														
Wet	-3	-14	-6	-4	-6	-17	-23	-19	-10	-4	-1	0	0	-1
Above Normal	-3	-14	-6	-4	-6	0	-23	-19	-10	-4	-1	0	0	-1
Below Normal	-3	0	-6	-4	-6	-19	-24	-20	-10	-4	-1	0	0	0
Dry	-3	0	-6	-4	-6	-19	-24	-21	-10	-4	-1	0	0	0
Critical	-3	-21	-6	0	-1	-14	-19	-16	-1	0	0	0	0	0
With-Action Vernalis Flow - cfs														
Wet	7497	13586	15694	13596	11994	7383	5077	3081	2490	3596	2999	4600	7500	13599
Above Normal	5797	7186	6194	5896	4594	2600	2077	1981	1490	1996	1799	2300	5800	7199
Below Normal	2297	3200	3294	3696	3694	2081	1876	1480	1190	1896	1699	2200	2300	3200
Dry	1897	2600	2294	2696	2194	1781	1376	1079	990	1696	1599	2100	1900	2600
Critical	1297	1679	1594	1800	1499	1286	981	984	999	1500	1400	1500	1300	1700
Benchmark Vernalis Water Quality - mmhos (April and May values may not be reflective of split-month operations when objectives control)														
Wet	352	286	310	269	212	310	341	460	442	359	497	432	352	286
Above Normal	404	380	465	364	334	486	509	534	588	494	657	639	404	380
Below Normal	757	631	690	465	382	700	700	700	680	510	681	657	757	631
Dry	880	736	1000	700	700	700	700	700	772	547	708	678	880	736
Critical	1000	1000	1000	700	700	700	700	700	772	595	772	859	1000	1000
Change in Vernalis Water Quality with Action - mmhos (April and May values may not be reflective of split-month operations when objectives control)														
Wet	-1	-1	0	0	0	-1	-2	-1	0	0	0	0	0	0
Above Normal	-1	-2	-1	0	0	-5	-2	-2	1	0	0	0	0	0
Below Normal	-1	-6	-1	0	0	0	0	0	1	0	0	0	0	0
Dry	-1	-8	0	0	0	0	0	0	1	0	0	0	0	0
Critical	-2	0	0	0	0	0	0	0	0	0	0	0	0	0
With-Action Vernalis Water Quality - mmhos (April and May values may not be reflective of split-month operations when objectives control)														
Wet	351	284	310	269	212	310	340	459	442	359	497	432	352	286
Above Normal	404	378	465	364	333	482	507	532	589	494	657	639	404	380
Below Normal	756	625	690	465	382	700	700	700	681	510	681	657	757	631
Dry	878	728	1000	700	700	700	700	700	772	547	708	678	880	736
Critical	998	1000	1000	700	700	700	700	700	771	595	772	859	1000	1000

New Melones

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Total
Incremental Change in NM Storage due to WQ Release Change - Acre-feet															
Wet	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Above Normal	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Below Normal	0	0	0	0	0	87	21	49	0	0	0	0	0	0	158
Dry	0	0	22	-9	-25	87	21	108	0	0	0	0	0	0	204
Critical	0	386	39	8	15	223	297	213	0	0	0	0	0	0	1,180
Incremental Change in NM Storage due to Vernalis Flow Release Change - Acre-feet															
Wet	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Above Normal	0	0	0	0	0	-1027	0	0	0	0	0	0	0	0	-1,027
Below Normal	0	-779	0	0	0	0	0	0	0	0	0	0	0	-41	-820
Dry	0	-779	0	0	0	0	0	0	0	0	0	0	0	-41	-820
Critical	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Net Incremental Change in NM Storage due to Vernalis Flow & Quality Release Change - Acre-feet															
Wet	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Above Normal	0	0	0	0	0	-1027	0	0	0	0	0	0	0	0	-1,027
Below Normal	0	-779	0	0	0	87	21	49	0	0	0	0	0	-41	-662
Dry	0	-779	22	-9	-25	87	21	108	0	0	0	0	0	-41	-616
Critical	0	386	39	8	15	223	297	213	0	0	0	0	0	0	1,180

Project Delta Supply

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Total
Total Potential Delta supply Impact w/o NM Adjustments - Acre-feet															
Wet	0	-273	0	0	0	0	-1427	-1173	0	0	0	0	0	-14	-2,886
Above Normal	0	-273	0	0	0	-1027	-1427	-1173	0	0	0	0	0	-14	-3,914
Below Normal	0	-273	0	0	0	-1027	-1427	-1173	0	0	0	0	0	-14	-3,914
Dry	0	-273	-124	-43	-378	-1027	-1427	-1173	-616	-242	0	0	0	-14	-5,316
Critical	0	-779	-303	-20	-40	-626	-849	-748	-58	0	0	0	0	0	-3,424
New Melones Adjustments - Acre-feet (positive means increase in supply)															
Wet	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Above Normal	0	0	0	0	0	1027	0	0	0	0	0	0	0	0	1,027
Below Normal	0	273	0	0	0	-87	-21	-49	0	0	0	0	0	14	129
Dry	0	273	-8	3	25	-87	-21	-108	0	0	0	0	0	14	91
Critical	0	-386	-39	-8	-15	-223	-297	-213	0	0	0	0	0	0	-1,180
Incremental Change in Project Delta Supply due to Action - Acre-feet															
Wet	0	-273	0	0	0	0	-1427	-1173	0	0	0	0	0	-14	-2,886
Above Normal	0	-273	0	0	0	0	-1427	-1173	0	0	0	0	0	-14	-2,886
Below Normal	0	0	0	0	0	-1114	-1448	-1222	0	0	0	0	0	0	-3,784
Dry	0	0	-132	-40	-353	-1114	-1448	-1281	-616	-242	0	0	0	0	-5,225
Critical	0	-1165	-342	-28	-55	-849	-1146	-960	-58	0	0	0	0	0	-4,604

Study: C-1-0-S: 130 CONSERVATION SOURCE — Water Development and Disposition Assumptions

All Values Relative to Benchmark (Existing) Condition

Disposition Non-Crit	Crit		SJR Continuity Non-Crit	Crit		SJR Non-Continuity Non-Crit	Crit	
0	0	Agriculture-SJRc	0	0	Conservation of Evaporation/Seepage to GW-SJRc	0	0	Conservation of Evaporation/Seepage to GW-SJRnc
0	0	Wildlife Areas-SJRc	0	0	Conservation of Drain Spills to Wildlife Areas-SJRc	0	0	Conservation of Drain Spills to Wildlife Areas-SJRnc
0	0	Urban-SJRc	-6000	0	Groundwater-SJRc	0	0	Groundwater-SJRnc
0	0	Agriculture-SJRnc	15465	0	Tailwater Recapture-SJRc	900	0	Tailwater Recapture-SJRnc
0	0	Wildlife Areas-SJRnc	42000	42000	Fallowing -SJRc	8000	8000	Fallowing-SJRnc
0	0	Urban-SJRnc						
0	0	EWA						

	Non-Crit	Crit
Total Developed Water:	60365	50000
Total Disposition:	0	0

All Values Relative to Benchmark (Existing) Condition — Basic Hydrologic Accounting

		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Total
Water Developed - Non Critical Years																
Change in Evaporation/Seepage to GW		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Change in Drain Spills to Wildlife Areas		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Change in Discharge to SJR Streams		141	1054	1054	1757	2285	2285	2285	2285	1406	914	0	0	0	0	15,465
Change to Flows Upstream of Sack Dam		0	45	90	90	99	144	162	162	72	27	9	0	0	0	900
Crop Fallowing		1031	4639	5155	344	687	10653	14433	12715	344	0	0	0	0	0	50,000
Groundwater		0	0	0	-750	-840	-990	-1200	-900	-600	-600	-120	0	0	0	-6,000
Total		1172	5739	6299	1441	2231	12092	15680	14261	1222	341	-111	0	0	0	60,365
Effects to SJR Flows due to Developing Water - Non Critical Years																
Change in Evaporation/Seepage to GW		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Change in Drain Spills to Wildlife Areas		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Change in Discharge to SJR Streams		141	1054	1054	1757	2285	2285	2285	2285	1406	914	0	0	0	0	15,465
Change to Flows Upstream of Sack Dam		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Crop Fallowing		173	779	303	20	40	626	849	748	58	0	0	0	0	0	3,597
Groundwater		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total (Positive value means flow reduced)		314	1834	1358	1778	2325	2911	3133	3032	1464	914	0	0	0	0	19,062
Return Flows from Disposition of Transfer Water - Non Critical Years																
Incremental Return from Agricultural Transferees		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Incremental Return from Wildlife Area Transferees		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Envirnomental Water Account Beneficiaries																
Incremental Return from Agricultural Entities		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Net Effect to San Joaquin River Flow Before NM Adjustment	(Acre-feet)	-314	-1834	-1358	-1778	-2325	-2911	-3133	-3032	-1464	-914	0	0	0	0	-19,062
(Positive value means flow added)	(cfs)	-5	-33	-22	-30	-38	-49	-51	-49	-25	-15	0	0	0	0	0
Water Developed - Critical Years																
Change in Evaporation/Seepage to GW		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Change in Drain Spills to Wildlife Areas		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Change in Discharge to SJR Streams		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Change to Flows Upstream of Sack Dam		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Crop Fallowing		1031	4639	5155	344	687	10653	14433	12715	344	0	0	0	0	0	50,000
Groundwater		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total		1031	4639	5155	344	687	10653	14433	12715	344	0	0	0	0	0	50,000
Effects to SJR Flows due to Developing Water - Critical Years																
Change in Evaporation/Seepage to GW		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Change in Drain Spills to Wildlife Areas		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Change in Discharge to SJR Streams		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Change to Flows Upstream of Sack Dam		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Crop Fallowing		173	779	303	20	40	626	849	748	58	0	0	0	0	0	3,597
Groundwater		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total (Positive value means flow reduced)		173	779	303	20	40	626	849	748	58	0	0	0	0	0	3,597
Return Flows from Disposition of Transfer Water - Critical Years																
Incremental Return from Agricultural Transferees		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Incremental Return from Wildlife Area Transferees		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Envirnomental Water Account Beneficiaries																
Incremental Return from Agricultural Entities		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Net Effect to San Joaquin River Flow Before NM Adjustment	(Acre-feet)	-173	-779	-303	-20	-40	-626	-849	-748	-58	0	0	0	0	0	-3,597
(Positive value means flow added)	(cfs)	-3	-14	-5	0	-1	-11	-14	-12	-1	0	0	0	0	0	0

Vernalis

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb
Benchmark Vernalis Flow - cfs														
Wet	7500	13600	15700	13600	12000	7400	5100	3100	2500	3600	3000	4600	7500	13600
Above Normal	5800	7200	6200	5900	4600	2600	2100	2000	1500	2000	1800	2300	5800	7200
Below Normal	2300	3200	3300	3700	3700	2100	1900	1500	1200	1900	1700	2200	2300	3200
Dry	1900	2600	2300	2700	2200	1800	1400	1100	1000	1700	1600	2100	1900	2600
Critical	1300	1700	1600	1800	1500	1300	1000	1000	1000	1500	1400	1500	1300	1700
Change in Vernalis Flow with Action - cfs														
Wet	-5	-33	-22	-30	-38	-49	-51	-49	-25	-15	0	0	0	0
Above Normal	-5	-33	-22	-30	-38	0	-51	-49	-25	-15	0	0	0	0
Below Normal	-5	0	-22	-30	-38	-66	-69	-63	-25	-15	0	0	0	0
Dry	-5	0	-25	-42	-52	-66	-69	-63	-25	-15	0	0	0	0
Critical	-3	-21	-6	0	-1	-14	-19	-16	-1	0	0	0	0	0
With-Action Vernalis Flow - cfs														
Wet	7495	13567	15678	13570	11962	7351	5049	3051	2475	3585	3000	4600	7500	13600
Above Normal	5795	7167	6178	5870	4562	2600	2049	1951	1475	1985	1800	2300	5800	7200
Below Normal	2295	3200	3278	3670	3662	2034	1831	1437	1175	1885	1700	2200	2300	3200
Dry	1895	2600	2275	2658	2148	1734	1331	1037	975	1685	1600	2100	1900	2600
Critical	1297	1679	1594	1800	1499	1286	981	984	999	1500	1400	1500	1300	1700
Benchmark Vernalis Water Quality - mmhos (April and May values may not be reflective of split-month operations when objectives control)														
Wet	352	286	310	269	212	310	341	460	442	359	497	432	352	286
Above Normal	404	380	465	364	334	486	509	534	588	494	657	639	404	380
Below Normal	757	631	690	465	382	700	700	700	680	510	681	657	757	631
Dry	880	736	1000	700	700	700	700	700	772	547	708	678	880	736
Critical	1000	1000	1000	700	700	700	700	700	772	595	772	859	1000	1000
Change in Vernalis Water Quality with Action - mmhos (April and May values may not be reflective of split-month operations when objectives control)														
Wet	-1	-3	-1	-2	-3	-4	-6	-7	-6	-2	0	0	0	0
Above Normal	-1	-5	-2	-4	-7	-17	-10	-9	-8	-3	0	0	0	0
Below Normal	-2	-15	-3	-6	-8	0	0	0	-8	-3	0	0	0	0
Dry	-2	-18	0	-3	-5	0	0	0	-7	-3	0	0	0	0
Critical	-2	0	0	0	0	0	0	0	0	0	0	0	0	0
With-Action Vernalis Water Quality - mmhos (April and May values may not be reflective of split-month operations when objectives control)														
Wet	351	283	309	267	209	306	335	453	436	357	497	432	352	286
Above Normal	403	375	463	360	327	470	499	525	581	491	657	639	404	380
Below Normal	755	617	687	459	373	700	700	700	672	507	681	657	757	631
Dry	877	718	1000	697	695	700	700	700	765	544	708	678	880	736
Critical	998	1000	1000	700	700	700	700	700	771	595	772	859	1000	1000

New Melones

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Total
Incremental Change in NM Storage due to WQ Release Change - Acre-feet															
Wet	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Above Normal	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Below Normal	0	0	0	0	0	1036	1097	863	0	0	0	0	0	0	2,995
Dry	0	0	173	726	860	1036	1097	863	0	0	0	0	0	0	4,755
Critical	0	386	39	8	15	223	297	213	0	0	0	0	0	0	1,180
Incremental Change in NM Storage due to Vernalis Flow Release Change - Acre-feet															
Wet	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Above Normal	0	0	0	0	0	-2911	0	0	0	0	0	0	0	0	-2,911
Below Normal	0	-1834	0	0	0	0	0	0	0	0	0	0	0	0	-1,834
Dry	0	-1834	0	0	0	0	0	0	0	0	0	0	0	0	-1,834
Critical	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Net Incremental Change in NM Storage due to Vernalis Flow & Quality Release Change - Acre-feet															
Wet	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Above Normal	0	0	0	0	0	-2911	0	0	0	0	0	0	0	0	-2,911
Below Normal	0	-1834	0	0	0	1036	1097	863	0	0	0	0	0	0	1,161
Dry	0	-1834	173	726	860	1036	1097	863	0	0	0	0	0	0	2,921
Critical	0	386	39	8	15	223	297	213	0	0	0	0	0	0	1,180

Project Delta Supply

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Total
Total Potential Delta supply Impact w/o NM Adjustments - Acre-feet															
Wet	0	-642	0	0	0	0	-3133	-3032	0	0	0	0	0	0	-6,807
Above Normal	0	-642	0	0	0	-2911	-3133	-3032	0	0	0	0	0	0	-9,718
Below Normal	0	-642	0	0	0	-2911	-3133	-3032	0	0	0	0	0	0	-9,718
Dry	0	-642	-475	-311	-2325	-2911	-3133	-3032	-1464	-884	0	0	0	0	-15,178
Critical	0	-779	-303	-20	-40	-626	-849	-748	-58	0	0	0	0	0	-3,424
New Melones Adjustments - Acre-feet (positive means increase in supply)															
Wet	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Above Normal	0	0	0	0	0	2911	0	0	0	0	0	0	0	0	2,911
Below Normal	0	642	0	0	0	-1036	-1097	-863	0	0	0	0	0	0	-2,353
Dry	0	642	-61	-254	-860	-1036	-1097	-863	0	0	0	0	0	0	-3,528
Critical	0	-386	-39	-8	-15	-223	-297	-213	0	0	0	0	0	0	-1,180
Incremental Change in Project Delta Supply due to Action - Acre-feet															
Wet	0	-642	0	0	0	0	-3133	-3032	0	0	0	0	0	0	-6,807
Above Normal	0	-642	0	0	0	0	-3133	-3032	0	0	0	0	0	0	-6,807
Below Normal	0	0	0	0	0	-3947	-4230	-3895	0	0	0	0	0	0	-12,072
Dry	0	0	-536	-565	-3185	-3947	-4230	-3895	-1464	-884	0	0	0	0	-18,706
Critical	0	-1165	-342	-28	-55	-849	-1146	-960	-58	0	0	0	0	0	-4,604

Study: C-1-1-C: 130 CONSERVATION REFUGE COMPOSITE — Water Development and Disposition Assumptions

All Values Relative to Benchmark (Existing) Condition

Disposition Non-Crit	Crit		SJR Continuity Non-Crit	Crit		SJR Non-Continuity Non-Crit	Crit	
34738	0	Agriculture-SJRc	0	0	Conservation of Evaporation/Seepage to GW-SJRc	0	0	Conservation of Evaporation/Seepage to GW-SJRnc
17823	40000	Wildlife Areas-SJRc	0	0	Conservation of Drain Spills to Wildlife Areas-SJRc	0	0	Conservation of Drain Spills to Wildlife Areas-SJRnc
0	0	Urban-SJRc	-6000	0	Groundwater-SJRc	0	0	Groundwater-SJRnc
-7385	0	Agriculture-SJRnc	15465	0	Tailwater Recapture-SJRc	900	0	Tailwater Recapture-SJRnc
9497	0	Wildlife Areas-SJRnc	42000	42000	Fallowing -SJRc	8000	8000	Fallowing-SJRnc
0	0	Urban-SJRnc						
0	0	EWA						

	Non-Crit	Crit
Total Developed Water:	60365	50000
Total Disposition:	54673	40000

All Values Relative to Benchmark (Existing) Condition — Basic Hydrologic Accounting

		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Total
Water Developed - Non Critical Years																
Change in Evaporation/Seepage to GW		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Change in Drain Spills to Wildlife Areas		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Change in Discharge to SJR Streams		141	1054	1054	1757	2285	2285	2285	2285	1406	914	0	0	0	0	15,465
Change to Flows Upstream of Sack Dam		0	45	90	90	99	144	162	162	72	27	9	0	0	0	900
Crop Fallowing		1031	4639	5155	344	687	10653	14433	12715	344	0	0	0	0	0	50,000
Groundwater		0	0	0	-750	-840	-990	-1200	-900	-600	-600	-120	0	0	0	-6,000
Total		1172	5739	6299	1441	2231	12092	15680	14261	1222	341	-111	0	0	0	60,365
Effects to SJR Flows due to Developing Water - Non Critical Years																
Change in Evaporation/Seepage to GW		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Change in Drain Spills to Wildlife Areas		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Change in Discharge to SJR Streams		141	1054	1054	1757	2285	2285	2285	2285	1406	914	0	0	0	0	15,465
Change to Flows Upstream of Sack Dam		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Crop Fallowing		173	779	303	20	40	626	849	748	58	0	0	0	0	0	3,597
Groundwater		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total (Positive value means flow reduced)		314	1834	1358	1778	2325	2911	3133	3032	1464	914	0	0	0	0	19,062
Return Flows from Disposition of Transfer Water - Non Critical Years																
Incremental Return from Agricultural Transferees		0	0	53	231	349	415	598	440	577	259	70	18	24	42	3,074
Incremental Return from Wildlife Area Transferees		0	0	33	5	0	0	0	3026	165	-17	282	66	220	252	4,032
Envirnomental Water Account Beneficiaries																
Incremental Return from Agricultural Entities		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total		0	0	87	236	349	415	598	3465	742	241	352	83	243	295	7,106
Net Effect to San Joaquin River Flow Before NM Adjustment	(Acre-feet)	-314	-1834	-1271	-1541	-1976	-2496	-2535	433	-722	-673	352	83	243	295	-11,955
(Positive value means flow added)	(cfs)	-5	-33	-21	-26	-32	-42	-41	7	-12	-11	6	1	4	5	0
Water Developed - Critical Years																
Change in Evaporation/Seepage to GW		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Change in Drain Spills to Wildlife Areas		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Change in Discharge to SJR Streams		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Change to Flows Upstream of Sack Dam		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Crop Fallowing		1031	4639	5155	344	687	10653	14433	12715	344	0	0	0	0	0	50,000
Groundwater		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total		1031	4639	5155	344	687	10653	14433	12715	344	0	0	0	0	0	50,000
Effects to SJR Flows due to Developing Water - Critical Years																
Change in Evaporation/Seepage to GW		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Change in Drain Spills to Wildlife Areas		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Change in Discharge to SJR Streams		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Change to Flows Upstream of Sack Dam		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Crop Fallowing		173	779	303	20	40	626	849	748	58	0	0	0	0	0	3,597
Groundwater		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total (Positive value means flow reduced)		173	779	303	20	40	626	849	748	58	0	0	0	0	0	3,597
Return Flows from Disposition of Transfer Water - Critical Years																
Incremental Return from Agricultural Transferees		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Incremental Return from Wildlife Area Transferees		0	0	75	11	0	0	0	6791	370	-39	634	148	493	567	9,049
Envirnomental Water Account Beneficiaries																
Incremental Return from Agricultural Entities		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total		0	0	75	11	0	0	0	6791	370	-39	634	148	493	567	9,049
Net Effect to San Joaquin River Flow Before NM Adjustment	(Acre-feet)	-173	-779	-228	-9	-40	-626	-849	6043	312	-39	634	148	493	567	5,453
(Positive value means flow added)	(cfs)	-3	-14	-4	0	-1	-11	-14	98	5	-1	11	2	8	10	0

Vernalis

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb
Benchmark Vernalis Flow - cfs														
Wet	7500	13600	15700	13600	12000	7400	5100	3100	2500	3600	3000	4600	7500	13600
Above Normal	5800	7200	6200	5900	4600	2600	2100	2000	1500	2000	1800	2300	5800	7200
Below Normal	2300	3200	3300	3700	3700	2100	1900	1500	1200	1900	1700	2200	2300	3200
Dry	1900	2600	2300	2700	2200	1800	1400	1100	1000	1700	1600	2100	1900	2600
Critical	1300	1700	1600	1800	1500	1300	1000	1000	1000	1500	1400	1500	1300	1700
Change in Vernalis Flow with Action - cfs														
Wet	-5	-33	-21	-26	-32	-42	-41	7	-12	-11	6	1	4	5
Above Normal	-5	-33	-21	-26	-32	0	-41	7	-12	-11	6	1	4	5
Below Normal	-5	0	-21	-26	-32	-62	-64	37	-12	-11	6	1	4	0
Dry	-5	0	-23	-38	-47	-62	-64	38	-12	-11	6	1	4	0
Critical	-3	-21	-2	0	-1	-14	-19	199	5	-1	11	2	8	15
With-Action Vernalis Flow - cfs														
Wet	7495	13567	15679	13574	11968	7358	5059	3107	2488	3589	3006	4601	7504	13605
Above Normal	5795	7167	6179	5874	4568	2600	2059	2007	1488	1989	1806	2301	5804	7205
Below Normal	2295	3200	3279	3674	3668	2038	1836	1537	1188	1889	1706	2201	2304	3200
Dry	1895	2600	2277	2662	2153	1738	1336	1138	988	1689	1606	2101	1904	2600
Critical	1297	1679	1598	1800	1499	1286	981	1199	1005	1499	1411	1502	1308	1715
Benchmark Vernalis Water Quality - mmhos (April and May values may not be reflective of split-month operations when objectives control)														
Wet	352	286	310	269	212	310	341	460	442	359	497	432	352	286
Above Normal	404	380	465	364	334	486	509	534	588	494	657	639	404	380
Below Normal	757	631	690	465	382	700	700	700	680	510	681	657	757	631
Dry	880	736	1000	700	700	700	700	700	772	547	708	678	880	736
Critical	1000	1000	1000	700	700	700	700	700	772	595	772	859	1000	1000
Change in Vernalis Water Quality with Action - mmhos (April and May values may not be reflective of split-month operations when objectives control)														
Wet	-1	-3	-1	-2	-3	-4	-6	6	-6	-2	1	0	0	0
Above Normal	-1	-5	-2	-4	-7	-15	-11	10	-8	-3	1	0	0	1
Below Normal	-2	-15	-3	-6	-8	0	0	0	-8	-3	1	0	1	2
Dry	-2	-18	0	-3	-5	0	0	0	-7	-3	1	0	0	3
Critical	-2	0	0	0	0	0	0	0	2	0	3	0	1	0
With-Action Vernalis Water Quality - mmhos (April and May values may not be reflective of split-month operations when objectives control)														
Wet	351	283	309	267	209	306	335	467	436	357	498	432	352	286
Above Normal	403	375	463	360	327	471	498	543	581	491	659	639	405	381
Below Normal	755	617	688	459	374	700	700	700	672	507	682	658	757	634
Dry	877	718	1000	697	695	700	700	700	765	545	709	678	880	738
Critical	998	1000	1000	700	700	700	700	700	773	595	775	859	1001	1000

New Melones

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Total
Incremental Change in NM Storage due to WQ Release Change - Acre-feet															
Wet	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Above Normal	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Below Normal	0	0	0	0	0	1176	1382	-1829	0	0	0	0	0	0	729
Dry	0	0	130	735	901	1176	1382	-1890	0	0	0	0	0	0	2,434
Critical	0	386	-97	-12	15	223	297	-6209	0	0	0	0	0	-267	-5,665
Incremental Change in NM Storage due to Vernalis Flow Release Change - Acre-feet															
Wet	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Above Normal	0	0	0	0	0	-2496	0	0	0	0	0	0	0	0	-2,496
Below Normal	0	-1834	0	0	0	0	0	0	0	0	0	0	0	295	-1,539
Dry	0	-1834	0	0	0	0	0	0	0	0	0	0	0	295	-1,539
Critical	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Net Incremental Change in NM Storage due to Vernalis Flow & Quality Release Change - Acre-feet															
Wet	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Above Normal	0	0	0	0	0	-2496	0	0	0	0	0	0	0	0	-2,496
Below Normal	0	-1834	0	0	0	1176	1382	-1829	0	0	0	0	0	295	-811
Dry	0	-1834	130	735	901	1176	1382	-1890	0	0	0	0	0	295	895
Critical	0	386	-97	-12	15	223	297	-6209	0	0	0	0	0	-267	-5,665

Project Delta Supply

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Total
Total Potential Delta supply Impact w/o NM Adjustments - Acre-feet															
Wet	0	-642	0	0	0	0	-2535	433	0	0	0	0	0	103	-2,641
Above Normal	0	-642	0	0	0	-2496	-2535	433	0	0	0	0	0	103	-5,137
Below Normal	0	-642	0	0	0	-2496	-2535	433	0	0	0	0	0	103	-5,137
Dry	0	-642	-445	-270	-1976	-2496	-2535	433	-722	-651	0	0	0	103	-9,200
Critical	0	-779	-228	-9	-40	-626	-849	6043	312	-39	634	0	0	567	4,985
New Melones Adjustments - Acre-feet (positive means increase in supply)															
Wet	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Above Normal	0	0	0	0	0	2496	0	0	0	0	0	0	0	0	2,496
Below Normal	0	642	0	0	0	-1176	-1382	1829	0	0	0	0	0	-103	-190
Dry	0	642	-46	-257	-901	-1176	-1382	1890	0	0	0	0	0	-103	-1,333
Critical	0	-386	97	12	-15	-223	-297	6209	0	0	0	0	0	267	5,665
Incremental Change in Project Delta Supply due to Action - Acre-feet															
Wet	0	-642	0	0	0	0	-2535	433	0	0	0	0	0	103	-2,641
Above Normal	0	-642	0	0	0	0	-2535	433	0	0	0	0	0	103	-2,641
Below Normal	0	0	0	0	0	-3672	-3917	2262	0	0	0	0	0	0	-5,327
Dry	0	0	-490	-527	-2877	-3672	-3917	2323	-722	-651	0	0	0	0	-10,533
Critical	0	-1165	-131	4	-55	-849	-1146	12252	312	-39	634	0	0	834	10,650

Study: C-1-2-C: 130 CONSERVATION AGRICULTURE COMPOSITE — **Water Development and Disposition Assumptions**

All Values Relative to Benchmark (Existing) Condition

Disposition Non-Crit	Crit		SJR Continuity Non-Crit	Crit		SJR Non-Continuity Non-Crit	Crit	
96412	50000	Agriculture-SJRc	0	0	Conservation of Evaporation/Seepage to GW-SJRc	0	0	Conservation of Evaporation/Seepage to GW-SJRnc
0	0	Wildlife Areas-SJRc	0	0	Conservation of Drain Spills to Wildlife Areas-SJRc	0	0	Conservation of Drain Spills to Wildlife Areas-SJRnc
0	0	Urban-SJRc	-6000	0	Groundwater-SJRc	0	0	Groundwater-SJRnc
-7385	0	Agriculture-SJRnc	15465	0	Tailwater Recapture-SJRc	900	0	Tailwater Recapture-SJRnc
0	0	Wildlife Areas-SJRnc	42000	42000	Fallowing -SJRc	8000	8000	Fallowing-SJRnc
0	0	Urban-SJRnc						
0	0	EWA						

	Non-Crit	Crit
Total Developed Water:	60365	50000
Total Disposition:	89027	50000

All Values Relative to Benchmark (Existing) Condition — Basic Hydrologic Accounting

		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Total
Water Developed - Non Critical Years																
Change in Evaporation/Seepage to GW		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Change in Drain Spills to Wildlife Areas		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Change in Discharge to SJR Streams		141	1054	1054	1757	2285	2285	2285	2285	1406	914	0	0	0	0	15,465
Change to Flows Upstream of Sack Dam		0	45	90	90	99	144	162	162	72	27	9	0	0	0	900
Crop Fallowing		1031	4639	5155	344	687	10653	14433	12715	344	0	0	0	0	0	50,000
Groundwater		0	0	0	-750	-840	-990	-1200	-900	-600	-600	-120	0	0	0	-6,000
Total		1172	5739	6299	1441	2231	12092	15680	14261	1222	341	-111	0	0	0	60,365
Effects to SJR Flows due to Developing Water - Non Critical Years																
Change in Evaporation/Seepage to GW		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Change in Drain Spills to Wildlife Areas		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Change in Discharge to SJR Streams		141	1054	1054	1757	2285	2285	2285	2285	1406	914	0	0	0	0	15,465
Change to Flows Upstream of Sack Dam		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Crop Fallowing		173	779	303	20	40	626	849	748	58	0	0	0	0	0	3,597
Groundwater		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total (Positive value means flow reduced)		314	1834	1358	1778	2325	2911	3133	3032	1464	914	0	0	0	0	19,062
Return Flows from Disposition of Transfer Water - Non Critical Years																
Incremental Return from Agricultural Transferees		0	0	148	641	969	1151	1659	1220	1602	718	193	49	66	117	8,532
Incremental Return from Wildlife Area Transferees		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Envirnomental Water Account Beneficiaries																
Incremental Return from Agricultural Entities		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total		0	0	148	641	969	1151	1659	1220	1602	718	193	49	66	117	8,532
Net Effect to San Joaquin River Flow Before NM Adjustment	(Acre-feet)	-314	-1834	-1209	-1136	-1356	-1760	-1474	-1812	138	-196	193	49	66	117	-10,530
(Positive value means flow added)	(cfs)	-5	-33	-20	-19	-22	-30	-24	-29	2	-3	3	1	1	2	0
Water Developed - Critical Years																
Change in Evaporation/Seepage to GW		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Change in Drain Spills to Wildlife Areas		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Change in Discharge to SJR Streams		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Change to Flows Upstream of Sack Dam		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Crop Fallowing		1031	4639	5155	344	687	10653	14433	12715	344	0	0	0	0	0	50,000
Groundwater		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total		1031	4639	5155	344	687	10653	14433	12715	344	0	0	0	0	0	50,000
Effects to SJR Flows due to Developing Water - Critical Years																
Change in Evaporation/Seepage to GW		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Change in Drain Spills to Wildlife Areas		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Change in Discharge to SJR Streams		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Change to Flows Upstream of Sack Dam		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Crop Fallowing		173	779	303	20	40	626	849	748	58	0	0	0	0	0	3,597
Groundwater		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total (Positive value means flow reduced)		173	779	303	20	40	626	849	748	58	0	0	0	0	0	3,597
Return Flows from Disposition of Transfer Water - Critical Years																
Incremental Return from Agricultural Transferees		0	0	77	333	503	597	861	633	831	372	100	25	34	61	4,425
Incremental Return from Wildlife Area Transferees		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Envirnomental Water Account Beneficiaries																
Incremental Return from Agricultural Entities		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total		0	0	77	333	503	597	861	633	831	372	100	25	34	61	4,425
Net Effect to San Joaquin River Flow Before NM Adjustment	(Acre-feet)	-173	-779	-226	312	462	-30	12	-115	773	372	100	25	34	61	828
(Positive value means flow added)	(cfs)	-3	-14	-4	5	8	0	0	-2	13	6	2	0	1	1	0

Vernalis

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb
Benchmark Vernalis Flow - cfs														
Wet	7500	13600	15700	13600	12000	7400	5100	3100	2500	3600	3000	4600	7500	13600
Above Normal	5800	7200	6200	5900	4600	2600	2100	2000	1500	2000	1800	2300	5800	7200
Below Normal	2300	3200	3300	3700	3700	2100	1900	1500	1200	1900	1700	2200	2300	3200
Dry	1900	2600	2300	2700	2200	1800	1400	1100	1000	1700	1600	2100	1900	2600
Critical	1300	1700	1600	1800	1500	1300	1000	1000	1000	1500	1400	1500	1300	1700
Change in Vernalis Flow with Action - cfs														
Wet	-5	-33	-20	-19	-22	-30	-24	-29	2	-3	3	1	1	2
Above Normal	-5	-33	-20	-19	-22	0	-24	-29	2	-3	3	1	1	2
Below Normal	-5	0	-20	-19	-22	-54	-55	-51	2	-3	3	1	1	0
Dry	-5	0	-23	-32	-38	-54	-55	-48	2	-3	3	1	1	0
Critical	-3	-21	-4	5	7	-5	-5	-5	13	6	2	0	1	1
With-Action Vernalis Flow - cfs														
Wet	7495	13567	15680	13581	11978	7370	5076	3071	2502	3597	3003	4601	7501	13602
Above Normal	5795	7167	6180	5881	4578	2600	2076	1971	1502	1997	1803	2301	5801	7202
Below Normal	2295	3200	3280	3681	3678	2046	1845	1449	1202	1897	1703	2201	2301	3200
Dry	1895	2600	2277	2668	2162	1746	1345	1052	1002	1697	1603	2101	1901	2600
Critical	1297	1679	1596	1805	1507	1295	995	995	1013	1506	1402	1500	1301	1701
Benchmark Vernalis Water Quality - mmhos (April and May values may not be reflective of split-month operations when objectives control)														
Wet	352	286	310	269	212	310	341	460	442	359	497	432	352	286
Above Normal	404	380	465	364	334	486	509	534	588	494	657	639	404	380
Below Normal	757	631	690	465	382	700	700	700	680	510	681	657	757	631
Dry	880	736	1000	700	700	700	700	700	772	547	708	678	880	736
Critical	1000	1000	1000	700	700	700	700	700	772	595	772	859	1000	1000
Change in Vernalis Water Quality with Action - mmhos (April and May values may not be reflective of split-month operations when objectives control)														
Wet	-1	-3	-1	-2	-3	-4	-6	-8	-7	-2	0	0	0	0
Above Normal	-1	-5	-2	-4	-6	-13	-12	-11	-11	-3	0	0	0	0
Below Normal	-2	-15	-3	-6	-8	0	0	0	-11	-2	0	0	0	0
Dry	-2	-18	0	-3	-5	0	0	0	-9	-2	0	0	0	1
Critical	-2	0	0	0	0	0	0	0	-1	0	0	0	0	0
With-Action Vernalis Water Quality - mmhos (April and May values may not be reflective of split-month operations when objectives control)														
Wet	351	283	309	267	209	306	335	453	435	357	497	432	352	286
Above Normal	403	375	463	360	327	473	497	523	578	491	657	639	404	380
Below Normal	755	617	687	459	374	700	700	700	669	507	681	657	757	632
Dry	877	718	1000	697	695	700	700	700	763	545	707	678	880	736
Critical	998	1000	1000	700	700	700	700	700	771	595	772	859	1000	1000

New Melones

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Total
Incremental Change in NM Storage due to WQ Release Change - Acre-feet															
Wet	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Above Normal	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Below Normal	0	0	0	0	0	1425	1888	1332	0	0	0	0	0	0	4,645
Dry	0	0	222	776	975	1425	1888	1163	0	0	0	0	0	0	6,449
Critical	0	386	47	-12	30	260	350	223	0	0	0	0	0	14	1,296
Incremental Change in NM Storage due to Vernalis Flow Release Change - Acre-feet															
Wet	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Above Normal	0	0	0	0	0	-1760	0	0	0	0	0	0	0	0	-1,760
Below Normal	0	-1834	0	0	0	0	0	0	0	0	0	0	0	117	-1,717
Dry	0	-1834	0	0	0	0	0	0	0	0	0	0	0	117	-1,717
Critical	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Net Incremental Change in NM Storage due to Vernalis Flow & Quality Release Change - Acre-feet															
Wet	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Above Normal	0	0	0	0	0	-1760	0	0	0	0	0	0	0	0	-1,760
Below Normal	0	-1834	0	0	0	1425	1888	1332	0	0	0	0	0	117	2,928
Dry	0	-1834	222	776	975	1425	1888	1163	0	0	0	0	0	117	4,732
Critical	0	386	47	-12	30	260	350	223	0	0	0	0	0	14	1,296

Project Delta Supply

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Total
Total Potential Delta supply Impact w/o NM Adjustments - Acre-feet															
Wet	0	-642	0	0	0	0	-1474	-1812	0	0	0	0	0	41	-3,887
Above Normal	0	-642	0	0	0	-1760	-1474	-1812	0	0	0	0	0	41	-5,648
Below Normal	0	-642	0	0	0	-1760	-1474	-1812	0	0	0	0	0	41	-5,648
Dry	0	-642	-423	-199	-1356	-1760	-1474	-1812	138	-190	0	0	0	41	-7,677
Critical	0	-779	-226	312	462	-30	12	-115	773	372	100	0	0	61	942
New Melones Adjustments - Acre-feet (positive means increase in supply)															
Wet	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Above Normal	0	0	0	0	0	1760	0	0	0	0	0	0	0	0	1,760
Below Normal	0	642	0	0	0	-1425	-1888	-1332	0	0	0	0	0	-41	-4,044
Dry	0	642	-78	-272	-975	-1425	-1888	-1163	0	0	0	0	0	-41	-5,200
Critical	0	-386	-47	12	-30	-260	-350	-223	0	0	0	0	0	-14	-1,296
Incremental Change in Project Delta Supply due to Action - Acre-feet															
Wet	0	-642	0	0	0	0	-1474	-1812	0	0	0	0	0	41	-3,887
Above Normal	0	-642	0	0	0	0	-1474	-1812	0	0	0	0	0	41	-3,887
Below Normal	0	0	0	0	0	-3186	-3362	-3144	0	0	0	0	0	0	-9,692
Dry	0	0	-501	-470	-2331	-3186	-3362	-2976	138	-190	0	0	0	0	-12,877
Critical	0	-1165	-273	325	432	-289	-338	-337	773	372	100	0	0	47	-354

Study: C-1-3-C: 130 CONSERVATION OUT COMPOSITE

Water Development and Disposition Assumptions

All Values Relative to Benchmark (Existing) Condition

Disposition Non-Crit	Crit		SJR Continuity Non-Crit	Crit		SJR Non-Continuity Non-Crit	Crit	
-33588	0	Agriculture-SJRc	0	0	Conservation of Evaporation/Seepage to GW-SJRc	0	0	Conservation of Evaporation/Seepage to GW-SJRnc
0	0	Wildlife Areas-SJRc	0	0	Conservation of Drain Spills to Wildlife Areas-SJRc	0	0	Conservation of Drain Spills to Wildlife Areas-SJRnc
0	0	Urban-SJRc	-6000	0	Groundwater-SJRc	0	0	Groundwater-SJRnc
122615	50000	Agriculture-SJRnc	15465	0	Tailwater Recapture-SJRc	900	0	Tailwater Recapture-SJRnc
0	0	Wildlife Areas-SJRnc	42000	42000	Fallowing -SJRc	8000	8000	Fallowing-SJRnc
0	0	Urban-SJRnc						
0	0	EWA						

	Non-Crit	Crit
Total Developed Water:	60365	50000
Total Disposition:	89027	50000

All Values Relative to Benchmark (Existing) Condition

Basic Hydrologic Accounting

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Total
Water Developed - Non Critical Years															
Change in Evaporation/Seepage to GW	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Change in Drain Spills to Wildlife Areas	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Change in Discharge to SJR Streams	141	1054	1054	1757	2285	2285	2285	2285	1406	914	0	0	0	0	15,465
Change to Flows Upstream of Sack Dam	0	45	90	90	99	144	162	162	72	27	9	0	0	0	900
Crop Fallowing	1031	4639	5155	344	687	10653	14433	12715	344	0	0	0	0	0	50,000
Groundwater	0	0	0	-750	-840	-990	-1200	-900	-600	-600	-120	0	0	0	-6,000
Total	1172	5739	6299	1441	2231	12092	15680	14261	1222	341	-111	0	0	0	60,365
Effects to SJR Flows due to Developing Water - Non Critical Years															
Change in Evaporation/Seepage to GW	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Change in Drain Spills to Wildlife Areas	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Change in Discharge to SJR Streams	141	1054	1054	1757	2285	2285	2285	2285	1406	914	0	0	0	0	15,465
Change to Flows Upstream of Sack Dam	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Crop Fallowing	173	779	303	20	40	626	849	748	58	0	0	0	0	0	3,597
Groundwater	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total (Positive value means flow reduced)	314	1834	1358	1778	2325	2911	3133	3032	1464	914	0	0	0	0	19,062
Return Flows from Disposition of Transfer Water - Non Critical Years															
Incremental Return from Agricultural Transferees	0	0	-52	-223	-338	-401	-578	-425	-558	-250	-67	-17	-23	-41	-2,972
Incremental Return from Wildlife Area Transferees	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Envirnomental Water Account Beneficiaries															
Incremental Return from Agricultural Entities	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	0	-52	-223	-338	-401	-578	-425	-558	-250	-67	-17	-23	-41	-2,972
Net Effect to San Joaquin River Flow Before NM Adjustment (Acre-feet)	-314	-1834	-1409	-2001	-2663	-3312	-3711	-3457	-2022	-1164	-67	-17	-23	-41	-22,034
(Positive value means flow added) (cfs)	-5	-33	-23	-34	-43	-56	-60	-56	-34	-19	-1	0	0	-1	0
Water Developed - Critical Years															
Change in Evaporation/Seepage to GW	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Change in Drain Spills to Wildlife Areas	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Change in Discharge to SJR Streams	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Change to Flows Upstream of Sack Dam	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Crop Fallowing	1031	4639	5155	344	687	10653	14433	12715	344	0	0	0	0	0	50,000
Groundwater	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	1031	4639	5155	344	687	10653	14433	12715	344	0	0	0	0	0	50,000
Effects to SJR Flows due to Developing Water - Critical Years															
Change in Evaporation/Seepage to GW	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Change in Drain Spills to Wildlife Areas	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Change in Discharge to SJR Streams	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Change to Flows Upstream of Sack Dam	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Crop Fallowing	173	779	303	20	40	626	849	748	58	0	0	0	0	0	3,597
Groundwater	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total (Positive value means flow reduced)	173	779	303	20	40	626	849	748	58	0	0	0	0	0	3,597
Return Flows from Disposition of Transfer Water - Critical Years															
Incremental Return from Agricultural Transferees	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Incremental Return from Wildlife Area Transferees	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Envirnomental Water Account Beneficiaries															
Incremental Return from Agricultural Entities	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Net Effect to San Joaquin River Flow Before NM Adjustment (Acre-feet)	-173	-779	-303	-20	-40	-626	-849	-748	-58	0	0	0	0	0	-3,597
(Positive value means flow added) (cfs)	-3	-14	-5	0	-1	-11	-14	-12	-1	0	0	0	0	0	0

Vernalis

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb
Benchmark Vernalis Flow - cfs														
Wet	7500	13600	15700	13600	12000	7400	5100	3100	2500	3600	3000	4600	7500	13600
Above Normal	5800	7200	6200	5900	4600	2600	2100	2000	1500	2000	1800	2300	5800	7200
Below Normal	2300	3200	3300	3700	3700	2100	1900	1500	1200	1900	1700	2200	2300	3200
Dry	1900	2600	2300	2700	2200	1800	1400	1100	1000	1700	1600	2100	1900	2600
Critical	1300	1700	1600	1800	1500	1300	1000	1000	1000	1500	1400	1500	1300	1700
Change in Vernalis Flow with Action - cfs														
Wet	-5	-33	-23	-34	-43	-56	-60	-56	-34	-19	-1	0	0	-1
Above Normal	-5	-33	-23	-34	-43	0	-60	-56	-34	-19	-1	0	0	-1
Below Normal	-5	0	-23	-34	-43	-71	-74	-68	-34	-19	-1	0	0	0
Dry	-5	0	-25	-46	-57	-71	-74	-69	-34	-19	-1	0	0	0
Critical	-3	-21	-6	0	-1	-14	-19	-16	-1	0	0	0	0	0
With-Action Vernalis Flow - cfs														
Wet	7495	13567	15677	13566	11957	7344	5040	3044	2466	3581	2999	4600	7500	13599
Above Normal	5795	7167	6177	5866	4557	2600	2040	1944	1466	1981	1799	2300	5800	7199
Below Normal	2295	3200	3277	3666	3657	2029	1826	1432	1166	1881	1699	2200	2300	3200
Dry	1895	2600	2275	2654	2143	1729	1326	1031	966	1681	1599	2100	1900	2600
Critical	1297	1679	1594	1800	1499	1286	981	984	999	1500	1400	1500	1300	1700
Benchmark Vernalis Water Quality - mmhos (April and May values may not be reflective of split-month operations when objectives control)														
Wet	352	286	310	269	212	310	341	460	442	359	497	432	352	286
Above Normal	404	380	465	364	334	486	509	534	588	494	657	639	404	380
Below Normal	757	631	690	465	382	700	700	700	680	510	681	657	757	631
Dry	880	736	1000	700	700	700	700	700	772	547	708	678	880	736
Critical	1000	1000	1000	700	700	700	700	700	772	595	772	859	1000	1000
Change in Vernalis Water Quality with Action - mmhos (April and May values may not be reflective of split-month operations when objectives control)														
Wet	-1	-3	-1	-2	-3	-4	-6	-7	-6	-2	0	0	0	0
Above Normal	-1	-5	-2	-5	-7	-18	-10	-8	-7	-3	0	0	0	0
Below Normal	-2	-15	-3	-6	-9	0	0	0	-7	-3	0	0	0	0
Dry	-2	-18	0	-3	-4	0	0	0	-6	-3	0	0	0	0
Critical	-2	0	0	0	0	0	0	0	0	0	0	0	0	0
With-Action Vernalis Water Quality - mmhos (April and May values may not be reflective of split-month operations when objectives control)														
Wet	351	283	309	266	209	306	335	454	436	357	497	432	352	286
Above Normal	403	375	463	360	326	469	500	525	582	491	657	639	404	380
Below Normal	755	617	688	459	373	700	700	700	673	506	681	657	757	631
Dry	877	718	1000	697	696	700	700	700	766	544	708	678	880	736
Critical	998	1000	1000	700	700	700	700	700	771	595	772	859	1000	1000

New Melones

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Total
Incremental Change in NM Storage due to WQ Release Change - Acre-feet															
Wet	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Above Normal	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Below Normal	0	0	0	0	0	900	821	700	0	0	0	0	0	0	2,420
Dry	0	0	156	709	819	900	821	758	0	0	0	0	0	0	4,164
Critical	0	386	39	8	15	223	297	213	0	0	0	0	0	0	1,180
Incremental Change in NM Storage due to Vernalis Flow Release Change - Acre-feet															
Wet	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Above Normal	0	0	0	0	0	-3312	0	0	0	0	0	0	0	0	-3,312
Below Normal	0	-1834	0	0	0	0	0	0	0	0	0	0	0	-41	-1,875
Dry	0	-1834	0	0	0	0	0	0	0	0	0	0	0	-41	-1,875
Critical	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Net Incremental Change in NM Storage due to Vernalis Flow & Quality Release Change - Acre-feet															
Wet	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Above Normal	0	0	0	0	0	-3312	0	0	0	0	0	0	0	0	-3,312
Below Normal	0	-1834	0	0	0	900	821	700	0	0	0	0	0	-41	546
Dry	0	-1834	156	709	819	900	821	758	0	0	0	0	0	-41	2,290
Critical	0	386	39	8	15	223	297	213	0	0	0	0	0	0	1,180

Project Delta Supply

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Total
Total Potential Delta supply Impact w/o NM Adjustments - Acre-feet															
Wet	0	-642	0	0	0	0	-3711	-3457	0	0	0	0	0	-14	-7,825
Above Normal	0	-642	0	0	0	-3312	-3711	-3457	0	0	0	0	0	-14	-11,136
Below Normal	0	-642	0	0	0	-3312	-3711	-3457	0	0	0	0	0	-14	-11,136
Dry	0	-642	-493	-350	-2663	-3312	-3711	-3457	-2022	-1126	0	0	0	-14	-17,790
Critical	0	-779	-303	-20	-40	-626	-849	-748	-58	0	0	0	0	0	-3,424
New Melones Adjustments - Acre-feet (positive means increase in supply)															
Wet	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Above Normal	0	0	0	0	0	3312	0	0	0	0	0	0	0	0	3,312
Below Normal	0	642	0	0	0	-900	-821	-700	0	0	0	0	0	14	-1,764
Dry	0	642	-55	-248	-819	-900	-821	-758	0	0	0	0	0	14	-2,946
Critical	0	-386	-39	-8	-15	-223	-297	-213	0	0	0	0	0	0	-1,180
Incremental Change in Project Delta Supply due to Action - Acre-feet															
Wet	0	-642	0	0	0	0	-3711	-3457	0	0	0	0	0	-14	-7,825
Above Normal	0	-642	0	0	0	0	-3711	-3457	0	0	0	0	0	-14	-7,825
Below Normal	0	0	0	0	0	-4212	-4532	-4157	0	0	0	0	0	0	-12,901
Dry	0	0	-548	-598	-3482	-4212	-4532	-4216	-2022	-1126	0	0	0	0	-20,736
Critical	0	-1165	-342	-28	-55	-849	-1146	-960	-58	0	0	0	0	0	-4,604

Study: C-2-1-C: 130 GROUNDWATER REFUGE COMPOSITE — Water Development and Disposition Assumptions

All Values Relative to Benchmark (Existing) Condition

Disposition Non-Crit	Crit		SJR Continuity Non-Crit	Crit		SJR Non-Continuity Non-Crit	Crit	
34738	0	Agriculture-SJRc	0	0	Conservation of Evaporation/Seepage to GW-SJRc	0	0	Conservation of Evaporation/Seepage to GW-SJRnc
17823	40000	Wildlife Areas-SJRc	0	0	Conservation of Drain Spills to Wildlife Areas-SJRc	0	0	Conservation of Drain Spills to Wildlife Areas-SJRnc
0	0	Urban-SJRc	10365	0	Groundwater-SJRc	0	0	Groundwater-SJRnc
-7385	0	Agriculture-SJRnc	0	0	Tailwater Recapture-SJRc	0	0	Tailwater Recapture-SJRnc
9497	0	Wildlife Areas-SJRnc	42000	42000	Fallowing -SJRc	8000	8000	Fallowing-SJRnc
0	0	Urban-SJRnc						
0	0	EWA						

	Non-Crit	Crit
Total Developed Water:	60365	50000
Total Disposition:	54673	40000

All Values Relative to Benchmark (Existing) Condition — Basic Hydrologic Accounting

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Total
Water Developed - Non Critical Years															
Change in Evaporation/Seepage to GW	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Change in Drain Spills to Wildlife Areas	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Change in Discharge to SJR Streams	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Change to Flows Upstream of Sack Dam	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Crop Fallowing	1031	4639	5155	344	687	10653	14433	12715	344	0	0	0	0	0	50,000
Groundwater	0	0	0	1296	1451	1710	2073	1555	1037	1037	207	0	0	0	10,365
Total	1031	4639	5155	1639	2138	12363	16506	14270	1380	1037	207	0	0	0	60,365
Effects to SJR Flows due to Developing Water - Non Critical Years															
Change in Evaporation/Seepage to GW	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Change in Drain Spills to Wildlife Areas	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Change in Discharge to SJR Streams	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Change to Flows Upstream of Sack Dam	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Crop Fallowing	173	779	303	20	40	626	849	748	58	0	0	0	0	0	3,597
Groundwater	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total (Positive value means flow reduced)	173	779	303	20	40	626	849	748	58	0	0	0	0	0	3,597
Return Flows from Disposition of Transfer Water - Non Critical Years															
Incremental Return from Agricultural Transferees	0	0	53	231	349	415	598	440	577	259	70	18	24	42	3,074
Incremental Return from Wildlife Area Transferees	0	0	33	5	0	0	0	3026	165	-17	282	66	220	252	4,032
Envirnomental Water Account Beneficiaries															
Incremental Return from Agricultural Entities	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	0	87	236	349	415	598	3465	742	241	352	83	243	295	7,106
Net Effect to San Joaquin River Flow Before NM Adjustment (Acre-feet)	-173	-779	-216	216	309	-212	-251	2718	684	241	352	83	243	295	3,510
(Positive value means flow added) (cfs)	-3	-14	-4	4	5	-4	-4	44	11	4	6	1	4	5	0
Water Developed - Critical Years															
Change in Evaporation/Seepage to GW	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Change in Drain Spills to Wildlife Areas	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Change in Discharge to SJR Streams	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Change to Flows Upstream of Sack Dam	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Crop Fallowing	1031	4639	5155	344	687	10653	14433	12715	344	0	0	0	0	0	50,000
Groundwater	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	1031	4639	5155	344	687	10653	14433	12715	344	0	0	0	0	0	50,000
Effects to SJR Flows due to Developing Water - Critical Years															
Change in Evaporation/Seepage to GW	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Change in Drain Spills to Wildlife Areas	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Change in Discharge to SJR Streams	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Change to Flows Upstream of Sack Dam	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Crop Fallowing	173	779	303	20	40	626	849	748	58	0	0	0	0	0	3,597
Groundwater	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total (Positive value means flow reduced)	173	779	303	20	40	626	849	748	58	0	0	0	0	0	3,597
Return Flows from Disposition of Transfer Water - Critical Years															
Incremental Return from Agricultural Transferees	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Incremental Return from Wildlife Area Transferees	0	0	75	11	0	0	0	6791	370	-39	634	148	493	567	9,049
Envirnomental Water Account Beneficiaries															
Incremental Return from Agricultural Entities	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	0	75	11	0	0	0	6791	370	-39	634	148	493	567	9,049
Net Effect to San Joaquin River Flow Before NM Adjustment (Acre-feet)	-173	-779	-228	-9	-40	-626	-849	6043	312	-39	634	148	493	567	5,453
(Positive value means flow added) (cfs)	-3	-14	-4	0	-1	-11	-14	98	5	-1	11	2	8	10	0

Vernalis

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb
Benchmark Vernalis Flow - cfs														
Wet	7500	13600	15700	13600	12000	7400	5100	3100	2500	3600	3000	4600	7500	13600
Above Normal	5800	7200	6200	5900	4600	2600	2100	2000	1500	2000	1800	2300	5800	7200
Below Normal	2300	3200	3300	3700	3700	2100	1900	1500	1200	1900	1700	2200	2300	3200
Dry	1900	2600	2300	2700	2200	1800	1400	1100	1000	1700	1600	2100	1900	2600
Critical	1300	1700	1600	1800	1500	1300	1000	1000	1000	1500	1400	1500	1300	1700
Change in Vernalis Flow with Action - cfs														
Wet	-3	-14	-4	4	5	-4	-4	44	11	4	6	1	4	5
Above Normal	-3	-14	-4	4	5	0	-4	44	11	4	6	1	4	5
Below Normal	-3	0	-4	4	5	-10	-14	85	11	4	6	1	4	0
Dry	-3	0	-3	3	4	-10	-14	85	11	4	6	1	4	0
Critical	-3	-21	-2	0	-1	-14	-19	199	5	-1	11	2	8	15
With-Action Vernalis Flow - cfs														
Wet	7497	13586	15696	13604	12005	7396	5096	3144	2511	3604	3006	4601	7504	13605
Above Normal	5797	7186	6196	5904	4605	2600	2096	2044	1511	2004	1806	2301	5804	7205
Below Normal	2297	3200	3296	3704	3705	2090	1886	1585	1211	1904	1706	2201	2304	3200
Dry	1897	2600	2297	2703	2204	1790	1386	1185	1011	1704	1606	2101	1904	2600
Critical	1297	1679	1598	1800	1499	1286	981	1199	1005	1499	1411	1502	1308	1715
Benchmark Vernalis Water Quality - mmhos (April and May values may not be reflective of split-month operations when objectives control)														
Wet	352	286	310	269	212	310	341	460	442	359	497	432	352	286
Above Normal	404	380	465	364	334	486	509	534	588	494	657	639	404	380
Below Normal	757	631	690	465	382	700	700	700	680	510	681	657	757	631
Dry	880	736	1000	700	700	700	700	700	772	547	708	678	880	736
Critical	1000	1000	1000	700	700	700	700	700	772	595	772	859	1000	1000
Change in Vernalis Water Quality with Action - mmhos (April and May values may not be reflective of split-month operations when objectives control)														
Wet	-1	-1	0	0	0	-1	-2	11	0	0	1	0	0	0
Above Normal	-1	-2	0	0	0	-2	-3	16	-1	0	1	0	0	1
Below Normal	-1	-6	0	0	0	0	0	0	-1	0	1	0	1	2
Dry	-1	-8	0	0	0	0	0	0	0	0	1	0	0	3
Critical	-2	0	0	0	0	0	0	0	2	0	3	0	1	0
With-Action Vernalis Water Quality - mmhos (April and May values may not be reflective of split-month operations when objectives control)														
Wet	351	284	310	269	212	310	340	472	442	359	498	432	352	286
Above Normal	404	378	465	365	334	484	506	550	588	494	659	639	405	381
Below Normal	756	625	690	465	382	700	700	700	680	510	682	658	757	634
Dry	878	728	1000	700	700	700	700	700	771	548	709	678	880	738
Critical	998	1000	1000	700	700	700	700	700	773	595	775	859	1001	1000

New Melones

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Total
Incremental Change in NM Storage due to WQ Release Change - Acre-feet															
Wet	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Above Normal	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Below Normal	0	0	0	0	0	363	582	-2479	0	0	0	0	0	0	-1,534
Dry	0	0	-4	17	57	363	582	-2540	0	0	0	0	0	0	-1,526
Critical	0	386	-97	-12	15	223	297	-6209	0	0	0	0	0	-267	-5,665
Incremental Change in NM Storage due to Vernalis Flow Release Change - Acre-feet															
Wet	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Above Normal	0	0	0	0	0	-212	0	0	0	0	0	0	0	0	-212
Below Normal	0	-779	0	0	0	0	0	0	0	0	0	0	0	295	-485
Dry	0	-779	0	0	0	0	0	0	0	0	0	0	0	295	-485
Critical	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Net Incremental Change in NM Storage due to Vernalis Flow & Quality Release Change - Acre-feet															
Wet	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Above Normal	0	0	0	0	0	-212	0	0	0	0	0	0	0	0	-212
Below Normal	0	-779	0	0	0	363	582	-2479	0	0	0	0	0	295	-2,019
Dry	0	-779	-4	17	57	363	582	-2540	0	0	0	0	0	295	-2,011
Critical	0	386	-97	-12	15	223	297	-6209	0	0	0	0	0	-267	-5,665

Project Delta Supply

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Total
Total Potential Delta supply Impact w/o NM Adjustments - Acre-feet															
Wet	0	-273	0	0	0	0	-251	2718	0	0	0	0	0	103	2,297
Above Normal	0	-273	0	0	0	-212	-251	2718	0	0	0	0	0	103	2,085
Below Normal	0	-273	0	0	0	-212	-251	2718	0	0	0	0	0	103	2,085
Dry	0	-273	-76	38	309	-212	-251	2718	684	233	0	0	0	103	3,274
Critical	0	-779	-228	-9	-40	-626	-849	6043	312	-39	634	0	0	567	4,985
New Melones Adjustments - Acre-feet (positive means increase in supply)															
Wet	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Above Normal	0	0	0	0	0	212	0	0	0	0	0	0	0	0	212
Below Normal	0	273	0	0	0	-363	-582	2479	0	0	0	0	0	-103	1,704
Dry	0	273	1	-6	-57	-363	-582	2540	0	0	0	0	0	-103	1,704
Critical	0	-386	97	12	-15	-223	-297	6209	0	0	0	0	0	267	5,665
Incremental Change in Project Delta Supply due to Action - Acre-feet															
Wet	0	-273	0	0	0	0	-251	2718	0	0	0	0	0	103	2,297
Above Normal	0	-273	0	0	0	0	-251	2718	0	0	0	0	0	103	2,297
Below Normal	0	0	0	0	0	-575	-833	5197	0	0	0	0	0	0	3,789
Dry	0	0	-74	32	252	-575	-833	5258	684	233	0	0	0	0	4,978
Critical	0	-1165	-131	4	-55	-849	-1146	12252	312	-39	634	0	0	834	10,650

Study: C-2-2-C: 130 GROUNDWATER AGRICULTURE COMPOSITE — Water Development and Disposition Assumptions

All Values Relative to Benchmark (Existing) Condition

Disposition Non-Crit	Crit	
96412	50000	Agriculture-SJRc
0	0	Wildlife Areas-SJRc
0	0	Urban-SJRc
-7385	0	Agriculture-SJRnc
0	0	Wildlife Areas-SJRnc
0	0	Urban-SJRnc
0	0	EWA

SJR Continuity Non-Crit	Crit	
0	0	Conservation of Evaporation/Seepage to GW-SJRc
0	0	Conservation of Drain Spills to Wildlife Areas-SJRc
10365	0	Groundwater-SJRc
0	0	Tailwater Recapture-SJRc
42000	42000	Fallowing -SJRc
60365	50000	Total Developed Water:

SJR Non-Continuity Non-Crit	Crit	
0	0	Conservation of Evaporation/Seepage to GW-SJRnc
0	0	Conservation of Drain Spills to Wildlife Areas-SJRnc
0	0	Groundwater-SJRnc
0	0	Tailwater Recapture-SJRnc
8000	8000	Fallowing-SJRnc
89027	50000	Total Disposition:

All Values Relative to Benchmark (Existing) Condition — Basic Hydrologic Accounting

		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Total
Water Developed - Non Critical Years																
Change in Evaporation/Seepage to GW		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Change in Drain Spills to Wildlife Areas		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Change in Discharge to SJR Streams		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Change to Flows Upstream of Sack Dam		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Crop Fallowing		1031	4639	5155	344	687	10653	14433	12715	344	0	0	0	0	0	50,000
Groundwater		0	0	0	1296	1451	1710	2073	1555	1037	1037	207	0	0	0	10,365
Total		1031	4639	5155	1639	2138	12363	16506	14270	1380	1037	207	0	0	0	60,365
Effects to SJR Flows due to Developing Water - Non Critical Years																
Change in Evaporation/Seepage to GW		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Change in Drain Spills to Wildlife Areas		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Change in Discharge to SJR Streams		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Change to Flows Upstream of Sack Dam		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Crop Fallowing		173	779	303	20	40	626	849	748	58	0	0	0	0	0	3,597
Groundwater		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total (Positive value means flow reduced)		173	779	303	20	40	626	849	748	58	0	0	0	0	0	3,597
Return Flows from Disposition of Transfer Water - Non Critical Years																
Incremental Return from Agricultural Transferees		0	0	148	641	969	1151	1659	1220	1602	718	193	49	66	117	8,532
Incremental Return from Wildlife Area Transferees		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Envirnomental Water Account Beneficiaries																
Incremental Return from Agricultural Entities		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total		0	0	148	641	969	1151	1659	1220	1602	718	193	49	66	117	8,532
Net Effect to San Joaquin River Flow Before NM Adjustment	(Acre-feet)	-173	-779	-155	621	929	524	811	472	1544	718	193	49	66	117	4,935
(Positive value means flow added)	(cfs)	-3	-14	-3	10	15	9	13	8	26	12	3	1	1	2	0
Water Developed - Critical Years																
Change in Evaporation/Seepage to GW		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Change in Drain Spills to Wildlife Areas		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Change in Discharge to SJR Streams		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Change to Flows Upstream of Sack Dam		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Crop Fallowing		1031	4639	5155	344	687	10653	14433	12715	344	0	0	0	0	0	50,000
Groundwater		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total		1031	4639	5155	344	687	10653	14433	12715	344	0	0	0	0	0	50,000
Effects to SJR Flows due to Developing Water - Critical Years																
Change in Evaporation/Seepage to GW		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Change in Drain Spills to Wildlife Areas		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Change in Discharge to SJR Streams		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Change to Flows Upstream of Sack Dam		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Crop Fallowing		173	779	303	20	40	626	849	748	58	0	0	0	0	0	3,597
Groundwater		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total (Positive value means flow reduced)		173	779	303	20	40	626	849	748	58	0	0	0	0	0	3,597
Return Flows from Disposition of Transfer Water - Critical Years																
Incremental Return from Agricultural Transferees		0	0	77	333	503	597	861	633	831	372	100	25	34	61	4,425
Incremental Return from Wildlife Area Transferees		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Envirnomental Water Account Beneficiaries																
Incremental Return from Agricultural Entities		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total		0	0	77	333	503	597	861	633	831	372	100	25	34	61	4,425
Net Effect to San Joaquin River Flow Before NM Adjustment	(Acre-feet)	-173	-779	-226	312	462	-30	12	-115	773	372	100	25	34	61	828
(Positive value means flow added)	(cfs)	-3	-14	-4	5	8	0	0	-2	13	6	2	0	1	1	0

Vernalis

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb
Benchmark Vernalis Flow - cfs														
Wet	7500	13600	15700	13600	12000	7400	5100	3100	2500	3600	3000	4600	7500	13600
Above Normal	5800	7200	6200	5900	4600	2600	2100	2000	1500	2000	1800	2300	5800	7200
Below Normal	2300	3200	3300	3700	3700	2100	1900	1500	1200	1900	1700	2200	2300	3200
Dry	1900	2600	2300	2700	2200	1800	1400	1100	1000	1700	1600	2100	1900	2600
Critical	1300	1700	1600	1800	1500	1300	1000	1000	1000	1500	1400	1500	1300	1700
Change in Vernalis Flow with Action - cfs														
Wet	-3	-14	-3	10	15	9	13	8	26	12	3	1	1	2
Above Normal	-3	-14	-3	10	15	0	13	8	26	12	3	1	1	2
Below Normal	-3	0	-3	10	15	-1	-5	-3	26	12	3	1	1	0
Dry	-3	0	-4	9	13	-1	-5	-1	26	12	3	1	1	0
Critical	-3	-21	-4	5	7	-5	-5	-5	13	6	2	0	1	1
With-Action Vernalis Flow - cfs														
Wet	7497	13586	15697	13610	12015	7409	5113	3108	2526	3612	3003	4601	7501	13602
Above Normal	5797	7186	6197	5910	4615	2600	2113	2008	1526	2012	1803	2301	5801	7202
Below Normal	2297	3200	3297	3710	3715	2099	1895	1497	1226	1912	1703	2201	2301	3200
Dry	1897	2600	2296	2709	2213	1799	1395	1099	1026	1712	1603	2101	1901	2600
Critical	1297	1679	1596	1805	1507	1295	995	995	1013	1506	1402	1500	1301	1701
Benchmark Vernalis Water Quality - mmhos (April and May values may not be reflective of split-month operations when objectives control)														
Wet	352	286	310	269	212	310	341	460	442	359	497	432	352	286
Above Normal	404	380	465	364	334	486	509	534	588	494	657	639	404	380
Below Normal	757	631	690	465	382	700	700	700	680	510	681	657	757	631
Dry	880	736	1000	700	700	700	700	700	772	547	708	678	880	736
Critical	1000	1000	1000	700	700	700	700	700	772	595	772	859	1000	1000
Change in Vernalis Water Quality with Action - mmhos (April and May values may not be reflective of split-month operations when objectives control)														
Wet	-1	-1	0	0	0	-1	-2	-2	-1	0	0	0	0	0
Above Normal	-1	-2	0	0	1	0	-5	-4	-3	0	0	0	0	0
Below Normal	-1	-6	-1	0	1	0	0	0	-3	1	0	0	0	0
Dry	-1	-8	0	0	-1	0	0	0	-2	1	0	0	0	1
Critical	-2	0	0	0	0	0	0	0	-1	0	0	0	0	0
With-Action Vernalis Water Quality - mmhos (April and May values may not be reflective of split-month operations when objectives control)														
Wet	351	284	310	269	212	310	340	458	440	359	497	432	352	286
Above Normal	404	378	465	365	334	486	505	530	585	494	657	639	404	380
Below Normal	756	625	690	465	382	700	700	700	677	510	681	657	757	632
Dry	878	728	1000	700	699	700	700	700	769	548	707	678	880	736
Critical	998	1000	1000	700	700	700	700	700	771	595	772	859	1000	1000

New Melones

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Total
Incremental Change in NM Storage due to WQ Release Change - Acre-feet															
Wet	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Above Normal	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Below Normal	0	0	0	0	0	612	1088	682	0	0	0	0	0	0	2,383
Dry	0	0	87	58	130	612	1088	513	0	0	0	0	0	0	2,489
Critical	0	386	47	-12	30	260	350	223	0	0	0	0	0	14	1,296
Incremental Change in NM Storage due to Vernalis Flow Release Change - Acre-feet															
Wet	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Above Normal	0	0	0	0	0	524	0	0	0	0	0	0	0	0	524
Below Normal	0	-779	0	0	0	0	0	0	0	0	0	0	0	117	-663
Dry	0	-779	0	0	0	0	0	0	0	0	0	0	0	117	-663
Critical	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Net Incremental Change in NM Storage due to Vernalis Flow & Quality Release Change - Acre-feet															
Wet	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Above Normal	0	0	0	0	0	524	0	0	0	0	0	0	0	0	524
Below Normal	0	-779	0	0	0	612	1088	682	0	0	0	0	0	117	1,720
Dry	0	-779	87	58	130	612	1088	513	0	0	0	0	0	117	1,826
Critical	0	386	47	-12	30	260	350	223	0	0	0	0	0	14	1,296

Project Delta Supply

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Total
Total Potential Delta supply Impact w/o NM Adjustments - Acre-feet															
Wet	0	-273	0	0	0	0	811	472	0	0	0	0	0	41	1,051
Above Normal	0	-273	0	0	0	524	811	472	0	0	0	0	0	41	1,575
Below Normal	0	-273	0	0	0	524	811	472	0	0	0	0	0	41	1,575
Dry	0	-273	-54	109	929	524	811	472	1544	695	0	0	0	41	4,797
Critical	0	-779	-226	312	462	-30	12	-115	773	372	100	0	0	61	942
New Melones Adjustments - Acre-feet (positive means increase in supply)															
Wet	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Above Normal	0	0	0	0	0	-524	0	0	0	0	0	0	0	0	-524
Below Normal	0	273	0	0	0	-612	-1088	-682	0	0	0	0	0	-41	-2,151
Dry	0	273	-30	-20	-130	-612	-1088	-513	0	0	0	0	0	-41	-2,163
Critical	0	-386	-47	12	-30	-260	-350	-223	0	0	0	0	0	-14	-1,296
Incremental Change in Project Delta Supply due to Action - Acre-feet															
Wet	0	-273	0	0	0	0	811	472	0	0	0	0	0	41	1,051
Above Normal	0	-273	0	0	0	0	811	472	0	0	0	0	0	41	1,051
Below Normal	0	0	0	0	0	-88	-278	-210	0	0	0	0	0	0	-576
Dry	0	0	-85	89	798	-88	-278	-41	1544	695	0	0	0	0	2,634
Critical	0	-1165	-273	325	432	-289	-338	-337	773	372	100	0	0	47	-354

All Values Relative to Benchmark (Existing) Condition

Non-Crit	Crit	Disposition	Non-Crit	Crit	SJR Continuity	Non-Crit	Crit	SJR Non-Continuity
-33588	0	Agriculture-SJRc	0	0	Conservation of Evaporation/Seepage to GW-SJRc	0	0	Conservation of Evaporation/Seepage to GW-SJRnc
0	0	Wildlife Areas-SJRc	0	0	Conservation of Drain Spills to Wildlife Areas-SJRc	0	0	Conservation of Drain Spills to Wildlife Areas-SJRnc
0	0	Urban-SJRc	10365	0	Groundwater-SJRc	0	0	Groundwater-SJRnc
122615	50000	Agriculture-SJRnc	0	0	Tailwater Recapture-SJRc	0	0	Tailwater Recapture-SJRnc
0	0	Wildlife Areas-SJRnc	42000	42000	Fallowing -SJRc	8000	8000	Fallowing-SJRnc
0	0	Urban-SJRnc						
0	0	EWA			Total Developed Water: Non-Crit 60365, Crit 50000			Total Disposition: Non-Crit 89027, Crit 50000

All Values Relative to Benchmark (Existing) Condition

Basic Hydrologic Accounting

		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Total
Water Developed - Non Critical Years																
Change in Evaporation/Seepage to GW		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Change in Drain Spills to Wildlife Areas		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Change in Discharge to SJR Streams		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Change to Flows Upstream of Sack Dam		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Crop Fallowing		1031	4639	5155	344	687	10653	14433	12715	344	0	0	0	0	0	50,000
Groundwater		0	0	0	1296	1451	1710	2073	1555	1037	1037	207	0	0	0	10,365
Total		1031	4639	5155	1639	2138	12363	16506	14270	1380	1037	207	0	0	0	60,365
Effects to SJR Flows due to Developing Water - Non Critical Years																
Change in Evaporation/Seepage to GW		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Change in Drain Spills to Wildlife Areas		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Change in Discharge to SJR Streams		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Change to Flows Upstream of Sack Dam		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Crop Fallowing		173	779	303	20	40	626	849	748	58	0	0	0	0	0	3,597
Groundwater		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total (Positive value means flow reduced)		173	779	303	20	40	626	849	748	58	0	0	0	0	0	3,597
Return Flows from Disposition of Transfer Water - Non Critical Years																
Incremental Return from Agricultural Transferees		0	0	-52	-223	-338	-401	-578	-425	-558	-250	-67	-17	-23	-41	-2,972
Incremental Return from Wildlife Area Transferees		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Envirnomental Water Account Beneficiaries																
Incremental Return from Agricultural Entities		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total		0	0	-52	-223	-338	-401	-578	-425	-558	-250	-67	-17	-23	-41	-2,972
Net Effect to San Joaquin River Flow Before NM Adjustment	(Acre-feet)	-173	-779	-355	-244	-378	-1027	-1427	-1173	-616	-250	-67	-17	-23	-41	-6,569
(Positive value means flow added)	(cfs)	-3	-14	-6	-4	-6	-17	-23	-19	-10	-4	-1	0	0	-1	0
Water Developed - Critical Years																
Change in Evaporation/Seepage to GW		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Change in Drain Spills to Wildlife Areas		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Change in Discharge to SJR Streams		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Change to Flows Upstream of Sack Dam		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Crop Fallowing		1031	4639	5155	344	687	10653	14433	12715	344	0	0	0	0	0	50,000
Groundwater		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total		1031	4639	5155	344	687	10653	14433	12715	344	0	0	0	0	0	50,000
Effects to SJR Flows due to Developing Water - Critical Years																
Change in Evaporation/Seepage to GW		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Change in Drain Spills to Wildlife Areas		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Change in Discharge to SJR Streams		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Change to Flows Upstream of Sack Dam		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Crop Fallowing		173	779	303	20	40	626	849	748	58	0	0	0	0	0	3,597
Groundwater		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total (Positive value means flow reduced)		173	779	303	20	40	626	849	748	58	0	0	0	0	0	3,597
Return Flows from Disposition of Transfer Water - Critical Years																
Incremental Return from Agricultural Transferees		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Incremental Return from Wildlife Area Transferees		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Envirnomental Water Account Beneficiaries																
Incremental Return from Agricultural Entities		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Net Effect to San Joaquin River Flow Before NM Adjustment	(Acre-feet)	-173	-779	-303	-20	-40	-626	-849	-748	-58	0	0	0	0	0	-3,597
(Positive value means flow added)	(cfs)	-3	-14	-5	0	-1	-11	-14	-12	-1	0	0	0	0	0	0

Vernalis

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb
Benchmark Vernalis Flow - cfs														
Wet	7500	13600	15700	13600	12000	7400	5100	3100	2500	3600	3000	4600	7500	13600
Above Normal	5800	7200	6200	5900	4600	2600	2100	2000	1500	2000	1800	2300	5800	7200
Below Normal	2300	3200	3300	3700	3700	2100	1900	1500	1200	1900	1700	2200	2300	3200
Dry	1900	2600	2300	2700	2200	1800	1400	1100	1000	1700	1600	2100	1900	2600
Critical	1300	1700	1600	1800	1500	1300	1000	1000	1000	1500	1400	1500	1300	1700
Change in Vernalis Flow with Action - cfs														
Wet	-3	-14	-6	-4	-6	-17	-23	-19	-10	-4	-1	0	0	-1
Above Normal	-3	-14	-6	-4	-6	0	-23	-19	-10	-4	-1	0	0	-1
Below Normal	-3	0	-6	-4	-6	-19	-24	-20	-10	-4	-1	0	0	0
Dry	-3	0	-6	-4	-6	-19	-24	-21	-10	-4	-1	0	0	0
Critical	-3	-21	-6	0	-1	-14	-19	-16	-1	0	0	0	0	0
With-Action Vernalis Flow - cfs														
Wet	7497	13586	15694	13596	11994	7383	5077	3081	2490	3596	2999	4600	7500	13599
Above Normal	5797	7186	6194	5896	4594	2600	2077	1981	1490	1996	1799	2300	5800	7199
Below Normal	2297	3200	3294	3696	3694	2081	1876	1480	1190	1896	1699	2200	2300	3200
Dry	1897	2600	2294	2696	2194	1781	1376	1079	990	1696	1599	2100	1900	2600
Critical	1297	1679	1594	1800	1499	1286	981	984	999	1500	1400	1500	1300	1700
Benchmark Vernalis Water Quality - mmhos (April and May values may not be reflective of split-month operations when objectives control)														
Wet	352	286	310	269	212	310	341	460	442	359	497	432	352	286
Above Normal	404	380	465	364	334	486	509	534	588	494	657	639	404	380
Below Normal	757	631	690	465	382	700	700	700	680	510	681	657	757	631
Dry	880	736	1000	700	700	700	700	700	772	547	708	678	880	736
Critical	1000	1000	1000	700	700	700	700	700	772	595	772	859	1000	1000
Change in Vernalis Water Quality with Action - mmhos (April and May values may not be reflective of split-month operations when objectives control)														
Wet	-1	-1	0	0	0	-1	-2	-1	0	0	0	0	0	0
Above Normal	-1	-2	-1	0	0	-5	-2	-2	1	0	0	0	0	0
Below Normal	-1	-6	-1	0	0	0	0	0	1	0	0	0	0	0
Dry	-1	-8	0	0	0	0	0	0	1	0	0	0	0	0
Critical	-2	0	0	0	0	0	0	0	0	0	0	0	0	0
With-Action Vernalis Water Quality - mmhos (April and May values may not be reflective of split-month operations when objectives control)														
Wet	351	284	310	269	212	310	340	459	442	359	497	432	352	286
Above Normal	404	378	465	364	333	482	507	532	589	494	657	639	404	380
Below Normal	756	625	690	465	382	700	700	700	681	510	681	657	757	631
Dry	878	728	1000	700	700	700	700	700	772	547	708	678	880	736
Critical	998	1000	1000	700	700	700	700	700	771	595	772	859	1000	1000

New Melones

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Total
Incremental Change in NM Storage due to WQ Release Change - Acre-feet															
Wet	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Above Normal	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Below Normal	0	0	0	0	0	87	21	49	0	0	0	0	0	0	158
Dry	0	0	22	-9	-25	87	21	108	0	0	0	0	0	0	204
Critical	0	386	39	8	15	223	297	213	0	0	0	0	0	0	1,180
Incremental Change in NM Storage due to Vernalis Flow Release Change - Acre-feet															
Wet	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Above Normal	0	0	0	0	0	-1027	0	0	0	0	0	0	0	0	-1,027
Below Normal	0	-779	0	0	0	0	0	0	0	0	0	0	0	-41	-820
Dry	0	-779	0	0	0	0	0	0	0	0	0	0	0	-41	-820
Critical	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Net Incremental Change in NM Storage due to Vernalis Flow & Quality Release Change - Acre-feet															
Wet	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Above Normal	0	0	0	0	0	-1027	0	0	0	0	0	0	0	0	-1,027
Below Normal	0	-779	0	0	0	87	21	49	0	0	0	0	0	-41	-662
Dry	0	-779	22	-9	-25	87	21	108	0	0	0	0	0	-41	-616
Critical	0	386	39	8	15	223	297	213	0	0	0	0	0	0	1,180

Project Delta Supply

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Total
Total Potential Delta supply Impact w/o NM Adjustments - Acre-feet															
Wet	0	-273	0	0	0	0	-1427	-1173	0	0	0	0	0	-14	-2,886
Above Normal	0	-273	0	0	0	-1027	-1427	-1173	0	0	0	0	0	-14	-3,914
Below Normal	0	-273	0	0	0	-1027	-1427	-1173	0	0	0	0	0	-14	-3,914
Dry	0	-273	-124	-43	-378	-1027	-1427	-1173	-616	-242	0	0	0	-14	-5,316
Critical	0	-779	-303	-20	-40	-626	-849	-748	-58	0	0	0	0	0	-3,424
New Melones Adjustments - Acre-feet (positive means increase in supply)															
Wet	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Above Normal	0	0	0	0	0	1027	0	0	0	0	0	0	0	0	1,027
Below Normal	0	273	0	0	0	-87	-21	-49	0	0	0	0	0	14	129
Dry	0	273	-8	3	25	-87	-21	-108	0	0	0	0	0	14	91
Critical	0	-386	-39	-8	-15	-223	-297	-213	0	0	0	0	0	0	-1,180
Incremental Change in Project Delta Supply due to Action - Acre-feet															
Wet	0	-273	0	0	0	0	-1427	-1173	0	0	0	0	0	-14	-2,886
Above Normal	0	-273	0	0	0	0	-1427	-1173	0	0	0	0	0	-14	-2,886
Below Normal	0	0	0	0	0	-1114	-1448	-1222	0	0	0	0	0	0	-3,784
Dry	0	0	-132	-40	-353	-1114	-1448	-1281	-616	-242	0	0	0	0	-5,225
Critical	0	-1165	-342	-28	-55	-849	-1146	-960	-58	0	0	0	0	0	-4,604

Study: C-3-1-C: 130 FALLOWING REFUGE COMPOSITE — Water Development and Disposition Assumptions

All Values Relative to Benchmark (Existing) Condition

Disposition Non-Crit	Crit		SJR Continuity Non-Crit	Crit		SJR Non-Continuity Non-Crit	Crit	
34738	0	Agriculture-SJRc	0	0	Conservation of Evaporation/Seepage to GW-SJRc	0	0	Conservation of Evaporation/Seepage to GW-SJRnc
17823	40000	Wildlife Areas-SJRc	0	0	Conservation of Drain Spills to Wildlife Areas-SJRc	0	0	Conservation of Drain Spills to Wildlife Areas-SJRnc
0	0	Urban-SJRc	-6000	0	Groundwater-SJRc	0	0	Groundwater-SJRnc
-7385	0	Agriculture-SJRnc	15465	0	Tailwater Recapture-SJRc	900	0	Tailwater Recapture-SJRnc
9497	0	Wildlife Areas-SJRnc	42000	42000	Fallowing -SJRc	8000	8000	Fallowing-SJRnc
0	0	Urban-SJRnc						
0	0	EWA						

	Non-Crit	Crit
Total Developed Water:	60365	50000
Total Disposition:	54673	40000

All Values Relative to Benchmark (Existing) Condition — Basic Hydrologic Accounting

Water Developed - Non Critical Years	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Total
Change in Evaporation/Seepage to GW	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Change in Drain Spills to Wildlife Areas	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Change in Discharge to SJR Streams	141	1054	1054	1757	2285	2285	2285	2285	1406	914	0	0	0	0	15,465
Change to Flows Upstream of Sack Dam	0	45	90	90	99	144	162	162	72	27	9	0	0	0	900
Crop Fallowing	1031	4639	5155	344	687	10653	14433	12715	344	0	0	0	0	0	50,000
Groundwater	0	0	0	-750	-840	-990	-1200	-900	-600	-600	-120	0	0	0	-6,000
Total	1172	5739	6299	1441	2231	12092	15680	14261	1222	341	-111	0	0	0	60,365
Effects to SJR Flows due to Developing Water - Non Critical Years															
Change in Evaporation/Seepage to GW	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Change in Drain Spills to Wildlife Areas	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Change in Discharge to SJR Streams	141	1054	1054	1757	2285	2285	2285	2285	1406	914	0	0	0	0	15,465
Change to Flows Upstream of Sack Dam	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Crop Fallowing	173	779	303	20	40	626	849	748	58	0	0	0	0	0	3,597
Groundwater	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total (Positive value means flow reduced)	314	1834	1358	1778	2325	2911	3133	3032	1464	914	0	0	0	0	19,062
Return Flows from Disposition of Transfer Water - Non Critical Years															
Incremental Return from Agricultural Transferees	0	0	53	231	349	415	598	440	577	259	70	18	24	42	3,074
Incremental Return from Wildlife Area Transferees	0	0	33	5	0	0	0	3026	165	-17	282	66	220	252	4,032
Envirnomental Water Account Beneficiaries															
Incremental Return from Agricultural Entities	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	0	87	236	349	415	598	3465	742	241	352	83	243	295	7,106
Net Effect to San Joaquin River Flow Before NM Adjustment (Acre-feet)	-314	-1834	-1271	-1541	-1976	-2496	-2535	433	-722	-673	352	83	243	295	-11,955
(Positive value means flow added) (cfs)	-5	-33	-21	-26	-32	-42	-41	7	-12	-11	6	1	4	5	0

Water Developed - Critical Years	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Total
Change in Evaporation/Seepage to GW	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Change in Drain Spills to Wildlife Areas	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Change in Discharge to SJR Streams	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Change to Flows Upstream of Sack Dam	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Crop Fallowing	1031	4639	5155	344	687	10653	14433	12715	344	0	0	0	0	0	50,000
Groundwater	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	1031	4639	5155	344	687	10653	14433	12715	344	0	0	0	0	0	50,000
Effects to SJR Flows due to Developing Water - Critical Years															
Change in Evaporation/Seepage to GW	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Change in Drain Spills to Wildlife Areas	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Change in Discharge to SJR Streams	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Change to Flows Upstream of Sack Dam	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Crop Fallowing	173	779	303	20	40	626	849	748	58	0	0	0	0	0	3,597
Groundwater	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total (Positive value means flow reduced)	173	779	303	20	40	626	849	748	58	0	0	0	0	0	3,597
Return Flows from Disposition of Transfer Water - Critical Years															
Incremental Return from Agricultural Transferees	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Incremental Return from Wildlife Area Transferees	0	0	75	11	0	0	0	6791	370	-39	634	148	493	567	9,049
Envirnomental Water Account Beneficiaries															
Incremental Return from Agricultural Entities	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	0	75	11	0	0	0	6791	370	-39	634	148	493	567	9,049
Net Effect to San Joaquin River Flow Before NM Adjustment (Acre-feet)	-173	-779	-228	-9	-40	-626	-849	6043	312	-39	634	148	493	567	5,453
(Positive value means flow added) (cfs)	-3	-14	-4	0	-1	-11	-14	98	5	-1	11	2	8	10	0

Vernalis

Benchmark Vernalis Flow - cfs	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb
Wet	7500	13600	15700	13600	12000	7400	5100	3100	2500	3600	3000	4600	7500	13600
Above Normal	5800	7200	6200	5900	4600	2600	2100	2000	1500	2000	1800	2300	5800	7200
Below Normal	2300	3200	3300	3700	3700	2100	1900	1500	1200	1900	1700	2200	2300	3200
Dry	1900	2600	2300	2700	2200	1800	1400	1100	1000	1700	1600	2100	1900	2600
Critical	1300	1700	1600	1800	1500	1300	1000	1000	1000	1500	1400	1500	1300	1700
Change in Vernalis Flow with Action - cfs														
Wet	-5	-33	-21	-26	-32	-42	-41	7	-12	-11	6	1	4	5
Above Normal	-5	-33	-21	-26	-32	0	-41	7	-12	-11	6	1	4	5
Below Normal	-5	0	-21	-26	-32	-62	-64	37	-12	-11	6	1	4	0
Dry	-5	0	-23	-38	-47	-62	-64	38	-12	-11	6	1	4	0
Critical	-3	-21	-2	0	-1	-14	-19	199	5	-1	11	2	8	15
With-Action Vernalis Flow - cfs														
Wet	7495	13567	15679	13574	11968	7358	5059	3107	2488	3589	3006	4601	7504	13605
Above Normal	5795	7167	6179	5874	4568	2600	2059	2007	1488	1989	1806	2301	5804	7205
Below Normal	2295	3200	3279	3674	3668	2038	1836	1537	1188	1889	1706	2201	2304	3200
Dry	1895	2600	2277	2662	2153	1738	1336	1138	988	1689	1606	2101	1904	2600
Critical	1297	1679	1598	1800	1499	1286	981	1199	1005	1499	1411	1502	1308	1715
Benchmark Vernalis Water Quality - mmhos (April and May values may not be reflective of split-month operations when objectives control)														
Wet	352	286	310	269	212	310	341	460	442	359	497	432	352	286
Above Normal	404	380	465	364	334	486	509	534	588	494	657	639	404	380
Below Normal	757	631	690	465	382	700	700	700	680	510	681	657	757	631
Dry	880	736	1000	700	700	700	700	700	772	547	708	678	880	736
Critical	1000	1000	1000	700	700	700	700	700	772	595	772	859	1000	1000
Change in Vernalis Water Quality with Action - mmhos (April and May values may not be reflective of split-month operations when objectives control)														
Wet	-1	-3	-1	-2	-3	-4	-6	6	-6	-2	1	0	0	0
Above Normal	-1	-5	-2	-4	-7	-15	-11	10	-8	-3	1	0	0	1
Below Normal	-2	-15	-3	-6	-8	0	0	0	-8	-3	1	0	1	2
Dry	-2	-18	0	-3	-5	0	0	0	-7	-3	1	0	0	3
Critical	-2	0	0	0	0	0	0	0	2	0	3	0	1	0
With-Action Vernalis Water Quality - mmhos (April and May values may not be reflective of split-month operations when objectives control)														
Wet	351	283	309	267	209	306	335	467	436	357	498	432	352	286
Above Normal	403	375	463	360	327	471	498	543	581	491	659	639	405	381
Below Normal	755	617	688	459	374	700	700	700	672	507	682	658	757	634
Dry	877	718	1000	697	695	700	700	700	765	545	709	678	880	738
Critical	998	1000	1000	700	700	700	700	700	773	595	775	859	1001	1000

New Melones

Incremental Change in NM Storage due to WQ Release Change - Acre-feet	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Total
Wet	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Above Normal	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Below Normal	0	0	0	0	0	1176	1382	-1829	0	0	0	0	0	0	729
Dry	0	0	130	735	901	1176	1382	-1890	0	0	0	0	0	0	2,434
Critical	0	386	-97	-12	15	223	297	-6209	0	0	0	0	0	-267	-5,665
Incremental Change in NM Storage due to Vernalis Flow Release Change - Acre-feet															
Wet	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Above Normal	0	0	0	0	0	-2496	0	0	0	0	0	0	0	0	-2,496
Below Normal	0	-1834	0	0	0	0	0	0	0	0	0	0	0	295	-1,539
Dry	0	-1834	0	0	0	0	0	0	0	0	0	0	0	295	-1,539
Critical	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Net Incremental Change in NM Storage due to Vernalis Flow & Quality Release Change - Acre-feet															
Wet	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Above Normal	0	0	0	0	0	-2496	0	0	0	0	0	0	0	0	-2,496
Below Normal	0	-1834	0	0	0	1176	1382	-1829	0	0	0	0	0	295	-811
Dry	0	-1834	130	735	901	1176	1382	-1890	0	0	0	0	0	295	895
Critical	0	386	-97	-12	15	223	297	-6209	0	0	0	0	0	-267	-5,665

Project Delta Supply

Total Potential Delta supply Impact w/o NM Adjustments - Acre-feet	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Total
Wet	0	-642	0	0	0	0	-2535	433	0	0	0	0	0	103	-2,641
Above Normal	0	-642	0	0	0	-2496	-2535	433	0	0	0	0	0	103	-5,137
Below Normal	0	-642	0	0	0	-2496	-2535	433	0	0	0	0	0	103	-5,137
Dry	0	-642	-445	-270	-1976	-2496	-2535	433	-722	-651	0	0	0	103	-9,200
Critical	0	-779	-228	-9	-40	-626	-849	6043	312	-39	634	0	0	567	4,985
New Melones Adjustments - Acre-feet (positive means increase in supply)															
Wet	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Above Normal	0	0	0	0	0	2496	0	0	0	0	0	0	0	0	2,496
Below Normal	0	642	0	0	0	-1176	-1382	1829	0	0	0	0	0	-103	-190
Dry	0	642	-46	-257	-901	-1176	-1382	1890	0	0	0	0	0	-103	-1,333
Critical	0	-386	97	12	-15	-223	-297	6209	0	0	0	0	0	267	5,665
Incremental Change in Project Delta Supply due to Action - Acre-feet															
Wet	0	-642	0	0	0	0	-2535	433	0	0	0	0	0	103	-2,641
Above Normal	0	-642	0	0	0	0	-2535	433	0	0	0	0	0	103	-2,641
Below Normal	0	0	0	0	0	-3672	-3917	2262	0	0	0	0	0	0	-5,327
Dry	0	0	-490	-527	-2877	-3672	-3917	2323	-722	-651	0	0	0	0	-10,533
Critical	0	-1165	-131	4	-55	-849	-1146	12252	312	-39	634	0	0	834	10,650

Study: C-3-2-C: 130 FALLOWING AGRICULTURE COMPOSITE — Water Development and Disposition Assumptions

All Values Relative to Benchmark (Existing) Condition

Disposition

Non-Crit	Crit	
96412	50000	Agriculture-SJRc
0	0	Wildlife Areas-SJRc
0	0	Urban-SJRc
-7385	0	Agriculture-SJRnc
0	0	Wildlife Areas-SJRnc
0	0	Urban-SJRnc
0	0	EWA

SJR Continuity

Non-Crit	Crit	
0	0	Conservation of Evaporation/Seepage to GW-SJRc
0	0	Conservation of Drain Spills to Wildlife Areas-SJRc
-6000	0	Groundwater-SJRc
15465	0	Tailwater Recapture-SJRc
42000	42000	Fallowing -SJRc
Total Developed Water:		Non-Crit 60365, Crit 50000

SJR Non-Continuity

Non-Crit	Crit	
0	0	Conservation of Evaporation/Seepage to GW-SJRnc
0	0	Conservation of Drain Spills to Wildlife Areas-SJRnc
0	0	Groundwater-SJRnc
900	0	Tailwater Recapture-SJRnc
8000	8000	Fallowing-SJRnc
Total Disposition:		Non-Crit 89027, Crit 50000

All Values Relative to Benchmark (Existing) Condition — Basic Hydrologic Accounting

Water Developed - Non Critical Years	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Total
Change in Evaporation/Seepage to GW	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Change in Drain Spills to Wildlife Areas	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Change in Discharge to SJR Streams	141	1054	1054	1757	2285	2285	2285	2285	1406	914	0	0	0	0	15,465
Change to Flows Upstream of Sack Dam	0	45	90	90	99	144	162	162	72	27	9	0	0	0	900
Crop Fallowing	1031	4639	5155	344	687	10653	14433	12715	344	0	0	0	0	0	50,000
Groundwater	0	0	0	-750	-840	-990	-1200	-900	-600	-600	-120	0	0	0	-6,000
Total	1172	5739	6299	1441	2231	12092	15680	14261	1222	341	-111	0	0	0	60,365
Effects to SJR Flows due to Developing Water - Non Critical Years															
Change in Evaporation/Seepage to GW	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Change in Drain Spills to Wildlife Areas	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Change in Discharge to SJR Streams	141	1054	1054	1757	2285	2285	2285	2285	1406	914	0	0	0	0	15,465
Change to Flows Upstream of Sack Dam	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Crop Fallowing	173	779	303	20	40	626	849	748	58	0	0	0	0	0	3,597
Groundwater	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total (Positive value means flow reduced)	314	1834	1358	1778	2325	2911	3133	3032	1464	914	0	0	0	0	19,062
Return Flows from Disposition of Transfer Water - Non Critical Years															
Incremental Return from Agricultural Transferees	0	0	148	641	969	1151	1659	1220	1602	718	193	49	66	117	8,532
Incremental Return from Wildlife Area Transferees	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Envirnomental Water Account Beneficiaries															
Incremental Return from Agricultural Entities	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	0	148	641	969	1151	1659	1220	1602	718	193	49	66	117	8,532
Net Effect to San Joaquin River Flow Before NM Adjustment (Acre-feet)	-314	-1834	-1209	-1136	-1356	-1760	-1474	-1812	138	-196	193	49	66	117	-10,530
(Positive value means flow added) (cfs)	-5	-33	-20	-19	-22	-30	-24	-29	2	-3	3	1	1	2	0

Water Developed - Critical Years	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Total
Change in Evaporation/Seepage to GW	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Change in Drain Spills to Wildlife Areas	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Change in Discharge to SJR Streams	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Change to Flows Upstream of Sack Dam	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Crop Fallowing	1031	4639	5155	344	687	10653	14433	12715	344	0	0	0	0	0	50,000
Groundwater	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	1031	4639	5155	344	687	10653	14433	12715	344	0	0	0	0	0	50,000
Effects to SJR Flows due to Developing Water - Critical Years															
Change in Evaporation/Seepage to GW	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Change in Drain Spills to Wildlife Areas	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Change in Discharge to SJR Streams	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Change to Flows Upstream of Sack Dam	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Crop Fallowing	173	779	303	20	40	626	849	748	58	0	0	0	0	0	3,597
Groundwater	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total (Positive value means flow reduced)	173	779	303	20	40	626	849	748	58	0	0	0	0	0	3,597
Return Flows from Disposition of Transfer Water - Critical Years															
Incremental Return from Agricultural Transferees	0	0	77	333	503	597	861	633	831	372	100	25	34	61	4,425
Incremental Return from Wildlife Area Transferees	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Envirnomental Water Account Beneficiaries															
Incremental Return from Agricultural Entities	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	0	77	333	503	597	861	633	831	372	100	25	34	61	4,425
Net Effect to San Joaquin River Flow Before NM Adjustment (Acre-feet)	-173	-779	-226	312	462	-30	12	-115	773	372	100	25	34	61	828
(Positive value means flow added) (cfs)	-3	-14	-4	5	8	0	0	-2	13	6	2	0	1	1	0

Vernalis

Benchmark Vernalis Flow - cfs	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb
Wet	7500	13600	15700	13600	12000	7400	5100	3100	2500	3600	3000	4600	7500	13600
Above Normal	5800	7200	6200	5900	4600	2600	2100	2000	1500	2000	1800	2300	5800	7200
Below Normal	2300	3200	3300	3700	3700	2100	1900	1500	1200	1900	1700	2200	2300	3200
Dry	1900	2600	2300	2700	2200	1800	1400	1100	1000	1700	1600	2100	1900	2600
Critical	1300	1700	1600	1800	1500	1300	1000	1000	1000	1500	1400	1500	1300	1700
Change in Vernalis Flow with Action - cfs														
Wet	-5	-33	-20	-19	-22	-30	-24	-29	2	-3	3	1	1	2
Above Normal	-5	-33	-20	-19	-22	0	-24	-29	2	-3	3	1	1	2
Below Normal	-5	0	-20	-19	-22	-54	-55	-51	2	-3	3	1	1	0
Dry	-5	0	-23	-32	-38	-54	-55	-48	2	-3	3	1	1	0
Critical	-3	-21	-4	5	7	-5	-5	-5	13	6	2	0	1	1
With-Action Vernalis Flow - cfs														
Wet	7495	13567	15680	13581	11978	7370	5076	3071	2502	3597	3003	4601	7501	13602
Above Normal	5795	7167	6180	5881	4578	2600	2076	1971	1502	1997	1803	2301	5801	7202
Below Normal	2295	3200	3280	3681	3678	2046	1845	1449	1202	1897	1703	2201	2301	3200
Dry	1895	2600	2277	2668	2162	1746	1345	1052	1002	1697	1603	2101	1901	2600
Critical	1297	1679	1596	1805	1507	1295	995	995	1013	1506	1402	1500	1301	1701
Benchmark Vernalis Water Quality - mmhos (April and May values may not be reflective of split-month operations when objectives control)														
Wet	352	286	310	269	212	310	341	460	442	359	497	432	352	286
Above Normal	404	380	465	364	334	486	509	534	588	494	657	639	404	380
Below Normal	757	631	690	465	382	700	700	700	680	510	681	657	757	631
Dry	880	736	1000	700	700	700	700	700	772	547	708	678	880	736
Critical	1000	1000	1000	700	700	700	700	700	772	595	772	859	1000	1000
Change in Vernalis Water Quality with Action - mmhos (April and May values may not be reflective of split-month operations when objectives control)														
Wet	-1	-3	-1	-2	-3	-4	-6	-8	-7	-2	0	0	0	0
Above Normal	-1	-5	-2	-4	-6	-13	-12	-11	-11	-3	0	0	0	0
Below Normal	-2	-15	-3	-6	-8	0	0	0	-11	-2	0	0	0	0
Dry	-2	-18	0	-3	-5	0	0	0	-9	-2	0	0	0	1
Critical	-2	0	0	0	0	0	0	0	-1	0	0	0	0	0
With-Action Vernalis Water Quality - mmhos (April and May values may not be reflective of split-month operations when objectives control)														
Wet	351	283	309	267	209	306	335	453	435	357	497	432	352	286
Above Normal	403	375	463	360	327	473	497	523	578	491	657	639	404	380
Below Normal	755	617	687	459	374	700	700	700	669	507	681	657	757	632
Dry	877	718	1000	697	695	700	700	700	763	545	707	678	880	736
Critical	998	1000	1000	700	700	700	700	700	771	595	772	859	1000	1000

New Melones

Incremental Change in NM Storage due to WQ Release Change - Acre-feet	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Total
Wet	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Above Normal	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Below Normal	0	0	0	0	0	1425	1888	1332	0	0	0	0	0	0	4,645
Dry	0	0	222	776	975	1425	1888	1163	0	0	0	0	0	0	6,449
Critical	0	386	47	-12	30	260	350	223	0	0	0	0	0	14	1,296
Incremental Change in NM Storage due to Vernalis Flow Release Change - Acre-feet															
Wet	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Above Normal	0	0	0	0	0	-1760	0	0	0	0	0	0	0	0	-1,760
Below Normal	0	-1834	0	0	0	0	0	0	0	0	0	0	0	117	-1,717
Dry	0	-1834	0	0	0	0	0	0	0	0	0	0	0	117	-1,717
Critical	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Net Incremental Change in NM Storage due to Vernalis Flow & Quality Release Change - Acre-feet															
Wet	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Above Normal	0	0	0	0	0	-1760	0	0	0	0	0	0	0	0	-1,760
Below Normal	0	-1834	0	0	0	1425	1888	1332	0	0	0	0	0	117	2,928
Dry	0	-1834	222	776	975	1425	1888	1163	0	0	0	0	0	117	4,732
Critical	0	386	47	-12	30	260	350	223	0	0	0	0	0	14	1,296

Project Delta Supply

Total Potential Delta supply Impact w/o NM Adjustments - Acre-feet	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Total
Wet	0	-642	0	0	0	0	-1474	-1812	0	0	0	0	0	41	-3,887
Above Normal	0	-642	0	0	0	-1760	-1474	-1812	0	0	0	0	0	41	-5,648
Below Normal	0	-642	0	0	0	-1760	-1474	-1812	0	0	0	0	0	41	-5,648
Dry	0	-642	-423	-199	-1356	-1760	-1474	-1812	138	-190	0	0	0	41	-7,677
Critical	0	-779	-226	312	462	-30	12	-115	773	372	100	0	0	61	942
New Melones Adjustments - Acre-feet (positive means increase in supply)															
Wet	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Above Normal	0	0	0	0	0	1760	0	0	0	0	0	0	0	0	1,760
Below Normal	0	642	0	0	0	-1425	-1888	-1332	0	0	0	0	0	-41	-4,044
Dry	0	642	-78	-272	-975	-1425	-1888	-1163	0	0	0	0	0	-41	-5,200
Critical	0	-386	-47	12	-30	-260	-350	-223	0	0	0	0	0	-14	-1,296
Incremental Change in Project Delta Supply due to Action - Acre-feet															
Wet	0	-642	0	0	0	0	-1474	-1812	0	0	0	0	0	41	-3,887
Above Normal	0	-642	0	0	0	0	-1474	-1812	0	0	0	0	0	41	-3,887
Below Normal	0	0	0	0	0	-3186	-3362	-3144	0	0	0	0	0	0	-9,692
Dry	0	0	-501	-470	-2331	-3186	-3362	-2976	138	-190	0	0	0	0	-12,877
Critical	0	-1165	-273	325	432	-289	-338	-337	773	372	100	0	0	47	-354

Study: C-3-3-C: 130 FALLOWING OUT COMPOSITE — Water Development and Disposition Assumptions

All Values Relative to Benchmark (Existing) Condition

Disposition Non-Crit	Disposition Crit		SJR Continuity Non-Crit	SJR Continuity Crit		SJR Non-Continuity Non-Crit	SJR Non-Continuity Crit	
-33588	0	Agriculture-SJRc	0	0	Conservation of Evaporation/Seepage to GW-SJRc	0	0	Conservation of Evaporation/Seepage to GW-SJRnc
0	0	Wildlife Areas-SJRc	0	0	Conservation of Drain Spills to Wildlife Areas-SJRc	0	0	Conservation of Drain Spills to Wildlife Areas-SJRnc
0	0	Urban-SJRc	-6000	0	Groundwater-SJRc	0	0	Groundwater-SJRnc
122615	50000	Agriculture-SJRnc	15465	0	Tailwater Recapture-SJRc	900	0	Tailwater Recapture-SJRnc
0	0	Wildlife Areas-SJRnc	42000	42000	Fallowing -SJRc	8000	8000	Fallowing-SJRnc
0	0	Urban-SJRnc						
0	0	EWA						

	Non-Crit	Crit
Total Developed Water:	60365	50000
Total Disposition:	89027	50000

All Values Relative to Benchmark (Existing) Condition — Basic Hydrologic Accounting

		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Total
Water Developed - Non Critical Years																
Change in Evaporation/Seepage to GW		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Change in Drain Spills to Wildlife Areas		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Change in Discharge to SJR Streams		141	1054	1054	1757	2285	2285	2285	2285	1406	914	0	0	0	0	15,465
Change to Flows Upstream of Sack Dam		0	45	90	90	99	144	162	162	72	27	9	0	0	0	900
Crop Fallowing		1031	4639	5155	344	687	10653	14433	12715	344	0	0	0	0	0	50,000
Groundwater		0	0	0	-750	-840	-990	-1200	-900	-600	-600	-120	0	0	0	-6,000
Total		1172	5739	6299	1441	2231	12092	15680	14261	1222	341	-111	0	0	0	60,365
Effects to SJR Flows due to Developing Water - Non Critical Years																
Change in Evaporation/Seepage to GW		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Change in Drain Spills to Wildlife Areas		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Change in Discharge to SJR Streams		141	1054	1054	1757	2285	2285	2285	2285	1406	914	0	0	0	0	15,465
Change to Flows Upstream of Sack Dam		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Crop Fallowing		173	779	303	20	40	626	849	748	58	0	0	0	0	0	3,597
Groundwater		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total (Positive value means flow reduced)		314	1834	1358	1778	2325	2911	3133	3032	1464	914	0	0	0	0	19,062
Return Flows from Disposition of Transfer Water - Non Critical Years																
Incremental Return from Agricultural Transferees		0	0	-52	-223	-338	-401	-578	-425	-558	-250	-67	-17	-23	-41	-2,972
Incremental Return from Wildlife Area Transferees		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Envirnomental Water Account Beneficiaries																
Incremental Return from Agricultural Entities		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total		0	0	-52	-223	-338	-401	-578	-425	-558	-250	-67	-17	-23	-41	-2,972
Net Effect to San Joaquin River Flow Before NM Adjustment	(Acre-feet)	-314	-1834	-1409	-2001	-2663	-3312	-3711	-3457	-2022	-1164	-67	-17	-23	-41	-22,034
(Positive value means flow added)	(cfs)	-5	-33	-23	-34	-43	-56	-60	-56	-34	-19	-1	0	0	-1	0
Water Developed - Critical Years																
Change in Evaporation/Seepage to GW		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Change in Drain Spills to Wildlife Areas		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Change in Discharge to SJR Streams		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Change to Flows Upstream of Sack Dam		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Crop Fallowing		1031	4639	5155	344	687	10653	14433	12715	344	0	0	0	0	0	50,000
Groundwater		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total		1031	4639	5155	344	687	10653	14433	12715	344	0	0	0	0	0	50,000
Effects to SJR Flows due to Developing Water - Critical Years																
Change in Evaporation/Seepage to GW		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Change in Drain Spills to Wildlife Areas		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Change in Discharge to SJR Streams		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Change to Flows Upstream of Sack Dam		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Crop Fallowing		173	779	303	20	40	626	849	748	58	0	0	0	0	0	3,597
Groundwater		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total (Positive value means flow reduced)		173	779	303	20	40	626	849	748	58	0	0	0	0	0	3,597
Return Flows from Disposition of Transfer Water - Critical Years																
Incremental Return from Agricultural Transferees		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Incremental Return from Wildlife Area Transferees		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Envirnomental Water Account Beneficiaries																
Incremental Return from Agricultural Entities		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Net Effect to San Joaquin River Flow Before NM Adjustment	(Acre-feet)	-173	-779	-303	-20	-40	-626	-849	-748	-58	0	0	0	0	0	-3,597
(Positive value means flow added)	(cfs)	-3	-14	-5	0	-1	-11	-14	-12	-1	0	0	0	0	0	0

Vernalis

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb
Benchmark Vernalis Flow - cfs														
Wet	7500	13600	15700	13600	12000	7400	5100	3100	2500	3600	3000	4600	7500	13600
Above Normal	5800	7200	6200	5900	4600	2600	2100	2000	1500	2000	1800	2300	5800	7200
Below Normal	2300	3200	3300	3700	3700	2100	1900	1500	1200	1900	1700	2200	2300	3200
Dry	1900	2600	2300	2700	2200	1800	1400	1100	1000	1700	1600	2100	1900	2600
Critical	1300	1700	1600	1800	1500	1300	1000	1000	1000	1500	1400	1500	1300	1700
Change in Vernalis Flow with Action - cfs														
Wet	-5	-33	-23	-34	-43	-56	-60	-56	-34	-19	-1	0	0	-1
Above Normal	-5	-33	-23	-34	-43	0	-60	-56	-34	-19	-1	0	0	-1
Below Normal	-5	0	-23	-34	-43	-71	-74	-68	-34	-19	-1	0	0	0
Dry	-5	0	-25	-46	-57	-71	-74	-69	-34	-19	-1	0	0	0
Critical	-3	-21	-6	0	-1	-14	-19	-16	-1	0	0	0	0	0
With-Action Vernalis Flow - cfs														
Wet	7495	13567	15677	13566	11957	7344	5040	3044	2466	3581	2999	4600	7500	13599
Above Normal	5795	7167	6177	5866	4557	2600	2040	1944	1466	1981	1799	2300	5800	7199
Below Normal	2295	3200	3277	3666	3657	2029	1826	1432	1166	1881	1699	2200	2300	3200
Dry	1895	2600	2275	2654	2143	1729	1326	1031	966	1681	1599	2100	1900	2600
Critical	1297	1679	1594	1800	1499	1286	981	984	999	1500	1400	1500	1300	1700
Benchmark Vernalis Water Quality - mmhos (April and May values may not be reflective of split-month operations when objectives control)														
Wet	352	286	310	269	212	310	341	460	442	359	497	432	352	286
Above Normal	404	380	465	364	334	486	509	534	588	494	657	639	404	380
Below Normal	757	631	690	465	382	700	700	700	680	510	681	657	757	631
Dry	880	736	1000	700	700	700	700	700	772	547	708	678	880	736
Critical	1000	1000	1000	700	700	700	700	700	772	595	772	859	1000	1000
Change in Vernalis Water Quality with Action - mmhos (April and May values may not be reflective of split-month operations when objectives control)														
Wet	-1	-3	-1	-2	-3	-4	-6	-7	-6	-2	0	0	0	0
Above Normal	-1	-5	-2	-5	-7	-18	-10	-8	-7	-3	0	0	0	0
Below Normal	-2	-15	-3	-6	-9	0	0	0	-7	-3	0	0	0	0
Dry	-2	-18	0	-3	-4	0	0	0	-6	-3	0	0	0	0
Critical	-2	0	0	0	0	0	0	0	0	0	0	0	0	0
With-Action Vernalis Water Quality - mmhos (April and May values may not be reflective of split-month operations when objectives control)														
Wet	351	283	309	266	209	306	335	454	436	357	497	432	352	286
Above Normal	403	375	463	360	326	469	500	525	582	491	657	639	404	380
Below Normal	755	617	688	459	373	700	700	700	673	506	681	657	757	631
Dry	877	718	1000	697	696	700	700	700	766	544	708	678	880	736
Critical	998	1000	1000	700	700	700	700	700	771	595	772	859	1000	1000

New Melones

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Total
Incremental Change in NM Storage due to WQ Release Change - Acre-feet															
Wet	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Above Normal	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Below Normal	0	0	0	0	0	900	821	700	0	0	0	0	0	0	2,420
Dry	0	0	156	709	819	900	821	758	0	0	0	0	0	0	4,164
Critical	0	386	39	8	15	223	297	213	0	0	0	0	0	0	1,180
Incremental Change in NM Storage due to Vernalis Flow Release Change - Acre-feet															
Wet	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Above Normal	0	0	0	0	0	-3312	0	0	0	0	0	0	0	0	-3,312
Below Normal	0	-1834	0	0	0	0	0	0	0	0	0	0	0	-41	-1,875
Dry	0	-1834	0	0	0	0	0	0	0	0	0	0	0	-41	-1,875
Critical	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Net Incremental Change in NM Storage due to Vernalis Flow & Quality Release Change - Acre-feet															
Wet	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Above Normal	0	0	0	0	0	-3312	0	0	0	0	0	0	0	0	-3,312
Below Normal	0	-1834	0	0	0	900	821	700	0	0	0	0	0	-41	546
Dry	0	-1834	156	709	819	900	821	758	0	0	0	0	0	-41	2,290
Critical	0	386	39	8	15	223	297	213	0	0	0	0	0	0	1,180

Project Delta Supply

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Total
Total Potential Delta supply Impact w/o NM Adjustments - Acre-feet															
Wet	0	-642	0	0	0	0	-3711	-3457	0	0	0	0	0	-14	-7,825
Above Normal	0	-642	0	0	0	-3312	-3711	-3457	0	0	0	0	0	-14	-11,136
Below Normal	0	-642	0	0	0	-3312	-3711	-3457	0	0	0	0	0	-14	-11,136
Dry	0	-642	-493	-350	-2663	-3312	-3711	-3457	-2022	-1126	0	0	0	-14	-17,790
Critical	0	-779	-303	-20	-40	-626	-849	-748	-58	0	0	0	0	0	-3,424
New Melones Adjustments - Acre-feet (positive means increase in supply)															
Wet	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Above Normal	0	0	0	0	0	3312	0	0	0	0	0	0	0	0	3,312
Below Normal	0	642	0	0	0	-900	-821	-700	0	0	0	0	0	14	-1,764
Dry	0	642	-55	-248	-819	-900	-821	-758	0	0	0	0	0	14	-2,946
Critical	0	-386	-39	-8	-15	-223	-297	-213	0	0	0	0	0	0	-1,180
Incremental Change in Project Delta Supply due to Action - Acre-feet															
Wet	0	-642	0	0	0	0	-3711	-3457	0	0	0	0	0	-14	-7,825
Above Normal	0	-642	0	0	0	0	-3711	-3457	0	0	0	0	0	-14	-7,825
Below Normal	0	0	0	0	0	-4212	-4532	-4157	0	0	0	0	0	0	-12,901
Dry	0	0	-548	-598	-3482	-4212	-4532	-4216	-2022	-1126	0	0	0	0	-20,736
Critical	0	-1165	-342	-28	-55	-849	-1146	-960	-58	0	0	0	0	0	-4,604

WETMANSIM Model Update

Nigel W.T. Quinn, Ph.D., P.E.

April 21, 2004

Mr Dan Meier
Water Acquisition Program
US Bureau of Reclamation
2800 Cottage Way
Sacramento, CA 95825

April 21, 2004

Dear Dan :

I recently completed an update of analysis I performed in 1997 related to potential water quality impacts in the San Joaquin River resulting from the delivery of Level IV water supply to refuges and private wetlands in the San Joaquin Basin. This update replaces two spreadsheet models; my original spreadsheet model developed in 1997 and a subsequent version published by Ch2M-Hill which presented the same basic data in a revised format. I chose to return to the original spreadsheet format in this new work, finding it easier to follow and explain, and have given it a name - WETMANSIM (Wetland Management Simulator). The model is being copyrighted and is currently in version 0.95.

The WETMANSIM model addresses some deficiencies in the previous spreadsheet models.

- Wetland flooded area was static – leading to potential errors in wetland evaporation, seepage and return flow volume.
- Water delivery estimates and land use were based on figures published in the San Joaquin Basin Action Plan, which are now out of date.
- Little time was spent talking to wetland managers and the water masters responsible for water operations in the federal, state and private wetland areas.

The current model reflects current operations in the federal, state and private wetland areas as provided by the following individuals :

- Scott Lower: Water Master, Grassland Water District
- Dale Garrison: Refuge Water Supply Coordinator, US Fish and Wildlife Service
- Bill Cook: Refuge Manager, Los Banos State Wildlife Area, California Department of Fish and Game
- John Beam: Refuge Supervisor, California Department of Fish and Game
- Paul Forsberg: Refuge Water Supply Coordinator, California Department of Fish and Game

This information was conveyed in early March 2004 during a number of working sessions, organized in both Sacramento and Los Banos. The working group decided on an average flood-up and drainage cycle for seasonal managed wetlands, average monthly seepage and evaporation estimates and how the supplemental Level IV water supply (water supply in addition to the base, Level –II allocation)was typically distributed by month. By "coloring" this supplemental water supply it becomes clearer how this additional water is used within the wetland areas. Determination of when Level IV water supply is used on these seasonal wetland areas makes it easier to assess potential water quality impacts. Developing a consensus on this issue was an important outcome of this planning effort and has resulted in a more realistic planning tool.

Attached is a summary of assumptions that went into the development of WETMANSIM. This summary follows the parameter listing in each spreadsheet and follows the computational logic within the spreadsheet.

Please call me at 510 486-7056 or e-mail me at nwquinn@lbl.gov with any questions about the spreadsheet model or the model description.

Sincerely

Nigel W.T. Quinn, PhD, P.E.
Group Leader, Hydrologic Engineering Advanced Decision Support
Berkeley National Laboratory

WETMANSIM ASSUMPTIONS

parameter	units	Aug-Mar	Annual
1. flooded Surface Area	acres	2293	
2. ETO loss inches per month	inches		
3. mean rainfall	inches	6.9	9.4
4. porosity	percent	0.2	0.2
5. target pond depth	inches	9.1	6.2
6. fillable vadose zone depth	inches	6.9	8.6
7. potential seepage loss	inches	9.6	20.6
8. applied water - LEVEL-2/4	acre-feet	19000	19000
9. non-district inflow	acre-feet	0	0
10. flood wetlands	inches	80.5	80.5
11. make-up water	inches	42.7	42.7
12. applied irrigation	inches	0.0	10.5
13. end of month storage	inches		
14. wetland release	inches	76.2	84.8
15. runoff/ag spill & drainage	inches		
16. released/applied	percent		
17. EC of supply water	uS/cm		
18. TDS supply water	(mg/L)	603	645
19. TDS wetland discharge	(mg/l)	706	898
20. TDS ag runoff	(mg/l)		
21. total wetland discharge	acre-feet	10,387	11,540
22. wetland discharge salt load	(tons)	9,969	14,099
23. combined discharge to SJR	acre-feet	10,387	11,540
24. combined discharge TDS	(mg/l)	706	898

1. The flooded surface area was obtained from the wetland water managers for each wetland unit. This represents the best guess for a normal water year of the acreage of ponded water during each month. Scott Lower provided these numbers for the GWD, Dale Garrison for the federal Refuges and Bill Cook for the State Wildlife Areas. Wetland units are defined as follows : Grassland WD is considered one wetland unit combining the North and South Grassland WD wetland areas; San Luis National Wildlife Refuge Complex is divided into San Luis, West Bear Creek, East Bear Creek, Freitas, Salt Slough and Kesterson wetland units; Los Banos WMA, Volta WMA and China island WMA are considered separate wetland units.
2. ET0 is the potential monthly water loss from each flooded wetland. The average ET0 for the whole Grassland Ecological Area was provided by Scott Lower.
3. Mean monthly rainfall. This estimate is based on rainfall records from CIMIS stations in Panoche Water District and at Kesterson NWR and was supplied by Scott Lower.
4. Porosity. This parameter is used to help estimate the amount of water that is required to displace the air-filled pores in the vadose zone of the regional aquifer. A higher porosity of 0.3-0.4, typical of sands, would require more water to fill and thus the

wetland would exhibit greater water losses during flood-up. Monthly seepage would also be high and reach a steady-state once the initial flooding had filled all available pores. A value of 0.2 was used for most wetlands – which is indicate of a tighter soil with a high clay fraction.

5. Pond depth. The monthly average pond depth in seasonal wetlands will rise during flood-up to a level known as "shooting depth" (about 12 inches), which is a water depth that attracts diving ducks and other bottom-feeding waterfowl. This depth was assumed to be the average ponding depth once flood-up was completed.
6. Fillable vadose zone depth. This depth specifies the depth of the vadose zone and therefore help to define the volume of fillable pores that must be filled before water can pond on the surface.
7. Potential seepage loss. This is calculated as : fillable vadose zone depth * porosity. It is the estimated depth of surface applied water that will move into the groundwater in any given month.
8. Applied water. The volume of water (acre-ft) diverted from surface channels and applied as groundwater to each wetland area. This quantity is greater for level IV water supply since it includes water allocated under CVPIA. Most incremental Level IV water is applied during the summer months and not uniformly distributed over the year. Monthly surface applied water for Level II and Level IV was developed in a series of open discussions including Scott Lower from GWD, Bill Cook and John Beam from CDFG and Dale Garrison from USFWS. Much of the discussion centered around coloring the water to determine which allocation of water was being used each month. Level IV water used after the month of April will less impact of South Delta agriculture than Level IV water used between Feb 1 and April 30.
9. Non-district inflow. The volume of return flows from adjacent agricultural land. This mostly applies to return flows from CCID and San Luis Canal Company that have historically been conveyed through Grassland WD channels. These flows are occasionally used in GWD and supplement Reclamation water deliveries to the District. Scott Lower provided these average volumes of non-project inflow.
10. Flood wetlands. The depth of water applied to the average flooded area during each month during flood-up. For ease of accounting the spreadsheet begins in August. In most years flood-up occurs in September to minimize evaporative losses that would occur if flood-up occurred earlier. Shooting depth is achieved at different times in different parts of each wetland area. It is used as a calibration variable in the spreadsheet model.
11. Make-up water. The depth of water added after initial flood-up to bring water level to the desired average depth within each wetland management area.
12. Applied irrigation. The depth of water applied in the late spring and early summer months after initial drawdown to encourage the propogation of desireable moist soil plants. These quantities were supplied by the water masters, Scott Lower for GWD, Bill Cook for CDFG and Dale Garrison to USFWS.
13. End of month storage. A calculated water depth equivalent to the remaining depth of water after accounting for inflows and outflows to the wetland management area : EOMS = flood wetlands + mean rainfall – potential evapotranspiration – seepage loss – target pond depth.
14. Wetland release. Calculated depth of water equivalent to the remainder when the monthly target pond depth is subtracted from the end of month storage depth. Is the equivalent depth of water returned to Mud or Salt Slough which discharge to the San Joaquin River. This can be converted to a volume by multiplying by the monthly average flooded surface area.

15. Runoff / ag spill. This water depth refers to any return flows generated during wetland irrigation. This volume is typically small owing to high evaporation during the late spring and early summer months.
16. Released/applied. The ratio of released water to water applied is expressed as a percentage. This is an index of wetland flushing – a higher percentage indicates a greater amount of wetland flushing.
17. EC of supply water. Most water applied to seasonal and permanent wetlands in the Grassland Ecological Area, other than groundwater pumping, derives from the Delta and is delivered via the Delta Mendota Canal. This EC is the average salinity (measured in umhos/cm) of the supply water. The monthly EC values were based on monitoring conducted by Quinn and others in the Volta wasteway and on personal observation of Scott Lower.
18. TDS of supply water. The ratio of EC to TDS varies depending on the salt composition of the water. For Delta water an average factor of 0.64 is used to convert EC to TDS.
19. TDS wetland discharge. Water ponded in seasonal and permanent wetlands is subject to evaporation resulting from wind energy and heat which remove pure water leaving saltier water behind. Dust and bird excreta also add to wetland salt loads. Evaporation increases in the summer months when temperatures are higher resulting in elevated wetland TDS concentrations.
20. TDS agricultural runoff. In cases where summer irrigation results in drainage runoff - the salinity of this runoff is elevated owing to dissolution of surface salts and solubilized bird guano. Runoff was assumed negligible in the model.
21. Total wetland discharge. Obtained by multiplying the wetland release depth of water by the flooded surface area.
22. Wetland discharge salt load. Obtained by multiplying the total wetland discharge (calculated in 21) by the TDS of wetland discharge and adjusting the total using a conversion factor to convert acre-ft * mg/l to tons of salt.
23. Combined discharge to the SJR. This number should be the same as 19 except in the case of the GWD where the return flow is a blend of the GWD wetland return flow and the surface return flows conveyed through GWD channels from CCID and SLCC. The return flows from these Exchange Contractors typically improve the wetland drainage water quality providing dilution.
24. Combined discharge TDS. This also applies only to GWD and is the blended water quality when the wetland discharges and the agricultural surface return flows are combined.

Appendix C
Special-Status Species with the Potential to Occur in the Project Area

Table C-1
Special-Status Species with the Potential to Occur in the Project Area

Common Name	Scientific Name	Status			Potential Occurrence in the Study Area[d]											
		Federal[a]	State[b]	CNPS[c]	Fresno County	Kern County	Kings County	Merced County	Monterey County	Santa Cruz County	San Benito County	San Joaquin County	Stanislaus County	Madera County	Santa Clara County	Tulare County
PLANTS																
Akali mariposa lily	*Calochortus striatus*	SC	None	1B		X										
Alkali milk-vetch	*Astragalus tener* var. *tener*	None	None	1B				X				X	X		X	
Alkalli mariposa lily	*Calochortus striatus*	SC	None	1B												X
Alpine sterptanthus	*Streptanthus gracilis*	SC	None	1B	X											X
Arburua Ranch jewelflower	*Streptanthus insignis* ssp. *lyonii*	SC	None	1B				X								
Arcuate bush mallow	*Malacothamnus arcutatus*	SLC	None	1B											X	
Aromatic canyon gooseberry	*Ribes menziesii* var. *ixoderme*	SLC	None	1B	X	X										X
Bakersfield cactus	*Opuntia treleasei*	E	None	None		X										
Bakersfield saltbush	*Atriplex tularensis*	None	E	1B		X										
Beach layia	*Layia carnosa*	E							X							
Beaked clarkia	*Clarkia rostrata*	SC	None	1B				X								
Beaked clarkia	*Clarkia rostrata*	SC	None	1B									X			
Beaked clarkia	*Clarkia rostrata*	SC	None	1B									X			
Ben Lomond buckwheat	*Eriogonum nudum* var. *decurrents*	SC	None	1B											X	

Table C-1 (continued)

Common Name	Scientific Name	Status			Potential Occurrence in the Study Area[d]											
		Federal[a]	State[b]	CNPS[c]	Fresno County	Kern County	Kings County	Merced County	Monterey County	Santa Cruz County	San Benito County	San Joaquin County	Stanislaus County	Madera County	Santa Clara County	Tulare County
Ben Lomond spineflower	*Chorizanthe pungens* var. *hartwegiana*	E	None	1B						X						
Ben Lomond wallflower	*Erysimum teretifolium*	E	E	1B						X						
Big tarplant	*Blepharizonia plumosa* ssp. *plumosa*	SC	None	1B								X	X			
Big-scale balsamroot	*Balsamorhiza macrolepis* var. *macrolepis*	SLC	None	1B											X	
Bodie Hills rock cress	*Arabis bodiensis*	SC	None	1B	X											X
Boggs Lake hedge-hyssop	*Gratiola heterosepala*	None	E	1B	X			X				X		X		
Brandegee's wooly-star	*Eriastrum brandegeae*	SC	None	1B											X	
Brittlescale	*Atriplex depressa*	SC	None	1B	X	X			X				X	X		X
Cache Peak buckwheat	*Eriogonum kennedyi* var. *pinicola*	SC	None	1B		X										
Calico monkeyflower	*Mimulus pictus*	SC	None	1B		X										X
Caliente clarkia	*Clarkia tembloriensis* ssp. *Calientensis*	SC	None	1B		X										
California jewelflower	*Aulanthus californicus*	E	None	None	X	X	X									X

Table C-1 (continued)

Common Name	Scientific Name	Status			Potential Occurrence in the Study Area[d]											
		Federal[a]	State[b]	CNPS[c]	Fresno County	Kern County	Kings County	Merced County	Monterey County	Santa Cruz County	San Benito County	San Joaquin County	Stanislaus County	Madera County	Santa Clara County	Tulare County
California pterygoneurum moss	*Pterygoneurum californicum*	SC	None	None		X										
California seablite	*Suaeda californica*	E	None	1B											X	
California tortula moss	*Tortula californica*	SLC	None	None		X										
Capper-fruited tropidocarpum	*Tropidocarpum capparideum*	SC	None	1A								X			X	
Carpenteria	*Carpenteria californica*	SC	T	1B	X									X		
Carrizo (=Jared's) peppergrass	*Lepidium jaredii* var. *jaredii*	SC	None	1B		X										
Chaparral harebell	*Campanula exigua*	SLC	None	1B									X		X	
Charlotte's phacelia	*Phacelia nashiana*	SC	None	1B		X										X
Clustered lady's-slipper	*Cypripedium fasciculatum*	SC	None	4											X	
Coastal dunes milk vetch	*Astragulus tener* var. *titi*	E	E	1B					X							
Colusa grass	*Neostapfia colusana*	T	E	1B				X					X			
Comanche layia	*Layia leucopappa*	SC	None	1B		X										
Common moonwort	*Botrychium lunaria*	SC	None	2										X		
Congdon's tarplant	*Hemizonia parryi* ssp. *congdonii*	SC	None	None											X	

Table C-1 (continued)

Common Name	Scientific Name	Status			Potential Occurrence in the Study Area[d]											
		Federal[a]	State[b]	CNPS[c]	Fresno County	Kern County	Kings County	Merced County	Monterey County	Santa Cruz County	San Benito County	San Joaquin County	Stanislaus County	Madera County	Santa Clara County	Tulare County
Contra Costa goldfields	*Lasthenia conjugens*	E	None	1B					X						X	
Cottony buckwheat	*Eriogonum gossypinum*	SLC	None	4	X		X									
Coyote ceanothus	*Ceanothus ferrisae*	E	None	1B											X	
Curly-leaved monardella	*Monardella undulata*	SC	None	4											X	
Dedecker's lupine	*Lupinus padre-crowleyi*	SC	R	1B												X
Delta coyote-thistle	*Eryngium racemosum*	SC	E	1B								X	X			
Delta coyote-thistle	*Eryngium racemosum*	SC	E	1B				X								
Delta tule pea	*Lathyrus jepsonii* var. *jepsonii*	SC	None	1B	X										X	
Delta tule pea	*Lathyrus jepsonii* var. *jepsonii*	SC	None	1B								X				
Diamond-petaled California poppy	*Eschscholzia rhombipetala*	SC	None	1B									X			
Diamond-petaled California poppy	*Eschscholzia rhombipetala*	SC	None	1B		X										
Dwarf calycadenia	*Calycadenia villosa*	SC	None	1B		X										

Table C-1 (continued)

Common Name	Scientific Name	Status			Potential Occurrence in the Study Area[d]											
		Federal[a]	State[b]	CNPS[c]	Fresno County	Kern County	Kings County	Merced County	Monterey County	Santa Cruz County	San Benito County	San Joaquin County	Stanislaus County	Madera County	Santa Clara County	Tulare County
Earlimart orache	*Atriplex erecticaulis*	SLC	None	1B		X	X									X
Ewan's larkspur	*Delphinium hansenii* ssp. *ewanianum*	SC	None	4										X		X
Field ivesia	*Ivesia campestis*	SLC	None	1B	X											X
Flax-like monardella	*Monardella linoides* ssp. *oblonga*	SC	None	1B		X										X
Forked fiddleneck	*Amsinckia vernicosa* var. *furcata*	SLC	None	4	X	X	X									
Fragrant fritillary	*Fritillaria liliacea*	SC	None	1B											X	
Fragrant fritillary	*Fritillaria liliacea*	SC	None	1B											X	
Franciscan onion	*Allium peninsulare* var. *francisanum*	SLC	None	1B											X	
Fresno County bird's-beak	*Cordylanthus tenuis* ssp. *barbatus*	SC	None	4	X											
Ft. Tejon woolly-sunflower	*Erioiphyllum lanatum* var. *hallllii*	SC	None	1B		X										
Gairdner's yampah	*Perideridi gairdneri* ssp. *gairdneri*	SC	None	4		X									X	

Table C-1 (continued)

Common Name	Scientific Name	Status			Potential Occurrence in the Study Area[d]											
		Federal[a]	State[b]	CNPS[c]	Fresno County	Kern County	Kings County	Merced County	Monterey County	Santa Cruz County	San Benito County	San Joaquin County	Stanislaus County	Madera County	Santa Clara County	Tulare County
Gowen cypress	*Cupressus goveniana* ssp. *goveniana*	T	None	1B					X							
Greene's popcorn flower	*Plagiobothrys reticulatus* var. *rossianorum*	SC	None	None		X									X	
Greene's tuctoria	*Tuctoria greenei*	E	R	1B	X			X				X	X	X		X
Greenhorn adobe-lily	*Fritillaria striata*	None	T	1B		X										X
Hairless allocarya	*Plagiobothrys glaber*	SC	None	1A				X							X	
Hairy Orcutt grass	*Orcuttia pilosa*	E	E	1B				X					X	X		
Hall's bush mallow	*Malacothamnus hallii*	SLC	None	1B				X							X	
Hall's bush mallow	*Malacothamnus hallii*	SC	None	1B									X			
Hall's tarplant	*Deinandra halliana*	SC	None	1B	X	X										
Hartweg's golden sunburst	*Pseudobahia bahiifolia*	E	E	1B	X								X	X		
Heartscale	*Atriplex cordulata*	SC	None	1B	X	X	X		X			X	X	X		X
Henderson's bent grass	*Agrostis hendersonii*	SC	None	3				X								
Hispid bird's-beak	*Cordylanthus mollis* ssp. *hispidus*	SCq	None	1B		X		X								

Table C-1 (continued)

Common Name	Scientific Name	Status			Potential Occurrence in the Study Area[d]											
		Federal[a]	State[b]	CNPS[c]	Fresno County	Kern County	Kings County	Merced County	Monterey County	Santa Cruz County	San Benito County	San Joaquin County	Stanislaus County	Madera County	Santa Clara County	Tulare County
Hoover's button-celery	*Eryngium aristulatum* var. *hooveri*	SC	None	1B											X	
Hoover's calycadenia	*Calycadenia hooveri*	SLC	None	1B				X					X	X		
Hoover's cryptantha	*Cryptantha hooveri*	SLC	None	1B				X				X	X	X		
Hoover's eriastrum	*Eriastrum hooveri*	D	None	4	X	X	X				X					X
Hoover's spurge	*Chamaesyce hooveri*	T	None	1B				X								X
Indian Valley bush mallow	*Malacothamnus aboriginum*	SLC	None	1B	X											
Interior California larkspur	*Delphinium californicum* ssp. *interius*	SC	None	1B		X		X				X			X	
Kaweah brodiaea	*Brodiaea insignis*	None	E	1B												X
Kaweah Lakes fawn-lily	*Erythronium grandiflorum* ssp. *pusaterii*	SLC	None	None												X
Keck's checker-mallow	*Sidalcea keckii*	E	None	1B	X	X										X
Kelso Creek monkeyflower	*Mimulus shevockii*	SC	None	1B		X										
Kern Canyon clarkia	*Clarkia xaniana*	SLC	None	1B		X										
Kern mallow	*Eremaiche kernensis*	E	None	1B		X										

Table C-1 (continued)

Common Name	Scientific Name	Status			Potential Occurrence in the Study Area[d]											
		Federal[a]	State[b]	CNPS[c]	Fresno County	Kern County	Kings County	Merced County	Monterey County	Santa Cruz County	San Benito County	San Joaquin County	Stanislaus County	Madera County	Santa Clara County	Tulare County
Kern Plateau milk-vetch	*Astragalus lentiginosus* var. *kernensis*	SLC	None	1B												X
Kern River daisy	*Erigeron multiceps*	SC	None	1B	X											X
Kernville poppy	*Eschscholzia procera*	SC	None	3		X										
King's gold	*Twisselmannia californica*	SC	None	1B		X	X									
Kings Mountain manzanita	*Arctostaphylos regismontana*	SLC	None	1B											X	
Kings River buckwheat	*Eriogonum nudum* var. *regirivum*	SC	None	1B	X											
Large-flowered fiddleneck	*Amsinckia grandiflora*	E	E	1B								X				
Large-flowered linanthus	*Linanthus grandiflorus*	SC	None	4				X						X	X	
Legenere	*Legenere limosa*	SC	None	1B									X			
Lemmon's jewelflower	*Caulanthus coulteri* var. *lemmonii*	SLC	None	1B	X	X	X					X	X			
Lesser saltscale	*Atriplex minuscula*	SC	None	1B	X	X		X						X		X
Little mousetail	*Myosurus minimus* ssp. *apus*	SC	None	3												X

Table C-1 (continued)

Common Name	Scientific Name	Status			Potential Occurrence in the Study Area[d]											
		Federal[a]	State[b]	CNPS[c]	Fresno County	Kern County	Kings County	Merced County	Monterey County	Santa Cruz County	San Benito County	San Joaquin County	Stanislaus County	Madera County	Santa Clara County	Tulare County
Livermore tarplant	*Deinandra bacigalupii*	SC	None	1B								X				
Loma Prieta hoia	*Hoita strobilina*	SC	None	1B											X	
Long-petaled lewisia	*Lewisia longipetala*	SC	None	1B	X											
Lost Hills saltbush	*Atriplex vallicola*	SC	None	1B	X	X	X	X								
Madera linanthus	*Linanthus serrulatus*	SLC	None	1B	X	X								X		X
Maple-leaved checkerbloom	*Sidalcea malachroides*	SLC	None	1B											X	
Mariposa pussy-paws	*Calyptridium pulchellum*	T	None	1B	X											
Mariposa pussy-paws	*Calyptridium pulchellum*	T	None	1B										X		
Mason's lilaeopsis	*Lilaeopsis masonii*	SC	R	1B								X				
Mason's nestraw	*Stylocline masonii*	SC	None	1B		X										
Menzie's wallflower	*Erysimum manziesii*	E	E	1B					X							
Merced monardella	*Monardella leucocephala*	SC	None	1A				X								
Merced phacelia	*Phacelia ciliata* var. *opaca*	SC	None	1B				X								
Metcalf Canyon jewelflower	*Streptanthus albidus* ssp. *albidus*	E	None	1B											X	
Monarch gilia	*Gilia yorkii*	SLC	None	1B	X											

Table C-1 (continued)

Common Name	Scientific Name	Status			Potential Occurrence in the Study Area[d]											
		Federal[a]	State[b]	CNPS[c]	Fresno County	Kern County	Kings County	Merced County	Monterey County	Santa Cruz County	San Benito County	San Joaquin County	Stanislaus County	Madera County	Santa Clara County	Tulare County
Mono Hot Springs evening primrose	*Camissonia sierrae* ssp. *alticola*	SC	None	1B	X									X		
Monterey spinfelower	*Chorizanthe pungens* var. *pungens*	T	None	1B						X						
Mouse buckwheat	*Eriogonum nudum* var. *murinum*	SC	None	1B	X											X
Mt. Diablo phacelia	*Phacelia phacelioides*	SC	None	1B											X	
Mt. Diablo phacelia	*Phacelia phacelioides*	SC	None	1B									X			
Mt. Hamilton coreopsis	*Coreopsis hamiltonii*	SC	None	1B									X		X	
Mt. Hamilton harebell	*Campanula sharsmithiae*	SC	None	1B									X		X	
Mt. Hamilton jewelflower	*Steptanthus callistus*	SLC	None	1B											X	
Mt. Hamilton lomatium	*Lomatium observatorium*	SLC	None	1B											X	
Mt. Hamilton lomatium	*Lomatium observatorium*	SLC	None	1B									X			
Mt. Hamilton thistle	*Cirsium fontinale* var. *campylon*	SC	None	1B									X		X	
Munz's tidy-tips	*Layia munzii*	SC	None	1B	X	X										
Napa western flax	*Hesperolinon serpentinum*	SC	None	1B									X			

Table C-1 (continued)

Common Name	Scientific Name	Status			Potential Occurrence in the Study Area[d]											
		Federal[a]	State[b]	CNPS[c]	Fresno County	Kern County	Kings County	Merced County	Monterey County	Santa Cruz County	San Benito County	San Joaquin County	Stanislaus County	Madera County	Santa Clara County	Tulare County
Nine Mile Canyon phacelia	*Phacelia novenmillensis*	SC	None	1B		X										X
Obovate-leaved thornmint	*Acanthomintha obovata* ssp. *obovata*	SC	None	4	X											
Oil neststraw	*Stylocline citroleum*	SC	None	1B		X										
Orange lupine	*Lupinus citrinus* var. *citrinus*	SC	None	1B	X									X		
Oregon meconella	*Meconella oregana*	SC	None	1B											X	
Owens Peak lomatium	*Lomatium shevockii*	SC	None	1B		X										
Pacific cordgrass	*Spartina foliosa*	SLC	None	None											X	
Pale-yellow layia	*Layia heterotricha*	SC	None	1B	X	X	X									
Palmate-bracted bird's beak	*Cordylathus palmatus*	E	E	1B	X							X		X		
Palmer's mariposa lily	*Calochortus palmeri* var. *palmeri*	SC	None	1B		X										
Panoche peppergrass	*Lepidium jaredii* var. *album*	SC	None	1B	X	X										
Parasol clover	*Trifolium bolanderi*	SC	None	1B	X									X		

Table C-1 (continued)

Common Name	Scientific Name	Status			Potential Occurrence in the Study Area[d]											
		Federal[a]	State[b]	CNPS[c]	Fresno County	Kern County	Kings County	Merced County	Monterey County	Santa Cruz County	San Benito County	San Joaquin County	Stanislaus County	Madera County	Santa Clara County	Tulare County
Pierpoint Springs liveforever	*Dudleya cymosa* ssp. *costafolia*	SC	None	1B												X
Pincushion navarretia	*Naverretia myersii spp. myersii*	SC	None	1B				X								
Piute buckwheat	*Eriogonum breedlovei* var. *breedlovei*	SC	None	4		X										
Piute cypress	*Cupressus nevadensis*	SC	None	None		X										X
Piute Mountains jewelflower	*Streptanthus cordatus* var. *piutensis*	SC	None	1B		X										
Piute Mountains navarretia	*Navaretia setiloba*	SC	None	1B		X										X
Point Reyes bird's-beak	*Cordylanthus maritimus* ssp. *palustris*	SC	None	1B											X	
Prostrate navarretia	*Navarretia prostrata*	SC	None	1B				X								
Purple mountain-parsley	*Oreonana purpurascens*	SLC	None	1B												X
Ramshaw sand-verbena	*Abronia alpina*	C	None	1B												X
Raven's milk-vetch	*Astragalus monoensis* var. *ravenii*	SC	None	1B	X											

Table C-1 (continued)

Common Name	Scientific Name	Status			Potential Occurrence in the Study Area[d]											
		Federal[a]	State[b]	CNPS[c]	Fresno County	Kern County	Kings County	Merced County	Monterey County	Santa Cruz County	San Benito County	San Joaquin County	Stanislaus County	Madera County	Santa Clara County	Tulare County
Rawson's flaming-trumpet	*Collomia rawsoniana*	SC	None	1B										X		
Rayless layia	*Layia discoidea*	SC	None	1B	X											
Recurved larkspur	*Delphinium recurvatum*	SC	None	1B	X	X	X	X								X
Red rock poppy	*Eschscholzia minutiflora* ssp. *twisselmannii*	SC	None	1B		X										
Red-flowered lotus	*Lotus rubriflorus*	SC	None	1B									X			
Robust spineflower	*Chorizanthe robusta* var. *robusta*	E	None	1B											X	
Rock sanicle	*Sanicula saxatilis*	SC	R	1B											X	
Salinas Valley popcorn flower	*Plagiobothrys uncinatus*	SC	None	1B											X	
San Benito evening primrose	*Camisonia benitensis*	T	None	1B	X						X	X				
San Benito spineflower	*Chorizanthe biloba* var. *immemora*	SC	None	1B	X											
San Francisco Bay spineflower	*Chorizanthe cuspidata* var. *cuspidata*	SC	None	1B											X	
San Francisco wallflower	*Erysimum fransiscanum*	SC	None	4											X	

Table C-1 (continued)

Common Name	Scientific Name	Status			Potential Occurrence in the Study Area[d]											
		Federal[a]	State[b]	CNPS[c]	Fresno County	Kern County	Kings County	Merced County	Monterey County	Santa Cruz County	San Benito County	San Joaquin County	Stanislaus County	Madera County	Santa Clara County	Tulare County
San Joaquin adobe sunburst	*Pseudohagia peirsonii*	T	E	1B	X											X
San Joaquin Valley Orcutt grass	*Orcuttia inaequalis*	T	E	1B	X			X					X	X		X
San Joaquin woolly-threads	*Monolopia congondii*	E	None	1B	X	X	X				X					X
Santa Clara Valley dudleya	*Dudleya setchellii*	E	None	1B											X	
Santa Cruz cypress	*Cupressus abramsiana*	E	E	1B						X						
Santa Cruz manzanita	*Arctostaphylos andersonii*	SC	None	1B											X	
Santa Cruz Mts. Beardtongue	*Penstemon rattanii* var. *kleei*	SLC	None	1B											X	
Santa Cruz tarplant	*Holocarpha macradenia*	T	E	1B						X						
Scalliped moonwort	*Botrychium crenulatum*	SC	None	2												X
Scott's Valley spineflower	*Chorizanthe robusta (* var. *hartwegii)*	E	None	1B						X						
Sequoia gooseberry	*Ribes tularense*	SLC	None	1B												X
Serpentine bedstraw	*Galium andrewsii* ssp. *gatense*	SLC	None	4	X										X	
Sharsmith's onion	*Allium sharsmithae*	SC	None	1B									X		X	

Table C-1 (continued)

Common Name	Scientific Name	Status			Potential Occurrence in the Study Area[d]											
		Federal[a]	State[b]	CNPS[c]	Fresno County	Kern County	Kings County	Merced County	Monterey County	Santa Cruz County	San Benito County	San Joaquin County	Stanislaus County	Madera County	Santa Clara County	Tulare County
Shevock's copper-moss	*Schizymenium shevockii*	SLC	None	1B	X										X	
Shirley Meadows mariposa lily	*Calochortus westonii*	SC	None	1B		X										S
Short-leaved hulsea	*Hulsea brevifolia*	SLC	None	1B	X									X		X
Showy Indian clover	*Trifolium amoenum*	E	None	1B											X	
Showy madia	*Madia radiata*	SC	None	1B	X	X	X					X				
Slender moonwort	*Botrychium lineare*	C	None	1B	X									X		
Slender-stalked monkeyflower	*Mimulus gracilipes*	SLC	None	1B	X											
Slough thistle	*Cirsium crassicaule*	SC	None	1B		X	X					X				
Small's southern clarkia	*Clarkia australis*	SC	None	1B										X		
Smooth lessingia	*Lessingia micradenia* var. *glabrata*	SC	None	1B											X	
South Bay clarkia	*Clarkia concinna* ssp. *automixa*	SC	None	1B											X	
South Coast Range morning-glory	*Calystegia collina* ssp. *venusta*	SC	None	4	X											
Spiny-sepaled coyote-thistle	*Eryngium spinosepalum*	SC	None	1B	X								X	X		X

Table C-1 (continued)

Common Name	Scientific Name	Status			Potential Occurrence in the Study Area[d]											
		Federal[a]	State[b]	CNPS[c]	Fresno County	Kern County	Kings County	Merced County	Monterey County	Santa Cruz County	San Benito County	San Joaquin County	Stanislaus County	Madera County	Santa Clara County	Tulare County
Springville clarkia	*Clarkia springvillensis*	T	E	1B												X
Stinkbells	*Fritillaria agrestis*	SLC	None	4	X								X			
Subtle orache	*Atriplex subtilis*	SLC	None	1B	X	X	X	X						X		X
Succulent (fleshy) owl's clover	*Castilleja campestris* ssp. *succulenta*	T	E	1B	X			X				X	X	X		
Suisun Marsh aster	*Aster lentus*	SC	None	1B								X				
Talus fritillary	*Fritillaria falcata*	SC	None	1B									X		X	
Tehipite Valley jewelflower	*Streptanthus fenestratus*	SLC	None	1B	X											
Tejon poppy	*Eschscholzia lemmonii* spp. *Kernensis*	SC	None	1B		X										
Temblor buckwheat	*Eriogonum temblorense*	SC	None	1B		X										
Tiburon buckwheat	*Eriogonum caninum*	SLC	None	None											X	
Tiburon paintbrush	*Castilleja affinis* ssp. *neglecta*	E	T	1B											X	
Tidestrom's lupine	*Lupinus tidestromii*	E	E	1B						X						
Tulare horkelia	*Horkelia tularensis*	SLC	None	1B												X
Twisselmann's buckwheat	*Eriogonum twisselmannii*	SC	R	1B												X

Table C-1 (continued)

Common Name	Scientific Name	Status			Potential Occurrence in the Study Area[d]											
		Federal[a]	State[b]	CNPS[c]	Fresno County	Kern County	Kings County	Merced County	Monterey County	Santa Cruz County	San Benito County	San Joaquin County	Stanislaus County	Madera County	Santa Clara County	Tulare County
Twisselmann's nemacladus	*Nemaclaudus twisselmannii*	SC	R	1B		X										X
Valley sagittaria	*Sagittaria sanfordii*	SC	None	1B	X			X				X				
Valley spearscale	*Atriplex joaquiniana*	SC	None	1B				X				X			X	X
Vernal pool saltbush	*Atriplex persistens*	SC	None	1B				X					X			X
Walker Pass milk-vetch	*Astragalus erterae*	SC	None	1B		X										
Water sack clover	*Trifolium depauperatum* var. *hydrophilum*	SC	None	1B											X	
Western leatherwood	*Dirca occidentalis*	SLC	None	1B											X	
White-rayed pentachaeta	*Pentachaeta bellidiflora*	E	E	1B						X						
Yosemite lewisia	*Lewisia disepala*	SC	None	1B	X	X								X		X
Yosemite woolly-sunflower	*Eriophyllum nubigenum*	SC	None	1B										X		
INVERTEBRATES																
Antioch Dunes anthicid beetle	*Anthicus antiochensis*	SC	None	NA								X	X			
Bay checkerspot butterfly	*Euphydryas editha bayensis*	T	None	NA											X	

Table C-1 (continued)

Common Name	Scientific Name	Status			Potential Occurrence in the Study Area[d]											
		Federal[a]	State[b]	CNPS[c]	Fresno County	Kern County	Kings County	Merced County	Monterey County	Santa Cruz County	San Benito County	San Joaquin County	Stanislaus County	Madera County	Santa Clara County	Tulare County
Bohart's blue butterfly	*Philotiella speciosa bohartorum*	SC	None	NA	X									X		
California linderiella fairy shrimp	*Linderiella occidentalis*	SC	None	NA	X	X	X	X				X	X	X	X	X
Ciervo aegialian scarab beetle	*Aegialia concinna*	SC	None	NA	X		X	X								
Conservancy fairy shrimp	*Branchinecta conservatio*	E	None	NA				X	X		X	X	X			
Curved-foot hygrotus diving beetle	*Hygrotus curvipes*	SC	None	NA								X				
Denning's cryptic caddisfly	*Cryptochia denningi*	SC	None	NA												X
Doyen's rigonascuta dune wevil	*Trigonoscuta doyeni*	SC	None	NA			X									
Dry Creek cliff strider bug	*Oravelia pege*	SC	None	NA	X											
Edgewood blind harvestman	*Calicina (Sitalcina) minor*	SC	None	NA											X	
Hom's microblind harvestman	*Microcina homi*	SC	None	NA											X	
Hopping's blister beetle	*Lytta hoppingi*	SC	None	NA	X	X										X

Table C-1 (continued)

Common Name	Scientific Name	Status			Potential Occurrence in the Study Area[d]											
		Federal[a]	State[b]	CNPS[c]	Fresno County	Kern County	Kings County	Merced County	Monterey County	Santa Cruz County	San Benito County	San Joaquin County	Stanislaus County	Madera County	Santa Clara County	Tulare County
Jung's microblind harvestman	*Microcina juni*	SC	None	NA											X	
Kern primrose sphinx moth	*Euproserpinus euterpe*	T	None	NA		X										
Kern shoulderband snail	*Helminthoglypta callistoderma*	SC	None	NA		X										
Kings Canyon cryptochian caddisfly	*Cryptochia excella*	SC	None	NA	X											X
Leech's skyline diving beetle	*Hydroporus leechi*	SC	None	NA										X		
Longhorn fairy shrimp	*Branchinecta longiantenna*	E	None	NA		X		X	X		X	X	X	X		
Mid-valley fairy shrimp	*Branchinecta mesovallensis*	SC	None	NA	X			X				X	X	X		
Moestan blister beetle	*Lytta moesta*	SC	None	NA	X	X						X	X			X
Molestan blister beetle	*Lytta molesta*	SC	None	NA	X	X	X	X				X	X			X
Morrison's blister beetle	*Lytta morrisoni*	SC	None	NA	X	X										X
Mt. Hermon june beetle	*Polyphylla barbata*	E	None	NA						X						
Ohlone tiger beetle	*Cicindela ohlone*	E	None	NA						X						
Opler's longhorn moth	*Adela oplerella*	SC	None	NA											X	

Table C-1 (continued)

Common Name	Scientific Name	Status			Potential Occurrence in the Study Area[d]											
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Ricksecker's water scavenger beetle	*Hydrochara rickseckeri*	SC	None	NA											X	
Sacramento anthicid beetle	*Anthicus sacramento*	SC	None	NA								X	X			
San Emigdio blue butterfly	*Plebulina emigdionis*	SC	None	NA		X										X
San Joaquin dune beetle	*Coelus grailis*	SC	None	NA	X		X	X								
San Joaquin tiger beetle	*Cicindela tranquebarica*		None	NA	X											X
Sierra pygmy grasshopper	*Tetrix sierrana*	SC	None	NA	X									X		
Smith's blue butterfly	*Euphilotes enoptoes smithi*	E	None	NA					X							
Tehachapi Mt. silverspot butterfly	*Speyeria egleis tehachapina*	SC	None	NA		X										
Unsilvered fritiallary butterfly	*Speyeria adiaste adiaste*	SC	None	NA											X	
Valley elderberry longhorn beetle	*Desmocerus californicus dimorphus*	FT	None	NA	X	X	X	X				X	X	X		X
Vernal pool fairy shrimp	*Branchinecta lynchi*	FT	None	NA	X	X	X	X	X		X	X	X	X	X	X
Vernal pool tadpole shrimp	*Lepidurus packardi*	E	None	NA	X		X	X			X		X	X		X

Table C-1 (continued)

Common Name	Scientific Name	Status			Potential Occurrence in the Study Area[d]											
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Wawona riffle beetle	*Atractelmis wawona*	SC	None	NA										X		
Wooly hydroporus diving beetle	*Hydroporus hirsutus*	SC	None	NA	X											
Yosemite mariposa sideband snail	*Monadenia hillebrandi yosemitensis*	SC	None	NA										X		
Zayante band-winged grasshopper	*Trimerotropis infantilis*	E	None	NA						X						
FISH																
California golden trout	*Oncorhynchus mykiss aquabonita*	SC	None	NA												X
Chinook salmon, Sacramento Valley winter-run ESU	*Oncorhynchus tshawytscha*	E	E	NA								XX				
Chinook salmon, Central Valley fall/late fall-run ESU	*Oncorhynchus tshawytscha*	C	SC	NA				X				X	X		X	
Chinook salmon, Central Valley spring-run ESU	*Oncorhynchus tshawytscha*	T	T	NA											X	

Table C-1 (continued)

Common Name	Scientific Name	Status			Potential Occurrence in the Study Area[d]											
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Coho salmon, Central California Coast ESU	*Oncorhynchus kisutch*	T	E	NA											X	
Delta smelt	*Hypomesus transpacificus*	D	T	NA	X		X	X				X	X	X	X	X
Green sturgeon	*Acipencer medirostris*	SC	SC	NA	X			X				X	X	X	X	
Hardhead	*Mylopharodon conocephalus*	None	SC	NA	X	X	X	X				X	X	X		X
Kern brook lamprey	*Lampetra hubbsi*	SC	SC	NA	X	X	X	X				X	X	X		X
Kern River rainbow trout	*Oncorhynchus mykiss gilberti*	SC	None	NA		X										
Lahontan cutthroat trout	*Oncorhynchus clarki henshawi*	T	None	NA	X									X		
Little Kern golden trout	*Oncorhynchus aquabonita whitei*	T	None	NA												X
Longfin smelt	*Spirinchus thaleichthys*	SC	SC	NA	X	X		X				X	X	X	X	
Pacific lamprey	*Lampetra tridentata*	SC	None	NA	X			X				X	X			
Paiute cutthroat trout	*Oncorhynchus clarki seleniris*	T	None	NA	X									X		
River lamprey	*Lampetra ayresi*	SC	SC	NA	X			X				X		X		
Sacramento splittail	*Pogonichthys macrolepidotus*	SC	None	NA	X		X	X				X	X	X	X	X

Table C-1 (continued)

Common Name	Scientific Name	Status			Potential Occurrence in the Study Area[d]											
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Steelhead, Central Valley ESU	*Oncorhynchus mykiss irideus*	T	None	NA				X				X	X	X		
Steelhead, South Central California ESU	*Oncorhynchus mykiss*	T	None	NA	X											
Tidewater goby	*Eucyclogobius newberryi*	E	SC	NA					X	X					X	
AMPHIBIANS																
Arroyo toad	*Bufo californicus*	E	SC	NA					X							
Breckenridge Mt. slender salamander	*Batrachoseps* sp.	SC	None	NA		X										
California red-legged frog	*Rana aurora draytonii*	T	SC	NA	X	X	X	X	X	X	X	X	X	X	X	X
California tiger salamander	*Ambystoma californiense*	C	SC,P	NA	X	X	X	X	X	X	X	X	X	X	X (PT)	X
Foothill yellow-legged frog	*Rana boylii*	SC	SC,P	NA	X	X	X	X				X	X	X	X	X
Kern Canyon slender salamander	*Batrochoseps simatus*	SC	T	NA		X										X
Mount Lyell salamander	*Hydromantes platycephalus*	SC	SC	NA	X									X		X
Mountain yellow-legged frog	*Rana mucosa*	FE	SC	NA	X	X								X		X

Table C-1 (continued)

Common Name	Scientific Name	Status			Potential Occurrence in the Study Area[d]											
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Relictual slender salamander	*Batrachoseps relictus*	SC	SC	NA		X										X
Santa Cruz long-toed salamander	*Ambystoma macrodactylum*	E	SE,P	NA					X	X						
Tehachapi slender salamander	*Batrachoseps stebbinsi*	SC	ST	NA		X										
Western spadefoot	*Scaphiopus hammondii*	SC	SC	NA	X	X	X	X				X	X	X	X	X
Yellow-blotched ensatina	*Ensatina excholtzii corceator*	SC	SC	NA		X										X
Yosemite toad	*Bufo canorus*	C	SC	NA	X									X		
REPTILES																
Alameda whipsnake	*Masticophis lateralis euryxanthus*	T	ST	NA								X			X	
Blunt-nosed leopard lizard	*Gambelia (Crotaphytus) silus*	E	SE,P	NA	X	X	X	X	X		X			X		X
California horned lizard	*Phrynosoma coronatum frontale*	SC	SC,P	NA	X	X	X	X				X	X	X	X	X
Giant garter snake	*Thamnophis gigas*	T	ST	NA	X		X	X				X	X	X		X
Northern sagebrush lizard	*Sceloporus graciosus graciosus*	SC	None	NA										X		

Table C-1 (continued)

Common Name	Scientific Name	Status			Potential Occurrence in the Study Area[d]											
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Northwestern pond turtle	*Clemmys marmorata marmorata*	SC	SC,P	NA	X	X	X	X				X	X	X	X	X
Rosy boa	*Lichanura trivirgata*	SC	SC	NA		X										
San Francisco garter snake	*Thamnophis sirtalis tetrataenia*	E	E	NA		X				X					X	
San Joaquin coachwhip	*Masicophis flagellum ruddocki*	SC	SC	NA	X	X	X	X				X	X		X	X
Sierra night lizard	*Xantusia vigilis sierrae*	SC	SC	NA		X										
Silvery legless lizard	*Anniella pulchra pulchra*	SC	SC	NA	X	X	X	X				X	X	X	X	
Southern rubber boa	*Charina bottae umbratica*	None	SC	NA		X										
Southwestern pond turtle	*Clemmys marmorata pallida*	SC	SC,P	NA	X	X	X	X				X	X	X	X	X
BIRDS																
Alameda (South Bay) song sparrow	*Melospiza melodia pusillula*	SC	SC	NA											X	
Aleutian Canada goose	*Branta canadensis leucopareia*	T	SC	NA	X	X	X	X				X	X	X		X
Allen's hummingbird	*Selasphorus sasin*	SC	SC	NA											X	
American bittern	*Botaurus lentiginosus*	SC	None	NA	X		X	X				X	X	X	X	X

Table C-1 (continued)

Common Name	Scientific Name	Status			Potential Occurrence in the Study Area[d]											
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American dipper	*Cinclus mexicanus*	SLC	None	NA	X	X								X		X
American peregrine falcon	*Falco peregrinus anatum*	D	SC	NA	X	X	X	X				X	X	X	X	X
Bald eagle	*Haliaeetus leucocephalus*	PD	E	NA	X	X	X	X	X	X	X	X	X	X	X	X
Bank swallow	*Riparia riparia*	None	T	NA	X		X	X				X	X	X		X
Bell's sage sparrow	*Amphispiza belli belli*	SC	SC	NA			X	X				X	X	X	X	X
Black rail	*Laterallus jamaicensis corturniculus*	SC	T,FP	NA								X			XX	
Black skimmer	*Rynchops niger*	SC	SC	NA											X	
Black swift	*Cypseloides niger*	SC	SC	NA	X	X								X	X	X
California brown pelican	*Pelecanus occidentalis californicus*	E	E	NA					X	X					X	
California clapper rail	*Rallus longirostris obsoletus*	E	E,FP	NA					X	X					X	
California condor	*Gymnogyps californianus*	E	E	NA	X	X	X		X							X
California least tern	*Sterna antillarum (albifrons) browni*	E	E,FP	NA					X						X	
California spotted owl	*Strix occidentalis occidentalis*	SC	SC	NA	X	X								X		X

Table C-1 (continued)

Common Name	Scientific Name	Status			Potential Occurrence in the Study Area[d]											
		Federal[a]	State[b]	CNPS[c]	Fresno County	Kern County	Kings County	Merced County	Monterey County	Santa Cruz County	San Benito County	San Joaquin County	Stanislaus County	Madera County	Santa Clara County	Tulare County
California thrasher	*Toxostoma redivivum*	SC	None	NA	X	X	X	X				X	X	X	X	X
Costa's hummingbird	*Calypte costae*	SC	SC	NA	X	X	X	X					X	X	X	X
Ferruginous hawk	*Buteo regalis*	SC	SC	NA	X	X	X	X				X	X	X	X	X
Flammulated owl	*Otus flammeolus*	SC	None	NA	X	X								X		X
Greater sandhill crane	*Grus canadensis tabida*	SC	T	NA	X	X	X	X				X	X	X		X
Harlequin duck	*Histrionicus histrionicus*	SC	None	NA										X		
Lawrence's goldfinch	*Carduelis lawrencei*	SC	None	NA	X	X	X	X				X	X	X	X	X
Least bell's vireo	*Vireo belliii pusillus*	E	E	NA		X			X		X				X	
Lewis' woodpecker	*Melanerpes lewis*	SC	None	NA	X	X		X				X	X		X	X
Little willow flycatcher	*Epidonax traillii brewsteri*	None	E	NA	X	X	X	X				X	X	X	X	X
Loggerhead shrike	*Lanius ludovicianus*	SC	SC	NA	X	X	X	X				X	X	X	X	X
Long-billed curlew	*Numenius americanus*	SC	SC	NA	X	X	X	X					X	X	X	X
Marbled godwit	*Limosa fedoa*	SC	None	NA								X	X			
Marbled murrelet	*Brachyramphus marmoratus*	T	E	NA					X	X					X	

Table C-1 (continued)

Common Name	Scientific Name	Status			Potential Occurrence in the Study Area[d]											
		Federal[a]	State[b]	CNPS[c]	Fresno County	Kern County	Kings County	Merced County	Monterey County	Santa Cruz County	San Benito County	San Joaquin County	Stanislaus County	Madera County	Santa Clara County	Tulare County
Mountain plover	*Charadrius montanus*	SC	None	NA	X	X	X	X				X	X	X	X	X
Northern goshawk	*Accipiter gentilis*	SC	SC	NA	X	X								X		X
Nutall's woodpecker	*Picoides nutallii*	SLC	None	NA	X	X		X				X	X	X		X
Oak titmouse	*Baelophus inornatus*	SLC	None	NA	X	X		X				X	X	X		X
Olive-sided flycatcher	*Contopus borealis (cooperi)*	SC	None	NA	X							X	X	X	X	X
Red knot	*Calidris canutus*	SC	None	NA											X	
Red-breasted sapsucker	*Spyrapicus ruber*	SC	None	NA	X							X		X	X	X
Rufous hummingbird	*Selasphorus rufus*	SC	None	NA	X	X	X	X				X	X	X	X	X
Salt marsh common yellowthroat	*Geothlypis trichas sinuosa*	SC	SC	NA											X	
San Joaquin LeConte's thrasher	*Toxostoma lecontei macmillanorum*	SC	None	NA	X	X	X									X
Southwest willow flycatcher	*Empidonax traillii extimus*	E	E	NA		X										
Swainson's hawk	*Buteo Swainsoni*	None	T	NA	X	X	X	X				X	X	X		
Tricolored blackbird	*Agelaius tricolor*	SC	SC	NA	X	X	X	X				X	X	X	X	X
Vaux's swift	*Chaetura vauxi*	SC	SC	NA	X	X	X	X					X	X	X	X

Table C-1 (continued)

Common Name	Scientific Name	Status: Federal[a]	Status: State[b]	Status: CNPS[c]	Potential Occurrence in the Study Area[d]: Fresno County	Kern County	Kings County	Merced County	Monterey County	Santa Cruz County	San Benito County	San Joaquin County	Stanislaus County	Madera County	Santa Clara County	Tulare County
Western burrowing owl	*Athene cunicularia hypugea*	SC	SC	NA	X	X	X	X				X	X	X	X	X
Western snowy plover	*Charadruis alexandrinus nivosus*	T	SC	NA					X	X					X	
Whimbrel	*Numenius phaeopus*	SC	None	NA											X	
White-faced ibis	*Plegadis chihi*	SC	None	NA	X	X	X	X				X	X	X		X
White-headed woodpecker	*Picoides albolarvatus*	SC	None	NA	X	X								X		X
White-tailed (black-shouldered) kite	*Elanus leucurus*	SC	FP	NA	X	X	X	X				X	X	X	X	X
Yellow-billed cuckoo	*Coccyzus americanus*	C	None	NA	X	X	X	X	X	X	X	X	X	X		X
MAMMALS																
American marten	*Martes americana*	SC	None	NA	X									X		X
Buena Vista Lake shrew	*Sorex ornatus relictus*	E	None	NA		X										
California wolverine	*Gulo gulo luteus*	None	SC	NA	X									X		
Fisher	*Martes pennanti*	SC	SC	NA	X	X								X		X
Fresno kangaroo rat	*Dipodomys nitratoides exilis*	E	E	NA	X		X							X		X

Table C-1 (continued)

Common Name	Scientific Name	Status: Federal[a]	Status: State[b]	Status: CNPS[c]	Potential Occurrence in the Study Area[d]: Fresno County	Kern County	Kings County	Merced County	Monterey County	Santa Cruz County	San Benito County	San Joaquin County	Stanislaus County	Madera County	Santa Clara County	Tulare County
Fringed myotis bat	*Myotis thysanodes*	SC	None	NA	X	X	X	X				X		X	X	X
Giant kangaroo rat	*Dipodomys ingens*	E	None	NA	X	X	X	X			X					X
Greater western mastiff-bat	*Eumops perotis californicus*	SC	SC	NA	X	X	X	X				X	X	X	X	X
Long-eared myotis bat	*Myotis evotis*	SC	None	NA	X	X	X	X				X	X	X	X	X
Long-legged myotis bat	*Myotis volans*	SC	None	NA	X	X	X	X				X	X	X	X	X
Merced kangaroo rat	*Dipodomys heermanni dixoni*	SC	None	NA				X				X	X	X		
Mohave ground squirrel	*Spermohilus mohavensis*	None	T	NA		X										
Mt. Lyell shrew	*Sorex lyelli*	SC	SC	NA	X											
Pacific western big-eared bat	*Corynorthinus (Plecotus) townsendii townsendii*	SC	SC	NA	X	X	X	X				X	X	X	X	X
Pale Townsend's big-eared bat	*Corynorthinus (Plecotus) townsendii pallescens*	SC	None	NA	X			X						X		X
Riparian brushrabbit	*Sylvilagos bachmavi riparius*	E	E	NA				X				X	X		X	

Table C-1 (continued)

Common Name	Scientific Name	Status			Potential Occurrence in the Study Area[d]											
		Federal[a]	State[b]	CNPS[c]	Fresno County	Kern County	Kings County	Merced County	Monterey County	Santa Cruz County	San Benito County	San Joaquin County	Stanislaus County	Madera County	Santa Clara County	Tulare County
Salt marsh harvest mouse	*Reitherodontomys raviventris*	E	E,FP	NA											X	
Salt marsh vagrant shrew	*Sorex vagrans halicoetes*	SC	SC	NA											X	
San Francisco dusky-footed woodrat	*Neotoma fuscipes annectens*	SC	SC	NA											X	
San Joaquin antelope squirrel	*Ammonspermophilus nelsoni*	SC	T	NA	X	X	X	X						X		X
San Joaquin kit fox	*Vulpes macrotis mutica*	E	T	NA	X	X	X	X	X		X	X	X	X	X	X
San Joaquin pocket mouse	*Perognathus inornatus*	SC	None	NA	X	X	X	X				X	X			X
San Joaquin pocketmouse	*Perognathus inornatus*	PE	SC	NA				X						X		
San Joaquin Valley woodrat	*Neotoma fuscipes riparia*	E	None	NA	X			XX			X	X	X			
Short-nosed kangaroo rat	*Dipodomys nitratoides brevinasus*	SC	None	NA	X	X	X	X						X		X
Sierra Nevada bighorn sheep	*Ovis canadensis californiana*	E	E	NA	X	X										X
Sierra Nevada red fox	*Vulpes vulpes necator*	SC	SC	NA	X	X								X		X
Sierra Nevada snowshoe hare	*Lepus americanus tahoensis*	SC	SC	NA										X		
Small-footed myotis bat	*Myotis ciliolabrum*	SC	N/A	SC	X	X	X	X				X	X	X	X	

Table C-1 (continued)

Common Name	Scientific Name	Status			Potential Occurrence in the Study Area[d]											
		Federal[a]	State[b]	CNPS[c]	Fresno County	Kern County	Kings County	Merced County	Monterey County	Santa Cruz County	San Benito County	San Joaquin County	Stanislaus County	Madera County	Santa Clara County	Tulare County
Southern grasshopper mouse	*Onychomys torridus ramona*	SC	SC	NA	X	X	X							X		X
Southern sea otter	*Enhydra lutris nereis*	T	None	NA					X	X						
Spotted bat	*Euderma maculatum*	SC	SC	NA	X	X		X						X		X
Tehachapi white-eared pocket mouse	*Perognathus inoratus*	SC	SC	NA		X										
Tipton kangaroo rat	*Dipodomys nitratoides nitratoides*	E	E	NA	X	X	X									X
Tulare grasshopper mouse	*Onychomys torridus tulatensis*	SC	SC	NA	X	X	X									X
Yuma myotis bat	*Myotis yumanensis*	SC	SC	NA	X		X	X				X	X	X	X	X

Table C-1 (concluded)

Notes:

[a] Federal Status Codes:

N =Not known to occur; no suitable habitat
E =Endangered; species in danger of extinction throughout all or a significant portion of its range
T =Threatened; species likely to become endangered within the foreseeable future
PE =Proposed for listing as endangered
PT =Proposed for listing as threatened
PD =Proposed for delisting
C =Candidate for listing
SC =Special concern species
P =Protected under the Marine Mammal Protection Act

[b] California Status Codes:

E =Endangered; species whose continued existence in California is in jeopardy
T =Threatened; species likely to become endangered within the foreseeable future
R =Rare; plant species, although not presently threatened with extinction, may become endangered in the foreseeable future
SC =California Department of Fish and Game species of special concern
FP&P =Fully protected and protected species defined in the State of California under Sections 3511 and 4700 of the Fish and Game Code

[c] California Native Plant Society Status Codes:

1A =Plants presumed extinct in California
1B =Plants that are rare, threatened, or endangered in California and elsewhere
2 =Plants that are rare, threatened, or endangered in California, but more common elsewhere
3 =Plants about which more information is needed
4 =Plants of limited distribution
H =Hybrid. Rejected for classification by the California Native Plant Society Inventory
NA =Not Applicable

[d] Definitions for potential occurrence in the study area:

Known to occur = Populations reported within the last 30 years
Potential to occur; suitable habitat present =
- Plants: known to have occurred historically in the study area, but may be extirpated
- Fish: status of population in study area not presently known
- Other wildlife = potential to occur based on presence of supporting foraging and/or breeding habitat; specific occurrence data for the study area may not have been found

Not likely to occur; no suitable habitat = Supporting habitat not present in the study area

Appendix D
Special-Status Species Known or Likely to Occur in the Exchange Contractors Service Area, Refuges, and Agricultural and Municipal and Industrial Areas

Table D-1
Special-Status Species Likely to Occur in the Exchange Contractors Service Area

Common Name	Scientific Name	Status			Potential Occurrence in the Study Area[e]				Potential to Adversely Affect Yes/No
		Federal[a]	State[b]	CNPS[c]	Fresno County	Merced County	Stanislaus County	Madera County	
INVERTEBRATES									
Conservancy fairy shrimp	*Branchinecta conservatio*	E	None	NA		X	X		No
Delta green ground beetle	*Elaphrus viridus*	T	None	NA					No
Longhorn fairy shrimp	*Branchinecta longiantenna*	E	None	NA		X	X	X	No
Valley elderberry longhorn beetle	*Desmocerus californicus dimorphus*	FT	None	NA	X	X	X	X	No
Vernal pool fairy shrimp	*Branchinecta lynchi*	FT	None	NA	X	X	X	X	No
Vernal pool tadpole shrimp	*Lepidurus packardi*	E	None	NA	X	X	X	X	No
AMPHIBIANS									
California red-legged frog	*Rana aurora draytonii*	T	SC,P	NA	X	X	X	X	No
California tiger salamander	*Ambystoma californiense*	C	SC,P	NA	X	X	X	X	No
Western spadefoot	*Scaphiopus hammondii*	SC	SC,P	NA	X	X	X	X	No

Table D-1 (continued)

Common Name	Scientific Name	Status			Potential Occurrence in the Study Area[e]				Potential to Adversely Affect Yes/No
		Federal[a]	State[b]	CNPS[c]	Fresno County	Merced County	Stanislaus County	Madera County	
REPTILES									
Blunt-nosed leopard lizard	*Gambelia (Crotaphytus) silus*	E	E	NA	X	X		X	No
Giant garter snake	*Thamnophis gigas*	T	T	NA	X	X	X	X	No
Northwestern pond turtle	*Clemmys marmorata marmorata*	SC	SC,P	NA	X	X	X	X	No
Southwestern pond turtle	*Clemmys marmorata pallida*	SC	SC,P	NA	X	X	X	X	No
BIRDS									
Aleutian Canada goose	*Branta canadensis leucopareia*	T	None	NA	X	X	X	X	No
American peregrine falcon	*Falco peregrinus anatum*	D	E	NA	X	X	X	X	No
Bald eagle	*Haliaeetus leucocephalus*	PD	E	NA	X	X	X	X	No
California condor	*Gymnogyps californianus*	E	E	NA	X				No
California gull	*Larus californicus*	None	SC	NA					No
California horned lark	*Eremophila alpestris actia*	None	SC	NA					No
Cooper's hawk	*Accipiter cooperii*	None	SC	NA					No
Ferruginous hawk	*Buteo regalis*	SC	SC	NA	X	X	X	X	No

Table D-1 (continued)

Common Name	Scientific Name	Status			Potential Occurrence in the Study Area[e]				Potential to Adversely Affect Yes/No
		Federal[a]	State[b]	CNPS[c]	Fresno County	Merced County	Stanislaus County	Madera County	
Golden eagle	*Aquila chrysaetos*	None	SC, FP	NA					No
Least bell's vireo	*Vireo belliii pusillus*	E	E	NA					No
Loggerhead shrike	*Lanius ludovicianus*	SC	SC	NA	X	X	X	X	No
Long-billed curlew	*Numenius americanus*	SC	SC	NA	X	X	X	X	No
Long-eared owl	*Asio otus*	None	SC	NA					No
Merlin	*Falco columbarius*	None	SC	NA					No
Mountain plover	*Charadrius montanus*	SC	None	NA	X	X	X	X	No
Northern harrier	*Circus cyaneus*	None	SC	NA					No
Prairie falcon	*Falco mexicanus*	None	SC	NA					No
San Joaquin LeConte's thrasher	*Toxostoma lecontei macmillanorum*	SC	None	NA					No
Sharp-shinned hawk	*Accipiter striatus*	None	SC	NA					No
Short-eared owl	*Asio flammeus*	None	SC	NA					No
Southwest willow flycatcher	*Empidonax traillii extimus*	E	None	NA					No
Swainson's hawk	*Buteo Swainsoni*	None	T	NA	X	X	X	X	Yes
Tricolored blackbird	*Agelaius tricolor*	SC	SC	NA	X	X	X	X	No

Table D-1 (continued)

Common Name	Scientific Name	Status			Potential Occurrence in the Study Area[e]				Potential to Adversely Affect Yes/No
		Federal[a]	State[b]	CNPS[c]	Fresno County	Merced County	Stanislaus County	Madera County	
Western burrowing owl	*Athene cunicularia hypugea*	SC	SC	NA	X	X	X	X	No
Western least bittern	*Ixobrychus exilis hespris*	None	SC	NA					No
Western snowy plover	*Charadruis alexandrinus nivosus*	T	SC	NA					No
Whimbrel	*Numenius phaeopus*	SC	None	NA					No
White-faced ibis	*Plegadis chihi*	SC	None	NA	X	X	X	X	No
White-tailed (black-shouldered) kite	*Elanus leucurus*	SC	FP	NA	X	X	X	X	No
Yellow warbler	*Dendroica petechia*	None	SC	NA					No
MAMMALS									
Buena Vista Lake shrew	*Sorex ornatus relictus*	E	None	NA					No
Fresno kangaroo rat	*Dipodomys nitratoides exilis*	E	E	NA	X			X	No
Giant kangaroo rat	*Dipodomys ingens*	E	E	NA					No
Pacific western big-eared bat	*Corynorthinus (Plecotus) townsendii townsendii*	SC	SC	NA	X	X	X	X	No
Pallid bat	*Antrozous pallidus*	None	SC	NA					No

Table D-1 (continued)

Common Name	Scientific Name	Status			Potential Occurrence in the Study Area[e]				Potential to Adversely Affect Yes/No
		Federal[a]	State[b]	CNPS[c]	Fresno County	Merced County	Stanislaus County	Madera County	
Riparian brush rabbit	*Sylvilagus bachmani riparius*	PE	E	NA			X		No
Riparian woodrat	*Neotoma fuscipes riparia*	PE	SC	NA			X	X	No
San Joaquin antelope squirrel	*Ammonspermo philus nelsoni*	SC	T	NA	X	X		X	No
San Joaquin kit fox	*Vulpes macrotis mutica*	E	T	NA	X	X	X	X	No
Tipton kangaroo rat	*Dipodomys nitratoides nitratoides*	E	E	NA	X				No
Tulare grasshopper mouse	*Onychomys torridus tulatensis*	SC	None	NA	X				No

Table D-1 (concluded)

Notes:

N = Not known to occur; no suitable habitat

[a] Federal Status Codes:

- E =Endangered; species in danger of extinction throughout all or a significant portion of its range
- T =Threatened; species likely to become endangered within the foreseeable future
- PE =Proposed for listing as endangered
- PT =Proposed for listing as threatened
- PD =Proposed for delisting
- C =Candidate for listing
- SC =Special concern species
- P =Protected under the Marine Mammal Protection Act

[b] California Status Codes:

- E =Endangered; species whose continued existence in California is in jeopardy
- T =Threatened; species likely to become endangered within the foreseeable future
- R =Rare; plant species, although not presently threatened with extinction, may become endangered in the foreseeable future
- SC =California Department of Fish and Game species of special concern
- FP&P =Fully protected and protected species defined in the State of California under Sections 3511 and 4700 of the Fish and Game Code

[c] California Native Plant Society Status Codes:

- 1A =Plants presumed extinct in California
- 1B =Plants that are rare, threatened, or endangered in California and elsewhere
- 2 =Plants that are rare, threatened, or endangered in California, but more common elsewhere
- 3 =Plants about which more information is needed
- 4 =Plants of limited distribution
- H =Hybrid. Rejected for classification by the California Native Plant Society Inventory
- NA =Not Applicable

Table D-2
Special-Status Species Likely to Occur in
National Wildlife Refuges and Wildlife Management Areas Within the Project Area

Common Name	Scientific Name	Status			Potential Occurrence in the Study Area[e]					Potential to Adversely Affect Yes/ No
		Federal[a]	State[b]	CNPS[c]	Fresno County	Kern County	Kings County	Merced County	Tulare County	
PLANTS										
Alkali milk-vetch	*Astragalus tener* var. *tener*	None	None	1B				X		No
Brittlescale	*Atriplex depressa*	SC	None	1B	X	X			X	No
Colusa grass	*Neostapfia colusana*	T	E	1B				X		No
Greene's tuctoria	*Tuctoria greenei*	E	Rare	1B	X			X	X	No
Hairy Orcutt grass	*Orcuttia pilosa*	E	E	1B				X		No
Heartscale	*Atriplex cordulata*	SC	None	1B	X	X	X		X	No
Hispid bird's-beak	*Cordylanthus mollis* ssp. *hispidus*	SCq	None	1B		X		X		No
Hoover's cryptantha	*Cryptantha hooveri*	SLC	None	1B				X		No
Hoover's eriastrum	*Eriastrum hooveri*	D	None	4	X	X	X		X	No
Lesser saltscale	*Atriplex minuscula*	SC	None	1B	X	X		X	X	No
Lost Hills saltbush	*Atriplex vallicola*	SC	None	1B	X	X	X	X		No
Palmate-bracted bird's beak	*Cordylanthus palmatus*	E	E	1B						No

Table D-2 (continued)

Common Name	Scientific Name	Status			Potential Occurrence in the Study Area[e]					Potential to Adversely Affect Yes/ No
		Federal[a]	State[b]	CNPS[c]	Fresno County	Kern County	Kings County	Merced County	Tulare County	
San Joaquin woolly-threads	*Lembertia congdonii*	E	None				X			No
Valley sagittaria	*Sagittaria sanfordii*	SC	None	1B	X			X		No
Valley spearscale	*Atriplex joaquinana*	SC	None	1B				X	X	No
INVERTEBRATES										
California linderiella fairy shrimp	*Linderiella occidentalis*	SC	None	NA	X	X	X	X	X	No
Conservancy fairy shrimp	*Branchinecta conservatio*	E	None	NA				X		No
Longhorn fairy shrimp	*Branchinecta longiantenna*	E	None	NA		X		X		No
Molestan blister beetle	*Lytta molesta*	SC	None	NA	X	X	X	X	X	No
Valley elderberry longhorn beetle	*Desmocerus californicus dimorphus*		None	NA	X	X	X	X	X	No
Vernal pool fairy shrimp	*Branchinecta lynchi*	FT	None	NA	X	X	X	X	X	No
Vernal pool tadpole shrimp	*Lepidurus packardi*	E	None	NA	X		X	X	X	No

Table D-2 (continued)

Common Name	Scientific Name	Status			Potential Occurrence in the Study Area[e]					Potential to Adversely Affect Yes/ No
		Federal[a]	State[b]	CNPS[c]	Fresno County	Kern County	Kings County	Merced County	Tulare County	
FISH										
Chinook salmon, Central Valley fall/late fall-run ESU	*Oncorhynchus tshawytscha*	C	SC	NA					X	No
Green sturgeon	*Acipencer medirostris*	C	SC	NA	X			X		No
Hardhead	*Mylopharodon conocephalus*	None	SC	NA	X	X	X	X	X	Yes
Kern brook lamprey	*Lampetra hubbsi*	SC	SC	NA	X	X	X	X	X	No
Pacific lamprey	*Lampetra tridentata*	SC	None	NA	X			X		No
River lamprey	*Lampetra ayresi*	SC	SC	NA	X			X		No
Sacramento splittail	*Pogonichthys macrolepidotus*	SC	None	NA	X		X	X	X	No
Steelhead, Central Valley ESU	*Oncorhynchus mykiss irideus*	T	None	NA				X		No
AMPHIBIANS										
California red-legged frog	*Rana aurora draytonii*	T	SC,P	NA	X	X	X	X	X	No
California tiger salamander	*Ambystoma californiense*	C	SC,P	NA	X	X	X	X	X	No
Foothill yellow-legged frog	*Rana boylii*	SC	SC,P	NA	X	X	X	X	X	No

Table D-2 (continued)

Common Name	Scientific Name	Status: Federal[a]	Status: State[b]	Status: CNPS[c]	Potential Occurrence in the Study Area[e]: Fresno County	Kern County	Kings County	Merced County	Tulare County	Potential to Adversely Affect Yes/ No
Western spadefoot	*Scaphiopus hammondii*	SC	SC,P	NA	X	X	X	X	X	No
REPTILES										
Blunt-nosed leopard lizard	*Gambelia (Crotaphytus) silus*	E	E	NA	X	X	X	X	X	No
California horned lizard	*Phrynosoma coronatum frontale*	SC	SC,P	NA	X	X	X	X	X	No
Giant garter snake	*Thamnophis gigas*	T	ST	NA	X		X	X	X	Yes
Northwestern pond turtle	*Clemmys marmorata marmorata*	SC	SC,P	NA	X	X	X	X	X	No
San Joaquin coachwhip	*Masicophis flagellum ruddocki*	SC	None	NA	X	X	X	X	X	No
Silvery legless lizard	*Anniella pulchra pulchra*	SC	None	NA	X	X	X	X		No
Southwestern pond turtle	*Clemmys marmorata pallida*	SC	SC,P	NA	X	X	X	X	X	No
BIRDS										
Aleutian Canada goose	*Branta canadensis leucopareia*	T	None	NA	X	X	X	X	X	No
American peregrine falcon	*Falco peregrinus anatum*	D	E	NA	X	X	X	X	X	No
American white pelican	*Pelecanus erythrorhynchos*	None	SC	NA						No

Table D-2 (continued)

Common Name	Scientific Name	Status			Potential Occurrence in the Study Area[e]					Potential to Adversely Affect Yes/ No
		Federal[a]	State[b]	CNPS[c]	Fresno County	Kern County	Kings County	Merced County	Tulare County	
Bald eagle	*Haliaeetus leucocephalus*	PD	E	NA	X	X	X	X	X	No
Bank swallow	*Riparia riparia*	None	T	NA	X		X	X	X	No
Black tern	*Chlidonias niger*	SC	SC	NA						No
California gull	*Larus californicus*	None	SC	NA						No
California horned lark	*Eremophila alpestris actia*	None	SC	NA						No
Cooper’s hawk	*Accipiter cooperii*	None	SC	NA						No
Double-crested cormorant	*Phalacrocorax auritas*	None	SC	NA						No
Ferruginous hawk	*Buteo regalis*	SC	SC	NA	X	X	X	X	X	No
Fulvous whistling-duck	*Dendrocygna bicolor*	SC	SC	NA						No
Golden eagle	*Aquila chrysaetos*	None	SC	NA						No
Greater sandhill crane	*Grus canadensis tabida*	SC ST	None	NA	X	X	X	X	X	No
Least bittern	*Ixobrychus exilis*	None	SC	NA						No
Little willow flycatcher	*Epidonax traillii brewsteri*	None	E	NA	X	X	X	X	X	No
Loggerhead shrike	*Lanius ludovicianus*	SC	SC	NA	X	X	X	X	X	No
Long-billed curlew	*Numenius americanus*	SC	SC	NA	X	X	X	X	X	No
Long-eared owl	*Asio otus*	None	SC	NA						No

Table D-2 (continued)

Common Name	Scientific Name	Status			Potential Occurrence in the Study Area[e]					Potential to Adversely Affect Yes/ No
		Federal[a]	State[b]	CNPS[c]	Fresno County	Kern County	Kings County	Merced County	Tulare County	
Marbled godwit	*Limosa fedoa*	SC	None	NA						No
Mountain plover	*Charadrius montanus*	SC FPT	None	NA	X	X	X	X	X	No
Merlin	*Falco columbarius*	None	SC	NA						No
Northern harrier	*Circus cyaneus*	None	SC	NA						No
Osprey	*Pandion haliaetus*	None	SC	NA						No
Prairie falcon	*Falco mexianus*	None	SC	NA						No
Sharp-shinned hawk	*Accipiter striatus*	None	SC	NA						No
Short-eared owl	*Asio flammeus*	None	SC	NA						No
Swainson's hawk	*Buteo Swainsoni*	None	T	NA	X	X	X	X		No
Tricolored blackbird	*Agelaius tricolor*	SC	SC	NA	X	X	X	X	X	No
Western burrowing owl	*Athene cunicularia hypugea*	SC	SC	NA	X	X	X	X	X	No
Western snowy plover	*Charadruis alexandrinus nivosus*	T	SC	NA						No
Whimbrel	*Numenius phaeopus*	SC	None	NA						No
White-faced ibis	*Plegadis chihi*	SC	None	NA	X	X	X	X	X	No
Yellow-breasted chat	*Icteria virens*	None	SC	NA						No

Table D-2 (continued)

Common Name	Scientific Name	Status: Federal[a]	Status: State[b]	Status: CNPS[c]	Potential Occurrence in the Study Area[e]: Fresno County	Kern County	Kings County	Merced County	Tulare County	Potential to Adversely Affect Yes/ No
Yellow warbler	*Dendroica petehia brewsteri*	None	SC	NA						No
MAMMALS										
Buena Vista Lake shrew	*Sorex ornatus relictus*	E	None	NA		X				No
Fresno kangaroo rat	*Dipodomys nitratoides exilis*	E	E	NA	X		X		X	No
Fringed myotis bat	*Myotis thysanodes*	SC	None	NA	X	X	X	X	X	No
Greater western mastiff-bat	*Eumops perotis californicus*	SC	SC	NA	X	X	X	X	X	No
Long-eared myotis bat	*Myotis evotis*	SC	None	NA	X	X	X	X	X	No
Long-legged myotis bat	*Myotis volans*	SC	None	NA	X	X	X	X	X	No
Merced kangaroo rat	*Dipodomys heermanni dixoni*	SC	None	NA				X		No
Pacific western big-eared bat	*Corynorthinus (Plecotus) townsendii townsendii*	SC	SC	NA	X	X	X	X	X	No
Pallid bat	*Antrozous pallidus*	None	SC	NA						No
Riparian brushrabbit	*Syvilagus bachmani riparius*	E	E	NA				X		No
San Joaquin antelope squirrel	*Ammonspermo-philus nelsoni*	SC	T	NA	X	X	X	X	X	No

Table D-2 (continued)

Common Name	Scientific Name	Status: Federal[a]	Status: State[b]	Status: CNPS[c]	Potential Occurrence in the Study Area[e]: Fresno County	Kern County	Kings County	Merced County	Tulare County	Potential to Adversely Affect Yes/ No
San Joaquin kit fox	*Vulpes macrotis mutica*	E	T	NA	X	X	X	X	X	No
San Joaquin pocket mouse	*Perognathus inornatus*	SC	None	NA	X	X	X	X	X	No
San Joaquin Valley woodrat	*Neotoma fuscipes riparia*	E	None	NA	X			X		No
Short-nosed kangaroo rat	*Dipodomys nitratoides brevinasus*	SC	None	NA	X	X	X	X	X	No
Small-footed myotis bat	*Myotis ciliolabrum*	SC	NA	SC	X	X	X	X		No
Spotted bat	*Euderma maculatum*	SC	None	NA	X	X		X	X	No
Yuma myotis bat	*Myotis yumanensis*	SC	SC	NA	X		X	X	X	No

Table D-2 (concluded)

Notes:
N = Not known to occur; no suitable habitat
[a] Federal Status Codes:

E	=Endangered; species in danger of extinction throughout all or a significant portion of its range
T	=Threatened; species likely to become endangered within the foreseeable future
PE	=Proposed for listing as endangered
PT	=Proposed for listing as threatened
PD	=Proposed for delisting
C	=Candidate for listing
SC	=Special concern species
P	=Protected under the Marine Mammal Protection Act

[b] California Status Codes:

E	=Endangered; species whose continued existence in California is in jeopardy
T	=Threatened; species likely to become endangered within the foreseeable future
R	=Rare; plant species, although not presently threatened with extinction, may become endangered in the foreseeable future
SC	=California Department of Fish and Game species of special concern
FP&P	=Fully protected and protected species defined in the State of California under Sections 3511 and 4700 of the Fish and Game Code

[c] California Native Plant Society Status Codes:

1A	=Plants presumed extinct in California
1B	=Plants that are rare, threatened, or endangered in California and elsewhere
2	=Plants that are rare, threatened, or endangered in California, but more common elsewhere
3	=Plants about which more information is needed
4	=Plants of limited distribution
H	=Hybrid. Rejected for classification by the California Native Plant Society Inventory
NA	=Not Applicable

Table D-3
Special-Status Species Likely to Occur in Agricultural and Municipal and Industrial Areas Within the Project Area

Common Name	Scientific Name	Status			Potential Occurrence in the Study Area[e]						Potential to Adversely Affect Yes/No
		Federal[a]	State[b]	CNPS[c]	San Benito County	San Joaquin County	Stanislaus County	Madera County	Santa Clara County	Tulare County	
PLANTS											
Alkali milk-vetch	*Astragalus tener* var. *tener*	None	None	1B		X	X		X		No
Arcuate bush mallow	*Malacothamnus arcutatus*	SLC	None	1B					X		No
Bakersfield cactus	*Opuntia treleasei*	E	None	None		X					No
Ben Lomond buckwheat	*Eriogonum nudum* var. *decurrents*	SC	None	1B					X		No
Big-scale balsamroot	*Balsamorhiza macrolepis* var. *macrolepis*	SLC	None	1B					X		No
Boggs Lake hedge-hyssop	*Gratiola heterosepala*	None	E	1B		X		X			No
Brandegee's wooly-star	*Eriastrum brandegeae*	SC	None	1B					X		No
Brittlescale	*Atriplex depressa*	SC	None	1B			X	X		X	No
California jewelflower	*Aulanthus californicus*	E	None	None						X	No
California seablite	*Suaeda californica*	E	None	1B					X		No
Capper-fruited tropidocarpum	*Tropidocarpum capparideum*	SC	None	1A		X			X		No
Carrizo peppergrass	*Lepidium jaredii* var. *jaredii*	SC	None	1B		X					No

Table D-3 (continued)

Common Name	Scientific Name	Status			Potential Occurrence in the Study Area[e]						Potential to Adversely Affect Yes/No
		Federal[a]	State[b]	CNPS[c]	San Benito County	San Joaquin County	Stanislaus County	Madera County	Santa Clara County	Tulare County	
Chaparral harebell	*Campanula exigua*	SLC	None	1B			X		X		No
Clustered lady's-slipper	*Cypripedium fasciculatum*	SC	None	4					X		No
Colusa grass	*Neostapfia colusana*	T	E	1B			X				No
Comanche layia	*Layia leucopappa*	SC	None	1B		X					No
Congdon's tarplant	*Hemizonia parryi* ssp. *congdonii*	SC	None	None					X		No
Contra Costa goldfields	*Lasthenia conjugens*	E	None	1B					X		No
Coyote ceanothus	*Ceanothus ferrisae*	E	None	1B					X		No
Curly-leaved monardella	*Monardella undulata*	SC	None	4					X		No
Delta tule pea	*Lathyrus jepsonii* var. *jepsonii*	SC	None	1B					X		No
Fragrant fritillary	*Fritillaria liliacea*	SC	None	1B					X		No
Franciscan onion	*Allium peninsulare* var. *francisanum*	SLC	None	1B					X		No
Forked fiddleneck	*Amsinckia vernicosa* var. *furcata*	SLC	None	4							No
Gairdner's yampah	*Perideridi gairdneri* ssp. *gairdneri*	SC	None	4					X		No

Table D-3 (continued)

Common Name	Scientific Name	Status			Potential Occurrence in the Study Area[e]						Potential to Adversely Affect Yes/No
		Federal[a]	State[b]	CNPS[c]	San Benito County	San Joaquin County	Stanislaus County	Madera County	Santa Clara County	Tulare County	
Greene's popcorn flower	*Plagiobothrys reticulatus* var. *rossianorum*	SC	None	None					X		No
Greene's tuctoria	*Tuctoria greenei*	E	Rare	1B		X	X	X		X	No
Hairless allocarya	*Plagiobothrys glaber*	SC	None	1A					X		No
Hairy Orcutt grass	*Orcuttia pilosa*	E	E	1B			X	X			No
Hall's bush mallow	*Malacothamnus hallii*	SLC	None	1B					X		No
Hartweg's golden sunburst	*Pseudobahia bahiifolia*	E	E	1B			X	X			No
Heartscale	*Atriplex cordulata*	SC	None	1B		X	X	X		X	No
Hoover's button-celery	*Eryngium aristulatum* var. *hooveri*	SC	None	1B					X		No
Hoover's calycadenia	*Calycadenia hooveri*	SLC	None	1B			X	X			No
Hoover's eriastrum	*Eriastrum hooveri*	D	None	4					X	X	No
Hoover's spurge	*Chamaesyce hooveri*	T	None	1B						X	No
Interior California larkspur	*Delphinium californicum* ssp. *interius*	SC	None	1B		X			X		No
Kaweah brodiaea	*Brodiaea insignis*	None	E	1B						X	No

Table D-3 (continued)

Common Name	Scientific Name	Status: Federal[a]	Status: State[b]	Status: CNPS[c]	Potential Occurrence in the Study Area[e]: San Benito County	San Joaquin County	Stanislaus County	Madera County	Santa Clara County	Tulare County	Potential to Adversely Affect Yes/No
Keck's checker-mallow	*Sidalcea keckii*	E	None	1B						X	No
Kernville poppy	*Eschscholzia procera*	SC	None	3		X					No
Kings Mountain manzanita	*Arctostaphylos regismontana*	SLC	None	1B					X		No
Large-flowered fiddleneck	*Amsinckia grandiflora*	E	E	1B		X					No
Large-flowered linanthus	*Linanthus grandiflorus*	SC	None	3				X	X		No
Lesser saltscale	*Atriplex minuscula*	SC	None	1B				X		X	No
Little mousetail	*Myosurus minimus* ssp. *apus*	SC	None	3						X	No
Loma Prieta hoia	*Hoita strobilina*	SC	None	1B					X		No
Lost Hills saltbush	*Atriplex vallicola*	SC	None	1B							No
Maple-leaved checkerbloom	*Sidalcea malachroides*	SLC	None	1B					X		No
Mason's neststraw	*Stylocline masonii*	SC	None	1B		X					No
Metcalf Canyon jewelflower	*Streptanthus albidus* ssp. *albidus*	E	None	1B					X		No

Table D-3 (continued)

Common Name	Scientific Name	Status			Potential Occurrence in the Study Area[e]						Potential to Adversely Affect Yes/No
		Federal[a]	State[b]	CNPS[c]	San Benito County	San Joaquin County	Stanislaus County	Madera County	Santa Clara County	Tulare County	
Mono Hot Springs evening primrose	*Camissonia sierrae* ssp. *alticola*	SC	None	1B				X			No
Mt. Diablo phacelia	*Phacelia phacelioides*	SC	None	1B					X		No
Mt. Hamilton coreopsis	*Coreopsis hamiltonii*	SC	None	1B			X		X		No
Mt. Hamilton harebell	*Campanula sharsmithiae*	SC	None	1B			X		X		No
Mt. Hamilton jewelflower	*Steptanthus callistus*	SLC	None	1B					X		No
Mt. Hamilton lomatium	*Lomatium observatorium*	SLC	None	1B					X		No
Mt. Hamilton thistle	*Cirsium fontinale* var. *campylon*	SC	None	1B			X		X		No
Nine Mile Canyon phacelia	*Phacelia novenmillensis*	SC	None	1B						X	No
No common name	*Schizymenium shevockii*	SLC	None	1B					X		No
Obovate-leaved thornmint	*Acanthomintha obovata* ssp. *obovata*	SLC	None	4							No
Oil neststraw	*Stylocline citroleum*	SC	None	1B		X					No
Oregon meconella	*Meconella oregana*	SC	E	1B					X		No
Pacific cordgrass	*Spartina foliosa*	SLC	None	None					X		No

Table D-3 (continued)

Common Name	Scientific Name	Status			Potential Occurrence in the Study Area[e]						Potential to Adversely Affect Yes/No
		Federal[a]	State[b]	CNPS[c]	San Benito County	San Joaquin County	Stanislaus County	Madera County	Santa Clara County	Tulare County	
Pale-yellow layia	*Layia heterotrica*	SC	None	1B	X	X	X				No
Palmate-bracted bird's beak	*Cordylathus palmatus*	E	E	1B		X		X			No
Panoche peppergrass	*Lepidium jaredii* var. *album*	SC	None	1B							No
Point Reyes bird's-beak	*Cordylanthus maritimus* ssp. *palustris*	SC	None	1B					X		No
Recurved larkspur	*Delphinium recurvatum*	SC	None	1B						X	No
Robust spineflower	*Chorizanthe robusta* var. *robusta*	E	None	1B					X		No
Rock sanicle	*Sanicula saxatilis*	SC	Rare	1B					X		No
Salinas Valley popcorn flower	*Plagiobothrys uncinatus*	SC	None	1B					X		No
San Benito evening primrose	*Camisonia benitensis*	T	None	1B		X					No
San Francisco Bay spineflower	*Chorizanthe cuspidata* var. *cuspidata*	SC	None	1B					X		No
San Francisco wallflower	*Erysimum fransiscanum*	SC	None	4					X		No
San Joaquin Valley Orcutt grass	*Orcuttia inaequalis*	T	E	1B			X	X		X	No

Table D-3 (continued)

Common Name	Scientific Name	Status			Potential Occurrence in the Study Area[e]						Potential to Adversely Affect Yes/No
		Federal[a]	State[b]	CNPS[c]	San Benito County	San Joaquin County	Stanislaus County	Madera County	Santa Clara County	Tulare County	
San Joaquin woolly-threads	*Monolopia congondii*	E	None	1B						X	No
Santa Clara Valley dudleya	*Dudleya setchellii*	E	None	1B					X		No
Santa Cruz manzanita	*Arctostaphylos andersonii*	SC	None	1B					X		No
Santa Cruz Mts. beardtongue	*Penstemon rattanii* var. *kleei*	SLC	None	1B					X		No
Serpentine bedstraw	*Galium andrewsii* ssp. *gatense*	SLC	None	4					X		No
Sharsmith's onion	*Allium sharsmithae*	SC	None	1B			X		X		No
Showy Indian clover	*Trifolium amoenum*	E	None	1B					X		No
Slender moonwort	*Botrychium lineare*	C	None	1B				X			No
Slough thistle	*Cirsium crassicaule*	SC	None	1B		X					No
Smooth lessingia	*Lessingia micradenia* var. *glabrata*	SC	None	1B					X		No
South Bay clarkia	*Clarkia concinna* ssp. *automixa*	SC	None	1B					X		No
Succulent (fleshy) owl's clover	*Castilleja campestris* ssp. *succulenta*	T	E	1B		X	X	X			No
Talus fritillary	*Fritillaria falcata*	SC	None	1B			X		X		No

Table D-3 (continued)

Common Name	Scientific Name	Status			Potential Occurrence in the Study Area[e]						Potential to Adversely Affect Yes/No
		Federal[a]	State[b]	CNPS[c]	San Benito County	San Joaquin County	Stanislaus County	Madera County	Santa Clara County	Tulare County	
Tiburon buckwheat	*Eriogonum canium*	SLC	None	None							No
Tiburon paintbrush	*Castilleja affinis* ssp. *neglecta*	E	T	1B					X		No
Valley sagittaria	*Sagittaria sanfordii*	SC	None	1B		X					No
Valley spearscale	*Atriplex joaquiniana*	SC	None	1B		X			X	X	No
Water sack clover	*Trifolium depauperatum* var. *hydrophilum*	SC	None	1B					X		No
Western leatherwood	*Dirca occidentalis*	SLC	None	1B					X		No
INVERTEBRATES											
California linderiella fairy shrimp	*Linderiella occidentalis*	SC	None	NA		X	X	X	X	X	No
Conservancy fairy shrimp	*Branchinecta conservatio*	E	None	NA	X	X	X				No
Longhorn fairy shrimp	*Branchinecta longiantenna*	E	None	NA	X	X	X	X			No
Midvalley fairy shrimp	*Branchinecta mesovallensis*	SC	None	NA		X	X	X			No
Valley elderberry longhorn beetle	*Desmocerus californicus dimorphus*	T	None	NA		X	X	X		X	No
Vernal pool fairy shrimp	*Branchinecta lynchi*	FT	None	NA	X	X	X	X	X	X	No

Table D-3 (continued)

Common Name	Scientific Name	Status			Potential Occurrence in the Study Area[e]						Potential to Adversely Affect Yes/No
		Federal[a]	State[b]	CNPS[c]	San Benito County	San Joaquin County	Stanislaus County	Madera County	Santa Clara County	Tulare County	
Vernal pool tadpole shrimp	*Lepidurus packardi*	E	None	NA	X		X	X		X	No
FISH											
Chinook salmon, Central Valley fall/late fall-run ESU	*Oncorhynchus tshawytscha*	PT	SC	NA		X	X		X		No
Chinook salmon, Central Valley spring-run ESU	*Oncorhynchus tshawytscha*	PE	T	NA					X		No
Chinook salmon, Sacramento Valley winter-run ESU	*Oncorhynchus tshawytscha*	E	E	NA		X					No
Coho salmon, Central California Coast ESU	*Oncorhynchus kisutch*	T	E	NA					X		No
Delta smelt	*Hypomesus transpacificus*	D	T	NA		X	X	X	X	X	No
Hardhead	*Mylopharodon conocephalus*	None	SSC	NA							No
Lahontan cutthroat trout	*Oncorhynchus clarki henshawi*	T	None	NA				X			No
Paiute cutthroat trout	*Oncorhynchus clarki seleniris*	T	None	NA				X			No
Sacramento splittail	*Pogonichthys macrolepidotus*	SC	None	NA		X	X	X	X	X	No

Table D-3 (continued)

Common Name	Scientific Name	Status			Potential Occurrence in the Study Area[e]						Potential to Adversely Affect Yes/No
		Federal[a]	State[b]	CNPS[c]	San Benito County	San Joaquin County	Stanislaus County	Madera County	Santa Clara County	Tulare County	
Steelhead, Central Valley ESU	*Oncorhynchus mykiss irideus*	T	None	NA		X	X	X			No
AMPHIBIANS											
California red-legged frog	*Rana aurora draytonii*	T	SC,P	NA	X	X	X	X	X	X	No
California tiger salamander	*Ambystoma californiense*	C	SC,P	NA	X	X	X	X	X (PT)	X	No
Western spadefoot	*Scaphiopus hammondii*	SC	SC,P	NA		X	X	X	X	X	No
REPTILES											
Alameda whipsnake	*Masticophis lateralis euryxanthus*	T	T,P	NA		X			X		No
Blunt-nosed leopard lizard	*Gambelia (Crotaphytus) silus*	E	SE	NA	X			X		X	No
Giant garter snake	*Thamnophis gigas*	T	ST	NA		X	X	X		X	No
Northwestern pond turtle	*Clemmys marmorata marmorata*	SC	SC,P	NA		X	X	X	X	X	No
Southwestern pond turtle	*Clemmys marmorata pallida*	SC	SC,P	NA		X	X	X	X	X	No
BIRDS											
Aleutian Canada goose	*Branta canadensis leucopareia*	T	None	NA		X	X	X		X	No

Table D-3 (continued)

Common Name	Scientific Name	Status			Potential Occurrence in the Study Area[e]						Potential to Adversely Affect Yes/No
		Federal[a]	State[b]	CNPS[c]	San Benito County	San Joaquin County	Stanislaus County	Madera County	Santa Clara County	Tulare County	
American bittern	*Botaurus lentiginosus*	SC	None	NA		X	X	X	X	X	No
American dipper	*Cinclus mexicanus*	SLC	None	NA				X			No
American peregrine falcon	*Falco peregrinus anatum*	D	SE	NA		X	X	X	X	X	No
Bald eagle	*Haliaeetus leucocephalus*	PD	E	NA	X	X	X	X	X	X	No
Bewick's wren	*Thryomanes bewickii*	SC	None	NA							No
Black rail	*Laterallus jamaicensis corturniculus*	SC	T,FP	NA		X			X		No
California condor	*Gymnogyps californianus*	E	SE	NA						X	No
California thrasher	*Toxostoma redivivum*	SC	None	NA		X	X	X	X	X	No
Ferruginous hawk	*Buteo regalis*	SC	SC	NA		X	X	X	X	X	No
Greater sandhill crane	*Grus canadensis tabida*	SC	None	NA		X	X	X		X	No
Grasshopper sparrow	*Ammodramus savannarum*	SC	None	NA							No
Harlequin duck	*Histrionicus histrionicus*	SC	None	NA				X			No
Horned lark	*Eremophila alpestris*	None	SC	NA							No

Table D-3 (continued)

Common Name	Scientific Name	Status			Potential Occurrence in the Study Area[e]						Potential to Adversely Affect Yes/No
		Federal[a]	State[b]	CNPS[c]	San Benito County	San Joaquin County	Stanislaus County	Madera County	Santa Clara County	Tulare County	
Lark sparrow	*Chondestes grammacus*	SC	None	NA							V
Least bell's vireo	*Vireo belliii pusillus*	E	SE	NA	X				X		No
Lewis' woodpecker	*Melanerpes lewis*	SC	None	NA		X	X		X	X	No
Little willow flycatcher	*Epidonax traillii brewsteri*	None	E	NA		X	X	X	X	X	No
Loggerhead shrike	*Lanius ludovicianus*	SC	SC	NA		X	X	X	X	X	No
Long-billed curlew	*Numenius americanus*	SC	SC	NA			X	X	X	X	No
Marbled godwit	*Limosa fedoa*	SC	None	NA		X	X				No
Marbled murrelet	*Brachyramphus marmoratus*	T	E	NA					X		No
Mountain plover	*Charadrius montanus*	SC	None	NA		X	X	X	X	X	No
Northern Harrier	*Circus cyaneus*	None	SC	NA							No
Nutall's woodpecker	*Picoides nutallii*	SLC	None	NA		X	X	X		X	No
Oak titmouse	*Baelophus inornatus*	SLC	None	NA		X	X	X		X	No
Red knot	*Calidris canutus*	SC	None	NA					X		No
Rufous hummingbird	*Selasphorus rufus*	SC	None	NA		X	X	X	X	X	No

Table D-3 (continued)

Common Name	Scientific Name	Status			Potential Occurrence in the Study Area[e]						Potential to Adversely Affect Yes/No
		Federal[a]	State[b]	CNPS[c]	San Benito County	San Joaquin County	Stanislaus County	Madera County	Santa Clara County	Tulare County	
San Joaquin LeConte's thrasher	*Toxostoma lecontei macmillanorum*	SC	None	NA						X	No
Short-eared owl	*Asio flammeus*	SC	SC	NA							No
Swainson's hawk	*Buteo Swainsoni*	SC	ST	NA							No
Swainson's hawk	*Buteo Swainsoni*	None	T	NA		X	X	X			No
Tricolored blackbird	*Agelaius tricolor*	SC	SC	NA		X	X	X	X	X	No
Western burrowing owl	*Athene cunicularia hypugea*	SC	SC	NA		X	X	X	X	X	No
Western least bittern	*Ixobrychus exilis hesperis*	SC	SC	NA							No
Whimbrel	*Numenius phaeopus*	SC	None	NA					X		No
White-faced ibis	*Plegadis chihi*	SC	None	NA		X	X	X		X	No
White-tailed (black-shouldered) kite	*Elanus leucurus*	SC	FP	NA		X	X	X	X	X	No
Yellow-billed cuckoo	*Coccyzus americanus*	C	None	NA	X	X	X	X		X	No
MAMMALS											
Fresno kangaroo rat	*Dipodomys nitratoides exilis*	E	E	NA				X		X	No

Table D-3 (continued)

Common Name	Scientific Name	Status: Federal[a]	Status: State[b]	Status: CNPS[c]	Potential Occurrence in the Study Area[e]: San Benito County	San Joaquin County	Stanislaus County	Madera County	Santa Clara County	Tulare County	Potential to Adversely Affect Yes/No
Fringed myotis bat	*Myotis thysanodes*	SC	None	NA		X		X	X	X	No
Giant kangaroo rat	*Dipodomys ingens*	E	None	NA	X					X	No
Greater western mastiff-bat	*Eumops perotis californicus*	SC	SC	NA		X	X	X	X	X	No
Long-eared myotis bat	*Myotis evotis*	SC	None	NA		X	X	X	X	X	No
Long-legged myotis bat	*Myotis volans*	SC	None	NA		X	X	X	X	X	No
Merced kangaroo rat	*Dipodomys heermanni dixoni*	SC	None	NA		X	X	X			No
Pacific western big-eared bat	*Corynorthinus (Plecotus) townsendii townsendii*	SC	SC	NA		X	X	X	X	X	No
Pale Townsend's big-eared bat	*Corynorthinus (Plecotus) townsendii pallescens*	SC	None	NA				X		X	No
Riparian brushrabbit	*Sylvilagus bachmani riparius*	E	E	NA		X	X		X		No- May be extirpated in CCID area
Riparian woodrat	*Neotoma fuscipes riparia*	PE	SC	NA							No
Salt marsh harvest mouse	*Reitherodontomys raviventris*	E	E,FP	NA					X		No

Table D-3 (continued)

Common Name	Scientific Name	Status			Potential Occurrence in the Study Area[e]						Potential to Adversely Affect Yes/No
		Federal[a]	State[b]	CNPS[c]	San Benito County	San Joaquin County	Stanislaus County	Madera County	Santa Clara County	Tulare County	
Salt marsh vagrant shrew	*Sorex vagrans halicoetes*	SC	SC	NA					X		No
San Joaquin antelope squirrel	*Ammonspermophilus nelsoni*	SC	T	NA				X		X	No
San Joaquin kit fox	*Vulpes macrotis mutica*	E	T	NA	X	X	X	X	X	X	No
San Joaquin pocketmouse	*Perognathus inornatus*	PE	SC	NA		X	X	X		X	No
San Joaquin Valley woodrat	*Neotoma fuscipes riparia*	E	SC	NA	X	X	X				No
Short-nosed kangaroo rat	*Dipodomys nitratoides brevinasus*	SC	None	NA				X		X	No
Small-footed myotis bat	*Myotis ciliolabrum*	SC	SC	NA		X	X	X	X		No
Southern grasshopper mouse	*Onychomys torridus ramona*	SC	SC	NA				X		X	No
Spotted bat	*Euderma maculatum*	SC	SC	NA				X		X	No
Tipton kangaroo rat	*Dipodomys nitratoides nitratoides*	E	E	NA						X	No
Tulare grasshopper mouse	*Onychomys torridus tulatensis*	SC	SC	NA						X	No
Yuma myotis bat	*Myotis yumanensis*	SC	SC	NA		X	X	X	X	X	No

Table D-3 (concluded)

Notes:

N = Not known to occur; no suitable habitat

[a] Federal Status Codes:

E	=Endangered; species in danger of extinction throughout all or a significant portion of its range
T	=Threatened; species likely to become endangered within the foreseeable future
PE	=Proposed for listing as endangered
PT	=Proposed for listing as threatened
PD	=Proposed for delisting
C	=Candidate for listing
SC	=Special concern species
P	=Protected under the Marine Mammal Protection Act

[b] California Status Codes:

E	=Endangered; species whose continued existence in California is in jeopardy
T	=Threatened; species likely to become endangered within the foreseeable future
R	=Rare; plant species, although not presently threatened with extinction, may become endangered in the forseeable future
SC	=California Department of Fish and Game species of special concern
FP&P	=Fully protected and protected species defined in the State of California under Sections 3511 and 4700 of the Fish and Game Code

[c] California Native Plant Society Status Codes:

1A	=Plants presumed extinct in California
1B	=Plants that are rare, threatened, or endangered in California and elsewhere
2	=Plants that are rare, threatened, or endangered in California, but more common elsewhere
3	=Plants about which more information is needed
4	=Plants of limited distribution
H	=Hybrid. Rejected for classification by the California Native Plant Society Inventory
NA	=Not Applicable