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); Δ SW = 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,

 $k_c = Crop \text{ coefficient (unitless)};$

 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_0 data 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):

 $\mathbf{r}_{e} = (0.70917 \cdot \mathbf{r}_{t}^{0.82416} - 0.11556) \cdot (10^{0.02426.u}) \cdot f$

where,

 $\begin{array}{ll} r_{e} &= average \ effective \ monthly \ rainfall \ (inches); \\ r_{t} &= average \ monthly \ rainfall \ (inches); \\ u &= average \ monthly \ consumptive \ use \ (inches); \ and \\ f &= correction \ factor \ for \ application \ depth \ different \ from 3 \ inches, \ and \ where \\ f = (0.531747 + 0.295164 \cdot D - 0.057697 \cdot D^{2} + 0.003804 \cdot D^{3}) \end{array}$

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
			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
Almonds	Central Vly	UC Leaflet 21428	cut in half from 7/20 to 8/20.
			small grains planted 11/1 except used
Barley		UC Leaflet 21454	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		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 small grains planted 11/1 except used
Wheat	San Joaquin Vly	UC Leaflet 21454	season end date of 6/1

Month Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov	Alfalfa Monthly Average Kc 0.95 0.95 0.95 0.95 0.95 0.95 0.95 0.95	Almonds Monthly Average Kc 0.00 0.18 0.62 0.71 0.80 0.74 0.62 0.80 0.62 0.80 0.62 0.02	Barley Monthly Average Kc 0.98 1.20 1.14 0.78 0.24 0.00 0.00 0.00 0.00 0.00 0.00 0.00	Beans Monthly Average Kc 0.00 0.00 0.00 0.00 0.28 1.08 0.28 1.08 0.98 0.25 0.00 0.00 0.00 0.00	Cereal (use Barley) Monthly Average Kc 0.98 1.20 1.14 0.78 0.24 0.00 0.00 0.00 0.00 0.00 0.00 0.00	$\begin{array}{c} 0.65\\ 0.65\\ 0.65\\ 0.65\\ 0.65\\ 0.65\\ 0.65\\ 0.65\\ 0.65\\ 0.65\\ 0.65\\ 0.65\\ 0.65\\ 0.65\\ 0.65\\ \end{array}$	Corn Monthly Average Kc 0.00 0.00 0.20 0.60 1.11 0.99 0.59 0.00 0.00 0.00 0.00	0.00 0.00 0.11 0.22 0.75 1.17 1.05 0.62 0.01 0.00	Deciduous Orchard, c Monthly Average Kc 0.00 0.00 0.58 0.70 0.82 0.87 0.87 0.87 0.87 0.83 0.71 0.00 0.00	0.00 0.00 0.75 0.91 0.97 0.97 0.97 0.95 0.88 0.00	Garlic/ Onions Monthly Average Kc 1.15 1.15 1.13 0.96 0.40 0.00 0.00 0.00 0.00 0.00 0.00 0.12 0.30	Grain Sorghum (Milo) Monthly Average Kc 0.00 0.00 0.00 0.00 0.16 0.51 1.04 0.81 0.00 0.00 0.00 0.00 0.00	Melons Monthly Average Kc 0.00 0.00 0.09 0.26 0.90 0.63 0.00 0.00 0.00 0.00 0.00 0.00 0.0
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
	Misc. (High) (use Corn) Monthly	Misc. (Low) (use 8/31 Lettuce) Monthly	Misc. (Med) (use avg. of High and Low)	Nursery/ Lettuce	Olives	Pasture		Rice		Tomatoes	Tomatoes (fresh market)	Vineyard/ Berries (use Grapes)	Wheat
1	Average	Average	Monthly Average	Monthly Average	Monthly Average	(Improved) Monthly	Potatoes Monthly	Monthly Average	Sugarbeets Monthly	(canning) Monthly	Monthly Average	Monthly Average	Monthly Average
Month	Kc	Average Kc	Average Kc	Average Kc	Average Kc	Monthly Average Kc	Monthly Average Kc	Average Kc	Monthly Average Kc	Monthly Average Kc	Monthly Average Kc	Monthly Average Kc	Monthly Average Kc
Jan	Kc	Average Kc 0.00	Average Kc 0.00	Average Kc 0.00	Average Kc 0.00	Monthly Average Kc 0.90	Monthly Average Kc 0.00	Average Kc 0.00	Monthly Average Kc 0.00	Monthly Average Kc 0.00	Monthly Average Kc 0.00	Monthly Average Kc 0.00	Monthly Average Kc 0.98
Jan Feb	Kc 0.00 0.00	Average Kc 0.00 0.00	Average Kc 0.00 0.00	Average Kc 0.00 0.00	Average Kc 0.00 0.00	Monthly Average Kc 0.90 0.90	Monthly Average Kc 0.00 0.00	Average Kc 0.00 0.00	Monthly Average Kc 0.00 0.00	Monthly Average Kc 0.00 0.00	Monthly Average Kc 0.00 0.00	Monthly Average Kc 0.00 0.00	Monthly Average Kc 0.98 1.20
Jan Feb Mar	Kc 0.00 0.00 0.00	Average Kc 0.00 0.00 0.00	Average Kc 0.00 0.00 0.00	Average Kc 0.00 0.00 0.00	Average Kc 0.00 0.00 0.02	Monthly Average Kc 0.90 0.90 0.90	Monthly Average Kc 0.00 0.00 0.58	Average Kc 0.00 0.00 0.00	Monthly Average Kc 0.00 0.00 0.08	Monthly Average Kc 0.00 0.00 0.00	Monthly Average Kc 0.00 0.00 0.02	Monthly Average Kc 0.00 0.00 0.17	Monthly Average Kc 0.98 1.20 1.20
Jan Feb Mar Apr	Kc 0.00 0.00 0.00 0.20	Average Kc 0.00 0.00 0.00 0.00	Average Kc 0.00 0.00 0.00 0.10	Average Kc 0.00 0.00 0.00 0.00	Average Kc 0.00 0.00 0.02 0.62	Monthly Average Kc 0.90 0.90 0.90 0.90	Monthly Average Kc 0.00 0.00 0.58 1.01	Average Kc 0.00 0.00 0.00 0.95	Monthly Average Kc 0.00 0.00 0.08 0.27	Monthly Average Kc 0.00 0.00 0.00 0.00	Monthly Average Kc 0.00 0.00 0.02 0.08	Monthly Average Kc 0.00 0.00 0.17 0.46	Monthly Average Kc 0.98 1.20 1.20 1.09
Jan Feb Mar Apr May	Kc 0.00 0.00 0.00 0.00 0.20 0.60	Average Kc 0.00 0.00 0.00 0.00 0.00	Average Kc 0.00 0.00 0.00 0.10 0.30	Average Kc 0.00 0.00 0.00 0.00 0.00	Average Kc 0.00 0.00 0.02 0.62 0.71	Monthly Average Kc 0.90 0.90 0.90 0.90 0.90	Monthly Average Kc 0.00 0.00 0.58 1.01 1.19	Average Kc 0.00 0.00 0.00 0.95 1.14	Monthly Average Kc 0.00 0.00 0.08 0.27 0.75	Monthly Average Kc 0.00 0.00 0.00 0.00 0.27	Monthly Average Kc 0.00 0.00 0.02 0.08 0.64	Monthly Average Kc 0.00 0.00 0.17 0.46 0.64	Monthly Average Kc 0.98 1.20 1.20 1.09 0.74
Jan Feb Mar Apr May Jun	Kc 0.00 0.00 0.00 0.00 0.20 0.60 1.11	Average Kc 0.00 0.00 0.00 0.00 0.00 0.00	Average Kc 0.00 0.00 0.00 0.10 0.30 0.56	Average Kc 0.00 0.00 0.00 0.00 0.00 0.00	Average Kc 0.00 0.00 0.02 0.62 0.71 0.78	Monthly Average Kc 0.90 0.90 0.90 0.90 0.90 0.90	Monthly Average Kc 0.00 0.58 1.01 1.19 0.71	Average Kc 0.00 0.00 0.00 0.95 1.14 1.25	Monthly Average Kc 0.00 0.00 0.08 0.27 0.75 1.10	Monthly Average Kc 0.00 0.00 0.00 0.00 0.27 0.62	Monthly Average Kc 0.00 0.00 0.02 0.08 0.64 1.00	Monthly Average Kc 0.00 0.00 0.17 0.46 0.64 0.80	Monthly Average Kc 0.98 1.20 1.20 1.09 0.74 0.24
Jan Feb Mar Apr May Jun Jul	Kc 0.00 0.00 0.00 0.00 0.60 1.11 0.99	Average Kc 0.00 0.00 0.00 0.00 0.00 0.00 0.00	Average Kc 0.00 0.00 0.10 0.30 0.56 0.49	Average Kc 0.00 0.00 0.00 0.00 0.00 0.00 0.00	Average Kc 0.00 0.02 0.62 0.71 0.78 0.80	Monthly Average Kc 0.90 0.90 0.90 0.90 0.90 0.90 0.90	Monthly Average Kc 0.00 0.58 1.01 1.19 0.71 0.00	Average Kc 0.00 0.00 0.95 1.14 1.25 1.17	Monthly Average Kc 0.00 0.00 0.08 0.27 0.75 1.10 1.09	Monthly Average Kc 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.27 0.62 1.04	Monthly Average Kc 0.00 0.00 0.02 0.08 0.64 1.00 0.90	Monthly Average Kc 0.00 0.00 0.17 0.46 0.64 0.64 0.80 0.82	Monthly Average Kc 0.98 1.20 1.20 0.098 0.204 0.00
Jan Feb Mar Apr May Jun Jun Jul Aug	Kc 0.00 0.00 0.00 0.00 0.60 1.11 0.99 0.59	Average Kc 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0	Average Kc 0.00 0.00 0.10 0.30 0.56 0.49 0.36	Average Kc 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0	Average Kc 0.00 0.02 0.62 0.71 0.78 0.80 0.80	Monthly Average Kc 0.90 0.90 0.90 0.90 0.90 0.90 0.90 0.9	Monthly Average Kc 0.00 0.58 1.01 1.19 0.71 0.00 0.00	Average Kc 0.00 0.00 0.95 1.14 1.25 1.17 1.02	Monthly Average Kc 0.00 0.00 0.08 0.27 0.75 1.10 1.09 1.02	Monthly Average Kc 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.27 0.62 1.04 0.99	Monthly Average Kc 0.00 0.00 0.02 0.08 0.64 1.00 0.90 0.05	Monthly Average Kc 0.00 0.00 0.17 0.46 0.64 0.64 0.80 0.82 0.70	Monthly Average Kc 0.98 1.20 1.20 0.098 0.204 0.00
Jan Feb Mar Apr May Jun Jul Aug Sep	Kc 0.00 0.00 0.00 0.00 0.60 1.11 0.99 0.59 0.00	Average Kc 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0	Average Kc 0.00 0.00 0.10 0.30 0.56 0.49 0.36 0.10	Average Kc 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0	Average Kc 0.00 0.02 0.62 0.71 0.78 0.80 0.80 0.80	Monthly Average Kc 0.90 0.90 0.90 0.90 0.90 0.90 0.90 0.9	Monthly Average Kc 0.00 0.58 1.01 1.19 0.71 0.00 0.00 0.00	Average Kc 0.00 0.00 0.95 1.14 1.25 1.17 1.02 0.00	Monthly Average Kc 0.00 0.00 0.27 0.75 1.10 1.09 1.02 0.48	Monthly Average Kc 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.27 0.62 1.04 0.99 0.38	Monthly Average Kc 0.00 0.02 0.08 0.64 1.00 0.90 0.05 0.00	Monthly Average Kc 0.00 0.17 0.46 0.64 0.80 0.82 0.70 0.00	Monthly Average Kc 0.98 1.20 1.20 0.74 0.24 0.00 0.00
Jan Feb Mar Apr May Jun Jul Aug Sep Oct	Kc 0.00 0.00 0.00 0.20 0.60 1.11 0.99 0.59 0.00 0.00	Average Kc 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0	Average Kc 0.00 0.00 0.10 0.30 0.56 0.49 0.36 0.10 0.35	Average Kc 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0	Average Kc 0.00 0.02 0.62 0.71 0.78 0.80 0.80 0.80 0.80	Monthly Average Kc 0.90 0.90 0.90 0.90 0.90 0.90 0.90 0.9	Monthly Average Kc 0.00 0.58 1.01 1.19 0.71 0.00 0.00 0.00 0.00	Average Kc 0.00 0.00 0.95 1.14 1.25 1.17 1.02 0.00 0.00	Monthly Average Kc 0.00 0.00 0.27 0.75 1.10 1.09 1.02 0.48 0.00	Monthly Average Kc 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.27 0.62 1.04 0.99 0.38 0.00	Monthly Average Kc 0.00 0.02 0.08 0.64 1.00 0.90 0.05 0.00 0.00	Monthly Average Kc 0.00 0.00 0.17 0.46 0.64 0.80 0.82 0.70 0.00 0.00	Monthly Average Kc 0.98 1.20 1.20 0.74 0.24 0.00 0.00 0.00
Jan Feb Mar Apr May Jun Jun Jul Aug Sep	Kc 0.00 0.00 0.00 0.00 0.60 1.11 0.99 0.59 0.00	Average Kc 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0	Average Kc 0.00 0.00 0.10 0.30 0.56 0.49 0.36 0.10	Average Kc 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0	Average Kc 0.00 0.02 0.62 0.71 0.78 0.80 0.80 0.80	Monthly Average Kc 0.90 0.90 0.90 0.90 0.90 0.90 0.90 0.9	Monthly Average Kc 0.00 0.58 1.01 1.19 0.71 0.00 0.00 0.00	Average Kc 0.00 0.00 0.95 1.14 1.25 1.17 1.02 0.00	Monthly Average Kc 0.00 0.00 0.27 0.75 1.10 1.09 1.02 0.48	Monthly Average Kc 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.27 0.62 1.04 0.99 0.38	Monthly Average Kc 0.00 0.02 0.08 0.64 1.00 0.90 0.05 0.00	Monthly Average Kc 0.00 0.17 0.46 0.64 0.80 0.82 0.70 0.00	Monthly Average Kc 0.98 1.20 1.20 0.74 0.24 0.00 0.00

 Table 2

 Monthly Crop Coefficients (Kc)

		potranspiration and Pree	NCDC Station with
			Representative
	CIMIS Station with	CIMIS Station with	Precipitation for Wet
District	Representative Eto for	Representative Eto for	and Dry Year
District	Wet Year	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 3

 Weather Stations Used for Reference Evapotranspiration and Precipitation Data

CIMIS														
Station No.	CIMIS Station Name	Jan	Feb	Mar	Apr	Мау	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 4Wet Year (1998) Total Monthly Reference Evapotranspiration (in)

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

CIMIS Station														
No.	CIMIS Station Name	Jan	Feb	Mar	Apr	Мау	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.

NCDC														
Station ID	NCDC Station Name	Jan	Feb	Mar	Apr	Мау	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 6

 Wet Year (1998) Total Monthly Precipitation (in)

NCDC Station														ľ
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

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

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

		Total Irrigated Acreage Reported
District	Source of Irrigated Apresso	to the Reclamation ¹
District	Source of Irrigated Acreage	to the Reclamation
	Average of irrigated acreage from	
Del Puerto WD	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
	Crop mix based on average of Reclamation	
	data (1985-94, 99) with total acreage of	
	4900 (based on reported total acreage in	
Pacheco WD	March 2000 Final EA/IS Table 3.4-4)	4,900
	Average of irrigated acreage from	
Panoche WD	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
	Average of irrigated acreage from	
San Luis WD	Reclamation (1979-96, 99)	45,758
	2002 Crop Report from Santa Clara County	
Santa Clara Vly WD	Department of Agriculture	25,677
Westlands WD	1995 Reclamation data	529,050
	Total:	1,577,348

 Table 8

 Sources of Irrigated Acreage in Water Balance Analysis

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

						-								
	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	

Table 9

District	Misc. Truck/ Field Crops (High)	Misc. Truck/ Field Crops (Low)	Misc. Truck/ Field Crops (Med)	Nursery/L ettuce	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

¹Contracted water amounts were obtained from interim and long-term renewal contracts (USBR 2001a - 2001i, USBR 2003).

²Irrigation demand was increased by 5% to account for leaching, with an additional increase to account for a 77% irrigation efficiency.

³It was assumed that in a wet year, the Friant Division would receive 100% of both Class 1 and Class 2 deliveries.

⁴It 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

les

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: W	Division: West San Joaquin	quin			Water	Water Needs Assessment	essment	-	District		Date:	10/11/00
Agricultura	Agricultural and M&I Water Supply	Water S						-	WESTLANDS WD	DS WD		
			Cont	ractor's \	Vater Supt	Contractor's Water Supply Sources and Quantities (acre-feet)	and Ouanti	ties (acre-)	[eet)			
				Surface	Surface Water Supply					Groundwater Supply	Ņ	
Timeframe 1	Refe Deli	Reference Delivery 2	USBR Total Deliv/Max 3	SWP A		Local Source 6	Irsfr/Rtrn /Recycle h 7	Irsfr/ Out 8	District Pr 9	Private Xi to 1	Safe Yield Recharge 11 17	Total Supply #3
1989	1,062,509		1,130,463	0	0		32,865	5,420	0	000		1,332,908
1996		0	0									0
2025	1,150	1,150,000 * 1	1,150,000 *	0	0		. 0	4,938	0	175,000	0	1,320,062
				Con	tractor's A	Contractor's Agricultural Water Demands	Water Den	Jands	M	axímum Prod	Maximum ProductiveAcres= :	545,268
	Grop Water	District irrig.	Effective Effective	Reference Effective	Calculated Net Crop	USBR Net Crop		Reference hrrigated	Calculated		Conveyance	Total Ay
Taneframe 1	Kequinement (acre-feet) t5	ETHCEANCY EX3 16	reep (acre-feet) 7	Precip (acro-ft) 18	water keq (acre-feet) 19	Water Reg [acre-feet] 20	Acres (acres) 21	ACT 03 [aCT 03] 22	FDR (AF/acro) 23	USBR FDR [AF/acro] 24	Loss (acre-feet) 25	Demand Lacre-feetU 26
1989	1,150,449	75	65,249 1	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 1	181,830	1,394,030	1,394,030	606,100	606,100	2.30	2.30	319	1,394,349
					Contractor	Contractor's M&I Water Demands	ter Demano	Is				
	Resi	Residential Water Demand	r Demand	Wei	Nonresidential Water Demand	ter Benand	L088					
		Per Capita	pita Total		Comm/	n/ Total	Unacc	Ref Urban	Calc Urban	Total MEI	Tota	Ummet
Turchan		—	Deman	l Industrial	ka Instit				Per Capita	Demand	Ag+ MCI Dand	Demand
	Population 28	28	lacre-168 30	0 1acre-1er 31	U 1acre-reeU 1acre-reeU 31 32	au lacre-feet) 33	l) (acre-feet) 34		Dind (gpod) 36	(acre-feet) 37	(acre-feet) 38	lacre-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 ord showr	In order to limit this to a shown as transfers out.	to an asse out.	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.	icultural w	ater needs,	M&I water d	emand in the	e amount of	5,420 AF in	1989 and 4,	938 AF in 202	5 are
* Represents	* Represents Maximum Contract Amount	ract Amoun	Шţ									

HSPI COGILO MCALISIUII UULU CUL ALINUUL

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

hformation 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.

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Division: Wast San Joa Crop Consumptive Use

Gross_Crop_Water_Requirement 203220 0.3 0.3 0.3 0.3 0.3 0.3 0.3 Total EP 0.3 Ave_EP 0.3 0.3 0.3 0.3 0.3 0.3 0.3 0.3 0.3 0.3 0.3 0.3 IDCON 0.13 0.25 0.00 0.25 0.00 0.05 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.10 0.00 0.00 Ave CP 0,00 0.00 Total_CP Total_Crop_Water_Requirement AVB_SE **fotal** SE 85 82 85 85 2025 4.5 3.2 2.0 Ave_ET 3.3 1.8 2.4 2.6 3.8 2.4 0.7 1.5 0.7 3.2 2.1 <u>ئ</u> Total_ET к, 4.7 Year_Ending 0.027 0.203 0.023 0.035 0.035 0.035 0.090 0.043 0.063 0.063 0.063 0.037 0.037 Total_FDR AV0_LR 0.213 0.202 0.011 0.165 0.115 0.106 0.025 otal_LR 0.06500 2025 Total_CR West San Joaquin WESTLANDS WD 5,300 18,800 87,000 24,800 203,400 14,000 13,900 22,700 Ave_Group_Acres 3,200 25,400 100 9,300 500 1,100 1,600 109,100 9,800 13,000 lotal_Acres 43,100 606,100 Barley Cotton Sugar Beets Wheat Almonds Deciduous Orchard Grains Melons Misc. Trk/Fld (Low) Misc. Trk/Fld (Med) Nursery/Lettuce Subtropical Orchard Tomatoes Alfalfa Misc. Tr/Fld (High) Pasture (Improved) Vineyard Beans (Dry) Corn (Field) Crop_Group_Number Division_Name rear_Beginning District_Name

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1,366,756

1,394,030

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Tuesday, August 29, 2000

Appendix B Hydrologic Effects of Water Transfers

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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 fiveyear 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 documented¹ 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.

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:

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

<u>Discharges from community ditches and drainage systems</u>. Either privately-owned or districtowned 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.

<u>Discharges to creeks and wasteways</u>. 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.

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

<u>Tilewater drainage</u>. 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 Bypass 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.

<u>Evaporation and seepage of tailwater</u>. 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 analysis² 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.

	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 Wate	er												
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

Table 3

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

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 Agreement⁴ 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 10Assumed 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

1 0110 00 1111				addanty	1.010400			Balano				
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	-	-	-	-	-	-	-	-	-	-	-	-

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

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

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

Delivery of Reclamation Developed Water Delivery of Exhange Contractor Developed Water Delivery of Reclamation Developed Water Delivery of Exhange Contractor Developed Water SJR-drainage Wildlife Areas SJR-drainage Wildlife Areas SJR-drainage Wildlife Areas SJR-drainage Wildlife Areas - 62.250 63,365 -— 0 1,115 -Non SJR-drainage Wildlife Areas Non SJR-drainage Wildlife Areas Non SJR-drainage Wildlife Areas Non SJR-drainage Wildlife Areas 0 12,329 12,329 0 SJR-drainage Agriculture SJR-drainage Agriculture Combined SJR-drainage Wildlife Areas 0 Combined SJR-drainage Wildlife Areas 0 63,365 63,365 Other Non SJR-drainage Entities Other Non SJR-drainage Entities Combined Non SJR-drainage Wildlife Areas Combined Non SJR-drainage Wildlife Areas 7,385 0 12,329 12,329 San Joaquin San Joaquin River River Exhange Contractor Developed Water Exhange Contractor Developed Water Reclamation Developed Water **Reclamation Developed Water** Evaporation / Seepage of Tailwater Evaporation / Seepage of Tailwater Sacramento Vallev 15.000 Sacramento Vallev 15.000 4,526 Drain Spills to Non-district Lands Drain Spills to Non-district Lands 30,000 - 14,000 - 14.000 South of Delta Discharge to Mud and Salt Sloughs South of Delta Discharge to Mud and Salt Sloughs 28,535 28,535 SJR-drainage Sources Tailwater Recovery Upstream of Sack Dam SJR-drainage Sources Tailwater Recovery Upstream of Sack Dam 6,412 6,100 40,000 6,100 Non SJR-drainage Sources Groundwater Substitution for Transfers Non SJR-drainage Sources Groundwater Substitution for Transfers 6,775 6,000 20,000 0 Land Fallowing Land Fallowing 0 0 Total Total Total Total 17,713 69,635 90,000 63,635

Existing Setting Non-critical Years

All values stated in acre-feet

All values stated in acre-feet

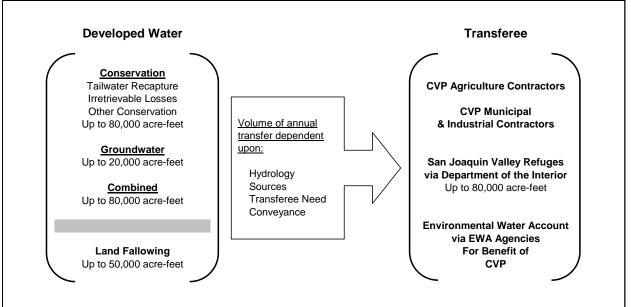
Future No Action Setting and No Project Alternative

Non-critical Years

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.





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

Table TOA															
									Develop	ed Water					
Existing Condition /	Future No Action					Exc	hange Contrac	tors				Inte	erior		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		28,535	6,100	6,000	0	69,635	4,526			17,713	87,348
		Critical		15,000	14,000		6,100	0	0	63,635	4,526			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		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			1		Change	from Existing C	ondition				Change from Ex	cisting Conditio	n	Change
	1					ge	Recovery]		g-
				Savings from		Recovery of Discharges to	from Discharges	Groundwater	Crop Idling / Temprary	Total Water Developed by	Sacramento		San Joaquin Valley SJR	Total Water	Total
	Developed Water	. -	a . 1	Evaporation	NonDistrict	Mud/Salt	Upstream of	Substitution	Land	Exchange	Valley	SJR Drainage		Developed by	Developed
Delivery Focus	Emphasis	Year Type	Study	and Seepage	Lands	Slough	Sack Dam	for Transfer	Fallowing	Contractors	Sources	Sources	Sources	Interior	Water
Refuge Focus	Conservation	Non-critical Critical	A-1-1-C A-1-0-S	-	-	15,465	900	(6,000)	- 50.000	10,365 50.000	11,730	15,262	4,062	31,054	41,419 50.000
Agriculture Focus		Non-critical	A-1-0-3		-	15.465	900	(6,000)	50,000	10.365	25.474	33,588	13.225	72,287	82,652
righteattare r ocus		Critical	1120	-	-	-		(0,000)	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
Refuge Focus	Fallowing	Critical Non-critical	A-3-1-C	-	-	-	-	- (6.000)	50,000 16,365	50,000 10,365	- 11.730	- 15,262	- 4.062	- 31.054	50,000 41,419
iverage Focus		Critical	A-3-1-C A-3-0-S		-	-		- (0,000)	50.000	50.000	-		4,062	- 31,054	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	1	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

								Watar D						
								water D						
Future No Action					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
		Future No Action	0	0	0	0								13,444 75.694
		Future No Action	0	0	9	0	0	0						13,444
Acre-feet Delivery				1	Change from E:	kisting Conditio		1	Change	from Existing C	Condition	Change	from Existing C	Condition
Developed Water Emphasis	Year Type	Study	Wildlife Areas SJR Drainage	Wildlife Areas SJR Non Drainage	Agricultural Contractors SJR Drainage	Out-of- Drainage Basin Entities	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
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
1										-	- 62 250			40,000 72,615
	Critical		-	-	50,000	-	50,000	-	-	-	-	-	-	50,000
	Non-critical	A-1-3-C		-	-		10,365			-		-	-	72,615
Groundwater		A-1-1-C		-	-				- 16.073	- 9.497		- 27.320	- 17.823	50,000 19,935
Circunation	Critical	A-1-0-S	40,000	-	-	-	40,000	40,000	-	-	-	40,000	40,000	40,000
		A-2-2-C				(7,385)		(62,250)	62,250	-	62,250	-	-	72,615 50.000
		A-2-3-C		-	- 50,000	72.615		(62,250)	- 62.250	-	62.250	-	-	72,615
	Critical		-	-	-	50,000	50,000	-	-	-	-	-	-	50,000
Fallowing														19,935 40,000
	Non-critical	A-3-2-C	(62,250)	-	80,000		10,365	(62,250)	62,250	-	62,250	40,000	-	72,615
-	Critical		-	-	50,000	-	50,000	-	-	-	-	-	-	50,000
		A-3-3-C	(62,250)	-	-			(62,250)	62,250	-	62,250	-	-	72,615 50,000
			•		Mode				•					
Developed Water Emphasis Conservation	Year Type	Study	Change in Water Developed from Evaporation and Seepage	Change in Water Developed from Spills to NonDistrict Lands	Mud/Salt Slough	Dam (Non SJR Drainage)	Change in Water Developed from Groundwater Substitution for Transfer (6 000)	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	Water Delivered to Non SJR Drainage Wildlife Areas	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 <u>SJR Drainage)</u> 4,062
Concertation	Critical	A-1-0-S	-	-	-	-	-	42,000	8,000	40,000	-	-	-	-
	Non-critical	A-1-2-C		-	15,465		(6,000)	-	- 8.000	-			25,474	13,225
1	Non-critical	A-1-3-C	-	-	15,465	900	(6,000)	-	-	-	-	(33,588)	25,474	- 13,225
		1				-	- 10,365	42,000	0,000	- 17,823	- 9,497	(15,262)	- 11,730	4,062
Groundwater	Non-critical	A-1-1-C	-	-	-									
Groundwater	Non-critical Critical	A-1-0-S	-	-	-	-		42,000	8,000	40,000	-	-	-	
Groundwater	Non-critical Critical Non-critical						10,365	-	-	40,000	-	46,412	- 25,474	13,225
Groundwater	Non-critical Critical Non-critical Critical Non-critical	A-1-0-S	-	-	-	-	10,365 10,365	- 42,000 -	- 8,000 -	-			25,474	
	Non-critical Critical Non-critical Critical Non-critical Critical	A-1-0-S A-2-2-C A-2-3-C	- - - -	- - - -	- - - -	- - - -	- 10,365 -	- 42,000 - 42,000	- 8,000 - 8,000			46,412 50,000 (33,588) -	25,474 - 25,474 -	13,225 - 13,225 -
Groundwater	Non-critical Critical Non-critical Critical Non-critical Critical Non-critical	A-1-0-S A-2-2-C A-2-3-C A-3-1-C			- - -		-	- 42,000 - 42,000 13,747	- 8,000 - 8,000 2,618	- - - 17,823	-	46,412 50,000 (33,588)	25,474 - 25,474	13,225
	Non-critical Critical Non-critical Critical Critical Non-critical Critical Non-critical Non-critical	A-1-0-S A-2-2-C A-2-3-C	- - - - - - - -	- - - - - - - - -	- - - - - - -	- - - - - - -	- 10,365 - (6,000)	- 42,000 - 42,000 13,747 42,000 13,747	- 8,000 - 2,618 8,000 2,618	- - - 17,823 40,000	- - - 9,497 - -	46,412 50,000 (33,588) - (15,262) - 46,412	25,474 - 25,474 - 11,730	13,225 - 13,225 - 4,062
	Non-critical Critical Non-critical Critical Non-critical Critical Non-critical Critical	A-1-0-S A-2-2-C A-2-3-C A-3-1-C A-3-0-S	- - - - - -	- - - - - -	- - - - - -	- - - - - -	- 10,365 - (6,000) -	42,000 - 42,000 13,747 42,000	- 8,000 - 8,000 2,618 8,000	- - - 17,823 40,000	- - - 9,497 -	46,412 50,000 (33,588) - (15,262) -	25,474 - 25,474 - 11,730 -	13,225 - 13,225 - 4,062 -
	Emphasis Conservation Groundwater Fallowing Developed Water	Year Type Non-critical Critical Non-critical Conservation Non-critical Conservation Non-critical Critical Non-critical Conservation Non-critical Critical Non-critical Critical	Year Type Study Non-critical Critical Existing Condition Non-critical Critical Future No Action Acre-feet Delivery Study Developed Water Emphasis Year Type Study Conservation Non-critical Critical A-1-1-C Critical Non-critical A-1-2-C Critical A-1-2-C Critical Groundwater Non-critical Critical A-1-3-C Critical Groundwater Non-critical Critical A-2-2-C Critical Non-critical A-2-2-C Critical A-3-0-S Non-critical Non-critical A-2-3-C Critical A-3-0-S Non-critical A-3-3-C Critical A-3-3-C Critical A-3-3-C Critical A-3-3-C Critical A-3-3-C Critical A-3-3-C Critical A-1-1-C Non-critical A-3-3-C Critical A-1-1-C Critical A-1-1-C Critical A-1-1-C Critical A-1-0-S Non-critical	Year Type Study Wildlife Areas SJR Drainage Non-critical Critical Existing Condition 62,250 0 Non-critical Future No Action 0 Critical Future No Action 0 Acre-feet Delivery	Year Type Analysis Baseline / Study Wildlife Areas SJR Non Drainage Non-critical Critical Existing Condition Critical 62,250 0 Non-critical Critical Future No Action 0 0 0 Acre-feet Delivery	Future No Action Analysis Baseline / Study Wildlife Areas SJR Drainage Agricultural Contractors Non-critical Critical Existing Condition 62,250 0 0 Non-critical Critical Future No Action 0 0 0 0 Acre-feet Delivery Change from Existing Conservation Wildlife Areas SJR Drainage Agricultural Contractors Agricultural Contractors Developed Water Emphasis Year Type Study SJR Drainage Wildlife Areas SJR Non Drainage Agricultural Contractors Conservation Non-critical Ano-critical A-1-2-C (62,250) - 80,000 Critical Groundwater Non-critical Ano-critical A-1-3-C (62,250) - - Fallowing Non-critical Ano-critical A-2-3-C (62,250) - - Fallowing Non-critical Ano-critical A-3-C (62,250) - - Non-critical Ano-critical A-3-C (62,250) - - - Non-critical Ano-critical A-3-C (62,250) - - - <	Vear Type Analysis Baseline / Study Wildlife Areas SJR Non SJR Drainage Agricultural Contractors SJR Drainage Out-of- Drainage Basin Entities On 0 Non-critical Critical Existing Condition 62,250 0 0 0 0 Non-critical Critical Future No Action 0 <td>Future No Action Total from Exchange Year Type Analysis Baseline / Study Wildlife Areas SJR Drainage Agricultural Contractor Drainage Out-of- Drainage Dut-of- Drainage Non-critical Critical Existing Condition 62,250 0 0 7,385 69,635 Non-critical Critical Future No Action 0 <td< td=""><td>Exchange Contractors Exchange Contractors Year Type Analysis Baseline / Study Wildlife Areas SJR Drainage Agricultural Drainage Contractors Total from Exchange Drainage Contractor Basin Entities Wildlife Areas Water Non-critical Critical Existing Condition 62.250 0 0 0 7.385 69.635 62.250 Critical Critical Future No Action 0</td><td>Future No Action Total From Total From Total From Total From Wildlife Areas Ver Type Study SJR Orange Analysis Baseline/ Wildlife Areas Agricultural Out-of- Drainage Dott-of- Drainage Total from Charge Contractor Charge From Developed Water Year Type Study SJR Drainage SJR Drainage SJR Drainage Dott-of- Drainage Total from Charge Contractor SJR Drainage Wildlife Areas Conservation Non-critical A-1-1-C 1,750 1.0 Dott-of- Drainage Contractor SJR Drainage Wildlife Areas SJR Drainage SJR Drainage</td><td>Exchange Contractors Interior Future No Action Exchange Middle Areas Cartical Analysis Baseline / Sub or Sub Romanage Widdle Areas Sub Romanage Sub Romanage Contractors Apricultural Data of Cartical Widdle Areas Exchange Widdle Areas Widdle Areas Cartical Widdle Areas Sub Romanage Non-critical Evalue No Action 62.20 <</td><td>Exchange Contractors Interior Future No Action Anatysis Baseline / Study Wildlife Areas SJR Darinage Agricultural Darinage Out-of- Darinage Exchange Future No Action Wildlife Areas SJR Darinage Wildlife Area</td><td>Exchange Contractors Interior Interior Future No Action Var Type Sudy Vidifie Areas SIR Printage Contractors Var Contractors Var Type Nuldifie Areas SIR Printage Contractors Var Type Var Type Sint Printage Contractors Var Type Var Type Sint Printage Contractors Var Type Var Type Sint Printage Contractors Var Type Sint Printage Contractors Var Type Var Type Sint Printage Contractors Contractors Contractors Contractors Contractors Sint Printage Contractors Contractors Sint Printage Contractors Contractors Contractors Contractors Contractors Contractors Contractors Sint Printage Contractors Contra</td><td>Exchange Contractors Interior Combined Future No Action Veer Type Study Wildlife Areas SUR Drainage Aralysis Baseline/ SUR Drainage Wildlife Areas SUR Drainage Aralysis Baseline/ Drainage Wildlife Areas SUR Drainage Total SUR Drainage Wildlife Areas SUR Drainage Total SUR Drainage Wildlife Areas SUR Drainage Wildlife Areas SUR Drainage Wildlife Areas SUR Drainage Wildlife Areas SUR Drainage Weater Wildlife Areas SUR Drainage Total Total SUR Drainage Drainage Weater Wildlife Areas SUR Drainage Total Drainage Drainage Wildlife Areas SUR Drainage Total SUR Drainage Drainage Wildlife Areas SUR Drainage Total Drainage Drainage Wildlife Areas SUR Drainage Total Drainage Drainage Wildlife Areas SUR Drainage Total Drainage Drainage SUR Drainage</td></td<></td>	Future No Action Total from Exchange Year Type Analysis Baseline / Study Wildlife Areas SJR Drainage Agricultural Contractor Drainage Out-of- Drainage Dut-of- Drainage Non-critical Critical Existing Condition 62,250 0 0 7,385 69,635 Non-critical Critical Future No Action 0 <td< td=""><td>Exchange Contractors Exchange Contractors Year Type Analysis Baseline / Study Wildlife Areas SJR Drainage Agricultural Drainage Contractors Total from Exchange Drainage Contractor Basin Entities Wildlife Areas Water Non-critical Critical Existing Condition 62.250 0 0 0 7.385 69.635 62.250 Critical Critical Future No Action 0</td><td>Future No Action Total From Total From Total From Total From Wildlife Areas Ver Type Study SJR Orange Analysis Baseline/ Wildlife Areas Agricultural Out-of- Drainage Dott-of- Drainage Total from Charge Contractor Charge From Developed Water Year Type Study SJR Drainage SJR Drainage SJR Drainage Dott-of- Drainage Total from Charge Contractor SJR Drainage Wildlife Areas Conservation Non-critical A-1-1-C 1,750 1.0 Dott-of- Drainage Contractor SJR Drainage Wildlife Areas SJR Drainage SJR Drainage</td><td>Exchange Contractors Interior Future No Action Exchange Middle Areas Cartical Analysis Baseline / Sub or Sub Romanage Widdle Areas Sub Romanage Sub Romanage Contractors Apricultural Data of Cartical Widdle Areas Exchange Widdle Areas Widdle Areas Cartical Widdle Areas Sub Romanage Non-critical Evalue No Action 62.20 <</td><td>Exchange Contractors Interior Future No Action Anatysis Baseline / Study Wildlife Areas SJR Darinage Agricultural Darinage Out-of- Darinage Exchange Future No Action Wildlife Areas SJR Darinage Wildlife Area</td><td>Exchange Contractors Interior Interior Future No Action Var Type Sudy Vidifie Areas SIR Printage Contractors Var Contractors Var Type Nuldifie Areas SIR Printage Contractors Var Type Var Type Sint Printage Contractors Var Type Var Type Sint Printage Contractors Var Type Var Type Sint Printage Contractors Var Type Sint Printage Contractors Var Type Var Type Sint Printage Contractors Contractors Contractors Contractors Contractors Sint Printage Contractors Contractors Sint Printage Contractors Contractors Contractors Contractors Contractors Contractors Contractors Sint Printage Contractors Contra</td><td>Exchange Contractors Interior Combined Future No Action Veer Type Study Wildlife Areas SUR Drainage Aralysis Baseline/ SUR Drainage Wildlife Areas SUR Drainage Aralysis Baseline/ Drainage Wildlife Areas SUR Drainage Total SUR Drainage Wildlife Areas SUR Drainage Total SUR Drainage Wildlife Areas SUR Drainage Wildlife Areas SUR Drainage Wildlife Areas SUR Drainage Wildlife Areas SUR Drainage Weater Wildlife Areas SUR Drainage Total Total SUR Drainage Drainage Weater Wildlife Areas SUR Drainage Total Drainage Drainage Wildlife Areas SUR Drainage Total SUR Drainage Drainage Wildlife Areas SUR Drainage Total Drainage Drainage Wildlife Areas SUR Drainage Total Drainage Drainage Wildlife Areas SUR Drainage Total Drainage Drainage SUR Drainage</td></td<>	Exchange Contractors Exchange Contractors Year Type Analysis Baseline / Study Wildlife Areas SJR Drainage Agricultural Drainage Contractors Total from Exchange Drainage Contractor Basin Entities Wildlife Areas Water Non-critical Critical Existing Condition 62.250 0 0 0 7.385 69.635 62.250 Critical Critical Future No Action 0	Future No Action Total From Total From Total From Total From Wildlife Areas Ver Type Study SJR Orange Analysis Baseline/ Wildlife Areas Agricultural Out-of- Drainage Dott-of- Drainage Total from Charge Contractor Charge From Developed Water Year Type Study SJR Drainage SJR Drainage SJR Drainage Dott-of- Drainage Total from Charge Contractor SJR Drainage Wildlife Areas Conservation Non-critical A-1-1-C 1,750 1.0 Dott-of- Drainage Contractor SJR Drainage Wildlife Areas SJR Drainage SJR Drainage	Exchange Contractors Interior Future No Action Exchange Middle Areas Cartical Analysis Baseline / Sub or Sub Romanage Widdle Areas Sub Romanage Sub Romanage Contractors Apricultural Data of Cartical Widdle Areas Exchange Widdle Areas Widdle Areas Cartical Widdle Areas Sub Romanage Non-critical Evalue No Action 62.20 <	Exchange Contractors Interior Future No Action Anatysis Baseline / Study Wildlife Areas SJR Darinage Agricultural Darinage Out-of- Darinage Exchange Future No Action Wildlife Areas SJR Darinage Wildlife Area	Exchange Contractors Interior Interior Future No Action Var Type Sudy Vidifie Areas SIR Printage Contractors Var Contractors Var Type Nuldifie Areas SIR Printage Contractors Var Type Var Type Sint Printage Contractors Var Type Var Type Sint Printage Contractors Var Type Var Type Sint Printage Contractors Var Type Sint Printage Contractors Var Type Var Type Sint Printage Contractors Contractors Contractors Contractors Contractors Sint Printage Contractors Contractors Sint Printage Contractors Contractors Contractors Contractors Contractors Contractors Contractors Sint Printage Contractors Contra	Exchange Contractors Interior Combined Future No Action Veer Type Study Wildlife Areas SUR Drainage Aralysis Baseline/ SUR Drainage Wildlife Areas SUR Drainage Aralysis Baseline/ Drainage Wildlife Areas SUR Drainage Total SUR Drainage Wildlife Areas SUR Drainage Total SUR Drainage Wildlife Areas SUR Drainage Wildlife Areas SUR Drainage Wildlife Areas SUR Drainage Wildlife Areas SUR Drainage Weater Wildlife Areas SUR Drainage Total Total SUR Drainage Drainage Weater Wildlife Areas SUR Drainage Total Drainage Drainage Wildlife Areas SUR Drainage Total SUR Drainage Drainage Wildlife Areas SUR Drainage Total Drainage Drainage Wildlife Areas SUR Drainage Total Drainage Drainage Wildlife Areas SUR Drainage Total Drainage Drainage SUR Drainage

Table 17A

									Develop	ed Water					
Existing Condition /	Future No Action					Exc	hange Contrac	tors				Inte	erior		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
				r											A 1
Alternative B 50,000	Acre-feet Delivery					Change	from Existing C	ondition				Change from Ex	isting Condition	n	Change
				Savings from	Savings from Spills to	Recovery of Discharges to	Recovery from Discharges	Groundwater	Crop Idling / Temprary	Total Water Developed by	Sacramento		San Joaquin Valley SJR	Total Water	Total
	Developed Water			Evaporation	NonDistrict	Mud/Salt	Upstream of	Substitution	Land	Exchange	Valley	SJR Drainage	Non Drainage	Developed by	Developed
Delivery Focus	Emphasis	Year Type	Study	and Seepage	Lands	Slough	Sack Dam	for Transfer	Fallowing	Contractors	Sources	Sources	Sources	Interior	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

									Water D	eliveries					
Existing Condition /	Future No Action					Exchange	Contractors				Interior			Combined	
		Year Type	Analysis Baseline / Study	Wildlife Areas SJR Drainage		Agricultural Contractors SJR Drainage	Out-of- Drainage Basin Entities	Fotal from Exchange Contractor Developed Water	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 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			1		Change from Ex	isting Conditio	n		Change	from Existing C	Condition	Change	from Existing C	ondition
					Wildlife Areas	Agricultural	Out-of-	Total from Exchange Contractor	Wildlife Areas from		Wildlife Areas	Wildlife Areas	Total	Total Deliveries to	
	Developed Water			Wildlife Areas	SJR Non	Contractors	Drainage	Developed	Exchange	Wildlife Areas	SJR Non	Developed	Deliveries to	SJR Wildlife	Total
Delivery Focus	Emphasis	Year Type	Study	SJR Drainage			Basin Entities	Water		SJR Drainage	Drainage	Water	Wildlife Areas	Areas	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
Non-SJR Focus		Critical Non-critical	B-3-3-C	- (62,250)	-	50,000	- 42.615	50,000 (19,635)	- (62.250)	- 62.250	-	- 62.250	-	-	50,000 42,615
Non-SJK Focus		Critical	B-3-3-C	(02,230)			50.000	50,000	(02,230)	- 02,250		- 02,250			50,000
		ondoar				Mode	el Input Parar								00,000
				Change in	Change in	Change in Water	Change in Water	Change in Water	Change in Water Developed	Change in Water		Change in	Net Change in	Change in	Change in
				Water Developed	Water Developed	Developed from	Developed from Dischrg	Developed from	from Crop Idling /	Developed from Land	Change in Water	Water Delivered to	Water Delivered to	Water Acquired from	Water Acqrd from San
Delivery Focus	Developed Water Emphasis	Year Type	Study	from Evaporation and Seepage	from Spills to NonDistrict Lands	Discharges to Mud/Salt Slough	Upstr of Sack Dam (Non SJR Drainage)	Groundwater Substitution for Transfer	Temprary Land Fallowing	Fallowing (Non SJR Drainage)	Delivered to SJR Drainage Wildlife Areas	Non SJR Drainage Wildlife Areas	SJR Drainage Agricultural Contractors	Sacramento Valley Sources	Joaquin Valley Sources (Non SJR Drainage)
Refuge Focus		Non-critical	B-3-1-C	and Seepage	Lanus	Slough	Drainage)	(6,000)	42.000	Brainage) 8.000	17.823	9.497	(28,596)	21,730	10,729
iterage i obus	anowing	Critical	B-3-0-S	-	-	-	-	-	42,000	8.000	40.000	-	(20,550)	-	-
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

Table TOA															
									Develop	ed Water					
Existing Condition /	Future No Action					Exc	hange Contrac	tors				Inte	erior		Combined
5					Savings from		Recovery from		Crop Idling /	Total Water	.		San Joaquin		
			Analysis Baseline /	Savings from Evaporation	Spills to NonDistrict	Discharges to Mud/Salt	Discharges Upstream of	Groundwater Substitution	Temprary Land	Developed by Exchange	Sacramento Vallev	SJR Drainage	Valley SJR Non Drainage	Total Water Developed by	Total Developed
		Year Type	Study	and Seepage	Lands	Slough	Sack Dam	for Transfer	Fallowing	Contractors	Sources	Sources	Sources	Interior	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	87,34
		Critical	Esture Ne Astiste	0	0	0	0	0	0	0	0	0	0	0	
		Non-critical Critical	Future No Action	0	0	0	0	0	0	0	0	0	0	0	
		ontiour				<u> </u>		0	<u> </u>	<u> </u>		<u> </u>		<u> </u>	· · · · · ·
Alternative C 130,00	0 Acre-feet Deliver	Y	-			Change	from Existing C	ondition		-		Change from Ex	cisting Conditio	n	Change
					Savings from	Recovery of	Recovery from		Crop Idling /	Total Water			San Joaquin		
	Developed Water			Savings from Evaporation	Spills to NonDistrict	Discharges to Mud/Salt	Discharges Upstream of	Groundwater Substitution	Temprary Land	Developed by Exchange	Sacramento Vallev	SJR Drainage	Valley SJR Non Drainage	Total Water Developed by	Total Developed
Delivery Focus	Emphasis	Year Type	Study	and Seepage	Lands	Slough	Sack Dam	for Transfer	Fallowing	Contractors	Sources	Sources	Sources	Interior	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)		60,365	25,474	33,588	13,225	72,287	132,652
Non-SJR Focus	-	Critical	C-1-3-C	-	-	- 15,465	-	-	50,000	50,000	-	- 33,588	- 13,225	- 72,287	50,000
NON-SJK FOCUS		Non-critical Critical	0-1-3-0	-	-	15,465	900	(6,000)	50,000 50.000	60,365 50.000	25,474	33,588	13,225	72,287	132,652 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
Refuge Focus	Fallowing	Critical Non-critical	C-3-1-C	-	-	- 15,465	- 900	- (6,000)	50,000 50,000	50,000 60,365	- 11,730	- 15,262	- 4,062	- 31,054	50,000 91,419
Iterage Focus	anowing	Critical	C-3-0-S	-	-	-	- 900	-	50,000	50,000	-	-	4,002		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)		60,365	25,474	33,588	13,225	72,287	132,652
		Critical		-	-	-	-	-	50,000	50,000	-	-	-	-	50,000

Table 18B

				1											
									Water D	eliveries			1		
Existing Condition /	Euture No Action					Exchange	Contractors				Interior			Combined	
	Pulure No Action	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 Non-critical	Future No Action	0	0	0	0	0	0	0	0	0	0	0	0
		Critical	Future No Action	0	-	-	0	0	0	0	-	•	0	0	0
					•										
Alternative C 130,000	0 Acre-feet Deliver	/				Change from Ex	cisting Condition	n Total from		Change	from Existing C	Condition	Change	from Existing C	ondition
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	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	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
	4	Critical	C-1-0-S	40,000	-	-	-	40,000	40,000	-	-	-	40,000	40,000	40,000
Agriculture Focus		Non-critical Critical	C-1-2-C	(62,250)	-	130,000 50,000	(7,385)	60,365 50,000	(62,250)	62,250	-	62,250	-	-	122,615 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 Critical	C-1-1-C C-1-0-S	1,750 40,000	-	50,000	(7,385)	44,365 40,000	1,750 40,000	16,073	9,497	25,570	27,320 40,000	17,823 40,000	69,935 40,000
Agriculture Focus		Non-critical	C-2-2-C	(62,250)	-	130,000	(7,385)	60,365	(62,250)	62,250	-	62,250	40,000	+0,000	122,615
	_	Critical		-	-	50,000	-	50,000	-	-	-	-	-	-	50,000
Non-SJR Focus		Non-critical Critical	C-2-3-C	(62,250)	-	-	122,615 50,000	60,365 50,000	(62,250)	62,250	-	62,250	-	-	122,615 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
5		Critical	C-3-0-S	40,000	-	-	-	40,000	40,000	-	-	-	40,000	40,000	40,000
Agriculture Focus		Non-critical Critical	C-3-2-C	(62,250)	-	130,000 50.000	(7,385)	60,365 50.000	(62,250)	62,250	-	62,250	-	-	122,615 50.000
Non-SJR Focus		Non-critical	C-3-3-C	(62,250)	-	50,000	- 122.615	60.365	(62,250)	62.250	-	62,250			122.615
INVIT-OUT FOCUS															122.013
NOT OUR FOCUS		Critical		-	-	-	50,000	50,000	-	-	-	-	-	-	50,000
NOT OUT YOUS				-	-	- Mode		50,000	-	-	-	-	-	-	
	Developed Water Emphasis	Critical	Study	Change in Water Developed from Evaporation and Seepage	Change in Water Developed from Spills to NonDistrict Lands	- Mode Change in Water Developed from Discharges to Mud/Salt Slough	50,000	50,000	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	
Delivery Focus Refuge Focus	Developed Water Emphasis Conservation	Critical Year Type Non-critical	C-1-1-C	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 15,465	50,000 el Input Paran Water Developed from Dischrg Upstr of Sack Dam (Non SJR Drainage) 900	50,000 neters Change in Water Developed from Groundwater Substitution	Change in Water Developed from Crop Idling / Temprary Land Fallowing 42,000	Water Developed from Land Fallowing (Non SJR Drainage) 8,000	Water Delivered to SJR Drainage Wildlife Areas 17,823	Change in Water Delivered to Non SJR Drainage Wildlife Areas 9,497	Water Delivered to SJR Drainage Agricultural Contractors 34,738	Water Acquired from Sacramento Valley Sources 11,730	50,000 Change in Water Acqrd from San Joaquin Valley Sources (Non SJR Drainage) 4,062
Delivery Focus Refuge Focus	Emphasis	Critical Year Type Non-critical Critical	C-1-1-C C-1-0-S	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 15,465	50,000 Input Parar Change in Water Developed from Dischrg Upstr of Sack Dam (Non SJR Drainage) 900	50,000 neters Change in Water Developed from Groundwater Substitution for Transfer (6,000	Change in Water Developed from Crop Idling / Temprary Land Fallowing 42,000	Water Developed from Land Fallowing (Non SJR Drainage) 8,000 8,000	Water Delivered to SJR Drainage Wildlife Areas 17,823 40,000	Change in Water Delivered to Non SJR Drainage Wildlife Areas 9,497	Water Delivered to SJR Drainage Agricultural Contractors 34,738	Water Acquired from Sacramento Valley Sources 11,730	50,000 Change in Water Acqrd from San Joaquin Valley Sources (Non SJR Drainage) 4,062
Delivery Focus	Emphasis	Critical Year Type Non-critical	C-1-1-C	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 15,465	50,000 el Input Paran Water Developed from Dischrg Upstr of Sack Dam (Non SJR Drainage) 900	50,000 neters Change in Water Developed from Groundwater Substitution for Transfer	Change in Water Developed from Crop Idling / Temprary Land Fallowing 42,000	Water Developed from Land Fallowing (Non SJR Drainage) 8,000	Water Delivered to SJR Drainage Wildlife Areas 17,823	Change in Water Delivered to Non SJR Drainage Wildlife Areas 9,497	Water Delivered to SJR Drainage Agricultural Contractors 34,738	Water Acquired from Sacramento Valley Sources 11,730	50,000 Change in Water Acqrd from San Joaquin Valley Sources (Non SJR Drainage) 4,062
Delivery Focus Refuge Focus	Emphasis	Year Type Non-critical Critical Non-critical Critical Non-critical	C-1-1-C C-1-0-S	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 15,465	50,000 el Input Parar Change in Water Developed from Dischrg Upstr of Sack Dam (Non SJR Drainage) 900 -	50,000 neters Change in Water Developed from Groundwater Substitution for Transfer (6,000)	Change in Water Developed from Crop Idling / Temprary Land Fallowing 42,000 42,000 42,000 42,000	Water Developed from Land Fallowing (Non SJR Drainage) 8,000 8,000 8,000 8,000 8,000 8,000	Water Delivered to SJR Drainage Wildlife Areas 17,823 40,000	Change in Water Delivered to Non SJR Drainage Wildlife Areas 9,497	Water Delivered to SJR Drainage Agricultural Contractors 34,738 - 96,412	Water Acquired from Sacramento Valley Sources 11,730 - 25,474	50,000 Change in Water Acqrd from San Joaquin Valley Sources (Non SJR Drainage) 4,062 - 13,225
Delivery Focus Refuge Focus Agriculture Focus Non-SJR Focus	Emphasis Conservation	Critical Year Type Non-critical Critical Non-critical Non-critical Critical	C-1-1-C C-1-0-S C-1-2-C C-1-3-C	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 15,465 - - 15,465 - -	50,000 Input Parar Change in Water Developed from Dischrg Upstr of Sack Dam (Non SJR Drainage) 900 - 900 -	50,000 neters Change in Water Developed from Groundwater Substitution for Transfer (6,000) 	Cnange in Water Developed from Crop Idling / Temprary Land 42,000 42,000 42,000 42,000 42,000 42,000	Water Developed from Land Fallowing (Non SJR Drainage) 8,000 8,000 8,000 8,000 8,000 8,000 8,000 8,000 8,000 8,000	Water Delivered to SJR Drainage Wildlife Areas 17,823 40,000 - - - -	Change in Water Delivered to Non SJR Drainage Wildlife Areas 9,497 	Water Delivered to SJR Drainage Agricultural Contractors 34,738 - - 96,412 50,000 (33,588) -	Water Acquired from Sacramento Valley Sources 11,730 - - 25,474 - - 25,474	50,000 Change in Water Acqrd from San Joaquin Valley Sources (Non SJR Drainage) 4,062
Delivery Focus Refuge Focus Agriculture Focus	Emphasis	Year Type Non-critical Critical Non-critical Critical Non-critical	C-1-1-C C-1-0-S C-1-2-C C-1-3-C C-1-1-C C-1-0-S	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 15,465 - 15,465	50,000 I Input Parar Change in Water Developed from Dischrg Upstr of Sack Dam (Non SJR Drainage) 900 - 900 - 900 -	50,000 neters Change in Water Developed from Groundwater Substitution for Transfer (6,000)	Change in Water Developed from Crop Idling / Temprary Land Fallowing 42,000 42,000 42,000 42,000	Water Developed from Land Fallowing (Non SJR Drainage) 8,000 8,000 8,000 8,000 8,000 8,000	Water Delivered to SJR Drainage Wildlife Areas 17,823 40,000	Change in Water Delivered to Non SJR Drainage Wildlife Areas - -	Water Delivered to SJR Drainage Agricultural Contractors 34,738 - 96,412 50,000	Water Acquired from Sacramento Valley Sources 11,730 - 25,474	50,000 Change in Water Acqrd from San Joaquin Valley Sources (Non SJR Drainage) 4,062 - 13,225
Delivery Focus Refuge Focus Agriculture Focus Non-SJR Focus	Emphasis Conservation	Year Type Non-critical Critical Non-critical Critical Non-critical Critical Non-critical Critical Non-critical Non-critical	C-1-1-C C-1-0-S C-1-2-C C-1-3-C C-1-1-C	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 15,465 - - 15,465 - - - - - - - - - - - - - - - - - - -	50,000 I Input Parar Change in Water Developed from Dischrg Upstr of Sack Dam (Non SJR Drainage) 900 - 900 - - - - - -	50,000 neters Change in Water Developed from Groundwater Substitution for Transfer (6,000) 	Cnange in Water Developed from Crop Idling / Temprary Land #2,000 42,000 42,000 42,000 42,000 42,000 42,000 42,000 42,000 42,000	Water Developed from Land Fallowing (Non SJR Drainage) 8,000 8,000 8,000 8,000 8,000 8,000 8,000 8,000 8,000 8,000 8,000	Water Delivered to SJR Drainage Wildlife Areas 17,823 40,000 - - - 17,823 40,000	Change in Water Delivered to Non SJR Drainage Wildlife Areas 9,497 	Water Delivered to SJR Drainage Agricultural Contractors 34,738 	Water Acquired from Sacramento Valley Sources 	50,000 Change in Water Acqrd from San Joaquin Valley Sources (Non SJR Drainage) 4,062
Delivery Focus Refuge Focus Agriculture Focus Non-SJR Focus Refuge Focus Agriculture Focus	Emphasis Conservation	Year Type Non-critical Critical Non-critical Critical Non-critical Critical Non-critical Critical Critical Critical Critical Critical Critical	C-1-1-C C-1-0-S C-1-2-C C-1-3-C C-1-3-C C-1-1-C C-1-0-S C-2-2-C	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 15,465 - - - 15,465 - - - - - - - - - - - - - - - - - - -	50,000 I Input Parar Change in Water Developed from Dischrg Upstr of Sack Dam (Non SJR Drainage) 900 - 900 - 900 - - - - - - - -	50,000 neters Change in Water Developed from Groundwater Substitution for Transfer (6,000) - (6,000) - 10,365 - - 10,365 -	Cnange in Water Developed from Crop Idling / Temprary Land Fallowing 42,000 42,000 42,000 42,000 42,000 42,000 42,000 42,000 42,000 42,000	Water Developed from Land Fallowing (Non SJR Drainage) 8,000 8,000 8,000 8,000 8,000 8,000 8,000 8,000 8,000 8,000 8,000 8,000	Water Delivered to SJR Drainage Wildlife Areas 17,823 40,000 - - - 17,823 40,000 -	Change in Water Delivered to Non SJR Drainage Wildlife Areas 9,497 - - - - - - - - - - - - - - - - - - -	Water Delivered to SJR Drainage Agricultural Contractors 34,738 - - - - - - - - - - - - - - - - - - -	Water Acquired from Sacramento Valley Sources 11,730 - - 25,474 - 11,730 - - 25,474 - - - - - - - - - - - - - - - - - -	50,000 Change in Water Acqrd from San Joaquin Valley Sources (Non SJR Drainage) 4,062
Delivery Focus Refuge Focus Agriculture Focus Non-SJR Focus Refuge Focus	Emphasis Conservation	Year Type Non-critical Critical Non-critical Critical Non-critical Critical Non-critical Critical Non-critical Non-critical	C-1-1-C C-1-0-S C-1-2-C C-1-3-C C-1-1-C C-1-0-S	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 15,465 - - 15,465 - - - - - - - - - - - - - - - - - - -	50,000 I Input Parar Change in Water Developed from Dischrg Upstr of Sack Dam (Non SJR Drainage) 900 - 900 - - - - - -	50,000 neters Change in Water Developed from Groundwater Substitution (6,000) - - (6,000) - - (6,000) - - - (6,000) - - - - - - - - - - - - - - - - - -	Cnange in Water Developed from Crop Idling / Temprary Land #2,000 42,000 42,000 42,000 42,000 42,000 42,000 42,000 42,000 42,000	Water Developed from Land Fallowing (Non SJR Drainage) 8,000 8,000 8,000 8,000 8,000 8,000 8,000 8,000 8,000 8,000 8,000	Water Delivered to SJR Drainage Wildlife Areas 17,823 40,000 - - - 17,823 40,000	Change in Water Delivered to Non SJR Drainage Wildlife Areas 9,497 	Water Delivered to SJR Drainage Agricultural Contractors 34,738 	Water Acquired from Sacramento Valley Sources 	50,000 Change in Water Acqrd from San Joaquin Valley Sources (Non SJR Drainage) 4,062
Delivery Focus Refuge Focus Agriculture Focus Non-SJR Focus Refuge Focus Agriculture Focus	Emphasis Conservation	Year Type Non-critical Critical Non-critical Critical Non-critical Critical Non-critical Critical Non-critical Critical Non-critical	C-1-1-C C-1-0-S C-1-2-C C-1-3-C C-1-3-C C-1-1-C C-1-0-S C-2-2-C	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 15,465 - - - 15,465 - - - - - - - - - - - - - - - - - - -	50,000 I Input Parar Change in Water Developed from Dischrg Upstr of Sack Dam (Non SJR Drainage) 900 - - 900 - - 900 - - 900 - - 900 - - 900 - - 900 - - 900 - - 900 - - - - - - - - - - - - -	50,000 neters Change in Water Developed from Groundwater Substitution for Transfer (6,000) - (6,000) - 10,365 - - 10,365 -	Change In Water Developed from Crop Idling / Temprary Land Fallowing 42,000 42,000 42,000 42,000 42,000 42,000 42,000 42,000 42,000 42,000 42,000 42,000	Water Developed from Land Fallowing (Non SJR Drainage) 8,000 8,000 8,000 8,000 8,000 8,000 8,000 8,000 8,000 8,000 8,000 8,000 8,000 8,000 8,000 8,000	Water Delivered to SJR Drainage Wildlife Areas 17,823 40,000 - - - 17,823 40,000 -	Change in Water Delivered to Non SJR Drainage Wildlife Areas 9,497 - - - - - - - - - - - - - - - - - - -	Water Delivered to SJR Drainage Agricultural Contractors 34,738 - - - - - - - - - - - - - - - - - - -	Water Acquired from Sacramento Valley Sources 11,730 - - 25,474 - 11,730 - - 25,474 - - - - - - - - - - - - - - - - - -	50,000 Change in Water Acqrd from San Joaquin Valley Sources (Non SJR Drainage) 4,062
Delivery Focus Refuge Focus Agriculture Focus Non-SJR Focus Refuge Focus Agriculture Focus Non-SJR Focus	Emphasis Conservation Groundwater	Year Type Non-critical Critical Non-critical Critical Non-critical Critical Non-critical Critical Non-critical Critical Non-critical Critical Non-critical Critical Non-critical Critical Non-critical Non-critical Non-critical	C-1-1-C C-1-0-S C-1-2-C C-1-3-C C-1-3-C C-1-1-C C-1-0-S C-2-2-C C-2-3-C C-2-3-C C-3-1-C	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 15,465 	50,000 I Input Parar Change in Water Developed from Dischrg Upstr of Sack Dam (Non SJR Drainage) 900 - - - - - - - - - - - - -	50,000 neters Change in Water Developed from Groundwater Substitution (6,000) - - 10,365 - - 10,365 - - (6,000) - - (6,000) - - - (6,000) - - - (6,000) - - - - (6,000) - - - - - - - - - - - - -	Cnange in Water Developed from Crop Idling / Temprary Land 42,000 42,000 42,000 42,000 42,000 42,000 42,000 42,000 42,000 42,000 42,000 42,000 42,000 42,000 42,000 42,000 42,000 42,000	Water Developed from Land Fallowing (Non SJR Drainage) 8,0000 8,00	Water Delivered to SJR Drainage Wildlife Areas 17,823 40,000 	Change in Water Delivered to Non SJR Drainage Wildlife Areas 9,497 	Water Delivered to SJR Drainage Agricultural Contractors 34,738 	Water Acquired from Sacramento Valley Sources - 25,474 - - 25,474 - - 25,474 - - 25,474 - - 25,474 - - - 25,474 - - - 25,474 - - - - 25,474 - - - - - - - - - - - - - - - - - -	50,000 Change in Water Acqrd from San Joaquin Valley Sources (Non SJR Drainage) 4,062 - 13,225 - - - 13,225 - - - - - - - - - - - - -
Delivery Focus Refuge Focus Agriculture Focus Non-SJR Focus Refuge Focus Agriculture Focus Non-SJR Focus Refuge Focus	Emphasis Conservation Groundwater	Year Type Non-critical Critical Non-critical Critical Non-critical Critical Non-critical Critical Non-critical Critical Critical Critical Non-critical Critical Critical Critical Critical Critical Critical Critical Critical Critical	C-1-1-C C-1-0-S C-1-2-C C-1-3-C C-1-3-C C-1-3-C C-1-1-C C-1-0-S C-2-2-C C-2-2-C C-2-3-C C-3-1-C C-3-0-S	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 15,465 - - - 15,465 - - - - - - - - - - - - - - - - - - -	50,000 I Input Parar Change in Water Developed from Dischrg Upstr of Sack Dam (Non SJR Drainage) 900 - - 900 - - - - - - - - - - - - -	50,000 neters Change in Water Developed from Groundwater Substitution (6,000) -	Change In Water Developed from Crop Idling / Temprary Land Fallowing 42,000 42,000 42,000 42,000 42,000 42,000 42,000 42,000 42,000 42,000 42,000 42,000 42,000 42,000 42,000 42,000	Water Developed from Land Fallowing (Non SJR Drainage) 8,0000 8,0000 8,0	Water Delivered to SJR Drainage Wildlife Areas 17,823 40,000 - - 17,823 40,000 - - - 17,823	Change in Water Delivered to Non SJR Drainage Wildlife Areas 9,497 - - - - - - - - - - - - - - - - - - -	Water Delivered to SJR Drainage Agricultural Contractors 34,738 - 96,412 50,000 (33,588) - - 34,738 - 96,412 50,000 (33,588) - - - 34,738 - - - 34,738 - - - - - - - - - - - - - - - - - - -	Water Acquired from Sacramento Valley Sources - 25,474 - - 25,474 - - 25,474 - - 25,474 - - 25,474 - - - 25,474 - - - 25,474 - - - - - - - - - - - - - - - - - -	50,000 Change in Water Acqrd from San Joaquin Valley 4,062 - 13,225 - - 13,225 - - 13,225 - - - 13,225 - - - - - - - - - - - - -

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.

<u>Evaporation, or seepage to the groundwater basin</u>. As described earlier, an inefficiency in onfarm 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.

<u>Tailwater Discharges to Mud Slough and Salt Slough</u>. 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

					Volu	ume - 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

<u>Discharges upstream of Sack Dam</u>. 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.

<u>Quality of Water Associated with Recapture Components</u>. 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 20Water Quality Associated with Tailwater Recapture above Sand Dam and Boundary Drain

				Ave	erage Mont	thly 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 Dist	ribution	of Grou	ndwater	[.] Pumpir	ng							
					Percent	of Annual T	otal					
	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 T	otal					
	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 T	otal					
	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

				Ave	erage Mon	thly 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 T	otal					
	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

				AV	erage ivion	thiy Quality	- µmnos					
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						
А		1		1		С
Alternative		Source Empha	asis	Disposition F	ocus	Evaluated Effects
A: 80,0	000 acre-feet	1: Coi	nservation	0: So	ource Only	S: Source Only
B: 50,0	000 acre-feet	2: Gro	oundwater	1: W	ildlife Area	C: Combined
C: 130,	000 acre-feet	3: Lar	nd Fallowing	2: Ag	griculture	
				3: N	on 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			E	Basic Hy	/drologi	ς Αςςοι	Inting
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 Y	ears						
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 Critica	l 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)

					ve	rnalis
Baseline Vernalis Flow - cfs	Jan	Feb	Mar	Apr	May	Ju
Wet	7500	13600	15700	13600	12000	740
Above Normal	5800	7200	6200	5900	4600	260
Below Normal	2300	3200	3300	3700	3700	210
Dry	1900	2600	2300	2700	2200	180
Critical	1300	1700	1600	1800	1500	130
Change in Vernalis Flow with Action - cfs						
Wet	-2	-19	-17	-31	-40	
Above Normal	-2	-19	-17	-31	-40	
Below Normal	-2	0	-17	-31	-40	
Dry	-2	0	-18	-43	-53	-
Critical	-3	-21	-2	0	-1	-
Nith-Action Vernalis Flow - cfs						
Wet	7498	13581	15683	13569	11960	73
Above Normal	5798	7181	6183	5869	4560	26
Below Normal	2298	3200	3283	3669	3660	20
Dry	1898	2600	2282	2657	2147	17
Critical	1297	1679	1598	1800	1499	12
Baseline Vernalis Water Quality - μmhos						
Wet	352	286	310	269	212	3
Above Normal	404	380	465	364	334	4
Below Normal	757	631	690	465	382	7
Dry	880	736	1000	700	700	7
Critical	1000	1000	1000	700	700	7
Change in Vernalis Water Quality with Action - µmhos						
Wet	0	-2	-1	-2	-3	
Above Normal	-1	-3	-2	-4	-7	-
Below Normal	-1	-8	-2	-6	-8	
Dry	-1	-10	0	-3	-4	
Critical	-2	0	0	0	0	
Nith-Action Vernalis Water Quality - µmhos						
Wet	351	284	309	267	209	3
Above Normal	404	377	464	360	327	4
Below Normal	756	623	688	459	374	7
Dry	879	725	1000	697	696	7
Critical	998	1000	1000	700	700	7

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)

				1	lew Me	lones
ncremental 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
ncremental Change in NM Storage due to Vernalis Flow Release Change - Ac	re-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	e 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

			CV	P/SWP	Delta S	upply
otal Potential CVP/SWP Delta supply Impact w/o NM Adjustments - Acre-f	Jan	Feb	Mar	Apr	May	Jur
Wet	0	-369	0	0	0	(
Above Normal	0	-369	0	0	0	-246
Below Normal	0	-369	0	0	0	-246
Dry	0	-369	-366	-324	-2438	-246
Critical	0	-779	-228	-9	-40	-62
ew Melones Adjustments - Acre-feet (positive means increase in supply)						
Wet	0	0	0	0	0	
Above Normal	0	0	0	0	0	246
Below Normal	0	369	0	0	0	-75
Dry	0	369	-23	-245	-826	-75
Critical	0	-386	97	12	-15	-22
cremental Change in CVP/SWP Delta Supply due to Action - Acre-feet						
Wet	0	-369	0	0	0	
Above Normal	0	-369	0	0	0	
Below Normal	0	0	0	0	0	-321
Dry	0	0	-389	-570	-3264	-321
Critical	0	-1165	-131	4	-55	-84

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.

<u>Hydrologic Effects Due to Water Development.</u> 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
	Conditions -	- Allemalive F	vvaler	Development

Above Normal 5800 7200 6200 5900 4600 2600 2100 1500 1500 1200 1800 Below Normal 2300 3200 3300 3700 2100 1900 1500 1200 1900 1700 1600 Dry 1900 2600 2300 2700 2200 1800 1400 1100 1000 1700 1600 Critical 1300 1700 1600 1800 1500 1300 1000 1000 1000 1000 1400 Above Normal -2 -19 -17 -30 -37 -38 -37 -37 -24 -15 0 Above Normal -2 -19 -17 -30 -37 -55 -50 -48 -24 -15 0 Dry -2 0 -17 -30 -37 -52 -50 -48 -24 -15 0 Dry -2	Dec 4600	Dec		Feb
Above Normal 5800 7200 6200 5900 4600 2600 2100 2000 1500 2000 1800 Below Normal 2300 3200 3300 3700 2100 1900 1500 1200 1900 1700 1600 Dry 1900 2600 2300 2700 2200 1800 1400 1100 1000 1700 1600 anage in Vernalis Flow with Action - cfs Intervalue Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Wet -2 -19 -17 -30 -37 -38 -37 -37 -24 -15 0 Above Normal -2 -19 -17 -30 -37 -37 -37 -24 -15 0 Dry -2 0 -19 -42 -51 -52 -50 -48 -24 -15 0 0 0 0		4600		13600
Below Normal 2300 3200 3300 3700 2700 2100 1900 1500 1200 1900 1700 Dry 1900 2600 2300 2700 2200 1800 1400 1100 1000 1700 1600 Critical 1300 1700 1600 1800 1500 1300 1000		2300		7200
Dry Critical 1900 1300 2600 1700 2300 1600 2700 1800 2200 1800 1800 1300 1400 1000 1000 1000 1700 1000 1600 1500 hange in Vernalis Flow with Action - cfs 1-0-S: 80 CONSERVATION SOURCE Vet -2 -19 -17 -30 -37 -38 -37 -37 -24 -15 0 Above Normal -2 0 -17 -30 -37 -52 -50 -48 -24 -15 0 Dry -2 0 -17 -30 -37 -52 -50 -48 -24 -15 0 Dry -2 0 -17 -30 -37 -52 -50 -48 -24 -15 0 Dry -2 0 -19 -42 -51 -52 -50 -48 -24 -15 0 Critical -3 -21 -6 0 -1 -14 -19 -16 -1	2200			3200
Critical 1300 1700 1600 1800 1300 1000 1000 1000 1500 1400 mange in Vernalis Flow with Action - cfs 1-0-S: 80 CONSERVATION SOURCE Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Wet -2 -19 -17 -30 -37 -38 -37 -37 -24 -15 0 Above Normal -2 0 -19 -17 -30 -37 -37 -37 -24 -15 0 Below Normal -2 0 -19 -42 -51 -52 -50 -48 -24 -15 0 Critical -3 -21 -6 0 -1 -14 -19 -16 -1 0 0 2-0-S: 80 GROUNDWATER SOURCE Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov <t< td=""><td>2200</td><td></td><td></td><td>2600</td></t<>	2200			2600
Wet -2 -19 -17 -30 -37 -38 -37 -37 -24 -15 0 Above Normal -2 -19 -17 -30 -37 -37 -37 -24 -15 0 Below Normal -2 0 -17 -30 -37 -52 -50 -48 -24 -15 0 Dry -2 0 -19 -42 -51 -52 -50 -48 -24 -15 0 Critical -3 -21 -6 0 -1 -14 -19 -16 -1 0 0 2-0-S: 80 GROUNDWATER SOURCE	1500			1700
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Wet -2 -19 -17 -30 -37 -38 -37 -37 -24 -15 0 Above Normal -2 0 -17 -30 -37 -38 -37 -37 -24 -15 0 Below Normal -2 0 -17 -30 -37 -52 -50 -48 -24 -15 0 Dry -2 0 -19 -42 -51 -52 -50 -48 -24 -15 0 Critical -3 -21 -6 0 -1 -14 -19 -16 -1 0 0 2c0-S: 80 GROUNDWATER SOURCE				
Wet -2 -19 -17 -30 -37 -38 -37 -37 -24 -15 0 Above Normal -2 -19 -17 -30 -37 -37 -37 -37 -24 -15 0 Below Normal -2 0 -17 -30 -37 -52 -50 -48 -24 -15 0 Dry -2 0 -19 -42 -51 -52 -50 -48 -24 -15 0 Critical -3 -21 -6 0 -1 -14 -19 -16 -1 0 0 2-0-S: 80 GROUNDWATER SOURCE				
Above Normal -2 -19 -17 -30 -37 0 -37 -37 -24 -15 0 Below Normal -2 0 -17 -30 -37 -52 -50 -48 -24 -15 0 Dry -2 0 -19 -42 -51 -52 -50 -48 -24 -15 0 Critical -3 -21 -6 0 -1 -14 -19 -16 -1 0 0 2-0-S: 80 GROUNDWATER SOURCE Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Vet 0	Dec	Dec	: Jan	Feb
Below Normal -2 0 -17 -30 -37 -52 -50 -48 -24 -15 0 Dry -2 0 -19 -42 -51 -52 -50 -48 -24 -15 0 Critical -3 -21 -6 0 -1 -14 -19 -16 -1 0 0 2-0-S: 80 GROUNDWATER SOURCE Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Wet 0	0	0	0	0
Dry -2 0 -19 -42 -51 -52 -50 -48 -24 -15 0 Critical -3 -21 -6 0 -1 -14 -19 -16 -1 0 0 2-0-S: 80 GROUNDWATER SOURCE Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Wet 0	0	0	0	0
Critical -3 -21 -6 0 -1 -14 -19 -16 -1 0 0 2-0-S: 80 GROUNDWATER SOURCE Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Wet 0	0	0	0	0
Constant of the second of the	0	0	0	0
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Wet 0 <td>0</td> <td>0</td> <td>0 0</td> <td>0</td>	0	0	0 0	0
Wet 0				
Above Normal 0 <t< td=""><td>Dec</td><td>Dec</td><td>: Jan</td><td>Feb</td></t<>	Dec	Dec	: Jan	Feb
Below Normal 0 <t< td=""><td>0</td><td>0</td><td>0</td><td>0</td></t<>	0	0	0	0
Dry 0 0 0 0 0 0 0 0 0 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 3-0-S: 80 FALLOWING SOURCE Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Wet -1 -5 -2 0 0 -3 -5 -4 0 0	0			0
3-0-S: 80 FALLOWING SOURCE Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Wet -1 -5 -2 0 0 -3 -5 -4 0 0 0	0	0	0	0
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Wet -1 -5 -2 0 0 -3 -5 -4 0 0 0	0	0	0	0
Wet -1 -5 -2 0 0 -3 -5 -4 0 0 0				
	Dec	Dec	; Jan	Feb
	0	0	0	0
Above Normal -1 -5 -2 0 0 0 -5 -4 0 0 0	0	0	0	0
Below Normal -1 0 -2 0 0 -5 -6 -5 0 0 0	0	0	0	0
Dry -1 0 -2 0 0 -5 -6 -5 0 0 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

	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	
hange in Vernalis Water (Quality with	Action -	µmhos												
-1-0-S: 80 CONSERVATIO	N 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	
-2-0-S: 80 GROUNDWATE															
	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	
-3-0-S: 80 FALLOWING SC															
	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

-1-0-S: 80 CONSERVATIO	N SOURCI	-													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Tota
Wet	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	-228
Below Normal	0	-1054	0	0	0	813	800	650	0	0	0	0	0	0	120
Dry	0	-1054	135	718	845	813	800	650	0	0	0	0	0	0	290
Critical	0	386	39	8	15	223	297	213	0	0	0	0	0	0	118
-2-0-S: 80 GROUNDWATE	R SOURC	E													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Tota
Wet	0	0	0	0	0	0	0	Ō	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	0	386	39	8	15	223	297	213	0	0	0	0	0	0	118
-3-0-S: 80 FALLOWING SC	URCE														
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Tota
Wet	0	0	0	0	Ó	0	0	ō	0	0	0	0	0	0	
Above Normal	0	0	0	0	0	-205	0	0	0	0	0	0	0	0	-20
Below Normal	0	-255	0	0	0	73	97	70	0	0	0	0	0	0	-1
Dry	0	-255	13	3	5	73	97	70	0	0	0	0	0	0	
Critical	0	386	39	8	15	223	297	213	0	0	0	0	0	0	118

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 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

-1-0-S: 80 CONSERVATIO	N SOURCE	E													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Tota
Wet	0	-369	0	0	0	0	-2285	-2285	0	0	0	0	0	0	-493
Above Normal	0	-369	0	0	0	0	-2285	-2285	0	0	0	0	0	0	-493
Below Normal	0	0	0	0	0	-3097	-3084	-2935	0	0	0	0	0	0	-911
Dry	0	0	-416	-559	-3129	-3097	-3084	-2935	-1406	-884	0	0	0	0	-1551
Critical	0	-1165	-342	-28	-55	-849	-1146	-960	-58	0	0	0	0	0	-460
-2-0-S: 80 GROUNDWATE	R SOURC	E													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Tota
Wet	0	0	0	0	ò	0	0	õ	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	0	-1165	-342	-28	-55	-849	-1146	-960	-58	0	0	0	0	0	-460
-3-0-S: 80 FALLOWING SC	URCE														
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Tota
Wet	0	-89	0	0	Ó	0	-278	-245	0	0	0	0	0	0	-61
Above Normal	0	-89	0	0	0	0	-278	-245	0	0	0	0	0	0	-61
Below Normal	0	0	0	0	0	-278	-375	-314	0	0	0	0	0	0	-96
Dry	0	0	-39	-2	-18	-278	-375	-314	-19	0	0	0	0	0	-104
Critical	0	-1165	-342	-28	-55	-849	-1146	-960	-58	0	0	0	0	0	-460

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.

<u>Hydrologic Effects Due to Combined Water Development and Transfer.</u> 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 acrefeet are being delivered as incremental Level 4 water supply to wildlife areas without hydrologic connectivity with the San Joaquin River. During noncritical years, these scenarios would increase wildlife areas draining to the San Joaquin River (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

	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	
ange in Vernalis Flow w	ith Action	- cfs													
1-1-C: 80 CONSERVATIO	N REFUGI	E COMPC	SITE												
	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	
2-1-C: 80 GROUNDWATE															
	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	
3-1-C: 80 FALLOWING RE															
	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 μ S/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 μ S/cm improvement to a 19 μ S/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

	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
ange in Vernalis Water G	uality with	n Action -	µmhos											
-1-C: 80 CONSERVATIO														
	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
2-1-C: 80 GROUNDWATE	R REFUGE	Е СОМРО	SITE											
	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
-1-C: 80 FALLOWING RE														
	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
	0	-1	0	0	0	-2	-1	18	1	0	1	0	0	1
Above Normal														
	0	-2 -3	0	0	0	0 0	0 0	0 0	1 1	0 0	1 1	0 0	1 1	2 2

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

-1-1-C: 80 CONSERVATIO	N REFUGI	E COMPO	SITE												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Tota
Wet	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	-246
Below Normal	0	-1054	0	0	0	751	674	-2285	0	0	0	0	0	234	-168
Dry	0	-1054	67	701	826	751	674	-2259	0	0	0	0	0	234	-5
Critical	0	386	-97	-12	15	223	297	-6209	0	0	0	0	0	-267	-566
-2-1-C: 80 GROUNDWATE	R REFUG	Е СОМРО	SITE												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Tot
Wet	0	0	0	0	Ó	0	0	Ō	0	0	0	0	0	0	
Above Normal	0	0	0	0	0	-182	0	0	0	0	0	0	0	0	-18
Below Normal	0	0	0	0	0	-62	-125	-2936	0	0	0	0	0	234	-288
Dry	0	0	-68	-17	-18	-62	-125	-2909	0	0	0	0	0	234	-296
Critical	0	386	-97	-12	15	223	297	-6209	0	0	0	0	0	-267	-566
-3-1-C: 80 FALLOWING RE	FUGE CC	MPOSITE													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Tot
Wet	0	0	0	0	ò	0	0	ō	Ö	0	0	0	0	0	
Above Normal	0	0	0	0	0	-387	0	0	0	0	0	0	0	0	-38
Below Normal	0	-255	0	0	0	11	-28	-2866	0	0	0	0	0	234	-290
	0	-255	-55	-14	-13	11	-28	-2839	0	0	0	0	0	234	-296
Dry	0	200													

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

-1-1-C: 80 CONSERVATIO	N REFUGI	E COMPO	SITE												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Tota
Wet	0	-369	0	0	0	0	-2547	548	0	0	0	0	0	82	-228
Above Normal	0	-369	0	0	0	0	-2547	548	0	0	0	0	0	82	-228
Below Normal	0	0	0	0	0	-3218	-3222	2833	0	0	0	0	0	0	-360
Dry	0	0	-389	-570	-3264	-3218	-3222	2807	-1495	-1011	0	0	0	0	-1036
Critical	0	-1165	-131	4	-55	-849	-1146	12252	312	-39	634	0	0	834	1065
-2-1-C: 80 GROUNDWATE	R REFUG	Е СОМРО	SITE												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Tot
Wet	0	0	0	0	Ó	0	-263	2833	0	0	0	0	0	82	265
Above Normal	0	0	0	0	0	0	-263	2833	0	0	0	0	0	82	265
Below Normal	0	0	0	0	0	-120	-137	5768	0	0	0	0	0	0	551
Dry	0	0	27	-11	-135	-120	-137	5741	-89	-127	0	0	0	0	514
Critical	0	-1165	-131	4	-55	-849	-1146	12252	312	-39	634	0	0	834	1065
Childai															
-3-1-C: 80 FALLOWING RE	FUGE CC	MPOSITE													
	FUGE CC	MPOSITE Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Tot
				Apr 0	May 0	Jun 0	Jul -540	Aug 2588	Sep 0	Oct 0	Nov 0	Dec 0	Jan 0	Feb 82	
-3-1-C: 80 FALLOWING RE	Jan	Feb	Mar						•						204
-3-1-C: 80 FALLOWING RE	Jan 0	Feb -89	Mar 0	0	Ó	0	-540	2588	0	0	0	0	0	82	204 204
-3-1-C: 80 FALLOWING RE Wet Above Normal	Jan 0 0	Feb -89 -89	Mar 0 0	0 0	0 0	0	-540 -540	2588 2588	0 0	0 0	0 0	0	0 0	82 82	Tota 204 204 454 410

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

	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	
nange in Vernalis Flow w	ith Action	- cfs													
1-2-C: 80 CONSERVATIO	N AGRICU		OMPOSI	TE											
	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	
2-2-C: 80 GROUNDWATE	R AGRICL	JLTURE (COMPOSI	TE											
	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	
3-2-C: 80 FALLOWING AG	GRICULTU		POSITE												
	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	
	-1	-5	0	5	7	0	8	6	13	6	2	0	1	1	
Above Normal		0	0	5	7	1	1	1	13	6	2	0	1	0	
Above Normal Below Normal	-1	-													
Above Normal	-1 -1	0	-1	5 5	6 7	1 -5	1 -5	2 -5	13 13	6 6	2 2	0	1	0	

For both the groundwater scenario and the land fallowing scenario, the spring-time and summertime 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	Δ Δ α	riculture Focus
	Quality	COnditions		A, AU	

	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
ange in Vernalis Water	Quality with	Action -	µmhos											
1-2-C: 80 CONSERVATIO	N AGRICU		OMPOSIT	E										
	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
2-2-C: 80 GROUNDWATE	ER AGRICU	LTURE C	OMPOSIT	E										
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb
		0	0	0	Ó	0	0	õ	-1	0	0	0	0	0
Wet	0					-			-1	0	0	0	0	0
Wet Above Normal	0	Ő	0	0	0	2	-1	-1			0	0	0	0
	-	-	0	0 0	0 0	2 0	-1 0	-1	-1	0	0	0	0	0
Above Normal	0	Ō			-					-		-		
Above Normal Below Normal	0	0	0	0	0	0	0	0	-1	Ō	0	0	0	0
Above Normal Below Normal Dry	0 0 -2 GRICULTUF	0 0 0 0 RE COMP	0 0 0 OSITE	0 - -	0 - -	0 0 0	0 0 0	0 0 0	-1 -1 -1	0 0 0	0 0 0	0 0 0	0 0 0	0 0 0
Above Normal Below Normal Dry Critical 3-2-C: 80 FALLOWING A	0 0 0 -2	0 0 0 0 RE COMP Feb	0 0 0 OSITE Mar	0 - - Apr	0 - - May	0 0 0 Jun	0 0 Jul	0 0 0 Aug	-1 -1	0 0 0 Oct	0 0 0 Nov	0 0 0 Dec	0 0 0 Jan	0 0 0 Feb
Above Normal Below Normal Dry Critical 3-2-C: 80 FALLOWING Av Wet	0 0 -2 GRICULTUF	0 0 0 0 RE COMP	0 0 0 OSITE	0 - -	0 - -	0 0 0	0 0 Jul -1	0 0 0 Aug -1	-1 -1 -1 Sep -1	0 0 0	0 0 0	0 0 0	0 0 0	0 0 0
Above Normal Below Normal Dry Critical 3-2-C: 80 FALLOWING A Wet Above Normal	0 0 -2 GRICULTUF Jan 0 0	0 0 0 0 0 RE COMP Feb 0 -1	0 0 0 OSITE Mar 0 0	0 - - Apr 0 0	0 - - May 0 0	0 0 Jun 0	0 0 0 Jul -1 -2	0 0 0 Aug -1 -2	-1 -1 -1 Sep -1 -2	0 0 0 0 0 0 0	0 0 0 0 Nov 0 0	0 0 0 0 0 0 0	0 0 0 Jan 0 0	0 0 0 Feb 0 0
Above Normal Below Normal Dry Critical 3-2-C: 80 FALLOWING Av Wet	0 0 -2 GRICULTUF Jan 0 0 0	0 0 0 0 0 8 Feb 0 -1 -2	0 0 OSITE Mar 0 0 0	0 - - Apr 0	0 - - May 0	0 0 Jun 0 0 0	0 0 Jul -1 -2 0	0 0 0 -1 -2 0	-1 -1 -1 Sep -1 -2 -2	0 0 0 0 0 0 0 0 0	0 0 0 Nov 0 0 0	0 0 0 0 0 0 0 0	0 0 0 Jan 0 0 0	0 0 0 Feb 0 0 0
Above Normal Below Normal Dry Critical 3-2-C: 80 FALLOWING A Wet Above Normal	0 0 -2 GRICULTUF Jan 0 0	0 0 0 0 0 RE COMP Feb 0 -1	0 0 0 OSITE Mar 0 0	0 - - Apr 0 0	0 - - May 0 0	0 0 Jun 0	0 0 0 Jul -1 -2	0 0 0 Aug -1 -2	-1 -1 -1 Sep -1 -2	0 0 0 0 0 0 0	0 0 0 0 Nov 0 0	0 0 0 0 0 0 0	0 0 0 Jan 0 0	0 0 0 Feb 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 μ S/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 μ S/cm improvement to about a 2 μ S/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

1-2-C: 80 CONSERVATIO	N AGRICU	ILTURE CO	OMPOSIT	E											
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Tota
Wet	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	-173
Below Normal	0	-1054	0	0	0	1000	1181	876	0	0	0	0	0	56	205
Dry	0	-1054	158	742	900	1000	1181	795	0	0	0	0	0	56	377
Critical	0	386	47	-12	30	260	350	223	0	0	0	0	0	14	129
2-2-C: 80 GROUNDWATE	R AGRICL	JLTURE C	OMPOSIT	E											
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Tota
Wet	0	0	0	0	Ö	0	0	Ō	0	0	0	0	0	0	
Above Normal	0	0	0	0	0	554	0	0	0	0	0	0	0	0	55
Below Normal	0	0	0	0	0	187	381	226	0	0	0	0	0	56	85
Dry	0	0	23	24	56	187	381	145	0	0	0	0	0	56	87
Critical	0	386	47	-12	30	260	350	223	0	0	0	0	0	14	129
3-2-C: 80 FALLOWING AC	RICULTU	RE COMP	OSITE												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Tot
Wet	0	0	0	0	ò	0	0	õ	0	0	0	0	0	0	
Above Normal	0	0	0	0	0	349	0	0	0	0	0	0	0	0	34
Below Normal	0	-255	0	0	0	260	478	296	0	0	0	0	0	56	83
Dry	0	-255	36	26	60	260	478	214	0	0	0	0	0	56	87
Critical	0	386	47	-12	30	260	350	223	0	0	0	0	0	14	129

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

-1-2-C: 80 CONSERVATIO	N AGRICU	ILTURE CO	OMPOSIT	E											
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Tota
Wet	0	-369	0	0	0	0	-1486	-1697	0	0	0	0	0	20	-353
Above Normal	0	-369	0	0	0	0	-1486	-1697	0	0	0	0	0	20	-353
Below Normal	0	0	0	0	0	-2731	-2666	-2573	0	0	0	0	0	0	-797
Dry	0	0	-399	-513	-2718	-2731	-2666	-2492	-635	-550	0	0	0	0	-1270
Critical	0	-1165	-273	325	432	-289	-338	-337	773	372	100	0	0	47	-35
-2-2-C: 80 GROUNDWATE	R AGRICU	JLTURE C	OMPOSIT	E											
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Tot
Wet	0	0	0	0	0	0	799	587	0	0	0	0	0	20	140
Above Normal	0	0	0	0	0	0	799	587	0	0	0	0	0	20	140
Below Normal	0	0	0	0	0	366	418	361	0	0	0	0	0	0	114
Dry	0	0	17	46	411	366	418	443	771	334	0	0	0	0	280
	0	-1165	-273	325	432	-289	-338	-337	773	372	100	0	0	47	-35
Critical	0														
Critical -3-2-C: 80 FALLOWING AG	Ū	RE COMP	OSITE												
	Ū	RE COMP Feb	OSITE Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Tot
	GRICULTU			Apr 0	May 0	Jun 0	Jul 521	Aug 343	Sep 0	Oct 0	Nov 0	Dec 0	Jan 0	Feb 20	
-3-2-C: 80 FALLOWING AG	GRICULTU Jan	Feb	Mar												79
-3-2-C: 80 FALLOWING AG	GRICULTU Jan 0	Feb -89	Mar 0	0	Ó	0	521	343	0	0	0	0	0	20	79 79
-3-2-C: 80 FALLOWING AG Wet Above Normal	GRICULTU Jan 0 0	Feb -89 -89	Mar 0 0	0 0	0 0	0 0	521 521	343 343	0	0 0	0 0	0	0 0	20 20	Tota 79 79 17 176

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. 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

	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	
hange in Vernalis Flow w	ith Action	- cfs													
-1-3-C: 80 CONSERVATIO	N OUT CO	MPOSITI	Ξ												
	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	
-2-3-C: 80 GROUNDWATE		MPOSIT	E												
	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	
-3-3-C: 80 FALLOWING O	ЈТ СОМРС	OSITE													
	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	

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 summertime 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 μ S/cm values in Table 44), no change in water quality would occur due to

Table 44

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb
Wet	352	286	310	269	212	310	341	460	3ep 442	359	497	432	352	286
Above Normal	352 404	200 380	465	269 364	334	486	509	460 534	442 588	494	497 657	432 639	352 404	280
Below Normal	404 757	631	465 690	364 465	382	400 700	700	534 700	500 680	494 510	681	657	404 757	631
		736				700	700	700	772	510 547	708	678	757 880	736
Dry Critical	880 1000	1000	1000 1000	700 700	700 700	700	700	700	772	547 595	708	678 859	880 1000	1000
Childan	1000	1000	1000	700	700	700	700	700	112	595	112	009	1000	1000
ange in Vernalis Water	Quality with	Action -	µmhos											
1-3-C: 80 CONSERVATIO														
	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
2-3-C: 80 GROUNDWATE	R OUT CO	MPOSITE												
	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
3-3-C: 80 FALLOWING O	JT COMPO	SITE												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb
Wet	0	0	0	0	Ö	0	0	õ	Ö	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
Drv	0	-3	0	-	-	0	0	0	1	0	0	0	0	0
Dry Critical	0 -2	-3 0	0	-	-	0 0	0	0	1 0	0	0	0	0	

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

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

-1-3-C: 80 CONSERVATIO	N OUT CO	MPOSITE													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Tota
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
-2-3-C: 80 GROUNDWATE	R OUT CC	MPOSITE													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Tota
Wet	0	0	0	0	ò	0	0	õ	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	-63′
Critical	0	386	39	8	15	223	297	213	0	0	0	0	0	0	1180
-3-3-C: 80 FALLOWING OU	JT COMPO	OSITE													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Tota
Wet	0	0	0	0	ó	0	0	ŏ	0	0	0	0	0	0	(
Above Normal	0	0	0	0	0	-606	0	0	0	0	0	0	0	0	-600
Below Normal	0	-255	0	0	0	-63	-178	-94	0	0	0	0	0	-41	-63
Dry	0	-255	-4	-14	-35	-63	-178	-35	0	0	0	0	0	-41	-620
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

A-1-3-C: 80 CONSERVATIO	N OUT CC	MPOSITE													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Tota
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 GROUNDWATE	R OUT CO	MPOSITE													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Tota
Wet	0	0	0	0	0	0	-578	-425	0	0	0	0	0	-14	-101
Above Normal	0	0	0	0	0	0	-578	-425	0	0	0	0	0	-14	-101
Below Normal	0	0	0	0	0	-265	-302	-262	0	0	0	0	0	0	-82
Dry	0	0	-12	-33	-297	-265	-302	-320	-558	-242	0	0	0	0	-203
Critical	0	-1165	-342	-28	-55	-849	-1146	-960	-58	0	0	0	0	0	-460
A-3-3-C: 80 FALLOWING OU	ЛТ СОМРО	OSITE													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Tota
Wet	0	-89	0	0	Ó	0	-856	-670	0	0	0	0	0	-14	-162
Above Normal	0	-89	0	0	0	0	-856	-670	0	0	0	0	0	-14	-162
Below Normal	0	0	0	0	0	-543	-677	-576	0	0	0	0	0	0	-179
Dry	0	0	-51	-35	-316	-543	-677	-635	-577	-242	0	0	0	0	-307
Critical	0	-1165	-342	-28	-55	-849	-1146	-960	-58	0	0	0	0	0	-460

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 guality 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 inbasin 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.

<u>Hydrologic Effects Due to Water Development.</u> 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

	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	
U U		- cfs													
0		- cfs													
0		- cfs Feb	Mar	Apr	Мау	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	
0	DURCE		Mar -5	Apr 0	May -1	Jun -11	Jul -14	Aug -12	Sep -1	Oct 0	Nov 0	Dec 0	Jan 0	Feb 0	
3-0-S: 50 FALLOWING SC	OURCE Jan	Feb			,										
3-0-S: 50 FALLOWING SO	OURCE Jan -3	Feb -14	-5	0	-1	-11	-14	-12	-1	0	0	0	0	0	
Above Normal	DURCE Jan -3 -3	Feb -14 -14	-5 -5	0 0	-1 -1	-11 0	-14 -14	-12 -12	-1 -1	0 0	0 0	0 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 Qu	uality Conditions -	- Alternative B	Water Developme	nt

	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
nge in Vernalis Water (Quality with	Action -	µmhos											
nge in Vernalis Water		Action -	µmhos											
•		Action - Feb	µmhos Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb
•	OURCE		•	Apr 0	May 0	Jun -1	Jul -2	Aug -2	Sep 0	Oct 0	Nov 0	Dec 0	Jan 0	Feb 0
0-S: 50 FALLOWING S	OURCE Jan	Feb	Mar											
0-S: 50 FALLOWING SO	OURCE Jan -1	Feb -1	Mar 0	0	Ó	-1	-2	-2	Ö	0	0	0	0	0
0-S: 50 FALLOWING S(Wet Above Normal	DURCE Jan -1 -1	Feb -1 -2	Mar 0 -1	0	0 0	-1 -4	-2 -3	-2 -2	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
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Chongo in Storogo					oir	Altorn	otivo		tor Do	volon	mont				
Change in Storage	mnew	vivier		esen	/011 -	Allem	alive	D VVa		velop	ment				
Net Incremental Change in	NM Storag	e due to	Vernalis F	-low & Q	uality Re	ease Cha	nge - Aci	re-feet							
B-3-0-S: 50 FALLOWING SO															
D-3-0-0. 301 ALLOWING 00	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Total
Wet	0	0	0	0	ò	0	0	õ	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

-3-0-S: 50 FALLOWING SC	DURCE														
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	
Wet	0	-273	0	0	Ó	0	-849	-748	0	0	0	0	0	0	-186
Above Normal	0	-273	0	0	0	0	-849	-748	0	0	0	0	0	0	-186
Below Normal	0	0	0	0	0	-849	-1146	-960	0	0	0	0	0	0	-295
Dry	0	0	-120	-6	-55	-849	-1146	-960	-58	0	0	0	0	0	-319
Critical	0	-1165	-342	-28	-55	-849	-1146	-960	-58	0	0	0	0	0	-460

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.

<u>Hydrologic Effects Due to Combined Water Development and Transfer</u>. 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 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

	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
0														
U C			E											
U C			E Mar	Apr	Мау	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb
•	EFUGE CO	MPOSITE		Apr -3	May -5	Jun -16	Jul -22	Aug 31	Sep -6	Oct -4	Nov 4	Dec 1	Jan 3	Feb 4
1-C: 50 FALLOWING R	EFUGE CO Jan	MPOSITE Feb	Mar		,							Dec 1 1		
1-C: 50 FALLOWING R	EFUGE CO Jan -3	MPOSITE Feb -14	Mar -5	-3	-5	-16	-22	31	-6	-4	4	Dec 1 1	3	4
Above Normal	EFUGE CO Jan -3 -3	MPOSITE Feb -14 -14	Mar -5 -5	-3 -3	-5 -5	-16 0	-22 -22	31 31	-6 -6	-4 -4	4 4	Dec 1 1 1	3 3	4 4

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 μ S/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 μ S/cm) to 17 μ S/cm degradation.

Table 52

Vernalis Water Quality Conditions – Alternative B, Refuge Focus

	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
ange in Vernalis Water (•													
•	•													
•	•			Apr	Мау	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb
•	FUGE COI	MPOSITE		Apr 0	May 0	Jun -1	Jul -2	Aug 12	Sep 1	Oct 0	Nov 1	Dec 0	Jan 0	Feb 0
1-C: 50 FALLOWING RE	EFUGE COI Jan	MPOSITE Feb	Mar		May 0 0				Sep 1 1		Nov 1 1			
1-C: 50 FALLOWING RI	FUGE COI Jan -1	MPOSITE Feb -1	Mar 0	0	Ó	-1	-2	12	Sep 1 1 2	0	Nov 1 1	0	0	
-1-C: 50 FALLOWING RI Wet Above Normal	FUGE COI Jan -1 -1	MPOSITE Feb -1 -2	Mar 0 0	0 0	0 0	-1 -5	-2 -2	12 17	1 1	0 0	Nov 1 1 1	0 0	0	0 1

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 acrefeet. 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

et Incremental Change in	NM Storag	e due to	Vernalis I	low & Q	uality Rel	ease Cha	nge - Ac	re-feet							
-3-1-C: 50 FALLOWING RE	FUGE CO	MPOSITE													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Tota
Wet	0	0	0	0	Ó	0	0	Ō	0	0	0	0	0	0	
Above Normal	0	0	0	0	0	-968	0	0	0	0	0	0	0	0	-96
Below Normal	0	-779	0	0	0	107	62	-2788	0	0	0	0	0	218	-318
Dry	0	-779	-36	-16	-19	107	62	-2738	0	0	0	0	0	218	-320
Critical	0	386	-97	-12	15	223	297	-6209	0	0	0	0	0	-267	-566

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	

cremental Change in Proj	ect Delta	Supply du	e to Actio	on - Acre-	feet										
-3-1-C: 50 FALLOWING RE	FUGE CO	MPOSITE													
	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	37
Above Normal	0	-273	0	0	0	0	-1341	1916	0	0	0	0	0	76	37
Below Normal	0	0	0	0	0	-1075	-1403	4704	0	0	0	0	0	0	222
Dry	0	0	-97	-31	-309	-1075	-1403	4654	-368	-223	0	0	0	0	114
Critical	0	-1165	-131	4	-55	-849	-1146	12252	312	-39	634	0	0	834	1065

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

	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
ange in Vernalis Flow w	ith Action	- cfs												
0			POSITE											
0			POSITE Mar	Apr	Мау	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb
•	GRICULTU	RE COM		Apr 1	May 2	Jun -7	Jul -9	Aug -9	Sep 4	Oct 2	Nov 1	Dec 0	Jan 0	Feb 0
-2-C: 50 FALLOWING A	GRICULTU Jan	RE COMI Feb	Mar	Apr 1 1					•		Nov 1 1			
2-C: 50 FALLOWING A	GRICULTU Jan -3	RE COMI Feb -14	Mar -5	Apr 1 1	2	-7	-9	-9	. 4	2	Nov 1 1 1	0	0	0
-2-C: 50 FALLOWING A Wet Above Normal	GRICULTU Jan -3 -3	RE COMF Feb -14 -14	Mar -5 -5	Apr 1 1 1	2 2	-7 0	-9 -9	-9 -9	4 4	2 2	Nov 1 1 1	0 0	0 0	0 0

Table 56

Vernalis Water Quality Conditions - Alternative B, Agriculture Focus

	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
nge in Vernalis Water (Quality with	Action -	µmhos											
•	•		•											
•	•		•	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb
•	GRICULTUR	RE COMP	OSITE	Apr 0	May 0	Jun -1	Jul -2	Aug -2	Sep 0	Oct 0	Nov 0	Dec 0	Jan 0	Feb 0
-C: 50 FALLOWING AG	GRICULTUF Jan	RE COMP Feb	OSITE Mar											
-C: 50 FALLOWING A	GRICULTUF Jan -1	RE COMP Feb -1	OSITE Mar 0	0	Ó	-1	-2	-2	0	0	0	0	0	0
2-C: 50 FALLOWING A Wet Above Normal	GRICULTUF Jan -1 -1	RE COMP Feb -1 -2	OSITE Mar 0 -1	0	0 0	-1 -3	-2 -3	-2 -2	0 -1	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.

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

			00175												
-3-2-C: 50 FALLOWING AC												_			_
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Tota
Wet	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	-43
Below Normal	0	-779	0	0	0	289	432	293	0	0	0	0	0	20	25
Dry	0	-779	47	17	35	289	432	264	0	0	0	0	0	20	32
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.

Delta CVP/SWP W	ater Su	upply	Effect	– Alte	ernativ	/e B, /	Agricu	Iture I	ocus						
Incremental Change in Proj	ject Delta	Supply du	ue to Actio	on - Acre-	feet										
B-3-2-C: 50 FALLOWING AG	RICULTU	RE COMF	OSITE												
	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 58

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

	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
ange in Vernalis Flow w	vith Action	- cfs												
0														
0			Mar	Apr	Мау	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb
0	UT COMPC	OSITE	Mar -6	Apr -4	May -6	Jun -17	Jul -23	Aug -19	Sep -10	Oct -4	Nov -1	Dec 0	Jan 0	Feb -1
3-3-C: 50 FALLOWING O	UT COMPO Jan	OSITE Feb							•					
3-3-C: 50 FALLOWING O Wet	UT COMPO Jan -3	OSITE Feb -14	-6	-4	-6	-17	-23	-19	-10	-4	-1	0	0	-1
Above Normal	UT COMPO Jan -3 -3	OSITE Feb -14 -14	-6 -6	-4 -4	-6 -6	-17 0	-23 -23	-19 -19	-10 -10	-4 -4	-1 -1	0 0	0 0	-1 -1

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 00			
Vernalis Water Quality Conditions -	Alternative B.	Out-of-Basin	Transfer

	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
nge in Vernalis Water	Quality with	Action -	µmhos											
0			µmhos											
•			µmhos Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb
•	UT COMPO	SITE	•	Apr 0	May 0	Jun -1	Jul -2	Aug -1	Sep 0	Oct 0	Nov 0	Dec 0	Jan 0	Feb 0
3-C: 50 FALLOWING O	UT COMPO Jan	SITE Feb	Mar											
3-C: 50 FALLOWING O Wet	UT COMPO Jan -1	SITE Feb -1	Mar 0	0	Ó	-1	-2	-1		0	0	0	0	0
3-C: 50 FALLOWING O Wet Above Normal	UT COMPO Jan -1 -1	SITE Feb -1 -2	Mar 0 -1	0	0 0	-1 -5	-2 -2	-1 -2		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 μ S/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

Table 60

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

		0 440 10	· ····aiio ·			lease Cha									
B-3-3-C: 50 FALLOWING OU	ЈТ СОМРО	SITE													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Total
Wet	0	0	0	0	Ö	0	0	Ō	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

3-3-C: 50 FALLOWING OU	JT COMPC	OSITE													
	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	-288
Above Normal	0	-273	0	0	0	0	-1427	-1173	0	0	0	0	0	-14	-288
Below Normal	0	0	0	0	0	-1114	-1448	-1222	0	0	0	0	0	0	-378
Dry	0	0	-132	-40	-353	-1114	-1448	-1281	-616	-242	0	0	0	0	-522
Critical	0	-1165	-342	-28	-55	-849	-1146	-960	-58	0	0	0	0	0	-460

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.

<u>Hydrologic Effects Due to Water Development.</u> 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 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	

	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	
hange in Vernalis Flow w	ith Action	- cfs													
-1-0-S: 130 CONSERVATI	ON SOUR	CE													
	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	
-2-0-S: 130 GROUNDWAT	ER SOUR	CE													
	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	
-3-0-S: 130 FALLOWING S	OURCE														
	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	
D	-5	0	-25	-42	-52	-66	-69	-63	-25	-15	0	0	0	0	
Dry	-3														

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

	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
nange in Vernalis Water (Quality with	Action -	µmhos											
1-0-S: 130 CONSERVATI	ON SOURC													
	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
2-0-S: 130 GROUNDWAT	ER SOURC	E												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb
Wet	-1	-1	0	0	Ō	-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
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
Distance Manager	-2	-15	-3	-6	-8	0	0	0	-8	-3	0	0	0	0
Below Normal						~	0	0	-7	-3	0	0	0	•
Below Normal Dry	-2	-18	0	-	-	0	0	0	-/	-3	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

1-0-S: 130 CONSERVATIO	ON SOUR	CE													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Tota
Wet	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	-291
Below Normal	0	-1834	0	0	0	1036	1097	863	0	0	0	0	0	0	116
Dry	0	-1834	173	726	860	1036	1097	863	0	0	0	0	0	0	292
Critical	0	386	39	8	15	223	297	213	0	0	0	0	0	0	118
2-0-S: 130 GROUNDWAT	ER SOUR	CE													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Tota
Wet	0	0	0	0	Ó	0	0	Ō	0	0	0	0	0	0	
Above Normal	0	0	0	0	0	-626	0	0	0	0	0	0	0	0	-62
Below Normal	0	-779	0	0	0	223	297	213	0	0	0	0	0	0	-4
Dry	0	-779	39	8	15	223	297	213	0	0	0	0	0	0	1
Critical	0	386	39	8	15	223	297	213	0	0	0	0	0	0	118
3-0-S: 130 FALLOWING S	OURCE														
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Tot
Wet	0	0	0	0	Ó	0	0	Ō	0	0	0	0	0	0	
Above Normal	0	0	0	0	0	-2911	0	0	0	0	0	0	0	0	-291
Below Normal	0	-1834	0	0	0	1036	1097	863	0	0	0	0	0	0	116
Dry	0	-1834	173	726	860	1036	1097	863	0	0	0	0	0	0	292
Critical	0	386	39	8	15	223	297	213	0	0	0	0	0	0	118

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 Developm	ent

Incremental Change in Project Delta Supply due to Action - Acre-feet C-1-0-S: 130 CONSERVATION SOURCE Feh Jul Mar Apr May Jun Aug Sep Oct Nov Dec Jar Feb Total -3133 -3032 Wet 0 -642 0 0 0 0 0 0 0 0 0 0 -6807 -642 -3133 0 0 0 -3032 0 -6807 Above Normal 0 0 0 0 0 0 0 Below Normal 0 0 0 0 0 -3947 -4230 -3895 0 0 0 0 0 -12072 0 -3895 Dry 0 0 -536 -565 -3185 -3947 -4230 -1464 -884 0 0 0 0 -18706 Critica 0 -1165 -342 -28 -55 -849 -1146 -960 -58 0 0 0 0 0 -4604 C-2-0-S: 130 GROUNDWATER SOURCE Oct Jan Feb Mar Apr May Jun Jul Aug Sep 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 0 0 -120 -55 -849 -1146 -960 -58 0 0 0 -3194 -6 0 0 Critical -1165 -28 -55 0 0 -342 -849 -1146 -960 -58 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 -3133 0 -642 0 0 Ó 0 -3032 0 0 0 0 0 0 -6807 Above Normal 0 -6807 0 -642 0 -3133 -3032 0 0 0 0 0 0 0 0 0 0 0 -3947 С 0 0 0 Below Normal 0 0 -4230 -3895 0 0 -12072 -3947 Dry Critical 0 -536 -565 -3185 -4230 -3895 -1464 -884 0 -18706 0 0 0 0 -1165 0 -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.

<u>Hydrologic Effects Due to Combined Water Development and Transfer.</u> 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

	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	
hange in Vernalis Flow w	ith Action	- cfs													
-1-1-C: 130 CONSERVATI	ON REFU	GE COMP	OSITE												
	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	
-2-1-C: 130 GROUNDWAT		GE COME	POSITE												
	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	Ő	-3	3	4	-10	-14	85	11	4	6	1	4	Ő	
Critical	-3	-21	-2	0	-1	-14	-19	199	5	-1	11	2	8	15	
-3-1-C: 130 FALLOWING F	REFUGE C	OMPOSI	TE												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	
	-5	-33	-21	-26	-32	-42	-41	7	-12	-11	6	1	4	5	
Wet			~ ~ ~	-26	-32	0	-41	7	-12	-11	6	1	4	5	
Wet Above Normal	-5	-33	-21	-20											
		-33 0	-21 -21	-20	-32	-62	-64	37	-12	-11	6	1	4	0	
Above Normal	-5					-62 -62	-64 -64	37 38	-12 -12	-11 -11	6 6	1 1	4 4	0 0	

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	с .	Refuge Focus
		, U	, iteruge i ocus

	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
ange in Vernalis Water (Quality with	Action -	µmhos											
1-1-C: 130 CONSERVATI														
	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
2-1-C: 130 GROUNDWAT	ER REFUG	E COMP	OSITE											
	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
3-1-C: 130 FALLOWING F	REFUGE CO	OMPOSIT	E											
	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
	-2	-18	0	-3	-		0	0	-7	-3	1	0	0	3
Dry	-2	-10												

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 μ S/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 μ S/cm improvement to a 16 μ S/cm degradation. The slight degradation in water quality is anticipated 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

-1-1-C: 130 CONSERVATIO	ON REFUC	GE COMPO	DSITE												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Tota
Wet	0	0	0	0	0	0	0	Ō	0	0	0	0	0	0	(
Above Normal	0	0	0	0	0	-2496	0	0	0	0	0	0	0	0	-249
Below Normal	0	-1834	0	0	0	1176	1382	-1829	0	0	0	0	0	295	-81
Dry	0	-1834	130	735	901	1176	1382	-1890	0	0	0	0	0	295	89
Critical	0	386	-97	-12	15	223	297	-6209	0	0	0	0	0	-267	-566
-2-1-C: 130 GROUNDWAT	ER REFU	GE COMPO	OSITE												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Tota
Wet	0	0	0	0	0	0	0	Ō	0	0	0	0	0	0	
Above Normal	0	0	0	0	0	-212	0	0	0	0	0	0	0	0	-21
Below Normal	0	-779	0	0	0	363	582	-2479	0	0	0	0	0	295	-201
Dry	0	-779	-4	17	57	363	582	-2540	0	0	0	0	0	295	-201
Critical	0	386	-97	-12	15	223	297	-6209	0	0	0	0	0	-267	-566
-3-1-C: 130 FALLOWING R	EFUGE C	OMPOSIT	E												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Tota
Wet	0	0	0	0	0	0	0	Ō	0	0	0	0	0	0	
Above Normal	0	0	0	0	0	-2496	0	0	0	0	0	0	0	0	-249
Below Normal	0	-1834	0	0	0	1176	1382	-1829	0	0	0	0	0	295	-81
Dry	0	-1834	130	735	901	1176	1382	-1890	0	0	0	0	0	295	89
Critical	0	386	-97	-12	15	223	297	-6209	0	0	0	0	0	-267	-566

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 Ef	fect – Alternative C	. Refuge Focus
--	---------------	-----------------	----------------------	----------------

-1-1-C: 130 CONSERVATION	ON REFU	GE COMPO	OSITE												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Tota
Wet	0	-642	0	0	0	0	-2535	433	0	0	0	0	0	103	-264
Above Normal	0	-642	0	0	0	0	-2535	433	0	0	0	0	0	103	-264
Below Normal	0	0	0	0	0	-3672	-3917	2262	0	0	0	0	0	0	-532
Dry	0	0	-490	-527	-2877	-3672	-3917	2323	-722	-651	0	0	0	0	-1053
Critical	0	-1165	-131	4	-55	-849	-1146	12252	312	-39	634	0	0	834	1065
-2-1-C: 130 GROUNDWAT	ER REFU	GE COMP	OSITE												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Tot
Wet	0	-273	0	0	0	0	-251	2718	0	0	0	0	0	103	229
Above Normal	0	-273	0	0	0	0	-251	2718	0	0	0	0	0	103	229
Below Normal	0	0	0	0	0	-575	-833	5197	0	0	0	0	0	0	378
Dry	0	0	-74	32	252	-575	-833	5258	684	233	0	0	0	0	497
Critical	0	-1165	-131	4	-55	-849	-1146	12252	312	-39	634	0	0	834	1065
-3-1-C: 130 FALLOWING F	REFUGE C	OMPOSIT	E												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Tot
Wet	0	-642	0	0	0	0	-2535	433	0	0	0	0	0	103	-264
Above Normal	0	-642	0	0	0	0	-2535	433	0	0	0	0	0	103	-264
Below Normal	0	0	0	0	0	-3672	-3917	2262	0	0	0	0	0	0	-532
Dry	0	0	-490	-527	-2877	-3672	-3917	2323	-722	-651	0	0	0	0	-1053
Critical	0	-1165	-131	4	-55	-849	-1146	12252	312	-39	634	0	0	834	1065

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

enchmark 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	
hange in Vernalis Flow w	ith Action	- cfs													
1-2-C: 130 CONSERVATI	ON AGRIC	ULTURE	сомроз	SITE											
	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	
-2-2-C: 130 GROUNDWAT			COMPOS												
2-2-0. 150 GROONDWAT	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	-14	-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	
	-			0	•	0	0	0		Ū	-	0	•	•	
-3-2-C: 130 FALLOWING A		Feb	Mar	Apr	Mov	Jun	Jul	A.u.a	Son	Oct	Nov	Dec	Jan	Feb	
10/++	Jan			Apr	May			Aug	Sep						
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	

Table 71

Vernalis Flow Conditions - Alternative C, Agriculture Focus

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

enchmark Vernalis Water	Quality - u	mhos													
	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	
hange in Vernalis Water (Quality with	Action -	µmhos												
-1-2-C: 130 CONSERVATI	ON AGRICI	JLTURE	COMPOSI	TE											
	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	
-2-2-C: 130 GROUNDWAT	ER AGRIC	ULTURE	COMPOS	ITE											
	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	
-3-2-C: 130 FALLOWING A	GRICULTU	JRE COM	POSITE												
	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 μ S/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 μ S/cm improvement to a

 1μ S/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	

-1-2-C: 130 CONSERVATI	ON AGRIC	ULTURE (COMPOSI	ΤE											
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Tota
Wet	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	-176
Below Normal	0	-1834	0	0	0	1425	1888	1332	0	0	0	0	0	117	292
Dry	0	-1834	222	776	975	1425	1888	1163	0	0	0	0	0	117	473
Critical	0	386	47	-12	30	260	350	223	0	0	0	0	0	14	129
-2-2-C: 130 GROUNDWAT	ER AGRIC		COMPOS	ITE											
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Tota
Wet	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	52
Below Normal	0	-779	0	0	0	612	1088	682	0	0	0	0	0	117	172
Dry	0	-779	87	58	130	612	1088	513	0	0	0	0	0	117	182
Critical	0	386	47	-12	30	260	350	223	0	0	0	0	0	14	129
-3-2-C: 130 FALLOWING A	GRICULT	URE COM	POSITE												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Tota
Wet	0	0	0	0	ò	0	0	ō	Ö	0	0	0	0	0	
	0	0	0	0	0	-1760	0	0	0	0	0	0	0	0	-176
Above Normal			0	0	0	1425	1888	1332	0	0	0	0	0	117	292
Above Normal Below Normal	0	-1834	0	0	0										
	0 0	-1834 -1834	222	776	975	1425	1888	1163	0	0	0	0	0	117	473

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	

C-1-2-C: 130 CONSERVATI	ON AGRIC	ULTURE (COMPOS	ITE											
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Tota
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 GROUNDWAT	ER AGRIC	ULTURE	COMPOS	ITE											
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Tota
Wet	0	-273	0	0	0	0	811	472	0	0	0	0	0	41	105
Above Normal	0	-273	0	0	0	0	811	472	0	0	0	0	0	41	105
Below Normal	0	0	0	0	0	-88	-278	-210	0	0	0	0	0	0	-57
Dry	0	0	-85	89	798	-88	-278	-41	1544	695	0	0	0	0	263
Critical	0	-1165	-273	325	432	-289	-338	-337	773	372	100	0	0	47	-354
C-3-2-C: 130 FALLOWING A	GRICULT	URE COM	POSITE												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Tota
	0	-642	0	0	Ó	0	-1474	-1812	Ö	0	0	0	0	41	-388
Wet		-642	0	0	0	0	-1474	-1812	0	0	0	0	0	41	-388
Wet Above Normal	0	-042	0												
	0 0	-042	0	0	0	-3186	-3362	-3144	0	0	0	0	0	0	-969
Above Normal	-		-	0 -470	0 -2331	-3186 -3186	-3362 -3362	-3144 -2976	0 138	0 -190	0 0	0 0	0 0	0 0	-969 -1287

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 guality 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

	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 w	ith Action	- cfs													
-1-3-C: 130 CONSERVATI	ON OUT C	OMPOSI	ΓE												
	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	
-2-3-C: 130 GROUNDWAT	ER OUT C	OMPOSI	TE												
	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	
-3-3-C: 130 FALLOWING (POSITE													
	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	
Delow Normal				40		74	-74	-69	-34	-19	-1	0	0	0	
Dry	-5	0	-25	-46	-57	-71	-74	-69	-34	-19	-1	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

	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
ange in Vernalis Water	Quality with	Action -	µmhos											
1-3-C: 130 CONSERVATI	ON OUT CO	OMPOSIT	E											
	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
2-3-C: 130 GROUNDWAT	ER OUT CO	OMPOSIT	E											
	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
3-3-C: 130 FALLOWING	OUT COMP	OSITE												
	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 μ S/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.

Tabl			-
rap	le	1	1

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

-1-3-C: 130 CONSERVATIO	ON OUT C	OMPOSIT	E												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Tota
Wet	0	0	0	0	Ó	0	0	Ō	0	0	0	0	0	0	
Above Normal	0	0	0	0	0	-3312	0	0	0	0	0	0	0	0	-331
Below Normal	0	-1834	0	0	0	900	821	700	0	0	0	0	0	-41	54
Dry	0	-1834	156	709	819	900	821	758	0	0	0	0	0	-41	229
Critical	0	386	39	8	15	223	297	213	0	0	0	0	0	0	118
-2-3-C: 130 GROUNDWAT	ER OUT C	OMPOSIT	E												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Tot
Wet	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	-102
Below Normal	0	-779	0	0	0	87	21	49	0	0	0	0	0	-41	-66
Dry	0	-779	22	-9	-25	87	21	108	0	0	0	0	0	-41	-61
Critical	0	386	39	8	15	223	297	213	0	0	0	0	0	0	118
-3-3-C: 130 FALLOWING C		OSITE													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Tot
Wet	0	0	0	0	Ó	0	0	Ō	0	0	0	0	0	0	
Above Normal	0	0	0	0	0	-3312	0	0	0	0	0	0	0	0	-331
Below Normal	0	-1834	0	0	0	900	821	700	0	0	0	0	0	-41	54
Dry	0	-1834	156	709	819	900	821	758	0	0	0	0	0	-41	229
Critical	0	386	39	8	15	223	297	213	0	0	0	0	0	0	118

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

-1-3-C: 130 CONSERVATIO	ON OUT C	OMPOSIT	E												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Tota
Wet	0	-642	0	0	0	0	-3711	-3457	0	0	0	0	0	-14	-782
Above Normal	0	-642	0	0	0	0	-3711	-3457	0	0	0	0	0	-14	-782
Below Normal	0	0	0	0	0	-4212	-4532	-4157	0	0	0	0	0	0	-1290
Dry	0	0	-548	-598	-3482	-4212	-4532	-4216	-2022	-1126	0	0	0	0	-2073
Critical	0	-1165	-342	-28	-55	-849	-1146	-960	-58	0	0	0	0	0	-460
-2-3-C: 130 GROUNDWAT	ER OUT C	OMPOSIT	E												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Tota
Wet	0	-273	0	0	Ó	0	-1427	-1173	0	0	0	0	0	-14	-288
Above Normal	0	-273	0	0	0	0	-1427	-1173	0	0	0	0	0	-14	-288
Below Normal	0	0	0	0	0	-1114	-1448	-1222	0	0	0	0	0	0	-378
Dry	0	0	-132	-40	-353	-1114	-1448	-1281	-616	-242	0	0	0	0	-522
Critical	0	-1165	-342	-28	-55	-849	-1146	-960	-58	0	0	0	0	0	-460
-3-3-C: 130 FALLOWING C		POSITE													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Tota
Wet	0	-642	0	0	Ó	0	-3711	-3457	0	0	0	0	0	-14	-782
Above Normal	0	-642	0	0	0	0	-3711	-3457	0	0	0	0	0	-14	-782
Below Normal	0	0	0	0	0	-4212	-4532	-4157	0	0	0	0	0	0	-1290
Dry	0	0	-548	-598	-3482	-4212	-4532	-4216	-2022	-1126	0	0	0	0	-2073
Critical	0	-1165	-342	-28	-55	-849	-1146	-960	-58	0	0	0	0	0	-460

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.

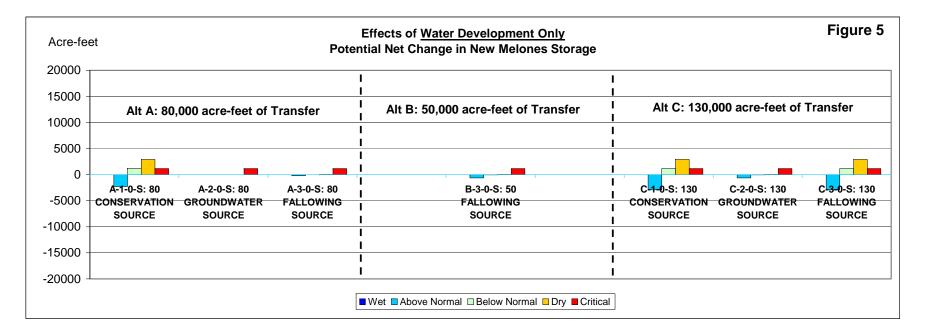
In summary of the combined effects among Alternative C scenarios, all scenarios of this alternative would cause changes to flows at Vernalis. The groundwater scenario is most neutral to Vernalis flow. For the wildlife area water scenarios, flow during August is expected to increase at Vernalis due to 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.

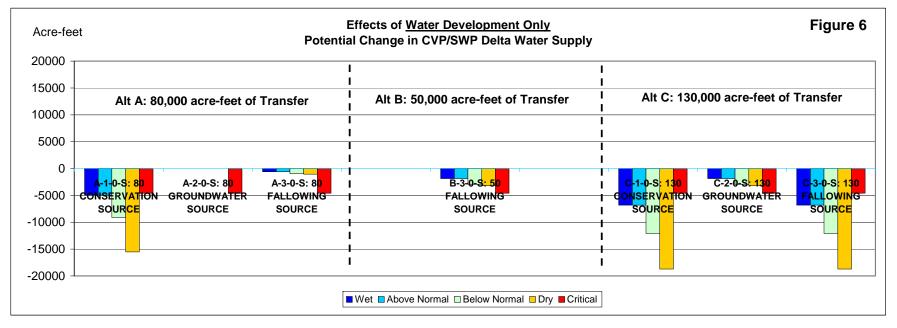
General Conclusions and Summary of Results

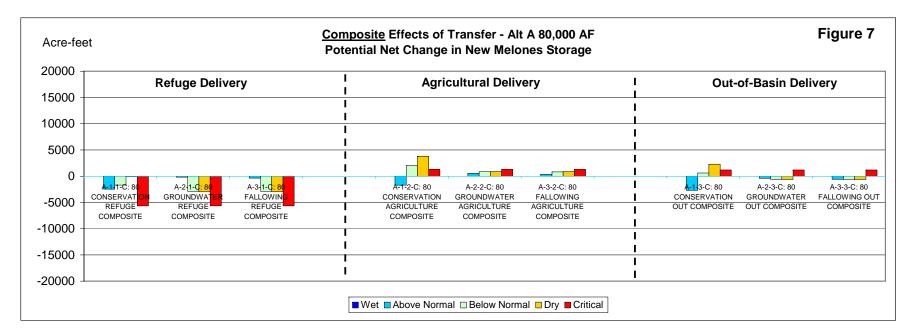
The results of the analyses vary significantly by size of program, components of supply, disposition of transfer and year-type. Very few conclusions can be made regarding an alternative or configuration that will be superior in terms of minimizing potential hydrologic effects across the entire range 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:

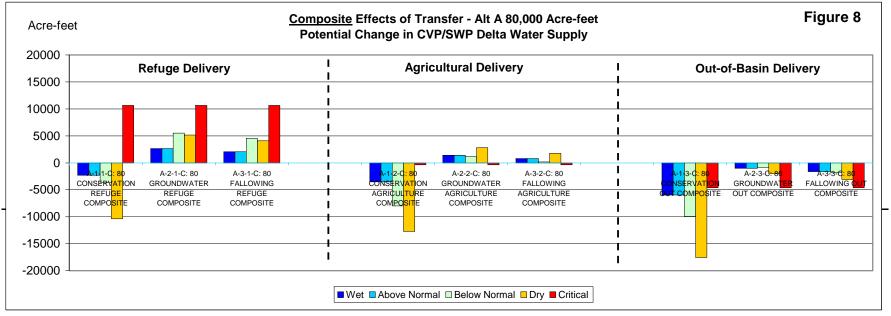
- The results indicate that no one alternative or configuration is best in all circumstances. Consistent with the performance of the current program being implemented, the best strategy appears to be one that is flexible in establishing size, transferees and sources of water.
- The potential effects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

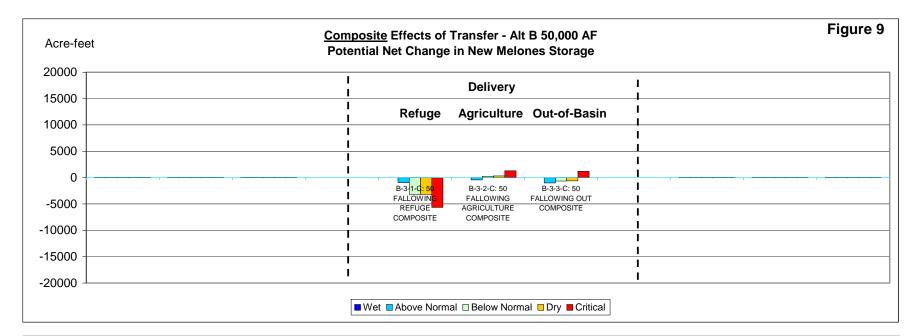
The results of the analyses in terms of potential New Melones Reservoir storage effects and potential CVP/SWP Delta supply effects are illustrated in Figures 5 through 12. The illustrations represent the results separately for the water development-only analyses and the combined, composite effect analyses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

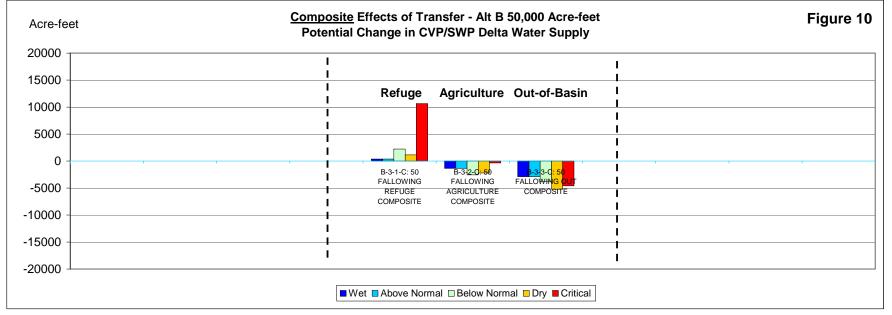


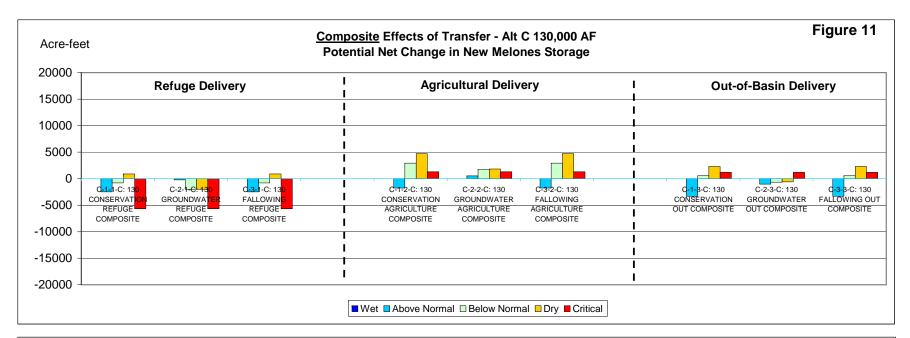


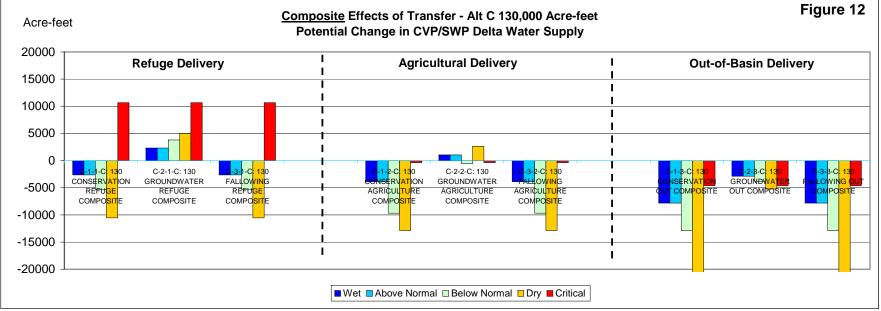












Attachment 1 Summary Results for Scenarios

	1-0-S: 80 CONSERVATION S ative to Benchmark (Existing) Condition											Water	Develop	oment a	and Disp	osition	Assum	ptions
Disposition Non-Crit	Crit	SJR Continuity Non-Crit	Crit						5	JR Non-Co Non-Crit	Crit							
0	0 Agriculture-SJRc 0 Wildlife Areas-SJRc	0	0 C 0 C	onservatio onservatio	n of Evapora n of Drain Sp	ition/Seepa cills to Wild	ge to GW-S life Areas-S	SJRc SJRc		0	0 Ci 0 Ci	onservation onservation	of Evapora of Drain Sp	tion/Seepa ills to Wild	ge to GW-S life Areas-S.	JRnc JRnc		
0	0 Urban-SJRc 0 Agriculture-SJRnc	-6000 15465		roundwate ailwater Re	r-SJRc capture-SJF	Rc				0 900		roundwater- ailwater Rec		inc				
0	0 Wildlife Areas-SJRnc 0 Urban-SJRnc	0		allowing -S			Non-Crit	Crit		0		allowing-SJI	Rnc Non-Crit	Crit				
0 All Values	0 EWA Relative to Benchmark (Exi	stina) Cor		otal Develo	ped Water:		10365	50000	T	otal Disposi	ition:		0	0	Basic Hy	/drologi	c Acco	untina
Water Develop	ed - Non Critical Years nge in Evaporation/Seepage to GW	, ee.		Jan 0	Feb 0	Mar 0	Apr 0	May 0	Jun 0	Jul 0	Aug 0	Sep 0	Oct 0	Nov 0	Dec 0	Jan 0	Feb 0	Total 0
Cha	nge in Drain Spills to Wildlife Areas nge in Discharge to SJR Streams			0 141	0 1054	0 1054	0 1757	0 2285	0 2285	0 2285	0 2285	0 1406	0 914	0	0	0	0	0 15,465
Cha	nge to Flows Upstream of Sack Dam			0	45 0	90	90	99	144	162 0	162 0	72	27	9	0	0	0	900
	undwater			0 141	0 1099	0 1144	-750 1097	-840 1544	-990 1439	-1200 1247	-900 1547	-600 878	-600 341	-120 -111	0	0	0	-6,000 10,365
Effects to SJR Cha	Flows due to Developing Water - Non O nge in Evaporation/Seepage to GW	Critical Years		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	nge in Drain Spills to Wildlife Areas nge in Discharge to SJR Streams			0 141	0 1054	0 1054	0 1757	0 2285	0 2285	0 2285	0 2285	0 1406	0 914	0	0	0	0	0 15,465
Cha	nge to Flows Upstream of Sack Dam o Fallowing			0	0	0	0 0	0	0	0	0 0	0	0	0	0	0	0	0
Tota	undwater Il (Positive value means flow reduced)			0 141	0 1054	0 1054	0 1757	0 2285	0 2285	0 2285	0 2285	0 1406	0 914	0	0	0	0	0 15,465
Incre	rom Disposition of Transfer Water - No emental Return from Agricultural Transfer	ees	irs	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Envi	emental Return from Wildlife Area Transfe imomental Water Account Beneficiaries	erees		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Tota	emental Return from Agricultural Entities մ an Joaquin River Flow Before NM Adju։	etmont (Ar	cre-feet)	0 -141	0 -1054	0 -1054	0	-2285	0 -2285	-2285	0 -2285	0 -1406	0 -914	0	0	0	0	0 0 -15,465
(Positive value r	means flow added)	(cfs		-2	-19	-1034	-30	-2205	-38	-2205	-2203	-24	-15	0	0	0	0	0
Water Develop	ed - Critical Years nge in Evaporation/Seepage to GW			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cha	nge in Drain Spills to Wildlife Areas nge in Discharge to SJR Streams			0	0 0	0	0	0	0	0 0	0	0	0	0	0	0	0	0
Cha Crop	nge to Flows Upstream of Sack Dam o Fallowing			0 1031	0 4639	0 5155	0 344	0 687	0 10653	0 14433	0 12715	0 344	0	0	0	0	0	0 50,000
Grou Tota	undwater l			0 1031	0 4639	0 5155	0 344	0 687	0 10653	0 14433	0 12715	0 344	0	0	0	0	0	0 50,000
Cha	Flows due to Developing Water - Critic nge in Evaporation/Seepage to GW	al Years		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cha	nge in Drain Spills to Wildlife Areas nge in Discharge to SJR Streams			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Crop	nge to Flows Upstream of Sack Dam o Fallowing			0 173	0 779	0 303	0 20	0 40	0 626	0 849	0 748	0 58	0	0	0	0	0	0 3,597
Tota	undwater Il (Positive value means flow reduced)			0 173	0 779	0 303	0 20	0 40	0 626	0 849	0 748	0 58	0	0 0	0	0	0	0 3,597
Incre	rom Disposition of Transfer Water - Cri emental Return from Agricultural Transfer emental Return from Wildlife Area Transfe	ees		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Envi	imomental Water Account Beneficiaries emental Return from Agricultural Entities	51663		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Tota		stment (Ad	cre-feet)	0 -173	0 -779	-303	0 -20	0 -40	-626	0 -849	0 -748	0 -58	0	0	0	0	0	0 -3,597
(Positive value r	means flow added)	(cfs	s)	-3	-14	-5	0	-1	-11	-14	-12	-1	0	0	0	0	0 Ve	o ernalis
Benchmark Ve Wet	rnalis Flow - cfs			Jan 7500	Feb 13600	Mar 15700	Apr 13600	May 12000	Jun 7400	Jul 5100	Aug 3100	Sep 2500	Oct 3600	Nov 3000	Dec 4600	Jan 7500	Feb 13600	inano
Abo	ve Normal w Normal			5800 2300	7200	6200 3300	5900 3700	4600 3700	2600 2100	2100 1900	2000 1500	1500 1200	2000 1900	1800 1700	2300 2200	5800 2300	7200 3200	
Dry				1900 1300	2600 1700	2300 1600	2700 1800	2200 1500	1800 1300	1400 1000	1100 1000	1000	1700 1500	1600 1400	2100 1500	1900 1300	2600 1700	
Change in Veri Wet	nalis Flow with Action - cfs			-2	-19	-17	-30	-37	-38	-37	-37	-24	-15	0	0	0	0	
	ve Normal w Normal			-2 -2	-19 0	-17 -17	-30 -30	-37 -37	0 -52	-37 -50	-37 -48	-24 -24	-15 -15	0	0	0	0	
Dry Criti				-2 -3	0 -21	-19 -6	-42 0	-51 -1	-52 -14	-50 -19	-48 -16	-24 -1	-15 0	0	0	0	0	
Wet				7498	13581	15683	13570	11963	7362	5063	3063	2476	3585	3000	4600	7500	13600	
Belo	ve Normal w Normal			5798 2298	7181 3200	6183 3283	5870 3670	4563 3663	2600 2048	2063 1850	1963 1452	1476 1176	1985 1885	1800 1700	2300 2200	5800 2300	7200 3200	
Dry Critic Benchmark Ve	cal rnalis Water Quality - mmhos (April and	d May yalune i	may not b	1898 1297 a reflectiv	2600 1679	2281 1594	2658 1800	2149 1499 n objective	1748 1286 s control)	1350 981	1052 984	976 999	1685 1500	1600 1400	2100 1500	1900 1300	2600 1700	
Wet		a may values i	may not b	352 404	286 380	310 465	269 364	212 334	310 486	341 509	460 534	442 588	359 494	497 657	432 639	352 404	286 380	
	w Normal			757	631 736	690 1000	465 700	382 700	700	700 700	700	680 772	510 547	681 708	657 678	757	631 736	
Criti	cal nalis Water Quality with Action - mmhos	s (April and M	lay values	1000	1000	1000	700	700	700	700	700	772	595	772	859	1000	1000	
Wet Abo	ve Normal			0 -1	-2 -3	-1 -2	-2 -4	-3 -7	-3 -13	-4 -8	-5 -7	-6 -7	-2 -3	0 0	0	0	0	
Dry	w Normal			-1 -1	-8 -10	-2 0	-6 -3	-8 -4	0	0	0	-7 -7	-3 -3	0	0	0	0	
	rnalis Water Quality - mmhos (April and	d May values	may not b					0 n objective		0	0	0	0	0	0	0	0	
	ve Normal w Normal			351 404 756	284 377 623	309 463 688	267 360 459	209 327 374	307 473 700	337 502 700	455 527 700	436 581 673	357 491 507	497 657 681	432 639 657	352 404 757	286 380 631	
Dry				756 879 998	725	1000	459 697 700	696 700	700 700 700	700	700 700 700	765 771	507 544 595	708	678 859	880 1000	736	
																	New M	
Wet	nange in NM Storage due to WQ Releas	e Change - Ad	cre-feet	Jan 0	Feb 0	Mar 0	Apr 0	May 0	Jun 0	Jul 0	Aug 0	Sep 0	Oct 0	Nov 0	Dec 0	Jan 0	Feb 0	Total 0
Belo	ve Normal w Normal			0 0 0	0	0	0 0 718	0	0 813 813	0 800 800	0 650	0	0	0 0	0	0	0	0 2,263 3 960
Dry Criti	cal nange in NM Storage due to Vernalis Flo	ow Release O	hange *	0	0 386	135 39	718 8	845 15	813 223	800 297	650 213	0	0	0	0	0 0	0	3,960 1,180
Wet	hange in NM Storage due to Vernalis Figure	ow nelease C	nanye - Al	0	0	0	0	0	0 -2285	0	0	0	0	0	0	0	0	0 -2,285
	w Normal			0	-1054 -1054	0	0	0	-2285 0 0	0	0	0	0	0	0	0	0	-2,285 -1,054 -1,054
Criti	cal al Change in NM Storage due to Vernali	is Flow & Qua	lity Releas	0	0	Ő	Ő	0	Ő	ő	0	Ő	0	Ő	Ő	0	Ő	0
Wet Abo	ve Normal			0	0	0	0 0	0 0	0 -2285	0	0 0	0	0 0	0 0	0	0 0	0	0 -2,285
Dry	w Normal			0	-1054 -1054	0 135	0 718	0 845	813 813	800 800	650 650	0	0	0	0	0	0	1,208 2,906
Criti	cal			0	386	39	8	15	223	297	213	0	0	0	0	0 Project	0 Delta S	1,180 Supply
Wet		nts - Acre-fee	t	Jan 0	Feb -369	Mar 0	Apr 0	May 0	Jun 0	Jul -2285	Aug -2285	Sep 0	Oct 0	Nov 0	Dec 0	Jan 0	Feb 0	Total -4,938
Belo	ve Normal w Normal			0 0	-369 -369	0 0	0 0	0 0	-2285 -2285	-2285 -2285	-2285 -2285	0	0 0	0 0	0	0 0	0 0	-7,223 -7,223
Dry Criti				0	-369 -779	-369 -303	-308 -20	-2285 -40	-2285 -626	-2285 -849	-2285 -748	-1406 -58	-884 0	0 0	0	0 0	0	-12,474 -3,424
Wet		s increase in s	supply)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Belo	ve Normal w Normal			0	0 369	0	0	0	2285 -813	-800	-650	0	0	0	0	0	0	2,285 -1,894
Dry Critic		tion Ar (ot	0	369 -386	-47 -39	-251 -8	-845 -15	-813 -223	-800 -297	-650 -213	0	0	0	0	0	0	-3,037 -1,180
Wet	nange in Project Delta Supply due to Ac	Juon - Acre-fe	υt	0	-369 -369	0	0	0	0	-2285 -2285	-2285 -2285	0	0	0	0	0	0	-4,938 -4,938
	w Normal			0	-369	0 -416	0 -559	0 -3129	-3097 -3097	-2285 -3084 -3084	-2935 -2935	0 -1406	0 -884	0	0	0	0	-4,938 -9,116 -15,511
Criti	cal			0	-1165	-342	-339	-55	-849	-1146	-960	-1400	0	0	0	0	0	-4,604

	A-1-1-C: 80 CONSERVATION RI Relative to Benchmark (Existing) Condition		MPOSITE								Water	Develo	pment a	nd Disp	osition	Assum	ptions
Disposition Non-Crit -15262 17823 0 -7385	Crit O Agriculture-SJRc 40000 Wildlife Areas-SJRc 0 Urban-SJRc 0 Agriculture-SJRnc	UR Continuity Non-Crit 0 -6000 15465	Crit 0 Conservatio 0 Conservatio 0 Groundwate 0 Tailwater R	on of Drain S er-SJRc ecapture-SJ	pills to Wild	ige to GW-5 llife Areas-S	SJRc JRc	<u>s</u>	UR Non-Col Non-Crit 0 0 0 900	Crit 0 C 0 C 0 G 0 T	onservation roundwater- ailwater Rec	of Drain Sp -SJRnc :apture-SJR	tion/Seepag bills to Wildl Rnc	ge to GW-S ife Areas-S.	JRnc IRnc		
9497 0	0 Wildlife Areas-SJRnc 0 Urban-SJRnc	0 42	2000 Fallowing -			Non-Crit	Crit	-	0		allowing-SJI	Non-Crit	Crit				
	0 EWA Jes Relative to Benchmark (Exis	ting) Cond	ition	oped Water:		10365	50000		otal Disposi			4673		Basic Hy			
Water Dev	reloped - Non Critical Years Change in Evaporation/Seepage to GW Change in Drain Spills to Wildlife Areas Change in Discharge to SJR Streams Change to Flows Upstream of Sack Dam Crop Fallowing Groundwater		Jan 0 141 0 0 0	Feb 0 1054 45 0 0	Mar 0 1054 90 0 0	Apr 0 1757 90 0 -750	May 0 2285 99 0 -840	Jun 0 2285 144 0 -990	Jul 0 2285 162 0 -1200	Aug 0 2285 162 0 -900	Sep 0 1406 72 0 -600	Oct 0 914 27 0 -600	Nov 0 0 9 0 -120	Dec 0 0 0 0 0 0	Jan 0 0 0 0 0	Feb 0 0 0 0 0	Total 0 15,465 900 0 -6,000
Effects to	Total SJR Flows due to Developing Water - Non Cr Change in Evaporation/Seepage to GW Change in Drain Spills to Wildlife Areas Change in Discharge to SJR Streams Change to Flows Upstream of Sack Dam Crop Fallowing	ritical Years	141 0 0 141 0 0	1099 0 1054 0 0	1144 0 1054 0	1097 0 1757 0 0	1544 0 2285 0 0	1439 0 2285 0 0	1247 0 2285 0 0	1547 0 2285 0 0	878 0 1406 0	341 0 914 0	-111 0 0 0 0	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0 0 0 0	0 0 0 0	10,365 0 15,465 0
Return Flo	Groundwater Total (Positive value means flow reduced) ows from Disposition of Transfer Water - Non Incremental Return from Agricultural Transferer Incremental Return from Wildlife Area Transfer	es	0 141 0 0	0 1054 0 0	0 1054 -23 33	0 1757 -102 5	0 2285 -153 0	0 2285 -182 0	0 2285 -263 0	0 2285 -193 3026	0 1406 -254 165	0 914 -114 -17	0 0 -31 282	0 0 -8 66	0 0 -10 220	0 0 -18 252	0 15,465 -1,351 4,032
	Envirnomental Water Account Beneficiaries Incremental Return from Agricultural Entities Total		0	0	0 10	0 -96	0 -153	0 -182	0 -263	0 2833	0 -89	0 -131	0 252	0 58	0 209	0 234	0 2,682
	to San Joaquin River Flow Before NM Adjust alue means flow added)	tment (Acre- (cfs)		-1054 -19	-1044 -17	-1854 -31	-2438 -40	-2467 -41	-203 -2547 -41	2833 548 9	-1495 -25	-1045 -17	252 252 4	58 1	209 209 3	234 234 4	-12,783 0
	eloped - Critical Years Change in Evaporation/Seepage to GW Change in Drain Spills to Wildlife Areas Change in Discharge to SJR Streams Change to Flows Upstream of Sack Dam		0 0 0 0	0 0 0 0	0 0 0 0	0 0 0	0 0 0 0	0 0 0 0	0 0 0 0	0 0 0 0	0 0 0	0 0 0	0 0 0 0	0 0 0 0	0 0 0 0	0 0 0 0	0 0 0 0
Effacts to	Crop Fallowing Groundwater Total SJR Flows due to Developing Water - Critica	Voare	1031 0 1031	4639 0 4639	5155 0 5155	344 0 344	687 0 687	10653 0 10653	14433 0 14433	12715 0 12715	344 0 344	0 0 0	0 0 0	0 0 0	0 0 0	0 0 0	50,000 0 50,000
211001010	Change in Evaporation/Seepage to GW Change in Drain Spills to Wildlife Areas Change in Discharge to SJR Streams Change to Flows Upstream of Sack Dam Crop Fallowing Groundwater		0 0 0 173 0	0 0 0 779 0	0 0 0 303 0	0 0 0 20 0	0 0 0 40	0 0 0 626 0	0 0 0 849 0	0 0 0 748 0	0 0 0 58 0	0 0 0 0	0 0 0 0	0 0 0 0 0	0 0 0 0	0 0 0 0 0	0 0 0 3,597 0
Return Flo	Total (Positive value means flow reduced) ows from Disposition of Transfer Water - Criti Incremental Return from Agricultural Transfere Incremental Return from Wildlife Area Transfer Envinomental Water Account Beneficiaries	es	173 0 0	779 0 0	303 0 75	20 0 11	40 0 0	626 0 0	849 0 0	748 0 6791	58 0 370	0 0 -39	0 0 634	0 0 148	0 0 493	0 0 567	3,597 0 9,049
Net Effect (Positive v	Incremental Return from Agricultural Entities Total to San Joaquin River Flow Before NM Adjust alue means flow added)	tment (Acre- (cfs)	0 0 feet) -173 -3	0 0 -779 -14	0 75 -228 -4	0 11 -9 0	0 0 -40 -1	0 0 -626 -11	0 0 -849 -14	0 6791 6043 98	0 370 312 5	0 -39 -39 -1	0 634 634 11	0 148 148 2	0 493 493 8	0 567 567 10	0 9,049 5,453 0
	k Vernalis Flow - cfs		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Ve Feb	ernalis
	Wet Above Normal Below Normal Dry Critical		7500 5800 2300 1900 1300	13600 7200 3200 2600 1700	15700 6200 3300 2300 1600	13600 5900 3700 2700 1800	12000 4600 3700 2200 1500	7400 2600 2100 1800 1300	5100 2100 1900 1400 1000	3100 2000 1500 1100 1000	2500 1500 1200 1000 1000	3600 2000 1900 1700 1500	3000 1800 1700 1600 1400	4600 2300 2200 2100 1500	7500 5800 2300 1900 1300	13600 7200 3200 2600 1700	
Change ir	Vernalis Flow with Action - cfs Wet Above Normal Below Normal Dry		-2 -2 -2 -2	-19 -19 0 0	-17 -17 -17 -18	-31 -31 -31 -43	-40 -40 -53	-41 0 -54 -54	-41 -41 -52 -52	9 9 46 46	-25 -25 -25 -25	-17 -17 -17 -17	4 4 4	1 1 1 1	3 3 3	4 4 0 0	
With-Actio	Critical n Vernalis Flow - cfs Wet Above Normal Below Normal		-3 7498 5798 2298	-21 13581 7181 3200	-2 15683 6183 3283	0 13569 5869 3669	-1 11960 4560 3660	-14 7359 2600 2046	-19 5059 2059 1848	199 3109 2009 1546	5 2475 1475 1175	-1 3583 1983 1883	11 3004 1804 1704	2 4601 2301 2201	8 7503 5803 2303	15 13604 7204 3200	
Benchma	Dry Critical k Vernalis Water Quality - mmhos (April and Wet	May values ma	1898 1297	2600 1679 ve of split-m 286	2282 1598 nonth oper 310	2657 1800 ations whe 269	2147 1499	1746 1286	1348 981 341	1146 1199 460	975 1005 442	1683 1499 359	1604 1411 497	2101 1502 432	1903 1308 352	2600 1715 286	
	Above Normal Below Normal Dry Critical		404 757 880 1000	380 631 736 1000	465 690 1000 1000	364 465 700 700	334 382 700 700	486 700 700 700	509 700 700 700	534 700 700 700	588 680 772 772	494 510 547 595	657 681 708 772	639 657 678 859	404 757 880 1000	380 631 736 1000	
Change in	Vernalis Water Quality with Action - mmhos Wet Above Normal Below Normal Dry	(April and May	values may not 0 -1 -1 -1	-2 -3 -8 -10	e or split-m -1 -2 -2 0	-2 -4 -6 -3	-3 -7 -8 -4	-3 -14 0 0	s control) -4 -7 0 0	9 13 0 0	-5 -6 -6 -5	-2 -3 -3	1 1 1	0 0 0	0 0 1 1	0 1 2 2	
With-Actio	Critical on Vernalis Water Quality - mmhos (April and Wet Above Normal	May values ma	351 404	284 377	309 464	267 360	209 327	307 473	0 337 502	0 469 546	2 437 582	0 357 491	3 498 659	0 432 639	1 352 405	0 286 381	
	Below Normal Dry Critical		756 879 998	623 725 1000	688 1000 1000	459 697 700	374 696 700	700 700 700	700 700 700	700 700 700	674 766 773	507 544 595	682 709 775	658 678 859	757 880 1001	633 738 1000 New Me	elones
	al Change in NM Storage due to WQ Release Wet Above Normal Below Normal Dry Critical		0 0 0 0	Feb 0 0 0 386	Mar 0 0 67 -97	Apr 0 0 701 -12	May 0 0 826 15	Jun 0 751 751 223	Jul 0 674 674 297	Aug 0 -2285 -2259 -6209	Sep 0 0 0 0	Oct 0 0 0 0	Nov 0 0 0 0	Dec 0 0 0 0	Jan 0 0 0 0	Feb 0 0 0 -267	Total 0 -860 761 -5,665
Increment	al Change in NM Storage due to Vernalis Flor Wet Above Normal Below Normal Dry Critical	w Release Char	nge - Acre-feet 0 0 0 0 0	0 -1054 -1054 0	0 0 0 0	0 0 0 0	0 0 0 0	0 -2467 0 0	0 0 0 0	0 0 0	0 0 0 0	0 0 0 0	0 0 0	0 0 0 0	0 0 0 0	0 234 234 0	0 -2,467 -820 -820
Net Increr	enntal Change in NM Storage due to Vernalis Wet Above Normal Below Normal Dry	Flow & Quality				0 0 0 701	0 0 0 826	0 -2467 751 751	0 0 674 674	0 0 -2285 -2259	0 0 0	0 0 0	0 0 0 0	0 0 0	0 0 0	0 0 234 234	0 -2,467 -1,680 -59
Total Bat	Critical ntial Delta supply Impact w/o NM Adjustmen	te - Anno faat	0 0 Jan	-1034 386 Feb	-97 Mar	-12 Apr	15 May	223 Jun	297 Jul	-6209	0 Sep	0 Oct	0 Nov	0 Dec	0 Project	-267	-5,665
i otal Pote	Initial Derta supply impact w/o NM Adjustmen Wet Above Normal Below Normal Dry Critical	LO - AUI 8-1881	Jan 0 0 0 0 0	-369 -369 -369 -369 -369 -779	Mar 0 0 -366 -228	Apr 0 0 -324 -9	May 0 0 -2438 -40	Jun 0 -2467 -2467 -2467 -626	-2547 -2547 -2547 -2547 -2547 -849	Aug 548 548 548 548 548 6043	Sep 0 0 -1495 312	0 0 -1011 -39	Nov 0 0 0 634	0 0 0 0 0	Jan 0 0 0 0	Feb 82 82 82 82 567	-2,286 -4,753 -4,753 -10,387 4,985
New Melo	nes Adjustments - Acre-feet (positive means Wet Above Normal Below Normal	increase in sup	0 0 0 0	0 0 369	0 0 0	0 0 0	0 0 0	0 2467 -751	0 0 -674	0 0 2285	0 0 0	0 0 0	0 0 0	0 0 0	0 0 0	0 0 -82	0 2,467 1,147
Increment	Dry Critical al Change in Project Delta Supply due to Act Wet Above Normal	ion - Acre-feet	0 0 0	369 -386 -369 -369	-23 97 0 0	-245 12 0 0	-826 -15 0 0	-751 -223 0 0	-674 -297 -2547 -2547	2259 6209 548 548	0 0 0	0 0 0	0 0 0	0 0 0	0 0 0	-82 267 82 82	25 5,665 -2,286 -2,286
	Below Normal Dry Critical		0 0 0	0 0 -1165	0 -389 -131	0 -570 4	0 -3264 -55	-3218 -3218 -849	-3222 -3222 -1146	2833 2807 12252	0 -1495 312	0 -1011 -39	0 0 634	0 0 0	0 0 0	0 0 834	-3,606 -10,362 10,650
Move	004							2									

	A-1-2-C: 80 CONSERVATION AGRIC Relative to Benchmark (Existing) Condition		сомроз	SITE							Water	Develo	oment a	nd Disp	osition	Assum	ptions
Disposition Non-Crit 46412 0 0 -7385	Crit SURC Crit Non- 50000 Agriculture-SJRc 0 Wildlife Areas-SJRc 0 Urban-SJRc -6 0 Agriculture-SJRnc 15	0 0 0 0 000 0 465 0	Conservation Conservation Groundwate Tailwater Re	n of Drain Sj r-SJRc acapture-SJF	oills to Wild	ge to GW-S life Areas-S	iJRc JRc	<u>2</u>	<u>SJR Non-Co</u> Non-Crit 0 0 0 900	Crit 0 Cr 0 Cr 0 G 0 Tr	onservation roundwater- ailwater Rec	of Drain Sp -SJRnc :apture-SJR	tion/Seepag bills to Wildli	ge to GW-S fe Areas-S.	JRnc IRnc		
0	0 Wildlife Areas-SJRnc 0 Urban-SJRnc		Fallowing -S			Non-Crit	Crit	-	0		Illowing-SJF	Non-Crit	Crit				
	0 EWA Ies Relative to Benchmark (Existing					10365	50000		otal Disposi			39027		Basic Hy			
	eloped - Non Critical Years Change in Evaporation/Seepage to GW Change in Drain Spills to Wildlife Areas Change in Discharge to SJR Streams Change to Flows Upstream of Sack Dam Crop Fallowing Groundwater		Jan 0 141 0 0 0	Feb 0 1054 45 0 0	Mar 0 1054 90 0	Apr 0 1757 90 0 -750	May 0 2285 99 0 -840	Jun 0 2285 144 0 -990	Jul 0 2285 162 0 -1200	Aug 0 2285 162 0 -900	Sep 0 1406 72 0 -600	Oct 0 914 27 0 -600	Nov 0 0 9 0 -120	Dec 0 0 0 0 0 0	Jan 0 0 0 0 0	Feb 0 0 0 0 0	Total 0 15,465 900 0 -6,000
	Total SJR Flows due to Developing Water - Non Critical Change in Evaporation/Seepage to GW Change in Discharge to SJR Streams Change in Discharge to SJR Streams Change to Flows Upstream of Sack Dam	Years	0 141 0 141 0	1099 0 0 1054 0	0 1144 0 0 1054 0	-750 1097 0 1757 0	-840 1544 0 2285 0	-990 1439 0 2285 0	-1200 1247 0 2285 0	-300 1547 0 2285 0	-600 878 0 1406 0	-600 341 0 914 0	-120 -111 0 0 0	0 0 0 0	0		-6,000 10,365 0 15,465 0
	Crop Fallowing Groundwater		0 0	0	0	0	0 0	0	0	0 0	0	0	0	0	0	0	0
	Total (Positive value means flow reduced) ws from Disposition of Transfer Water - Non Critit Incremental Return from Agricultural Transferees Incremental Return from Wildlife Area Transferees Envirnomental Water Account Beneficiaries Incremental Return from Agricultural Entities	cal Years	141 0 0	1054 0 0	1054 71 0	1757 309 0	2285 467 0	2285 554 0	2285 799 0	2285 587 0	1406 771 0	914 345 0	0 93 0	0 23 0	0 32 0	0 56 0	15,465 4,107 0
Net Effect	Total to San Joaquin River Flow Before NM Adjustment		0 -141	0 -1054	71 -983	309 -1449	467 -1818	554 -1731	799 -1486	587 -1697	771 -635	345 -568	93 93	23 23	32 32	56 56	4,107 -11,358
	alue means flow added) eloped - Critical Years	(cfs)	-2	-19	-16	-24	-30	-29	-24	-28	-11	-9	2	0	1	1	0
	Change in Evaporation/Seepage to GW Change in Drain Spills to Wildlife Areas Change in Dicarbage to SJR Streams Change to Flows Upstream of Sack Dam Crop Fallowing Groundwater Total		0 0 0 1031 0 1031	0 0 0 4639 0 4639	0 0 5155 0 5155	0 0 0 344 0 344	0 0 0 687 0 687	0 0 0 10653 0 10653	0 0 0 14433 0 14433	0 0 12715 0 12715	0 0 0 344 0 344	0 0 0 0 0 0	0 0 0 0 0 0	0 0 0 0 0 0	0 0 0 0 0	0 0 0 0 0 0	0 0 0 50,000 0 50,000
	SJR Flows due to Developing Water - Critical Yea Change in Evaporation/Seepage to GW Change in Drah Spills to Wildlife Areas Change in Discharge to SJR Streams Change to Flows Upstream of Sack Dam Crop Fallowing Groundwater	rs	0 0 0 173 0	0 0 0 779 0	0 0 0 303 0	0 0 0 20 0	0 0 0 40 0	0 0 0 626 0	0 0 0 849 0	0 0 0 748 0	0 0 0 58 0	0 0 0 0 0	0 0 0 0 0	0 0 0 0 0	0 0 0 0 0	0 0 0 0 0	0 0 0 3,597 0
Return Flo	Total (Positive value means flow reduced) ws from Disposition of Transfer Water - Critical Y Incremental Return from Agricultural Transferees Incremental Return from Wildlife Area Transferees Envimomental Water Account Beneficiaries Incremental Return from Agricultural Entities	ears	173 0 0	779 0 0	303 77 0 0	20 333 0 0	40 503 0	626 597 0	849 861 0	748 633 0	58 831 0	0 372 0	0 100 0	0 25 0 0	0 34 0	0 61 0	3,597 4,425 0
Net Effect (Positive vi	Total to San Joaquin River Flow Before NM Adjustment alue means flow added)	t (Acre-feet) (cfs)	0 -173 -3	0 -779 -14	77 -226 -4	333 312 5	503 462 8	597 -30 0	861 12 0	633 -115 -2	831 773 13	372 372 6	100 100 2	25 25 0	34 34 1	61 61 1	4,425 828 0
	k Vernalis Flow - cfs	(Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Ve Feb	ernalis
	Wet Above Normal Below Normal Dry Critical		7500 5800 2300 1900 1300	13600 7200 3200 2600 1700	15700 6200 3300 2300 1600	13600 5900 3700 2700 1800	12000 4600 3700 2200 1500	7400 2600 2100 1800 1300	5100 2100 1900 1400 1000	3100 2000 1500 1100 1000	2500 1500 1200 1000 1000	3600 2000 1900 1700 1500	3000 1800 1700 1600 1400	4600 2300 2200 2100 1500	7500 5800 2300 1900 1300	13600 7200 3200 2600 1700	
Change in	Vernalis Flow with Action - cfs Wet Above Normal Below Normal Dry		-2 -2 -2 -2	-19 -19 0 0	-16 -16 -16 -19	-24 -24 -24 -37	-30 -30 -30 -44	-29 0 -46 -46	-24 -24 -43 -43	-28 -28 -42 -41	-11 -11 -11 -11	-9 -9 -9 -9	2 2 2 2	0 0 0	1 1 1	1 1 0	
With-Actic	Critical nn Vernalis Flow - cfs Wet Above Normal Below Normal Drv		-3 7498 5798 2298 1898	-21 13581 7181 3200 2600	-4 15684 6184 3284 2281	5 13576 5876 3676 2663	7 11970 4570 3670 2156	-5 7371 2600 2054 1754	-5 5076 2076 1857 1357	-5 3072 1972 1458 1059	13 2489 1489 1189 989	6 3591 1991 1891 1691	2 3002 1802 1702 1602	0 4600 2300 2200 2100	1 7501 5801 2301 1901	1 13601 7201 3200 2600	
Benchma	Critical k Vernalis Water Quality - mmhos (April and May	values may not	1297 t be reflectiv	1679 e of split-m	1596 onth opera	1805 ations when	1507 n objective	1295 s control)	995	995	1013	1506	1402	1500	1301	1701	
	Wet Above Normal Below Normal Dry Critical Vernalis Water Quality with Action - mmhos (Apri	Lond Mov volu	352 404 757 880 1000	286 380 631 736 1000	310 465 690 1000 1000	269 364 465 700 700	212 334 382 700 700	310 486 700 700 700	341 509 700 700 700 700	460 534 700 700 700	442 588 680 772 772	359 494 510 547 595	497 657 681 708 772	432 639 657 678 859	352 404 757 880 1000	286 380 631 736 1000	
Change in	Wet Above Normal Below Normal Dry Critical	r anu may valu	0 -1 -1 -1 -2	-2 -3 -8 -10 0	-1 -2 -2 0	-2 -4 -6 -3 0	-3 -7 -8 -5 0	-3 -11 0 0	-4 -8 0 0	-6 -7 0 0	-6 -9 -9 -8 -1	-2 -3 -3 -3 0	0 0 0 0	0 0 0 0	0 0 0 0	0 0 0 0	
	Morenalis Water Quality - mmhos (April and May Wet Above Normal Below Normal Dry	values may no							337 501 700 700	455 526 700 700	435 580 671 764	357 491 507 545	497 657 681 707	432 639 657 678	352 404 757 880	286 380 632 736	
	Critical		998	1000	1000	700	700	700	700	700	771	595	772	859	1000	1000 New M	
	al Change in NM Storage due to WQ Release Char Wet Above Normal Below Normal Dry Critical		Jan 0 0 0 0	Feb 0 0 0 386	Mar 0 0 158 47	Apr 0 0 742 -12	May 0 0 900 30	Jun 0 1000 1000 260	Jul 0 1181 1181 350	Aug 0 876 795 223	Sep 0 0 0 0 0	Oct 0 0 0 0	Nov 0 0 0 0	Dec 0 0 0 0	Jan 0 0 0 0	Feb 0 0 0 14	Total 0 3,057 4,776 1,296
	al Change in NM Storage due to Vernalis Flow Rei Wet Above Normal Below Normal Dry Critical	ease Change -	Acre-feet 0 0 0 0 0	0 -1054 -1054 0	0 0 0 0	0 0 0 0	0 0 0 0	0 -1731 0 0	0 0 0 0	0 0 0 0	0 0 0 0	0 0 0 0	0 0 0 0	0 0 0 0	0 0 0 0	0 56 56 0	0 -1,731 -998 -998 0
Net Incren	vental Change in NM Storage due to Vernalis Flow Wet Above Normal Below Normal Dry Critical	& Quality Rele			0 0 158 47	0 0 742 -12	0 0 900 30	0 -1731 1000 1000 260	0 0 1181 1181 350	0 0 876 795 223	0 0 0 0	0 0 0 0	0 0 0 0 0	0 0 0 0	0 0 0 0	0 0 56 56 14	0 -1,731 2,059 3,777 1,296
	Critical ntial Delta supply Impact w/o NM Adjustments - A	cre-feet	Jan	386 Feb	47 Mar	-12 Apr	30 May	260 Jun	350 Jul	Aug	Sep	Oct	Nov	Dec	-	Delta S	
	Wet Above Normal Below Normal Dry Critical		0 0 0 0 0	-369 -369 -369 -369 -779	0 0 -344 -226	0 0 -254 312	0 0 -1818 462	0 -1731 -1731 -1731 -30	-1486 -1486 -1486 -1486 12	-1697 -1697 -1697 -1697 -1697 -115	0 0 -635 773	0 0 -550 372	0 0 0 100	0 0 0 0 0	0 0 0 0 0	20 20 20 20 61	-3,533 -5,263 -5,263 -8,864 942
	nes Adjustments - Acre-feet (positive means incre Wet Above Normal Below Normal Dry Critical	ase in supply)	0 0 0 0	0 0 369 369 -386	0 0 -55 -47	0 0 -260 12	0 0 -900 -30	0 1731 -1000 -1000 -260	0 0 -1181 -1181 -350	0 0 -876 -795 -223	0 0 0 0	0 0 0 0	0 0 0 0	0 0 0 0	0 0 0 0	0 -20 -20 -14	0 1,731 -2,708 -3,841 -1,296
	al Change in Project Delta Supply due to Action Wet Above Normal Below Normal Dry	Acre-feet	0 0 0	-369 -369 0 0	0 0 -399	0 0 -513	0 0 -2718	0 0 -2731 -2731	-1486 -1486 -2666 -2666	-1697 -1697 -2573 -2492	0 0 -635	0 0 -550	0 0 0 0	0 0 0 0	0 0 0 0	20 20 0 0	-3,533 -3,533 -7,971 -12,705
Movi	Critical		0	-1165	-273	325	432	-289	-338	-337	773	372	100	0	0	47	-354

Study: All Values	A-1-3-C: 80 CONSERVATION OUT C Relative to Benchmark (Existing) Condition		I								Water	Develo	oment a	nd Disp	osition	Assum	ptions
Disposition Non-Crit -33588 0 0	Crit Non-C 0 Agriculture-SJRc	rit Crit 0 0 C 0 0 C		n of Evapora n of Drain Sp '-SJRc				5	JR Non-Cor Non-Crit 0 0 0	Crit 0 C 0 C	onservation onservation roundwater-	of Drain Sp	tion/Seepag ills to Wildli	ge to GW-S fe Areas-S.	JRnc IRnc		
72615 0 0	50000 Agriculture-SJRnc 154	65 O T		capture-SJF	Rc	Non-Crit	Crit		900 0	0 Ta	ailwater Rec allowing-SJI	apture-SJF	tnc Crit				
0	0 EWA Ies Relative to Benchmark (Existing)		otal Develo	ped Water:		10365	50000	1	otal Disposi	tion:		39027	50000	Basic Hy	drologi	c Acco	unting
Water Dev	eloped - Non Critical Years Change in Evaporation/Seepage to GW	condition	Jan 0	Feb 0	Mar 0	Apr 0	May 0	Jun 0	Jul 0	Aug 0	Sep 0	Oct 0	Nov 0	Dec 0	Jan 0	Feb 0	Total 0
	Change in Drain Spills to Wildlife Areas Change in Discharge to SJR Streams Change to Flows Upstream of Sack Dam		0 141 0	0 1054 45	0 1054 90	0 1757 90	0 2285 99	0 2285 144	0 2285 162	0 2285 162	0 1406 72	0 914 27	0 0 9	0 0 0	0 0 0	0 0 0	0 15,465 900
	Crop Fallowing Groundwater Total SJR Flows due to Developing Water - Non Critical N	logre	0 0 141	0 0 1099	0 0 1144	0 -750 1097	0 -840 1544	0 -990 1439	0 -1200 1247	0 -900 1547	0 -600 878	0 -600 341	0 -120 -111	0 0 0	0 0 0	0 0 0	0 -6,000 10,365
	Change in Evaporation/Seepage to GW Change in Drain Spills to Wildlife Areas Change in Discharge to SJR Streams	lears	0 0 141	0 0 1054	0 0 1054	0 0 1757	0 0 2285	0 0 2285	0 0 2285	0 0 2285	0 0 1406	0 0 914	0 0 0	0 0 0	0 0 0	0 0 0	0 0 15,465
	Change to Flows Upstream of Sack Dam Crop Fallowing Groundwater		0 0 0	0 0 0	0 0 0	0 0 0	0 0 0	0 0 0	0 0 0	0 0 0	0 0 0	0 0 0	0 0	0 0 0	0 0	0 0	0 0 0
Return Flo	Total (Positive value means flow reduced) ws from Disposition of Transfer Water - Non Critica Incremental Return from Agricultural Transferees Incremental Return from Wildlife Area Transferees	al Years	141 0 0	1054 0 0	1054 -52 0	1757 -223 0	2285 -338 0	2285 -401 0	2285 -578 0	2285 -425 0	1406 -558 0	914 -250 0	0 -67 0	0 -17 0	0 -23 0	0 -41 0	15,465 -2,972 0
	Envirnomental Water Account Beneficiaries Incremental Return from Agricultural Entities Total		0 0	0 0	0 -52	0 -223	0 -338	0 -401	0 -578	0 -425	0 -558	0 -250	0 -67	0 -17	0 -23	0 -41	0 -2,972
(Positive va	to San Joaquin River Flow Before NM Adjustment alue means flow added)	(Acre-feet) (cfs)	-141 -2	-1054 -19	-1106 -18	-1981 -33	-2622 -43	-2685 -45	-2863 -47	-2710 -44	-1964 -33	-1164 -19	-67 -1	-17 0	-23 0	-41 -1	-18,437 0
	eloped - 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 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 Crop Fallowing Groundwater		0 1031 0	0 4639 0	0 5155 0	0 344 0	0 687 0	0 10653 0	0 14433 0	0 12715 0	0 344 0	0 0 0	0 0 0	0 0 0	0 0 0	0 0 0	0 50,000 0
	Total SJR Flows due to Developing Water - Critical Years Change in Evaporation/Seepage to GW	:	1031 0	4639 0	5155 0	344 0	687 0	10653 0	14433 0	12715 0	344 0	0	0	0	0	0	50,000 0
	Change in Drain Spills to Wildlife Areas 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 Crop Fallowing Groundwater		0 173 0	0 779 0	0 303 0	0 20 0	0 40 0	0 626 0	0 849 0	0 748 0	0 58 0	0 0 0	0 0 0	0 0 0	0 0 0	0 0 0	0 3,597 0
Return Flo	Total (Positive value means flow reduced) ws from Disposition of Transfer Water - Critical Yes	ars	173	779	303	20	40	626	849	748	58	0	0	0	0	0	3,597
	Incremental Return from Agricultural Transferees Incremental Return from Wildlife Area Transferees Envirnomental Water Account Beneficiaries		0	0	0 0	0	0	0	0	0	0	0	0	0 0	0	0	0
Net Effect	Incremental Return from Agricultural Entities Total to San Joaquin River Flow Before NM Adjustment Jue means flow added)	(Acre-feet) (cfs)	0 0 -173 -3	0 0 -779 -14	0 0 -303 -5	0 0 -20 0	0 0 -40 -1	0 0 -626 -11	0 0 -849 -14	0 0 -748 -12	0 0 -58 -1	0 0 0	0 0 0	0 0 0	0 0 0	0 0 0	0 0 -3,597 0
	k Vernalis Flow - cfs	(613)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan		ernalis
	Wet Above Normal		7500 5800	13600 7200	15700 6200	13600 5900	12000 4600	7400 2600	5100 2100	3100 2000	2500 1500	3600 2000	3000 1800	4600 2300	7500 5800	13600 7200	
	Below Normal Dry Critical		2300 1900 1300	3200 2600 1700	3300 2300 1600	3700 2700 1800	3700 2200 1500	2100 1800 1300	1900 1400 1000	1500 1100 1000	1200 1000 1000	1900 1700 1500	1700 1600 1400	2200 2100 1500	2300 1900 1300	3200 2600 1700	
	Vernalis Flow with Action - cfs Wet		-2	-19	-18	-33	-43	-45	-47	-44	-33	-19	-1	0	0	-1	
	Above Normal Below Normal Dry		-2 -2 -2	-19 0 0	-18 -18 -20	-33 -33 -45	-43 -43 -56	0 -57 -57	-47 -55 -55	-44 -52 -53	-33 -33 -33	-19 -19 -19	-1 -1 -1	0 0 0	0 0 0	-1 0 0	
	Critical n Vernalis Flow - cfs Wet		-3 7498	-21 13581	-6 15682	0	-1 11957	-14 7355	-19 5053	-16 3056	-1 2467	0 3581	0 2999	0 4600	0 7500	0 13599	
	Above Normal Below Normal Dry		5798 2298 1898	7181 3200 2600	6182 3282 2280	5867 3667 2655	4557 3657 2144	2600 2043 1743	2053 1845 1345	1956 1448 1047	1467 1167 967	1981 1881 1681	1799 1699 1599	2300 2200 2100	5800 2300 1900	7199 3200 2600	
Benchmar	Critical k Vernalis Water Quality - mmhos (April and May va	ilues may not b	1297 e reflectiv	1679 e of split-m	1594 onth opera	1800 Itions when	1499 n objective:	1286 s control)	981	984	999	1500	1400	1500	1300	1700	
	Wet Above Normal Below Normal Dry		352 404 757 880	286 380 631 736	310 465 690 1000	269 364 465 700	212 334 382 700	310 486 700 700	341 509 700 700	460 534 700 700	442 588 680 772	359 494 510 547	497 657 681 708	432 639 657 678	352 404 757 880	286 380 631 736	
Change in	Critical Vernalis Water Quality with Action - mmhos (April : Wet	and May values	0	-2	-1	-2	-3	-3	-4	700 -5	-5	595 -2	772	859 0	1000 0	1000 0	
	Above Normal Below Normal Dry Critical		-1 -1 -1 -2	-3 -8 -10 0	-2 -2 0	-4 -6 -3 0	-7 -9 -4 0	-14 0 0	-7 0 0	-6 0 0	-6 -6 -6 0	-3 -3 -3 0	0 0 0	0 0 0	0 0 0	0 0 0	
With-Actio	n Vernalis Water Quality - mmhos (April and May va Wet Above Normal	alues may not l	oe reflectiv 351 404	e of split-m 284 377					337 502	455 527	436 582	357 491	497 657	432 639	352 404	286 380	
	Below Normal Dry Critical		756 879 998	623 725 1000	688 1000 1000	459 697 700	373 696 700	700 700 700	700 700 700	700 700 700	674 766 771	506 544 595	681 708 772	657 678 859	757 880 1000	631 736 1000	
	al Change in NM Storage due to WQ Release Chang	je - Acre-feet	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	New Me Feb	Total
	Wet Above Normal Below Normal Dry		0 0 0	0 0 0	0 0 118	0 0 701	0 0 0 804	0 0 677 677	0 0 524 524	0 0 487 546	0 0 0	0 0 0	0 0 0	0 0 0	0 0 0	0 0 0	0 0 1,688 3,370
	Critical al Change in NM Storage due to Vernalis Flow Rele: Wet	ase Change - A	cre-feet	386	39 0	8	15 0	223 0	297 0	213 0	0	0	0	0	0	0	1,180 0
	Above Normal Below Normal Dry		0 0 0	0 -1054 -1054	0 0 0	0 0 0	0 0 0	-2685 0 0	0 0 0	0 0 0	0 0 0	0 0 0	0 0 0	0 0 0	0 0 0	0 -41 -41	-2,685 -1,095 -1,095
	Critical nental Change in NM Storage due to Vernalis Flow & Wet	& Quality Relea	0 se Change 0	- Acre-feet	0	0	0	0	0	0	0	0	0	0	0	0	0
	Above Normal Below Normal Dry		0 0 0	0 -1054 -1054	0 0 118	0 0 701	0 0 804	-2685 677 677	0 524 524	0 487 546	0 0 0	0 0 0	0 0 0	0 0 0	0 0 0	0 -41 -41	-2,685 593 2,275
	Critical	ra faat	0	386 Eab	39 Mar	8	15 May	223	297	213	0	0 Oct	0 Nov	0	0 Project		
	ntial Delta supply Impact w/o NM Adjustments - Acr Wet Above Normal	-188(Jan 0 0	Feb -369 -369	Mar 0 0	Apr 0 0	May 0 0	Jun 0 -2685	Jul -2863 -2863	Aug -2710 -2710	Sep 0 0	Oct 0 0	Nov 0 0	Dec 0 0	Jan 0 0	Feb -14 -14	Total -5,956 -8,641
	Below Normal Dry Critical		0 0 0	-369 -369 -779	0 -387 -303	0 -347 -20	0 -2622 -40	-2685 -2685 -626	-2863 -2863 -849	-2710 -2710 -748	0 -1964 -58	0 -1126 0	0 0	0 0	0 0 0	-14 -14 0	-8,641 -15,087 -3,424
	nes Adjustments - Acre-feet (positive means increas Wet	se in supply)	0	0	0	0	0	0	0	0	-58 0	0	0	0	0	0	0
	Above Normal Below Normal Dry		0 0 0	0 369 369	0 0 -41	0 0 -245	0 0 -804	2685 -677 -677	0 -524 -524	0 -487 -546	0	0	0 0	0 0 0	0 0 0	0 14 14	2,685 -1,305 -2,454
	Critical al Change in Project Delta Supply due to Action - A	cre-feet	0	-386	-39	-8	-15	-223	-297	-213	0	0	0	0	0	0	-1,180
	Wet Above Normal Below Normal		0 0	-369 -369 0	0 0 0	0 0 0	0 0 0	0 0 -3363	-2863 -2863 -3387	-2710 -2710 -3196	0 0 0	0 0 0	0 0	0 0	0 0	-14 -14 0	-5,956 -5,956 -9,946
	Dry Critical		0 0	0 -1165	-428 -342	-592 -28	-3427 -55	-3363 -849	-3387 -1146	-3255 -960	-1964 -58	-1126 0	0 0	0 0	0 0	0 0	-17,542 -4,604
Move								F									

	A-2-1-C: 80 GROUNDWATER REFUC Relative to Benchmark (Existing) Condition		OSITE								Water	Develop	oment a	nd Disp	osition	Assum	ptions
Disposition Non-Crit -15262 17823 0 -7385	Crit SJR Cor Crit Non-C 0 Agriculture-SJRc 40000 Wildlife Areas-SJRc 0 Urban-SJRc 103 0 Agriculture-SJRnc	Crit Crit 0 0 0 0 65 0 0 0	Conservation Conservation Groundwate Tailwater Re	n of Drain Sp r-SJRc ecapture-SJF	oills to Wild	ge to GW-S life Areas-S	JRc JRc	<u>s</u>	UR Non-Con Non-Crit 0 0 0 0	Crit 0 Cr 0 Cr 0 G 0 Tr	onservation roundwater- ailwater Rec	of Drain Sp SJRnc apture-SJR	ills to Wildli	ge to GW-S fe Areas-S.	JRnc JRnc		
9497 0	0 Wildlife Areas-SJRnc 0 Urban-SJRnc	0 42000	Fallowing -S	JRc		Non-Crit	Crit		0	8000 Fa	Illowing-SJF	Rnc Non-Crit	Crit				
ہ All Valu	0 EWA Ies Relative to Benchmark (Existing)		Total Develo n	ped Water:		10365	50000	Т	otal Disposi	tion:		4673	40000 E	Basic Hy	/drologi	c Acco	unting
	eloped - Non Critical Years Change in Evaporation/Seepage to GW Change in Drain Spills to Wildlife Areas Change to In Discharge to SJR Streams Change to Flows Upstream of Sack Dam		Jan 0 0 0 0	Feb 0 0 0	Mar 0 0 0	Apr 0 0 0	May 0 0 0	Jun 0 0 0	Jul 0 0 0	Aug 0 0 0	Sep 0 0 0	Oct 0 0 0	Nov 0 0 0	Dec 0 0 0 0	Jan 0 0 0 0	Feb 0 0 0 0	Total 0 0 0 0
Effects to	Crop Fallowing Groundwater Total SJR Flows due to Developing Water - Non Critical ' Change in Evaporation/Seepage to GW	Years	0 0 0	0 0 0	0 0 0	0 1296 1296 0	0 1451 1451 0	0 1710 1710 0	0 2073 2073 0	0 1555 1555 0	0 1037 1037 0	0 1037 1037 0	0 207 207 0	0 0 0	0 0 0	0 0 0	0 10,365 10,365 0
	Change in Drain Spills to Wildlife Areas Change in Discharge to SJR Streams Change to Flows Upstream of Sack Dam Crop Fallowing		0 0 0	0 0 0 0	0 0 0 0	0 0 0	0 0 0	0 0 0	0 0 0	0 0 0	0 0 0	0 0 0	0 0 0 0	0 0 0	0 0 0	0 0 0	0 0 0
Return Fle	Groundwater Total (Positive value means flow reduced) ws from Disposition of Transfer Water - Non Critic:	al Years	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Incremental Return from Agricultural Transferees Incremental Return from Wildlife Area Transferees Envinomental Water Account Beneficiaries Incremental Return from Agricultural Entities		0 0	0 0	-23 33 0	-102 5 0	-153 0	-182 0	-263 0	-193 3026 0	-254 165 0	-114 -17 0	-31 282 0	-8 66 0	-10 220 0	-18 252 0	-1,351 4,032 0
	Total to San Joaquin River Flow Before NM Adjustment alue means flow added)	(Acre-feet) (cfs)	0 0 0	0 0	10 10 0	-96 -96 -2	-153 -153 -2	-182 -182 -3	-263 -263 -4	2833 2833 46	-89 -89 -1	-131 -131 -2	252 252 4	58 58 1	209 209 3	234 234 4	2,682 2,682 0
	eloped - Critical Years							-5									
	Change in Evaporation/Seepage to GW Change in Drain Spills to Wildlife Areas Change in Discharge to SJR Streams Change to Flows Upstream of Sack Dam Crop Fallowing Groundwater		0 0 0 1031 0	0 0 0 4639 0	0 0 0 5155 0	0 0 0 344 0	0 0 0 687 0	0 0 0 10653 0	0 0 0 14433 0	0 0 0 12715 0	0 0 0 344 0	0 0 0 0 0	0 0 0 0 0	0 0 0 0 0	0 0 0 0 0	0 0 0 0 0	0 0 0 50,000 0
Effects to	Total SJR Flows due to Developing Water - Critical Years Change in Evaporation/Seepage to GW Change in Drain Spills to Wildlife Areas Change in Discharge to SJR Streams	ŝ	1031 0 0 0	4639 0 0	5155 0 0 0	344 0 0 0	687 0 0	10653 0 0 0	14433 0 0 0	12715 0 0 0	344 0 0 0	0 0 0	0 0 0	0 0 0	0 0 0	0 0 0	50,000 0 0
D-1	Change to Flows Upstream of Sack Dam Crop Fallowing Groundwater Total (Positive value means flow reduced)		0 173 0 173	0 779 0 779	0 303 0 303	0 20 0 20	0 40 0 40	0 626 0 626	0 849 0 849	0 748 0 748	0 58 0 58	0 0 0	0 0 0	0 0 0	0 0 0 0	0 0 0 0	0 3,597 0 3,597
Return Flo	ws from Disposition of Transfer Water - Critical Ye Incremental Return from Agricultural Transferees Incremental Return from Wildlife Area Transferees Envimomental Water Account Beneficiaries Incremental Return from Agricultural Entities	ars	0 0 0	0 0 0	0 75 0	0 11 0	0 0 0	0 0 0	0 0 0	0 6791 0	0 370 0	0 -39 0	0 634 0	0 148 0	0 493 0	0 567 0	0 9,049 0
Net Effect (Positive v	Total to San Joaquin River Flow Before NM Adjustment alue means flow added)	(Acre-feet) (cfs)	0 -173 -3	0 -779 -14	75 -228 -4	11 -9 0	0 -40 -1	0 -626 -11	0 -849 -14	6791 6043 98	370 312 5	-39 -39 -1	634 634 11	148 148 2	493 493 8	567 567 10	9,049 5,453 0
	k Vernalis Flow - cfs	()	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan		ernalis
	Wet Above Normal Below Normal Dry Critical		7500 5800 2300 1900 1300	13600 7200 3200 2600 1700	15700 6200 3300 2300 1600	13600 5900 3700 2700 1800	12000 4600 3700 2200 1500	7400 2600 2100 1800 1300	5100 2100 1900 1400 1000	3100 2000 1500 1100 1000	2500 1500 1200 1000 1000	3600 2000 1900 1700 1500	3000 1800 1700 1600 1400	4600 2300 2200 2100 1500	7500 5800 2300 1900 1300	13600 7200 3200 2600 1700	
Change ir	Vernalis Flow with Action - cfs Wet Above Normal Below Normal		0 0 0	0 0 0	0 0 0	-2 -2 -2	-2 -2 -2	-3 0 -2	-4 -4 -2	46 46 94	-1 -1 -1	-2 -2 -2	4 4 4	1 1 1	3 3 3	4 4 0	
With-Actio	Dry Critical n Vernalis Flow - cfs Wet Above Normal		0 -3 7500 5800	0 -21 13600 7200	1 -2 15700 6200	-1 0 13598 5898	-2 -1 11998 4598	-2 -14 7397 2600	-2 -19 5096 2096	93 199 3146 2046	-1 5 2499 1499	-2 -1 3598 1998	4 11 3004 1804	1 2 4601 2301	3 8 7503 5803	0 15 13604 7204	
Benchma	Below Normal Dry Critical K Vernalis Water Quality - mmhos (April and May va K Vernalis Water Quality - mmhos (April and May va	alues may not				3698 2699 1800 ations when		2098 1798 1286 s control)	1898 1398 981	1594 1193 1199	1199 999 1005	1898 1698 1499	1704 1604 1411	2201 2101 1502	2303 1903 1308	3200 2600 1715	
	Wet Above Normal Below Normal Dry Critical		352 404 757 880 1000	286 380 631 736 1000	310 465 690 1000 1000	269 364 465 700 700	212 334 382 700 700	310 486 700 700 700	341 509 700 700 700	460 534 700 700 700	442 588 680 772 772	359 494 510 547 595	497 657 681 708 772	432 639 657 678 859	352 404 757 880 1000	286 380 631 736 1000	
Change ir	Vernalis Water Quality with Action - mmhos (April Wet Above Normal Below Normal Drv	and May valu	es may not l 0 0 0 0	be reflective 0 0 0 0	of split-m 0 0 0 0	ionth opera 0 0 0 0	itions when 0 0 0	n objective 0 -1 0 0	s control) 0 0 0	13 19 0 0	1 1 1	0 0 0	1 1 1	0 0 0	0 0 1	0 1 2 2	
With-Actio	Critical n Vernalis Water Quality - mmhos (April and May v Wet	alues may no	-2 t be reflectiv 352	0 ve of split-m 286	0 ionth oper 310	0 ations when 269	0 n objective 212	0 s control) 310	0 341	0	2 443	0 359	3 498	0 432	1 352	0 286	
	Above Normal Below Normal Dry Critical		404 757 880 998	380 631 736 1000	465 691 1000 1000	364 465 700 700	334 382 700 700	486 700 700 700	510 700 700 700	553 700 700 700	590 681 773 773	494 510 547 595	659 682 709 775	639 658 678 859	405 757 880 1001	381 633 738 1000 New Mo	alones
Increment	al Change in NM Storage due to WQ Release Chang Wet Above Normal Below Normal Dry	ge - Acre-feet	Jan 0 0 0	Feb 0 0 0	Mar 0 0 -68	Apr 0 0 -17	May 0 0 -18	Jun 0 -62 -62	Jul 0 -125 -125	Aug 0 -2936 -2909	Sep 0 0 0 0	Oct 0 0 0	Nov 0 0 0	Dec 0 0 0	Jan 0 0 0	Feb 0 0 0 0	Total 0 -3,122 -3,199
Increment	Critical al Change in NM Storage due to Vernalis Flow Rele Wet Above Normal	ase Change -	0 Acre-feet 0 0	386 0 0	-97 0 0	-12 0 0	15 0 0	223 0 -182	297 0 0	-6209 0 0	0 0 0	0 0 0	0 0 0	0 0 0	0 0 0	-267 0 0	-5,665 0 -182
Net Increr	Below Normal Dry Critical nental Change in NM Storage due to Vernalis Flow of Wet	& Quality Rele	0 0 ase Change	0 0 • - Acre-feet 0	0 0 0	0 0 0	0 0 0	0 0 0	0 0 0	0 0 0	0 0 0	0 0 0	0 0 0	0 0 0	0 0 0	234 234 0	234 234 0
	Above Normal Below Normal Dry Critical		0 0 0 0	0 0 0 386	0 0 -68 -97	0 0 -17 -12	0 0 -18 15	-182 -62 -62 223	0 -125 -125 297	0 -2936 -2909 -6209	0 0 0 0	0 0 0 0	0 0 0 0	0 0 0 0	0 0 0	0 234 234 -267	-182 -2,888 -2,965 -5,665
Total Pote	ntial Delta supply Impact w/o NM Adjustments - Ac Wet	re-feet	Jan 0	Feb 0	Mar 0	Apr 0	May 0	Jun 0	Jul -263	Aug 2833	Sep 0	Oct 0	Nov 0	Dec 0	Jan 0	Delta S	Total 2.652
	Above Normal Below Normal Dry Critical		0 0 0 0	0 0 0 -779	0 0 4 -228	0 0 -17 -9	0 0 -153 -40	-182 -182 -182 -626	-263 -263 -263 -263 -849	2833 2833 2833 2833 6043	0 0 -89 312	0 0 -127 -39	0 0 0 634	0 0 0 0	0 0 0 0	82 82 82 567	2,470 2,470 2,088 4,985
New Melo	nes Adjustments - Acre-feet (positive means increa Wet Above Normal	se in supply)	0	0	0 0	0	0	0 182	0	0	0 0	0 0	0	0	0	0	0 182
	Below Normal Dry Critical		0 0 0	0 0 -386	0 24 97	0 6 12	0 18 -15	62 62 -223	125 125 -297	2936 2909 6209	0 0 0	0 0 0	0 0 0	0 0 0	0 0 0	-82 -82 267	3,041 3,062 5,665
Increment	al Change in Project Delta Supply due to Action - A Wet Above Normal Below Normal Dry	cre-feet	0 0 0	0 0 0	0 0 0 27	0 0 -11	0 0 -135	0 0 -120 -120	-263 -263 -137 -137	2833 2833 5768 5741	0 0 -89	0 0 -127	0 0 0	0 0 0	0 0 0	82 82 0 0	2,652 2,652 5,510 5,149
Mov	Critical		0	-1165	-131	4	-155	-849	-1146	12252	312	-39	634	0	0	834	10,650

	A-2-2-C: 80 GROUNDWATER AGRIC	ULTURE C	OMPOS	BITE							Water	Develo	oment a	nd Disp	osition	Assum	ptions
Disposition Non-Crit 46412 0 0	Crit Non-Ci 50000 Agriculture-SJRc	rit Crit 0 0 C 0 0 C		n of Evapora n of Drain Sp r-S IRc				<u>s</u>	JR Non-Con Non-Crit 0 0 0	Crit 0 Co 0 Co	onservation onservation oundwater-	of Drain Sp	tion/Seepag ills to Wildl	ge to GW-S ife Areas-S.	JRnc JRnc		
-7385 0 0	0 Agriculture-SJRnc	0 O T		capture-SJF	Rc	Non-Crit	Crit		0	0 Ta	ilwater Rec llowing-SJF	apture-SJF	nc Crit				
0	0 EWA es Relative to Benchmark (Existing)			ped Water:		10365	50000	т	otal Disposi	tion:		39027	50000	Basic Hy	vdrologi	c Acco	unting
ater Dev	eloped - Non Critical Years Change in Evaporation/Seepage to GW		Jan 0	Feb 0	Mar 0	Apr 0	May 0	Jun 0	Jul 0	Aug 0	Sep 0	Oct 0	Nov 0	Dec 0	Jan 0	Feb 0	Tota
	Change in Drain Spills to Wildlife Areas Change in Discharge to SJR Streams Change to Flows Upstream of Sack Dam		0 0 0	0 0	0 0 0	0 0 0	0 0 0	0 0 0	0 0 0	0 0 0	0 0 0	0 0 0	0 0 0	0 0	0 0 0	0 0 0	0
	Crop Fallowing Groundwater		0	0	0	0 1296	0 1451	0 1710	0 2073	0 1555	0 1037	0 1037	0 207	0	0	0	10,36
ects to	Total SJR Flows due to Developing Water - Non Critical Y	ears	0	0	0	1296	1451	1710	2073	1555	1037	1037	207	0	0	0	10,36
	Change in Evaporation/Seepage to GW Change in Drain Spills to Wildlife Areas Change in Discharge to SJR Streams		0 0	0	0 0 0	0 0	0 0 0	0 0	0 0	0 0 0	0 0	0 0	0	0 0	0 0	0 0 0	
	Change to Flows Upstream of Sack Dam Crop Fallowing		0	0	0	0	0	0	0	0	0	0	0	0	0	0	
	Groundwater Total (Positive value means flow reduced)		0	0	0 0	0 0	0 0	0 0	0	0	0	0	0	0	0	0	
	ws from Disposition of Transfer Water - Non Critica Incremental Return from Agricultural Transferees Incremental Return from Wildlife Area Transferees	i rears	0	0	71 0	309 0	467 0	554 0	799 0	587 0	771 0	345 0	93 0	23 0	32 0	56 0	4,10
	Envirnomental Water Account Beneficiaries Incremental Return from Agricultural Entities		0	0	0	0	0	0	0	0	0	0	0	0	0	0	
t Effect	Total to San Joaquin River Flow Before NM Adjustment lue means flow added)	(Acre-feet) (cfs)	0 0	0 0	71 71 1	309 309 5	467 467 8	554 554 9	799 799 13	587 587 10	771 771 13	345 345 6	93 93 2	23 23 0	32 32 1	56 56 1	4,10 4,10
	eloped - Critical Years						• • • • •								·····	· · · · · · ·	
	Change in Evaporation/Seepage to GW Change in Drain Spills to Wildlife Areas		0	0	0	0	0	0	0	0	0	0	0	0	0	0	
	Change in Discharge to SJR Streams Change to Flows Upstream of Sack Dam Crop Fallowing		0 0 1031	0 0 4639	0 0 5155	0 0 344	0 0 687	0 0 10653	0 0 14433	0 0 12715	0 0 344	0	0	0	0 0	0 0 0	50,00
	Crop Fallowing Groundwater Total		0	4639	0 5155	0 344	0 687	10653	14433	12715	0 344	0	0	0	0	0	50,00
ects 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	
	Change in Drain Spills to Wildlife Areas Change in Discharge to SJR Streams Change to Flows Upstream of Sack Dam		0 0 0	0 0	0 0 0	0 0 0	0 0 0	0 0 0	0 0 0	0 0 0	0 0	0 0	0 0 0	0 0	0 0 0	0 0 0	
	Crop Fallowing Groundwater		173 0	779 0	303 0	20 0	40 0	626 0	849 0	748 0	58 0	0	0	0	0	0	3,59
turn Flo	Total (Positive value means flow reduced) ws from Disposition of Transfer Water - Critical Yea	irs	173	779	303	20	40	626	849	748	58	0	0	0	0	0	3,59
	Incremental Return from Agricultural Transferees Incremental Return from Wildlife Area Transferees Envirnomental Water Account Beneficiaries		0	0	77 0	333 0	503 0	597 0	861 0	633 0	831 0	372 0	100 0	25 0	34 0	61 0	4,42
	Incremental Return from Agricultural Entities Total		0 0	0	0 77	0 333	0 503	0 597	0 861	0 633	0 831	0 372	0 100	0 25	0 34	0 61	4,42
	to San Joaquin River Flow Before NM Adjustment lue means flow added)	(Acre-feet) (cfs)	-173 -3	-779 -14	-226 -4	312 5	462 8	-30 0	12 0	-115 -2	773 13	372 6	100 2	25 0	34 1	61 1 V	82 ernali
	x Vernalis Flow - cfs Wet		Jan 7500	Feb 13600	Mar 15700	Apr 13600	May 12000	Jun 7400	Jul 5100	Aug 3100	Sep 2500	Oct 3600	Nov 3000	Dec 4600	Jan 7500	Feb 13600	, man
	Above Normal		5800 2300	7200 3200	6200 3300	5900 3700	4600 3700	2600 2100	2100 1900	2000 1500	1500 1200	2000 1900	1800 1700	2300 2200	5800 2300	7200 3200	
	Dry Critical Vernalis Flow with Action - cfs		1900 1300	2600 1700	2300 1600	2700 1800	2200 1500	1800 1300	1400 1000	1100 1000	1000 1000	1700 1500	1600 1400	2100 1500	1900 1300	2600 1700	
	Wet Above Normal		0	0	1 1	5 5	8 8	9 0	13 13	10 10	13 13	6 6	2 2	0	1 1	1 1	
	Below Normal Dry Critical		0 0 -3	0 0 -21	1 1 -4	5 5 5	8 7 7	6 6 -5	7 7 -5	6 7 -5	13 13 13	6 6 6	2 2 2	0 0	1 1 1	0 0 1	
ith-Actio	n Vernalis Flow - cfs Wet		7500	13600	15701	13605	12008	7409	5113	-5 3110	2513	3606	3002	4600	7501	13601	
	Above Normal		5800 2300	7200 3200	6201 3301	5905 3705	4608 3708	2600 2106	2113 1907	2010 1506	1513 1213	2006 1906	1802 1702	2300 2200	5801 2301	7201 3200	
	Dry Critical k Vernalis Water Quality - mmhos (April and May val	lues mav not b	1900 1297 ce reflectiv	2600 1679 e of split-m	2301 1596 onth opera	2705 1805 ations when	2207 1507 1 objective	1806 1295 s control)	1407 995	1107 995	1013 1013	1706 1506	1602 1402	2100 1500	1901 1301	2600 1701	
	Wet Above Normal		352 404	286 380	310 465	269 364	212 334	310 486	341 509	460 534	442 588	359 494	497 657	432 639	352 404	286 380	
	Below Normal Dry Critical		757 880 1000	631 736 1000	690 1000 1000	465 700 700	382 700 700	700 700 700	700 700 700	700 700 700	680 772 772	510 547 595	681 708 772	657 678 859	757 880 1000	631 736 1000	
nange in	Vernalis Water Quality with Action - mmhos (April a Wet	nd May values								0	-1	0	0	0	0	0	
	Above Normal Below Normal		0	0	0	0	0	2	-1 0	-1 0	-1 -1	0	0	0	0	0	
	Dry Critical n Vernalis Water Quality - mmhos (April and May va	lues may not i	0 -2 be reflectiv	0 0 ve of split-m	0 0 Ionth opera	0 0 ations whe	0 0 n objective	0 0 s control)	0 0	0 0	-1 -1	0	0	0	0 0	0	
	Wet Above Normal		352 404	286 380	310 465	269 365	212 334	310 488	341 508	460 533	441 587	359 494	497 657	432 639	352 404	286 380	
	Below Normal Dry Critical		757 880 998	631 736 1000	690 1000 1000	465 700 700	382 700 700	700 700 700	700 700 700	700 700 700	679 771 771	510 548 595	681 707 772	657 678 859	757 880 1000	632 736 1000	
	Critical Il Change in NM Storage due to WQ Release Chang	e - Acre-feet	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	595 Oct	Nov	Dec		New Mo Feb	
	Wet Above Normal		Jan 0 0	0	0	Apr 0 0	0	0 0	0	0	0 0	0	0	0	0 0	0 0	
	Below Normal Dry		0 0	0	0 23	0 24	0 56 20	187 187	381 381	226 145	0	0	0 0	0	0	0 0	79 81
rementa	Critical Il Change in NM Storage due to Vernalis Flow Relea Wet	ise Change - A	0 cre-feet 0	386 0	47 0	-12 0	30 0	260 0	350 0	223 0	0	0	0	0	0	14 0	1,29
	Above Normal Below Normal		0	0	0	0	0	554 0	0	0	0	0	0	0	0	0 56	55 5
	Dry Critical ental Change in NM Storage due to Vernalis Flow &	Quality Palaa	0 0	0 0 • - Acre-feet	0	0	0	0	0 0	0	0	0	0	0	0	56 0	5
	Wet Above Normal	Quality Relea	0 0	0 0	0	0	0	0 554	0	0	0	0	0	0	0	0	55
	Below Normal Dry		0	0 0	0 23	0 24	0 56	187 187	381 381	226 145	0	0	0	0	0	56 56	85 87
	Critical ntial Delta supply Impact w/o NM Adjustments - Acr	o-foot	0 Jan	386 Eeb	47 Mar	-12 Apr	30 May	260	350	223	0 Sep	0 Oct	0 Nov	0 Dec	0 Project		1,29 Suppl Tot
	Wet Above Normal	0-188L	Jan 0 0	Feb 0 0	Mar 0 0	Apr 0 0	May 0 0	Jun 0 554	Jul 799 799	Aug 587 587	Sep 0 0	Oct 0 0	Nov 0 0	Dec 0 0	Jan 0 0	Feb 20 20	Tot 1,40 1,96
	Below Normal Dry		0	0	0 25	0 54	0 467	554 554	799 799	587 587	0 771	0 334	0	0	0	20 20	1,96 3,61
w Melor	Critical es Adjustments - Acre-feet (positive means increas Wet	e in supply)	0	-779 0	-226 0	312 0	462 0	-30	12 0	-115 0	773	372	100 0	0	0	61 0	94
	wet Above Normal Below Normal		0	0	0	0	0	-554 -187	0 -381	0 0 -226	0	0	0	0	0	0 -20	-55 -81
	Dry Critical		0	0 -386	-8 -47	-8 12	-56 -30	-187 -260	-381 -350	-145 -223	0	0	0	0	0	-20 -20 -14	-80 -1,29
	II Change in Project Delta Supply due to Action - Ac Wet Above Normal	re-feet	0	0	0	0	0	0	799 799	587 587	0	0	0	0	0	20 20	1,40 1,40
	Above Normal Below Normal Dry		0	0	0 0 17	0 0 46	0 0 411	366 366	799 418 418	587 361 443	0 0 771	0 0 334	0	0	0	20 0 0	1,40 1,14 2,80
	Critical		0	-1165	-273	325	432	-289	-338	-337	773	372	100	Ō	Ō	47	-35
21/2	004					-	0000 1	7									

All Values	A-2-3-C: 80 GROUNDWATER OUT C Relative to Benchmark (Existing) Condition		ΓE								Water	Develop	oment a	nd Disp	osition	Assum	nption
Disposition Non-Crit -33588 0	1 SJR Cor Crit Non-C 0 Agriculture-SJRc 0 Wildlife Areas-SJRc	Crit Crit 0 0 0 0	Conservation Conservation	n of Drain Sp	ition/Seepag	ge to GW-S life Areas-S	JRc JRc	5	UR Non-Con Non-Crit 0 0	Crit 0 Cc 0 Cc	nservation	of Drain Sp	tion/Seepag ills to Wildli	je to GW-S. fe Areas-SJ	JRnc IRnc		
0 72615 0 0	50000 Agriculture-SJRnc 0 Wildlife Areas-SJRnc	0 0	Groundwate Tailwater Re Fallowing -S	capture-SJF		Non-Crit	Crit		0 0 0	0 Ta	oundwater- ilwater Rec llowing-SJF	apture-SJR	nc Crit				
0	0 EWA ues Relative to Benchmark (Existing)) Conditic	Total Develo	ped Water:		10365	50000	т	otal Disposi	tion:		39027	50000	Basic Hy	drologi	ic Acco	untin
Vater Dev	veloped - Non Critical Years Change in Evaporation/Seepage to GW) conunc	Jan 0	Feb 0	Mar 0	Apr 0	May 0	Jun 0	Jul 0	Aug 0	Sep 0	Oct 0	Nov 0	Dec 0	Jan 0	Feb 0	Tot
	Change in Drain Spills to Wildlife Areas Change in Discharge to SJR Streams		0	0	0	0	0	0	0	0	0	0	0	0	0	0	
	Change to Flows Upstream of Sack Dam Crop Fallowing		0	0	0	0	0	0	0	0	0	0	0	0	0	0	
	Groundwater Total		0	0	0	1296 1296	1451 1451	1710 1710	2073 2073	1555 1555	1037 1037	1037 1037	207 207	0	0	0	10,36 10,36
ffects to	SJR Flows due to Developing Water - Non Critical N Change in Evaporation/Seepage to GW	Years	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
	Change in Drain Spills to Wildlife Areas Change in Discharge to SJR Streams		0	0	0	0	0	0	0	0	0	0	0	0	0	0	
	Change to Flows Upstream of Sack Dam Crop Fallowing		0	0	0	0	0	0	0	0	0	0	0	0	0	0	
	Groundwater Total (Positive value means flow reduced) bws from Disposition of Transfer Water - Non Critica	ol Vooro	0 0	0	0	0	0	0	0	0	0	0	0	0	0	0 0	
	Incremental Return from Agricultural Transferees Incremental Return from Wildlife Area Transferees	ai rears	0	0	-52 0	-223 0	-338 0	-401 0	-578 0	-425 0	-558 0	-250 0	-67 0	-17 0	-23 0	-41 0	-2,9
	Environmental Water Account Beneficiaries Incremental Return from Agricultural Entities		0	0	0	0	0	0	0	0	0	0	0	0	0	0	
	Total to San Joaquin River Flow Before NM Adjustment	(Acre-feet)	0	0	-52 -52	-223 -223	-338 -338	-401 -401	-578 -578	-425 -425	-558 -558	-250 -250	-67 -67	-17 -17	-23 -23	-41 -41	-2,9 -2,9
ositive va	alue means flow added)	(cfs)	0	0	-1	-4	-5	-7	-9	-7	-9	-4	-1	0	0	-1	
	veloped - Critical Years Change in Evaporation/Seepage to GW		0	0	0	0	0	0	0	0	0	0	0	0	0	0	
	Change in Drain Spills to Wildlife Areas Change in Discharge to SJR Streams		0	0	0	0	0	0	0	0	0	0	0	0	0	0	
	Change to Flows Upstream of Sack Dam Crop Fallowing		0 1031	0 4639	0 5155	0 344	0 687	0 10653	0 14433	0 12715	0 344	0	0	0	0	0	50,0
	Groundwater Total S IP Flows due to Developing Water - Critical Years		0 1031	0 4639	0 5155	0 344	0 687	0 10653	0 14433	0 12715	0 344	0	0	0	0	0 0	50,0
	SJR Flows due to Developing Water - Critical Years Change in Evaporation/Seepage to GW Change in Drain Spills to Wildlife Areas	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
	Change in Drain Spills to Wildlife Areas Change in Discharge to SJR Streams Change to Flows Upstream of Sack Dam		0	0	0	0	0	0	0	0	0	0	0	0	0	0	
	Crop Fallowing Groundwater		173 0	779 0	303 0	20 0	40 0	626 0	849 0	748 0	58 0	0	0	0	0	0	3,5
	Total (Positive value means flow reduced) ows from Disposition of Transfer Water - Critical Yes	ars	173	779	303	20	40	626	849	748	58	0	0	0	Ő	0	3,5
	Incremental Return from Agricultural Transferees Incremental Return from Wildlife Area Transferees		0 0	0	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	
et Effect	Total to San Joaquin River Flow Before NM Adjustment	(Acre-feet)		0 -779	-303	-20	-40	-626	0 -849	0 -748	-58	0	0	0	0	0	-3,5
	alue means flow added)	(cfs)	-3	-14	-5	0	-1	-11	-14	-12	-1	0	0	0	0		ernal
	rk Vernalis Flow - cfs Wet		Jan 7500	Feb 13600	Mar 15700	Apr 13600	May 12000	Jun 7400	Jul 5100	Aug 3100	Sep 2500	Oct 3600	Nov 3000	Dec 4600	Jan 7500	Feb 13600	
	Above Normal Below Normal		5800 2300	7200 3200	6200 3300	5900 3700	4600 3700	2600 2100	2100 1900	2000 1500	1500 1200	2000 1900	1800 1700	2300 2200	5800 2300	7200 3200	
	Dry Critical		1900 1300	2600 1700	2300 1600	2700 1800	2200 1500	1800 1300	1400 1000	1100 1000	1000 1000	1700 1500	1600 1400	2100 1500	1900 1300	2600 1700	
	Vernalis Flow with Action - cfs Wet		0	0	-1	-4	-5	-7	-9	-7	-9	-4	-1	0	0	-1	
	Above Normal Below Normal		0	0	-1 -1 -1	-4 -4 -3	-5 -5	0 -4 -4	-9 -5 -5	-7 -4 -5	-9 -9 -9	-4 -4 -4	-1 -1 -1	0	0	-1 0	
	Dry Critical on Vernalis Flow - cfs		0 -3	-21	-1	-3	-5 -1	-4	-5 -19	-5 -16	-9	-4	-1	0	0	0	
	Wet Above Normal		7500 5800	13600 7200	15699 6199	13596 5896	11995 4595	7393 2600	5091 2091	3093 1993	2491 1491	3596 1996	2999 1799	4600 2300	7500 5800	13599 7199	
	Below Normal Dry		2300 1900	3200 2600	3299 2299	3696 2697	3695 2195	2096 1796	1895 1395	1496 1095	1191 991	1896 1696	1699 1599	2200 2100	2300 1900	3200 2600	
	Critical rk Vernalis Water Quality - mmhos (April and May va	alues may no	1297 t be reflectiv	1679 e of split-m	1594 onth opera	1800 Itions when	1499 n objective:	1286 s control)	981	984	999	1500	1400	1500	1300	1700	
	Wet Above Normal		352 404	286 380	310 465	269 364	212 334	310 486	341 509	460 534	442 588	359 494	497 657	432 639	352 404	286 380	
	Below Normal Dry		757 880	631 736	690 1000	465 700	382 700	700 700	700 700 700	700 700	680 772	510 547	681 708	657	757	631 736	
nange in	Critical Vernalis Water Quality with Action - mmhos (April	and May valu		1000 pe reflective		700 onth opera	700							678	880		
	Wet Above Normal Below Normal		0				ations wher			700	772	595	772	859	1000	1000	
	Dry		0	0	0 0	0 0 0	ations wher 0 0 0	700 nobjective 0 -1 0		0 1 0	772 0 1 1	595 0 0	772 0 0 0		1000 0 0		
ith-Actic					ō	0 0	0	n objective 0 -1	s control) 0 1	0 1 0 0	772 0 1 1 1 0	0	0 0 0	859 0 0	1000	1000 0 0	
	Crítical on Vernalis Water Quality - mmhos (April and May va Wet	alues may no	0 0 -2	0 0 0	0 0 0	0 0 0 0	0 0 0 0	n objective 0 -1 0 0 0	s control) 0 1 0 0	0 1 0	0 1 1 1	0 0 0	0 0 0	859 0 0 0 0	1000 0 0 0 0	1000 0 0 0	
	Critical on Vernalis Water Quality - mmhos (April and May va	alues may no	0 0 -2 ot be reflectiv	0 0 0 e of split-m	0 0 0 0 0 0	0 0 0 0 ations when	0 0 0 0 0 0 0	n objective 0 -1 0 0 0 s control)	s control) 0 1 0 0 0	0 1 0 0 0	0 1 1 0	0 0 0 0	0 0 0 0	859 0 0 0 0 0	1000 0 0 0 0 0	1000 0 0 0 0 0	
	Critical on Vernalis Water Quality - mmhos (April and May very Wet Above Normal	alues may no	0 -2 ot be reflectiv 352 404	0 0 e of split-m 286 380	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0 0 0 ations when 269 364	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 212 334	0 -1 0 0 0 s control) 310 485	s control) 0 1 0 0 0 341 510	0 1 0 0 0 461 534	0 1 1 0 442 589	0 0 0 0 359 494	0 0 0 0 497 657	859 0 0 0 0 0 0 432 639	1000 0 0 0 352 404 757 880 1000	1000 0 0 0 286 380 631 736 1000	
	Critical no Vernalis Water Quality - mmhos (April and May v. Wet Above Normal Below Normal Below Normal Critical		0 -2 ot be reflectiv 352 404 757 880 998	0 0 286 380 631 736	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0 0 0 ations when 269 364 465 700 700	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	a objective 0 -1 0 0 5 control) 310 485 700 700	s control) 0 1 0 0 0 341 510 700 700	0 1 0 0 461 534 700 700 700	0 1 1 0 442 589 681 773 771	0 0 0 359 494 510 547	0 0 0 0 497 657 681 708	859 0 0 0 0 0 432 639 657 678	1000 0 0 0 352 404 757 880 1000	1000 0 0 0 286 380 631 736	lelone
crement	Critical no Vernalis Water Quality - mmhos (April and May v Wet Above Normal Below Normal Dry Critical al Change in NM Storage due to WQ Release Chang Wet Above Normal		0 0 -2 0 be reflectiv 352 404 757 880 998 - - Jan 0 0	0 0 0 286 380 631 736 1000	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0 0 0 ations when 269 364 465 700 700 700 700 0 0	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0 -1 0 0 0 0 5 control) 310 485 700 700 700 700 700 0 0 0 0	s control) 0 1 0 0 0 341 510 700 700 700 700 700 0 0 0 0 0	0 1 0 0 0 461 534 700 700 700 700 700	0 1 1 0 442 589 681 773	0 0 0 359 494 510 547 595	0 0 0 0 0 497 657 681 708 772 Nov 0 0	859 0 0 0 0 0 432 639 657 678 859	1000 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	1000 0 0 286 380 6 380 6 380 6 380 6 380 0 0 0 New M Feb 0 0	Тс
crement	Critical no Vernalis Water Quality - mmhos (April and May v Wet Above Normal Below Normal Dry Critical al Change in NM Storage due to WQ Release Chang Wet Above Normal Below Normal Dry		0 0 -2 0 be reflectiv 352 404 757 880 998 998 Jan 0 0 0 0 0	0 0 e of split-m 286 380 631 736 1000 Feb 0 0 0 0 0	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0 0 0 ations wher 269 364 465 700 700 700 700 700 700 700 700 700 70	0 0 0 m objective 212 334 382 700 700 700 700 700 0 0 0 0 0 0	0 -1 0 0 5 control) 310 485 700 700 700 700 700 700 700 700 700 70	s control) 0 1 0 0 341 510 700 700 700 700 700 700 700 7	0 1 1 0 0 0 461 534 700 700 700 700 700 700 700 700 700 70	0 1 1 1 589 681 773 771 Sep 0 0 0 0	0 0 0 359 494 510 547 595 Oct 0 0 0 0	0 0 0 497 657 681 708 772 Nov 0 0 0 0	859 0 0 0 0 0 432 639 657 678 859 Dec 0 0 0 0 0	1000 0 0 0 352 404 757 880 1000 Jan 0 0 0 0	1000 0 0 286 380 631 736 1000 New M Feb 0 0 0 0	Тс -5 -5
crement	Critical Oriveral Water Quality - mmhos (April and May vr Wet Above Normal Below Normal Dry Critical al Change in NM Storage due to WQ Release Chang Wet Above Normal Below Normal Dry Critical al Change in NM Storage due to Vernalis Flow Relea	ge - Acre-feet	0 0 -2 0t be reflectiv 352 404 757 880 998 : Jan 0 0 0 0 0 0 0	0 0 e of split-m 286 380 631 736 1000 Feb 0 0 0 0 386	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0 0 0 ations wher 269 364 465 700 700 700 700 700 700 700 700 700 70	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	a objective 0 -1 0 0 0 0 0 s control) 310 485 700 700 700 700 700 0 0 -1 310 485 700 700 700 700 700 700 700 70	s control) 0 1 1 0 0 0 341 510 700 700 700 700 700 700 700 7	0 1 0 0 461 534 700 700 700 700 700 	0 1 1 1 589 681 773 771 Sep 0 0 0 0 0	0 0 0 359 494 510 547 595 Oct 0 0 0 0 0	0 0 0 497 657 681 708 772 Nov 0 0 0 0 0	859 0 0 0 0 0 432 639 657 678 859 Dec 0 0 0 0 0 0	1000 0 0 0 352 404 757 880 1000 Jan 0 0 0 0 0	1000 0 0 286 380 631 736 1000 New M Feb 0 0 0 0 0 0 0	Тс -5 -5
crement	Critical Oriveral Water Quality - mmhos (April and May v Wet Above Normal Below Normal Dry Critical al Change in NM Storage due to WQ Release Chang Wet Above Normal Below Normal Dry Critical al Change in NM Storage due to Vernalis Flow Rele Wet Above Normal	ge - Acre-feet	0 0 -2 404 4757 880 998 : Jan 0 0 0 0 0 - Acre-feet 0 0	0 0 e of split-m 286 380 631 736 1000 Feb 0 0 0 0 386 0 0 0	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0 0 0 ations wher 269 364 465 700 700 700 700 0 0 0 -17 8 0 0 0 0 0 0	0 0 0 0 0 0 0 0 0 0 700 700 700 700 700	a objective 0 -1 0 0 0 s control) 310 485 700 700 700 700 700 0 0 -136 -136 -223 0 -401	s control) 0 1 0 0 0 0 341 510 700 700 700 700 700 700 700 7	0 1 0 0 461 534 700 700 700 700 700 700 -163 -105 213 0 0 0	0 1 1 0 442 589 681 773 771 Sep 0 0 0 0 0 0 0 0 0	0 0 0 3559 494 510 547 595 Oct 0 0 0 0 0 0 0 0 0 0	0 0 0 0 497 657 681 702 Nov 0 0 0 0 0 0 0 0 0	859 0 0 0 0 432 6357 678 859 657 678 859 0 0 0 0 0 0 0 0 0 0 0 0 0 0	1000 0 0 0 352 404 757 880 1000 Jan 0 0 0 0 0 0 0 0 0 0	1000 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	-5 -5 1,1 -4
crement	Critical Oriveral Water Quality - mmhos (April and May v Wet Above Normal Below Normal Dry Critical al Change in NM Storage due to WQ Release Chang Wet Above Normal Below Normal Dry Critical al Change in NM Storage due to Vernalis Flow Rele Wet Above Normal Below N	ge - Acre-feet	0 0 -2 tb ereflectiv 3522 404 757 880 998 998 998 998 0 0 0 0 0 0 0 0 0 0	0 0 e of split-m 286 380 631 736 1000 0 0 0 0 0 0 0 0 0 0 0 0	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0 0 0 ations wher 269 364 465 700 700 700 700 700 0 0 0 0 0 0 177 8 0 0 0 0 0 0 0 0 0 0	0 0 0 0 0 0 0 0 212 2 334 382 700 700 700 700 700 700 700 700 700 70	a objective 0 -1 0 0 5 control) 310 485 700 700 700 0 -136 -136 223 0 -401 0 0 0	s control) 0 1 0 0 0 341 510 700 700 700 700 700 700 700 7	0 1 0 0 461 534 700 700 700 700 700 -163 -105 213 0 0 0 0 0 0 0 0 0 0 0 0 0	0 1 1 0 442 5889 681 773 771 Sep 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0 0 0 359 494 510 547 595 Oct 0 0 0 0 0 0 0 0 0 0 0 0 0	0 0 0 497 657 681 708 772 Nov 0 0 0 0 0 0 0 0 0 0 0 0 0 0	859 0 0 0 432 635 657 678 859 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	1000 0 0 0 352 404 757 880 1000 Jan 0 0 0 0 0 0 0 0 0 0 0 0 0	1000 0 0 286 380 631 736 1000 New M Feb 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	-5 -5 1,1 -4
crement crement	Critical Oriveral Water Quality - mmhos (April and May v Wet Above Normal Below Normal Dry Critical al Change in NM Storage due to WQ Release Chang Wet Above Normal Below Normal Dry Critical al Change in NM Storage due to Vernalis Flow Rele Wet Above Normal Below Dormal Below Normal Below N	ge - Acre-feet ease Change	0 0-2 352 404 757 8998 - Jan 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0 0 0 e of split-m 286 380 631 736 1000 Feb 0 0 0 0 0 386 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0 0 0 0 364 465 700 700 700 700 700 700 700 700 700 70	0 0 0 0 0 0 0 0 212 2 334 382 700 700 700 700 700 700 700 700 700 70	a objective 0 -1 0 0 0 s control) 310 485 700 700 700 700 700 700 700 -136 -136 -136 223 0 -401 0 0 0 0 0 0 0 0 0 0 0 0 0	s control) 0 1 0 0 0 341 510 700 700 700 700 700 700 700 700 700 7	0 1 0 0 461 534 700 700 700 700 700 700 700 700 700 70	0 1 1 0 442 589 681 773 771 Sep 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0 0 0 3559 494 547 595 Oct 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0 0 0 497 657 681 708 772 Nov 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	859 0 0 0 0 432 639 657 678 859 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	1000 0 0 0 352 404 757 880 1000 Jan 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	1000 0 0 286 380 631 736 1000 New Mi Feb 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	-5 -5 1,1 -4
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crement crement tt Incren ttal Pote	Critical on Vernalis Water Quality - mmhos (April and May v Wet Above Normal Below Normal Dry Critical al Change in NM Storage due to WQ Release Chang Wet Above Normal Below Normal	ge - Acre-feet ease Change - & Quality Rel re-feet ese in supply)	0 0 -2 the reflective 352 404 757 880 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0 0 0 310 465 650 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0 0 0 0 0 0 0 0 364 465 700 700 700 700 700 700 700 0 0 0 0 0	0 0 0 0 212 382 700 700 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0 objectives 0	s control) 0 1 1 0 0 341 510 700 700 700 700 700 700 700 7	0 1 0 0 461 534 700 700 700 700 700 700 700 70	0 1 1 1 1 1 599 681 681 773 7 77 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7	0 0 0 359 494 575 575 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	859 0 0 0 0 0 0 0 432 657 657 657 859 0 0 0	10000 0 0 3522 404 4757 8000 10000 0 0 0 0 0 0 0 0 0 0 0 0 0 0	1000 0 0 2266 330 330 0 330 736 736 736 736 736 736 736 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	To -5- -5- -5- -6- -6- -6- -1.0. -1.4 -2.8 -3.4 -1.4 -2.8 -3.4 -1.1 -1.4 -3.4 -1.1 -1.1 -1.0
crement crement it Incren ital Pote w Melor crement	Critical Above Normal Below Normal Below Normal Below Normal Dry Critical al Change in NM Storage due to WQ Release Chang Wet Above Normal Below Normal Dry Critical metal Delta supply Impact w/o NM Adjustments - Act Wet Above Normal Below	ge - Acre-feet ease Change - & Quality Rel re-feet ese in supply)	0 0 -2 2 5 5 5 5 5 5 7 5 7 5 7 5 7 5 7 5 7 5	0 0 0 0 0 0 0 0 0 0 0 0 0 0	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0 0 0 0 212 700 700 May 0 0 0 40 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	o objective 0 obj	s control) 0 1 1 0 0 341 510 700 700 700 700 700 700 700 7	0 1 0 0 461 534 700 700 700 700 700 700 700 70	0 1 1 1 1 1 0 1 1 1 0 0 0 0 0 0 0 0 0 0	0 0 0 0 359 494 451 547 547 0 0 0 0 0 0 0 0 0 0 0 0 0	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	859 0 0 432 639 657 657 657 657 657 657 677 677 677 677	10000 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	1000 0 0 286 380 380 380 380 380 0 380 0 380 0 380 0 0 0	-5 -5 1,1 -4 -6 -6 -6 1,1

Study:	A-3-1-C: 80 FALLOWING REFUGE C Relative to Benchmark (Existing) Condition	OMPOSIT	E								Water	Develo	oment a	nd Disp	osition	Assum	ptions
Non-Crit -15262 17823 0	SJR Co Crit Non-C 0 Agriculture-SJRc 40000 Wildlife Areas-SJRc	Crit Crit 0 0 0 0	Conservation Conservation Groundwate	n of Drain S				1	SJR Non-Col Non-Crit 0 0 0	Crit 0 Co 0 Co		of Drain Sp		ge to GW-S fe Areas-S.			
-7385 9497	0 Agriculture-SJRnc 0 Wildlife Areas-SJRnc 137	0 0	Tailwater Re Fallowing -S	capture-SJF	Rc				0 2618	0 Ta	ailwater Rec allowing-SJI	apture-SJF Rnc					
0 0	0 Urban-SJRnc 0 EWA		Total Develo	ped Water:		Non-Crit 10365	Crit 50000		Total Disposi	tion:		Non-Crit 4673	Crit 40000		udrologi		
ater Dev	les Relative to Benchmark (Existing) eloped - Non Critical Years Change in Evaporation/Seepage to GW) contaitio	Jan 0	Feb 0	Mar 0	Apr 0	May 0	Jun 0	Jul 0	Aug 0	Sep 0	Oct 0	Nov 0	Basic Hy Dec	Jan 0	Feb	Tot
	Change in Drain Spills to Wildlife Areas Change in Discharge to SJR Streams		0	0	0	0	0	0	0	0	0	0	0	0	0	0	
	Change to Flows Upstream of Sack Dam Crop Fallowing		0 337	0 1518	0 1687	0 112	0 225	0 3487	0 4724	0 4162	0 112	0 0	0	0	0	0	16,36
	Groundwater Total SJR Flows due to Developing Water - Non Critical	Years	0 337	0 1518	0 1687	-750 -638	-840 -615	-990 2497	-1200 3524	-900 3262	-600 -488	-600 -600	-120 -120	0	0	0	-6,00 10,36
	Change in Evaporation/Seepage to GW Change in Drain Spills to Wildlife Areas	louio	0 0	0	0 0	0 0	0 0	0 0	0	0	0 0	0	0	0 0	0 0	0	
	Change in Discharge to SJR Streams Change to Flows Upstream of Sack Dam Crop Fallowing		0 0 57	0 0 255	0 0 99	0 0 7	0 0 13	0 0 205	0 0 278	0 0 245	0 0 19	0 0	0	0 0	0 0	0 0 0	1,1
	Groundwater Total (Positive value means flow reduced)		0 57	0 255	0 99	0 7	0	0 205	0 278	0 245	0	0	0	0	0	0	1,1
	ws from Disposition of Transfer Water - Non Critic Incremental Return from Agricultural Transferees	al Years	0	0	-23	-102	-153	-182	-263	-193	-254	-114	-31	-8	-10	-18	-1,3
	Incremental Return from Wildlife Area Transferees Envirnomental Water Account Beneficiaries Incremental Return from Agricultural Entities		0	0	33 0	5	0	0	0	3026 0	165 0	-17 0	282 0	66 0	220 0	252 0	4,0
et Effect	Total to San Joaquin River Flow Before NM Adjustment		0 -57	0 -255	10 -89	-96 -103	-153 -167	-182 -387	-263 -540	2833 2588	-89 -108	-131 -131	252 252	58 58	209 209	234 234	2,6 1,5
	Ilue means flow added)	(cfs)	-1	-5	-1	-2	-3	-7	-9	42	-2	-2	4	1	3	4	
	Change in Evaporation/Seepage to GW Change in Drain Spills to Wildlife Areas		0	0	0	0	0	0	0	0	0	0	0	0	0	0	
	Change in Discharge to SJR Streams Change to Flows Upstream of Sack Dam Crop Fallowing		0 0 1031	0 0 4639	0 0 5155	0 0 344	0 0 687	0 0 10653	0 0 14433	0 0 12715	0 0 344	0 0	0	0 0	0 0	0 0 0	50.0
	Groundwater Total		1031 0 1031	4639 0 4639	5155 0 5155	344 0 344	687 687	10653 0 10653	14433 0 14433	12715 0 12715	344 0 344	0	0	0	0	0	50,0
	SJR Flows due to Developing Water - Critical Years Change in Evaporation/Seepage to GW	s	0	0	0	0	0	0	0	0	0	0	0	0	0	0	,.
	Change in Drain Spills to Wildlife Areas Change in Discharge to SJR Streams Change to Flows Upstream of Sack Dam		0 0 0	0	0 0 0	0	0	0	0	0	0	0	0	0	0	0	
	Crop Fallowing Groundwater		173 0	779 0	303 0	20 0	40 0	626 0	849 0	748 0	58 0	0	0	0	0	0	3,5
turn Flo	Total (Positive value means flow reduced) ws from Disposition of Transfer Water - Critical Ye Incremental Return from Agricultural Transferges	ars	173 0	779	303 0	20	40 0	626 0	849 0	748	58	0	0	0	0	0	3,5
	Incremental Return from Agricultural Transferees Incremental Return from Wildlife Area Transferees Envirnomental Water Account Beneficiaries		0	0	75	0 11	0	0	0	0 6791	0 370	-39	634	148	0 493	567	9,0
	Incremental Return from Agricultural Entities Total		0 0	0 0	0 75	0 11	0 0	0 0	0 0	0 6791	0 370	0 -39	0 634	0 148	0 493	0 567	9,0
	to San Joaquin River Flow Before NM Adjustment alue means flow added)	(Acre-feet) (cfs)	-173 -3	-779 -14	-228 -4	-9 0	-40 -1	-626 -11	-849 -14	6043 98	312 5	-39 -1	634 11	148 2	493 8	567 10	5,4 ernal
	k Vernalis Flow - cfs Wet		Jan 7500	Feb 13600	Mar 15700	Apr 13600	May 12000	Jun 7400	Jul 5100	Aug 3100	Sep 2500	Oct 3600	Nov 3000	Dec 4600	Jan 7500	Feb 13600	ernai
	Above Normal Below Normal		5800 2300	7200 3200	6200 3300	5900 3700	4600 3700	2600 2100	2100 1900	2000 1500	1500 1200	2000 1900	1800 1700	2300 2200	5800 2300	7200 3200	
	Dry Critical Vernalis Flow with Action - cfs		1900 1300	2600 1700	2300 1600	2700 1800	2200 1500	1800 1300	1400 1000	1100 1000	1000 1000	1700 1500	1600 1400	2100 1500	1900 1300	2600 1700	
	Wet Above Normal		-1 -1	-5 -5	-1 -1	-2 -2	-3 -3	-7 0	-9 -9	42 42	-2 -2	-2 -2	4 4	1 1	3 3	4 4	
	Below Normal Dry Critical		-1 -1	0	-1 -1 -2	-2 -1 0	-3 -2 -1	-7 -7 -14	-8 -8	89 88	-2 -2 5	-2 -2 -1	4	1 1 2	3 3 8	0	
ith-Actio	n Vernalis Flow - cfs Wet		-3 7499	-21 13595	-2 15699	13598	-1 11997	7393	-19 5091	199 3142	5 2498	3598	11 3004	2 4601	7503	15 13604	
	Above Normal Below Normal		5799 2299	7195 3200	6199 3299	5898 3698	4597 3697	2600 2093	2091 1892	2042 1589	1498 1198	1998 1898	1804 1704	2301 2201	5803 2303	7204 3200	
	Dry Critical k Vernalis Water Quality - mmhos (April and May v	alues mav not	1899 1297 be reflectiv	2600 1679 e of split-m	2299 1598 onth opera	2699 1800 ations when	2198 1499 n objective	1793 1286 s control)	1392 981	1188 1199	998 1005	1698 1499	1604 1411	2101 1502	1903 1308	2600 1715	
	Wet Above Normal		352 404	286 380	310 465	269 364	212 334	310 486	341 509	460 534	442 588	359 494	497 657	432 639	352 404	286 380	
	Below Normal Dry Critical		757 880 1000	631 736 1000	690 1000 1000	465 700 700	382 700 700	700 700 700	700 700 700	700 700 700	680 772 772	510 547 595	681 708 772	657 678 859	757 880 1000	631 736 1000	
hange in	Vernalis Water Quality with Action - mmhos (April Wet	and May valu								13	1	0	1	0	0	0	
	Above Normal Below Normal		0	-1 -2	0	0	0	-2 0	-1 0	18 0	1	0	1	0	0	1	
	Dry Critical n Vernalis Water Quality - mmhos (April and May v	alues may no	0 -2 t be reflectiv	-3 0 reofsplit-m	0 0 Nonth oper	0 0 ations whe	0 0 n objective	0 0 s control)	0 0	0	1 2	0	1 3	0	1 1	2 0	
	Wet Above Normal	,	352 404	285 380	310 465	269 364	212 334	310 485	341 509	473 552	442 590	359 494	498 659	432 639	352 405	286 381	
	Below Normal Dry Critical		756 879 998	629 733 1000	691 1000 1000	465 700 700	382 700 700	700 700 700	700 700 700	700 700 700	681 773 773	510 547 595	682 709 775	658 678 859	757 880 1001	633 738 1000	
	al Change in NM Storage due to WQ Release Change	ae - Acre-feet	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		New Me Feb	elone Ta
	Wet Above Normal		0 0	0	0 0	0	0	0 0	0	0 0	0 0	0 0	0 0	0 0	0	0	
	Below Normal Dry Critical		0 0 0	0 0 386	0 -55 -97	0 -14 -12	0 -13 15	11 11 223	-28 -28 297	-2866 -2839 -6209	0 0	0 0	0 0	0 0	0 0	0 0 -267	-2,8 -2,9 -5,6
crement	entical al Change in NM Storage due to Vernalis Flow Rele Wet	ease Change -		386	-97	-12	0	223	297	-6209	0	0	0	0	0	-267	-5,6
	Above Normal Below Normal		0	-255	0	0	0	-387	0	0	0	0	0	0	0	0 234	-3
	Dry Critical nental Change in NM Storage due to Vernalis Flow	& Quality Rele	0 0 ease Change	-255 0 • - Acre-feet	0	0	0	0	0	0	0	0	0	0	0	234 0	
	Wet Above Normal		0	0	0	0	0	0 -387	0	0 0	0	0	0	0	0	0	-3
	Below Normal Dry Critical		0 0 0	-255 -255 386	0 -55 -97	0 -14 -12	0 -13 15	11 11 223	-28 -28 297	-2866 -2839 -6209	0 0 0	0 0	0 0 0	0 0 0	0 0	234 234 -267	-2,9 -2,9 -5,6
	critical ntial Delta supply Impact w/o NM Adjustments - Ac	re-feet	Jan	Feb	-97 Mar	-12 Apr	May	Jun	Jul	-6209 Aug	Sep	Oct	Nov	Dec	Project Jan		
	Wet Above Normal		0 0	-89 -89	0 0	0	0	0 -387	-540 -540	2588 2588	0	0 0	0 0	0 0	0 0	82 82	2,0 1,6
	Below Normal Dry Critical		0 0 0	-89 -89 -779	0 -31 -228	0 -18 -9	0 -167 -40	-387 -387 -626	-540 -540 -849	2588 2588 6043	0 -108 312	0 -127 -39	0 0 634	0 0	0 0	82 82 567	1,6 1,2 4,9
w Melor	Critical nes Adjustments - Acre-feet (positive means increa Wet	ase in supply)	0	-779	-228	-9 0	-40 0	-626	-849	6043	312	-39	634	0	0	567	4,5
	Above Normal Below Normal		0	0 89	0	0	0	387 -11	0 28	0 2866	0	0	0	0	0	0 -82	2,8
	Dry Critical al Change in Project Delta Supply due to Action - A	cre-feet	0 0	89 -386	19 97	5 12	13 -15	-11 -223	28 -297	2839 6209	0	0	0	0	0	-82 267	2,9 5,6
	Wet Above Normal		0	-89 -89	0	0	0 0	0 0	-540 -540	2588 2588	0	0	0	0	0	82 82	2,0 2,0
	Below Normal Dry Critical		0 0	0 0 -1165	0 -12 -131	0 -13	0 -153 -55	-398 -398 -849	-512 -512 -1146	5454 5427 12252	0 -108 312	0 -127 -39	0 0 634	0 0	0 0	0 0 834	4,5 4,1 10.6
			U	-1100	-131	4	-55		-1140	12252	312	-38	034	U	U	834	10,6

	A-3-2-C: 80 FALLOWING AGRIC Relative to Benchmark (Existing) Condition		OMPOSITE								Water	Develo	oment a	nd Disp	osition	Assum	ptions
isposition Non-Crit 46412 0 0	Crit 50000 Agriculture-SJRc 0 Wildlife Areas-SJRc 0 Urban-SJRc	0 0 -6000	Crit 0 Conservation 0 Conservation 0 Groundwate 0 Toiluntor Ro	n of Drain S r-SJRc	pills to Wild	ge to GW-S life Areas-S	SJRc JRc	1	SJR Non-Con Non-Crit 0 0 0	Crit 0 Cr 0 Cr 0 Cr	onservation roundwater-	of Drain Sp SJRnc	ills to Wildl	ge to GW-S ife Areas-S.	JRnc JRnc		
-7385 0 0	0 Agriculture-SJRnc 0 Wildlife Areas-SJRnc 0 Urban-SJRnc	0 13747 420	0 Tailwater Re 00 Fallowing -S	JRc	Rc	Non-Crit	Crit		0 2618		ailwater Rec allowing-SJI		nc Crit				
Ō	o EWA es Relative to Benchmark (Exist	ing) Condit	Total Develo	ped Water:		10365	50000		Fotal Disposi	tion:		39027	50000	Basic Hy	drologi	c Acco	untin
ater Deve	Ploped - Non Critical Years Change in Evaporation/Seepage to GW	ing) condit	Jan 0	Feb 0	Mar 0	Apr 0	May 0	Jun 0	Jul 0	Aug 0	Sep 0	Oct 0	Nov 0	Dec 0	Jan 0	Feb 0	Tot
	Change in Drain Spills to Wildlife Areas Change in Discharge to SJR Streams Change to Flows Upstream of Sack Dam		0 0	0 0	0 0 0	0 0 0	0	0	0	0	0	0	0 0 0	0	0	0 0 0	
	Crop Fallowing Groundwater Total		337 0 337	1518 0 1518	1687 0 1687	112 -750 -638	225 -840 -615	3487 -990 2497	4724 -1200 3524	4162 -900 3262	112 -600 -488	0 -600 -600	0 -120 -120	0 0 0	0	0 0 0	16,36 -6,00 10,36
ects to \$	SJR Flows due to Developing Water - Non Cri Change in Evaporation/Seepage to GW	tical Years	0	0	0	0	0	0	0	0	0	0	0	0	0	0	10,30
	Change in Drain Spills to Wildlife Areas Change in Discharge to SJR Streams Change to Flows Upstream of Sack Dam		0 0 0	0 0	0 0	0 0 0	0 0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0 0	0 0 0	
	Crop Fallowing Groundwater		57 0 57	255 0 255	99 0 99	7 0 7	13 0 13	205 0 205	278 0 278	245 0 245	19 0 19	0 0 0	0 0 0	0 0 0	0 0 0	0 0 0	1,1 1,1
turn Flo	Total (Positive value means flow reduced) ws from Disposition of Transfer Water - Non (Incremental Return from Agricultural Transferee:	s	0	0	71	309	467	554	799	587	771	345	93	23	32	56	4,1
	Incremental Return from Wildlife Area Transfere Envirnomental Water Account Beneficiaries Incremental Return from Agricultural Entities	es	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
t Effect	Total To San Joaquin River Flow Before NM Adjustr lue means flow added)	ment (Acre-fe (cfs)	0 -57 -1	0 -255 -5	71 -28 0	309 302 5	467 453 7	554 349 6	799 521 8	587 343 6	771 752 13	345 345 6	93 93 2	23 23 0	32 32 1	56 56 1	4,1 2,9
ater Deve	eloped - Critical Years																
	Change in Evaporation/Seepage to GW Change in Drain Spills to Wildlife Areas Change in Discharge to SJR Streams		0 0 0	0 0 0	0 0 0	0 0 0	0 0 0	0 0 0	0 0 0	0 0 0	0 0 0	0 0 0	0 0	0 0	0 0 0	0 0 0	
	Change to Flows Upstream of Sack Dam Crop Fallowing Groundwater		0 1031 0	0 4639 0	0 5155 0	0 344 0	0 687 0	0 10653 0	0 14433 0	0 12715 0	0 344 0	0 0	0 0	0 0 0	0 0 0	0 0 0	50,0
ects to s	Total SJR Flows due to Developing Water - Critical	Years	1031	4639 0	5155	344 0	687	10653 0	14433 0	12715	344 0	0	0	0	0	0	50,0
	Change in Evaporation/Seepage to GW Change in Drain Spills to Wildlife Areas Change in Discharge to SJR Streams		0 0	0	0 0	0	0 0	0	0	0 0	0	0	0	0	0	0	
	Change to Flows Upstream of Sack Dam Crop Fallowing Groundwater		0 173 0	0 779 0	0 303 0	0 20 0	0 40 0	0 626 0	0 849 0	0 748 0	0 58 0	0 0 0	0 0 0	0 0 0	0 0 0	0 0 0	3,5
turn Flo	Total (Positive value means flow reduced) ws from Disposition of Transfer Water - Critic Incremental Return from Agricultural Transferee:	al Years	173 0	779	303 77	20 333	40 503	626 597	849 861	748 633	58 831	0 372	0 100	0 25	0 34	0 61	3,5 4,4
	Incremental Return from Wildlife Area Transfere Envirnomental Water Account Beneficiaries Incremental Return from Agricultural Entities		0	0	0	0	0	0	0	0	0	0	0	0	0	0	.,.
t Effect	Total io San Joaquin River Flow Before NM Adjusti lue means flow added)	ment (Acre-fe (cfs)	0	0 -779 -14	77 -226 -4	333 312 5	503 462 8	597 -30 0	861 12 0	633 -115 -2	831 773 13	372 372 6	100 100 2	25 25 0	34 34 1	61 61	4,4 8
	v Vernalis Flow - cfs	(CIS)	-5 Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	V Feb	ernali
	Wet Above Normal Below Normal		7500 5800 2300	13600 7200 3200	15700 6200 3300	13600 5900 3700	12000 4600 3700	7400 2600 2100	5100 2100 1900	3100 2000 1500	2500 1500 1200	3600 2000 1900	3000 1800 1700	4600 2300 2200	7500 5800 2300	13600 7200 3200	
	Dry Critical		1900 1300	2600 1700	2300 1600	2700 1800	2200 1500	1800 1300	1400 1000	1100 1000	1000 1000	1700 1500	1600 1400	2100 1500	1900 1300	2600 1700	
	Vernalis Flow with Action - cfs Wet Above Normal		-1 -1	-5	0	5 5	7	6 0	8 8	6 6	13 13	6 6	2	0	1	1	
	Below Normal Dry Critical		-1 -1 -3	0 0 -21	0 -1 -4	5 5 5	7 6 7	1 1 -5	1 1 -5	1 2 -5	13 13 13	6 6 6	2 2 2	0 0 0	1 1 1	0 0 1	
	n Vernalis Flow - cfs Wet Above Normal		7499 5799	13595 7195	15700 6200	13605 5905	12007 4607	7406 2600	5108 2108	3106 2006	2513 1513	3606 2006	3002 1802	4600 2300	7501 5801	13601 7201	
	Below Normal Dry Critical		2299 1899 1297	3200 2600 1679	3300 2299 1596	3705 2705 1805	3707 2206 1507	2101 1801 1295	1901 1401 995	1501 1102 995	1213 1013 1013	1906 1706 1506	1702 1602 1402	2200 2100 1500	2301 1901 1301	3200 2600 1701	
enchmari	Vernalis Water Quality - mmhos (April and M Wet	lay values may i	not be reflectiv 352	e of split-n 286	nonth opera 310	ations when 269	n objective 212	s control) 310	341	460	442	359	497	432	352	286	
	Above Normal Below Normal Dry		404 757 880	380 631 736	465 690 1000	364 465 700	334 382 700	486 700 700	509 700 700	534 700 700	588 680 772	494 510 547	657 681 708	639 657 678	404 757 880	380 631 736	
nange in	Critical Vernalis Water Quality with Action - mmhos (Wet	April and May va	1000 alues may not l 0	1000 be reflectiv 0	1000 e of split-m 0	700 Ionth opera 0	700 ations when 0	700 n objective 0	700 es control) -1	-1	-1	595 0	772	859 0	1000 0	1000 0	
	Above Normal Below Normal Dry		0 0 0	-1 -2 -3	0 0 0	0 0 0	0 0 0	0 0 0	-2 0 0	-2 0 0	-2 -2 -1	0 0 0	0 0 0	0 0 0	0 0 0	0 0 0	
ith-Actio	Critical n Vernalis Water Quality - mmhos (April and I Wet	May values may	-2	0	0	0	ō	0	0 341	0 459	-1 441	0 359	0 497	0 432	0 352	0 286	
	Above Normal Below Normal		404 756	380 629	465 690	365 465	334 382	487 700	508 700	532 700	587 678	494 510	657 681	639 657	404 757	380 632	
	Dry Critical		879 998	733 1000	1000 1000	700 700	700 700	700 700	700 700	700 700	771 771	548 595	707 772	678 859	880 1000	736 1000 New M	elone
	I Change in NM Storage due to WQ Release (Wet Above Normal	Change - Acre-fe	et Jan 0 0	Feb 0 0	Mar 0 0	Apr 0 0	May 0 0	Jun 0 0	Jul O O	Aug 0 0	Sep 0 0	Oct 0 0	Nov 0 0	Dec 0 0	Jan 0 0	Feb 0 0	То
	Below Normal Dry		0	0	0 36	0 26	0 60	260 260	478 478	296 214	0	0	0	0	0	0	1,0 1,0
crementa	Critical Il Change in NM Storage due to Vernalis Flow Wet	Release Chang	0	386 0	47 0	-12 0	30 0	260 0	350 0	223 0	0	0	0	0	0	14 0	1,2
	Above Normal Below Normal Dry		0 0 0	0 -255 -255	0 0 0	0 0 0	0 0 0	349 0 0	0 0 0	0 0 0	0 0 0	0 0 0	0 0 0	0 0 0	0 0 0	0 56 56	3 -1 -1
et Increm	Critical ental Change in NM Storage due to Vernalis I Wet	Flow & Quality R	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
	Above Normal Below Normal		0	0 -255	0	0	0	349 260	0 478	0 296	0	0	0	0	0	0 56	34
	Dry Critical		0	-255 386	36 47	26 -12	60 30	260 260	478 350	214 223	0	0	0	0	Project	56 14 Delta	8 1,2 Suppl
	tial Delta supply Impact w/o NM Adjustment Wet Above Normal	s - Acre-feet	Jan 0 0	Feb -89 -89	Mar 0 0	Apr 0 0	May 0 0	Jun 0 349	Jul 521 521	Aug 343 343	Sep 0 0	Oct 0 0	Nov 0 0	Dec 0 0	Jan 0 0	Feb 20 20	To 7: 1,1-
	Below Normal Dry		0	-89 -89	0 -10	0 53	0 453	349 349	521 521	343 343	0 752	0 334	0	0	0 0	20 20	1,1 2,7
w Melon	Critical es Adjustments - Acre-feet (positive means i Wet	ncrease in suppl	0	-779 0	-226 0	312 0	462 0	-30 0	12 0	-115 0	773 0	372 0	100 0	0	0	61 0	9
	Above Normal Below Normal Dry		0	0 89 89	0 0 -13	0 0 -9	0 0 -60	-349 -260 -260	0 -478 -478	0 -296 -214	0	0	0	0	0	0 -20 -20	-3 -9 -9
crementa	Critical I Change in Project Delta Supply due to Action	on - Acre-feet	0	-386	-47	12	-30	-260	-350	-223	0	0	0	0	0	-14	-1,2
	Wet Above Normal Below Normal		0 0 0	-89 -89 0	0 0 0	0 0 0	0 0 0	0 0 88	521 521 43	343 343 47	0 0 0	0 0 0	0 0 0	0 0 0	0 0 0	20 20 0	79 79 11
	Dry Critical		0 0	0 -1165	-22 -273	44 325	393 432	88 -289	43 -338	128 -337	752 773	334 372	0 100	0 0	0 0	0 47	1,76 -35
lav 2	004					-		- 10									

	A-3-3-C: 80 FALLOWING OUT C Relative to Benchmark (Existing) Condition	OMPOSITE									Water	Develop	oment a	nd Disp	osition	Assum	ptions
Disposition Non-Crit -33588 0 0	S. Crit 0 Agriculture-SJRc 0 Wildlife Areas-SJRc 0 Urban-SJRc		0 Conservatio 0 Conservatio 0 Groundwate	n of Drain S r-SJRc	oills to Wild	ige to GW-S life Areas-S	JRc JRc	5	SJR Non-Co Non-Crit 0 0 0	Crit 0 Cr 0 Cr 0 Cr	onservation roundwater		ills to Wildli	ge to GW-S fe Areas-S.	JRnc JRnc		
72615 0	50000 Agriculture-SJRnc 0 Wildlife Areas-SJRnc 0 Urban-SJRnc	0 13747 4200	0 Tailwater Re 00 Fallowing -S	capture-SJF JRc	ξ¢	Non-Crit	Crit		0 2618		Illowing-SJI	apture-SJR Rnc Non-Crit	nc Crit				
ō	0 EWA es Relative to Benchmark (Exis	tina) Conditi	Total Develo	oped Water:		10365	50000	1	Fotal Disposi	tion:		39027	50000	Basic Hy	/drologi	c Acco	untina
Water Dev	eloped - Non Critical Years Change in Evaporation/Seepage to GW	g) eenan	Jan 0	Feb 0	Mar 0	Apr 0	May 0	Jun 0	Jul 0	Aug 0	Sep 0	Oct 0	Nov 0	Dec 0	Jan 0	Feb 0	Total 0
	Change in Drain Spills to Wildlife Areas Change in Discharge to SJR Streams Change to Flows Upstream of Sack Dam Crop Fallowing		0 0 337	0 0 1518	0 0 0 1687	0 0 112	0 0 225	0 0 0 3487	0 0 4724	0 0 4162	0 0 112	0 0 0	0 0 0	0 0 0	0 0 0	0 0 0	0 0 16,365
Effects to	Groundwater Total SJR Flows due to Developing Water - Non Cr	itical Years	0 337	0 1518	0 1687	-750 -638	-840 -615	-990 2497	-1200 3524	-900 3262	-600 -488	-600 -600	-120 -120	0	0	0 0	-6,000 10,365
	Change in Evaporation/Seepage to GW Change in Drain Spills to Wildlife Areas Change in Discharge to SJR Streams Change to Flows Upstream of Sack Dam		0 0 0	0 0 0	0 0 0	0 0 0	0 0 0	0 0 0	0 0 0	0 0 0	0 0 0	0 0 0	0 0 0	0 0 0	0 0 0	0 0 0	0 0 0
	Crop Fallowing Groundwater Total (Positive value means flow reduced)		57 0 57	255 0 255	99 0 99	7 0 7	13 0 13	205 0 205	278 0 278	245 0 245	19 0 19	0 0 0	0	0 0 0	0	0 0 0	1,177 0 1,177
Return Flo	ws from Disposition of Transfer Water - Non Incremental Return from Agricultural Transferee Incremental Return from Wildlife Area Transferee	IS	0	0	-52 0	-223 0	-338 0	-401 0	-578 0	-425 0	-558	-250 0	-67 0	-17 0	-23 0	-41 0	-2,972
	Envirnomental Water Account Beneficiaries Incremental Return from Agricultural Entities Total		0	0	0 -52	0 -223	0 -338	0 -401	0 -578	0 -425	0 -558	0 -250	0 -67	0 -17	0 -23	0 -41	- -2,972
Net Effect Positive va	to San Joaquin River Flow Before NM Adjust Ilue means flow added)	(cfs)	et) -57 -1	-255 -5	-151 -2	-230 -4	-351 -6	-606 -10	-856 -14	-670 -11	-577 -10	-250 -4	-67 -1	-17 0	-23 0	-41 -1	-4,150 0
Water Dev	eloped - Critical Years																
	Change in Evaporation/Seepage to GW Change in Drain Spills to Wildlife Areas Change in Discharge to SJR Streams		0 0 0	0 0 0	0 0 0	0 0 0	0 0 0	0 0 0	0 0 0	0 0 0	0 0 0	0 0 0	0 0 0	0 0 0	0 0 0	0 0 0	0 0 0
	Change to Flows Upstream of Sack Dam Crop Fallowing Groundwater		0 1031 0	0 4639 0	0 5155 0	0 344 0	0 687 0	0 10653 0	0 14433 0	0 12715 0	0 344 0	0 0	0 0	0 0 0	0 0	0 0 0	0 50,000 0
Effects to 3	Total SJR Flows due to Developing Water - Critical Change in Evaporation/Seepage to GW Change in Drain Soille to Wildlife Arcos	Years	1031 0 0	4639 0	5155 0 0	344 0 0	687 0	10653 0 0	14433 0 0	12715 0 0	344 0 0	0	0	0	0	0	50,000 0 0
	Change in Drain Spills to Wildlife Areas Change in Discharge to SJR Streams Change to Flows Upstream of Sack Dam		0	0 0 779	0	0	0	0	0	0	0 0 58	0	0	0	0	0	0
	Crop Fallowing Groundwater Total (Positive value means flow reduced) ws from Disposition of Transfer Water - Criti	aal Vaara	173 0 173	0 779	303 0 303	20 0 20	40 0 40	626 0 626	849 0 849	748 0 748	0 58	0	0	0	0	0 0 0	3,597 0 3,597
	Incremental Return from Agricultural Transferee Incremental Return from Wildlife Area Transfere Envirnomental Water Account Beneficiaries	IS	0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0
	Incremental Return from Agricultural Entities Total to San Joaquin River Flow Before NM Adjust	ment (Acre-fee	0 0 et) -173	0 0 -779	0 0 -303	0 0 -20	0 0 -40	0 0 -626	0 0 -849	0 0 -748	0 0 -58	0 0 0	0 0 0	0 0 0	0 0 0	0 0 0	0 0 -3,597
(Positive va	lue means flow added)	(cfs)	-3	-14	-5	0	-1	-11	-14	-12	-1	0	0	0	0		0 ernalis
	k Vernalis Flow - cfs Wet Above Normal		Jan 7500 5800	Feb 13600 7200	Mar 15700 6200	Apr 13600 5900	May 12000 4600	Jun 7400 2600	Jul 5100 2100	Aug 3100 2000	Sep 2500 1500	Oct 3600 2000	Nov 3000 1800	Dec 4600 2300	Jan 7500 5800	Feb 13600 7200	
	Below Normal Dry Critical		2300 1900 1300	3200 2600 1700	3300 2300 1600	3700 2700 1800	3700 2200 1500	2100 1800 1300	1900 1400 1000	1500 1100 1000	1200 1000 1000	1900 1700 1500	1700 1600 1400	2200 2100 1500	2300 1900 1300	3200 2600 1700	
	Vernalis Flow with Action - cfs Wet Above Normal		-1	-5 -5	-2 -2	-4 -4	-6 -6	-10 0	-14 -14	-11 -11	-10 -10	-4 -4	-1 -1	0	0	-1 -1	
	Below Normal Dry Critical		-1 -1 -3	0 0 -21	-2 -2 -6	-4 -4 0	-6 -5 -1	-9 -9 -14	-11 -11 -19	-9 -10 -16	-10 -10 -1	-4 -4 0	-1 -1 0	0 0 0	0 0 0	0 0 0	
	n Vernalis Flow - cfs Wet Above Normal Below Normal		7499 5799 2299	13595 7195 3200	15698 6198 3298	13596 5896 3696	11994 4594 3694	7390 2600 2091	5086 2086 1889	3089 1989 1491	2490 1490 1190	3596 1996 1896	2999 1799 1699	4600 2300 2200	7500 5800 2300	13599 7199 3200	
	Dry Critical k Vernalis Water Quality - mmhos (April and I	May values may r	1899 1297	2600 1679	2298 1594	2696 1800 ations when	2195 1499	1791 1286	1389 981	1090 984	990 999	1696 1500	1599 1400	2100 1500	1900 1300	2600 1700	
	Wet Above Normal	nay values may i	352 404	286 380	310 465	269 364	212 334	310 486	341 509	460 534	442 588	359 494	497 657	432 639	352 404	286 380	
	Below Normal Dry Critical		757 880 1000	631 736 1000	690 1000 1000	465 700 700	382 700 700	700 700 700	700 700 700	700 700 700	680 772 772	510 547 595	681 708 772	657 678 859	757 880 1000	631 736 1000	
	Vernalis Water Quality with Action - mmhos Wet Above Normal	(April and May va	0	0 -1	0	0	0 0	0 -2	0 0	0	0	0	0	0	0	0	
	Below Normal Dry Critical n Vernalis Water Quality - mmhos (April and I	May yaluna may i	0 0 -2	-2 -3 0	0 0 0	0 0 0	0 0 0	0 0 0	0 0 0	0 0 0	1 0	0 0 0	0 0 0	0 0 0	0 0 0	0 0 0	
	Wet Above Normal Below Normal	may values may i	352 404 756	285 380 629	310 465 690	269 364 465	212 333 382	310 484 700	341 509 700	460 533 700	442 589 681	359 494 510	497 657 681	432 639 657	352 404 757	286 380 631	
	Dry Critical		879 998	733 1000	1000 1000	700 700	700 700	700 700	700 700	700 700	772 771	547 595	708 772	678 859	880 1000	736 1000	
	al Change in NM Storage due to WQ Release Wet Above Normal	Change - Acre-fe	et Jan 0 0	Feb 0 0	Mar 0 0	Apr 0 0	May 0 0	Jun 0 0	Jul 0 0	Aug 0	Sep 0 0	Oct 0 0	Nov 0 0	Dec 0 0	Jan 0 0	New Mo Feb 0	Total 0
	Above Normal Below Normal Dry Critical		0	0 0 386	0 -4 39	0 -14 8	0 -35 15	-63 -63 223	-178 -178 297	-94 -35 213	0	0 0 0	0	0 0 0	0	000000000000000000000000000000000000000	-335 -330 1,180
ncrementa	Critical al Change in NM Storage due to Vernalis Flow Wet Above Normal	v Release Change		0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Below Normal Dry		0	0 -255 -255	0 0 0	0 0	0 0 0	-606 0 0	0 0 0	0 0 0	0 0	0 0	0 0	0 0 0	0 0	0 -41 -41	-606 -296 -296
Net Increm	Critical ental Change in NM Storage due to Vernalis Wet	Flow & Quality R	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Above Normal Below Normal Dry		0 0 0	0 -255 -255	0 0 -4	0 0 -14	0 0 -35	-606 -63 -63	0 -178 -178	0 -94 -35	0 0 0	0 0	0 0	0 0 0	0 0	0 -41 -41	-606 -631 -626
	Critical ntial Delta supply Impact w/o NM Adjustment	s - Acre-feet	0 Jan	386 Feb	39 Mar	8 Apr	15 May	223 Jun	297 Jul	213 Aug	0 Sep	0 Oct	0 Nov	0 Dec	0 Project Jan	0 Delta S Feb	1,180 Supply Total
	Wet Above Normal Below Normal		0 0 0	-89 -89 -89	0 0 0	0 0 0	0 0 0	0 -606 -606	-856 -856 -856	-670 -670 -670	0	0 0 0	0 0 0	0 0 0	0 0 0	-14 -14 -14	-1,629 -2,235 -2,235
	Dry Critical nes Adjustments - Acre-feet (positive means i	ncrease in suppl	0	-89 -779	-53 -303	-40 -20	-351 -40	-606 -626	-856 -849	-670 -748	-577 -58	-242 0	0	0	0	-14 0	-3,498 -3,424
	Wet Above Normal Below Normal		9) 0 0	0 0 89	0 0 0	0 0 0	0 0 0	0 606 63	0 0 178	0 0 94	0 0 0	0 0 0	0 0 0	0 0 0	0 0	0 0 14	0 606 439
	Dry Critical	on - Acro (0 0 0	89 89 -386	0 1 -39	0 5 -8	0 35 -15	63 63 -223	178 178 -297	94 35 -213	0 0 0	0 0 0	0 0 0	0 0 0	0 0 0	14 14 0	439 422 -1,180
	al Change in Project Delta Supply due to Acti Wet Above Normal Below Normal	un - Acre-teet	0 0 0	-89 -89 0	0 0 0	0 0 0	0 0 0	0 0 -543	-856 -856 -677	-670 -670 -576	0 0 0	0 0 0	0 0	0 0 0	0 0 0	-14 -14 0	-1,629 -1,629 -1,796
	Below Normal Dry Critical		0 0 0	0 0 -1165	0 -51 -342	0 -35 -28	0 -316 -55	-543 -543 -849	-677 -677 -1146	-576 -635 -960	0 -577 -58	0 -242 0	0 0 0	0 0 0	0 0 0	0 0 0	-1,796 -3,076 -4,604
May 2	001					-	0000	- 11									

	-3-0-S: 50 FALLOWING SOU alative to Benchmark (Existing) Condition										Water	Develop	oment a	nd Disp	osition	Assum	ptions
Disposition Non-Crit 0 0 0	Crit 0 Agriculture-SJRc 0 Wildlife Areas-SJRc 0 Urban-SJRc	SJR Continuity Non-Crit 0 -6000	Crit 0 Conservatio 0 Conservatio 0 Groundwate	n of Drain S r-SJRc	pills to Wild	ge to GW-S life Areas-S	JRc JRc	5	SJR Non-Co Non-Crit 0 0 0	Crit 0 Cr 0 Cr 0 Cr	onservation roundwater-		ills to Wildli	je to GW-S fe Areas-S.	JRnc JRnc		
0	0 Agriculture-SJRnc 0 Wildlife Areas-SJRnc	0 42000 42	0 Tailwater Re 000 Fallowing -S		Rc	No. Orit	Crit		0 8000	0 Ta 8000 Fa	allowing-SJF						
0	0 Urban-SJRnc 0 EWA		Total Develo	oped Water:		Non-Crit 44000	50000	1	Fotal Disposi	ition:		Non-Crit 0	Crit 0				
Vater Develo	s Relative to Benchmark (Ex	listing) Condi	tion Jan 0	Feb 0	Mar	Apr	May 0	Jun	Jul	Aug	Sep	Oct	Nov	Basic Hy	Jan 0	Feb 0	Tota
Cł Cł Cł	aange in Evaporation/Seepage to GW aange in Drain Spills to Wildlife Areas aange in Discharge to SJR Streams aange to Flows Upstream of Sack Dam op Fallowing		0 0 0 1031	0 0 0 4639	0 0 0 5155	0 0 0 344	0 0 0 687	0 0 0 10653	0 0 0 14433	0 0 0 12715	0 0 0 344	0 0 0 0	0 0 0	0 0 0 0	0 0 0	0 0 0	50.00
Gr To ffects to SJ	oundwater	Critical Years	0 1031 0	4639 0 0	0 5155 0	-750 -406	-840 -153	-990 9663 0	-1200 13233	-900 11815 0	-600 -256 0	-600 -600	-120 -120 0	0 0	0	0000	-6,00 44,00
Cł Cł Cł	ange in Drain Spills to Wildlife Areas aange in Discharge to SJR Streams aange to Flows Upstream of Sack Dam op Fallowing		0 0 0 173	0 0 0 779	0 0 0 303	0 0 0 20	0 0 0 40	0 0 626	0 0 0 849	0 0 0 748	0 0 0 58	0 0 0	0 0 0	0 0 0	0 0 0	0 0 0	3,59
Gr To	oundwater Ital (Positive value means flow reduced) Is from Disposition of Transfer Water - N	on Critical Vears	0 173	0 779	0 303	0 20	0 40	0 626	0 849	0 748	0 58	0	0	0	0	0	3,59
Inc Inc <u>Er</u>	cremental Return from Agricultural Transfe cremental Return from Wildlife Area Transf wirnomental Water Account Beneficiaries	rees	0 0 0	000	0 0	0 0	0 0	0 0	0 0	000	0 0 0	0 0	0 0	0 0 0	0	0 0 0	
To	cremental Return from Agricultural Entities tal San Joaquin River Flow Before NM Adji	ustment (Acre-f	0	0 -779	0 -303	0 -20	0 -40	0 -626	0 -849	0 -748	0 -58	0	0	0	0	0	-3,59
ositive value	e means flow added)	(cfs)	-3	-14	-5	0	-1	-11	-14	-12	-1	0	0	0	0	0	
Cr Cr Cr	oped - Critical Years nange in Evaporation/Seepage to GW hange in Drain Spills to Wildlife Areas nange in Discharge to SJR Streams nange to Flows Upstream of Sack Dam		0 0 0	0 0 0	0 0 0	0 0 0	0 0 0	0 0 0	0 0 0	0 0 0	0 0 0	0 0 0	0 0 0	0 0 0	0 0 0	0 0 0	
Gr To			1031 0 1031	4639 0 4639	5155 0 5155	344 0 344	687 0 687	10653 0 10653	14433 0 14433	12715 0 12715	344 0 344	0 0 0	0 0 0	0 0 0	0 0 0	0 0 0	50,00 50,00
Cł Cł Cł	R Flows due to Developing Water - Criti hange in Evaporation/Seepage to GW hange in Drain Spills to Wildlife Areas hange in Discharge to SJR Streams	cal Years	0 0 0	0 0 0	0 0 0	0 0 0	0 0 0	0 0 0	0 0 0	0 0 0	0 0 0	0 0 0	0 0 0	0 0 0	0 0 0	0 0 0	
Cr Gr	nange to Flows Upstream of Sack Dam op Fallowing oundwater ital (Positive value means flow reduced)		0 173 0 173	0 779 0 779	0 303 0 303	0 20 0 20	0 40 0 40	0 626 0 626	0 849 0 849	0 748 0 748	0 58 0 58	0 0 0	0 0 0	0 0 0	0 0 0	0 0 0	3,59 3,59
Inc Inc <u>Er</u>	s from Disposition of Transfer Water - C cremental Return from Agricultural Transfe cremental Return from Wildlife Area Transf wirnomental Water Account Beneficiaries	rees	0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0	
To et Effect to	cremental Return from Agricultural Entities ital San Joaquin River Flow Before NM Adji e means flow added)	ustment (Acre-f	0 0 eet) -173 -3	0 0 -779 -14	0 0 -303 -5	0 0 -20 0	0 0 -40 -1	0 0 -626 -11	0 0 -849 -14	0 0 -748 -12	0 0 -58 -1	0 0 0	0 0 0	0 0 0	0 0 0	0 0 0	-3,59
	/ernalis Flow - cfs		Jan 7500	Feb 13600	Mar 15700	Apr 13600	May 12000	Jun 7400	Jul 5100	Aug 3100	Sep 2500	Oct 3600	Nov 3000	Dec 4600	Jan 7500	Feb 13600	ernali
Ab	love Normal		5800 2300 1900	7200 3200 2600	6200 3300 2300	5900 3700 2700	4600 3700 2200	2600 2100 1800	2100 1900 1400	2000 1500 1100	1500 1200 1000	2000 1900 1700	1800 1700 1600	2300 2200 2100	5800 2300 1900	7200 3200 2600	
hange in Ve W			1300 -3	1700 -14	1600 -5	1800 0	1500 -1	1300 -11	1000 -14	1000 -12	1000 -1	1500 0	1400 0	1500 0	1300 0	1700 0	
Be Dr Cr	iove Normal Ilow Normal Y Itical Vornalis Flow - cfs		-3 -3 -3 -3	-14 0 0 -21	-5 -5 -6	0 0 0	-1 -1 -1 -1	0 -14 -14 -14	-14 -19 -19 -19	-12 -16 -16 -16	-1 -1 -1	0 0 0	0 0 0	0 0 0	0 0 0	0 0 0 0	
W Ab	et xove Normal xlow Normal		7497 5797 2297 1897	13586 7186 3200 2600	15695 6195 3295 2294	13600 5900 3700 2700	11999 4599 3699 2199	7389 2600 2086 1786	5086 2086 1881 1381	3088 1988 1484 1084	2499 1499 1199 999	3600 2000 1900 1700	3000 1800 1700 1600	4600 2300 2200 2100	7500 5800 2300 1900	13600 7200 3200 2600	
Cr	, itical /ernalis Water Quality - mmhos (April ar	nd May values may	1297	1679	1594	1800 ations when 269	1499	1286	981 341	984 460	999 442	1500 359	1400 497	1500 432	1300 352	1700 286	
Ab Be Dr Cr	vove Normal Ilow Normal Y itical		404 757 880 1000	380 631 736 1000	465 690 1000 1000	364 465 700 700	334 382 700 700	486 700 700 700	509 700 700 700	534 700 700 700	588 680 772 772	494 510 547 595	657 681 708 772	639 657 678 859	404 757 880 1000	380 631 736 1000	
W Ab	love Normal	os (April and May	values may not -1 -1 -1 -1	-1 -1 -2 -6 -8	e of split-m 0 -1 -1 0	ionth opera 0 0 0 0	itions when 0 0 0	n objective -1 -4 0 0	-2 -3 0 0	-2 -2 0	0 0 0	0 0 0	0 0 0	0 0 0	0 0 0	0 0 0	
Cr	itical /ernalis Water Quality - mmhos (April a	nd May values may	-2	0	0	0	ō	0	0 340	0 459	0 0 441	0	0 497	0 432	0	0 286	
Ab Be Dr	love Normal		404 756 878 998	378 625 728 1000	465 690 1000 1000	364 465 700 700	334 382 700 700	483 700 700 700	507 700 700 700	531 700 700 700	588 680 771 771	494 510 547 595	657 681 708 772	639 657 678 859	404 757 880 1000	380 631 736 1000	
W		se Change - Acre-	0	Feb 0	Mar 0	Apr 0	May 0	Jun 0	Jul 0	Aug 0	Sep 0	Oct 0	Nov 0	Dec 0	Jan 0	New M	Tota
Be Dr Cr	itical		0 0 0	0 0 0 386	0 0 39 39	0 0 8 8	0 0 15 15	0 223 223 223	0 297 297 297	0 213 213 213	0 0 0	0 0 0	0 0 0	0 0 0	0 0 0	0 0 0	73 79 1,18
W Ab Be	love Normal	low Release Chan	0 0 0	0 0 -779	0 0 0	0 0 0	0 0 0	0 -626 0	0 0 0	0 0 0	0 0 0	0 0 0	0 0 0	0 0 0	0 0 0	0 0 0	-62 -77
Dr Cr et Incremer	y itical Ital Change in NM Storage due to Verna	lis Flow & Quality	0 0 Release Change			0	0	0	0	0	0	0	0	0	0	0	-77
Be	ove Normal Iow Normal Y		0 0 0 0	0 0 -779 -779	0 0 39	0 0 0 8	0 0 15	0 -626 223 223	0 0 297 297	0 213 213	0 0 0	0 0 0	0 0 0	0 0 0	0 0 0	0 0 0	-62 -4 1
Cr	itical al Delta supply Impact w/o NM Adjustm	ents - Acre-feet	0 Jan	386 Feb	39 Mar	8 Apr	15 May	223 Jun	297 Jul	213 Aug	0 Sep	0 Oct	0 Nov	0 Dec	0 Project Jan	0 Delta Feb	1,18
W Ab			0 0 0	-273 -273 -273	0	0 0 0	0 0 0	0 -626 -626	-849 -849 -849	-748 -748 -748	0 0 0	0	0	0	0 0 0	0	-1,86 -2,49 -2,49
Dr Cr		ns increase in sum	0	-273 -779	-106 -303	-4 -20	-40 -40	-626 -626	-849 -849	-748 -748	-58 -58	0	0	0	0	0	-2,70
W Ab			0 0 0	0 0 273	0 0 0	0 0 0	0 0 0	0 626 -223	0 0 -297	0 0 -213	0 0 0	0 0 0	0 0 0	0 0 0	0 0 0	0 0 0	62 -46
Dr Cr cremental (y itical Change in Project Delta Supply due to A	ction - Acre-feet	0 0	273 -386	-14 -39	-3 -8	-15 -15	-223 -223	-297 -297	-213 -213	0	0	0	0	0	0 0	-49 -1,18
W Ab Be Dr	et iove Normal ilow Normal y		0 0 0	-273 -273 0 0	0 0 -120	0 0 -6	0 0 -55	0 0 -849 -849	-849 -849 -1146 -1146	-748 -748 -960 -960	0 0 -58	0 0 0	0 0 0	0 0 0	0 0 0	0 0 0	-1,86 -1,86 -2,95 -3,19
Cr	itical		0	-1165	-342	-28	-55 Dage 1	-849	-1146	-960	-58	0	Ó	Ó	Ō	0	-4,604

Study: All Values	B-3-1-C: 50 FALLOWING REFU Relative to Benchmark (Existing) Condition		BITE								Water	Develop	oment a	nd Disp	osition	Assum	ptions
Disposition Non-Crit -28596 17823 0	Crit Spericulture-SJRc 40000 Wildlife Areas-SJRc 0 Urban-SJRc	SJR Continuity	Crit 0 Conservatio 0 Conservatio 0 Groundwate	n of Drain S	ation/Seepa pills to Wild	ige to GW-S life Areas-S	JRc JRc	<u>s</u>	UR Non-Co Non-Crit 0 0 0	Crit 0 C 0 C	onservation onservation roundwater	of Drain Sp	tion/Seepaç ills to Wildli	ge to GW-S fe Areas-S.	JRnc JRnc		
-7385 9497	0 Orban-SJRc 0 Agriculture-SJRnc 0 Wildlife Areas-SJRnc	0	0 Tailwater Re 00 Fallowing -S	ecapture-SJ	Rc				0 8000	0 T	ailwater Rec allowing-SJI	apture-SJR	inc				
0 0	0 Urban-SJRnc 0 EWA		Total Develo	oped Water:		Non-Crit 44000	Crit 50000	т	otal Disposi	tion:		Non-Crit -8661	Crit 40000				
Vater Dev	eloped - Non Critical Years	sting) Condit	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Basic Hy Dec	Jan	Feb	Tota
	Change in Evaporation/Seepage to GW Change in Drain Spills to Wildlife Areas Change in Discharge to SJR Streams		0 0 0	0 0	0 0	0 0 0	0 0 0	0 0	0 0	0 0	0 0	0 0	0	0 0	0 0	0 0 0	0
	Change to Flows Upstream of Sack Dam Crop Fallowing		0 1031	0 4639	0 5155	0 344	0 687	0 10653	0 14433	0 12715	0 344	0	0	0 0	0	0	50,000
	Groundwater Total		0 1031	0 4639	0 5155	-750 -406	-840 -153	-990 9663	-1200 13233	-900 11815	-600 -256	-600 -600	-120 -120	0	0	0	-6,000 44,000
	SJR Flows due to Developing Water - Non C Change in Evaporation/Seepage to GW Change in Drain Spills to Wildlife Areas	ritical Years	0	0	0	0	0	0	0	0	0	0	0	0	0	0	(
	Change in Discharge to SJR Streams Change to Flows Upstream of Sack Dam		0	0	0	0	0	0	0	0	0	0	0	0	0	0	
	Crop Fallowing Groundwater		173 0	779 0	303 0	20 0	40 0	626 0	849 0	748 0	58 0 58	0 0	0	0 0	0 0 0	0	3,59
eturn Flo	Total (Positive value means flow reduced) ws from Disposition of Transfer Water - Nor Incremental Return from Agricultural Transfere		173 0	779 0	303 -44	20 -190	40 -287	626 -341	849 -492	748 -362	-475	-213	-57	-14	-19	0 -35	3,59
	Incremental Return from Wildlife Area Transfer Environmental Water Account Beneficiaries	rees	0	0	33 0	5	0	0	0	3026 0	165 0	-17 0	282 0	66 0	220 0	252 0	4,03
	Incremental Return from Agricultural Entities Total to San Joaquin River Flow Before NM Adjus	stment (Acre-fe	0 0 eet) -173	0 -779	-10 -314	-185 -205	-287 -328	-341 -968	-492 -1341	2664 1916	-310 -368	-230 -230	225 225	51 51	200 200	218 218	1,50 -2,09
	alue means flow added)	(cfs)	-3	-14	-5	-3	-5	-16	-22	31	-6	-4	4	1	3	4	
	eloped - Critical Years Change in Evaporation/Seepage to GW Change in Drain Spills to Wildlife Areas		0	0	0	0	0	0	0	0	0	0	0	0	0	0	
	Change in Discharge to SJR Streams Change to Flows Upstream of Sack Dam		0	0	0	0 0	0	0 0	0	0	0	0	0	0	0	0	
	Crop Fallowing Groundwater		1031 0	4639 0	5155 0	344 0	687 0	10653 0	14433 0	12715 0	344 0	0	0	0	0	0	50,00
fects to	Total SJR Flows due to Developing Water - Critica Change in Evaporation/Seepage to GW	al Years	1031 0	4639 0	5155 0	344 0	687 0	10653 0	14433 0	12715 0	344 0	0	0	0	0	0	50,00
	Change in Drain Spills to Wildlife Areas Change in Discharge to SJR Streams		0	0	0	0	0	0	0	0	0	0	0	0	0	0	
	Change to Flows Upstream of Sack Dam Crop Fallowing Groundwater		0 173 0	0 779 0	0 303 0	0 20 0	0 40 0	0 626 0	0 849 0	0 748 0	0 58 0	0 0 0	0	0 0	0 0 0	0 0 0	3,59
turn Flo	Total (Positive value means flow reduced) ws from Disposition of Transfer Water - Crit	tical Years	173	779	303	20	40	626	849	748	58	0	0	0	0	0	3,59
	Incremental Return from Agricultural Transfere Incremental Return from Wildlife Area Transfer		0	0 0	0 75	0 11	0 0	0	0 0	0 6791	0 370	0 -39	0 634	0 148	0 493	0 567	9,04
	Environmental Water Account Beneficiaries Incremental Return from Agricultural Entities Total		0 0	0 0	0 75	0 11	0 0	0	0	0 6791	0 370	0 -39	0 634	0 148	0 493	0 567	9,04
et Effect Positive va	to San Joaquin River Flow Before NM Adjus alue means flow added)	stment (Acre-fe (cfs)	eet) -173 -3	-779 -14	-228 -4	-9 0	-40 -1	-626 -11	-849 -14	6043 98	312 5	-39 -1	634 11	148 2	493 8	567 10	5,45 ernalis
	k Vernalis Flow - cfs Wet		Jan 7500	Feb 13600	Mar 15700	Apr 13600	May 12000	Jun 7400	Jul 5100	Aug 3100	Sep 2500	Oct 3600	Nov 3000	Dec 4600	Jan 7500	Feb 13600	ernans
	Above Normal Below Normal		5800 2300	7200 3200	6200 3300	5900 3700	4600 3700	2600 2100	2100 1900	2000 1500	1500 1200	2000 1900	1800 1700	2300 2200	5800 2300	7200 3200	
	Dry Critical Vernalis Flow with Action - cfs		1900 1300	2600 1700	2300 1600	2700 1800	2200 1500	1800 1300	1400 1000	1100 1000	1000 1000	1700 1500	1600 1400	2100 1500	1900 1300	2600 1700	
	Wet Above Normal		-3 -3	-14 -14	-5 -5	-3 -3	-5 -5	-16 0	-22 -22	31 31	-6 -6	-4 -4	4 4	1 1	3 3	4 4	
	Below Normal Dry		-3 -3	0	-5 -5	-3 -3	-5 -5	-18 -18	-23 -23	76 76	-6 -6	-4 -4	4	1	3	0	
ith-Actic	Critical n Vernalis Flow - cfs Wet		-3 7497	-21 13586	-2 15695	0	-1 11995	-14 7384	-19 5078	199 3131	5 2494	-1 3596	11 3004	2 4601	8	15 13604	
	Above Normal Below Normal		5797 2297	7186 3200	6195 3295	5897 3697	4595 3695	2600 2082	2078 1877	2031 1576	1494 1194	1996 1896	1804 1704	2301 2201	5803 2303	7204 3200	
	Dry Critical k Vernalis Water Quality - mmhos (April and	May values may	1897 1297 not be reflectiv	2600 1679 re of split-m	2295 1598	2697 1800 ations whe	2195 1499 nobjective	1782 1286 s control)	1377 981	1176 1199	994 1005	1696 1499	1604 1411	2101 1502	1903 1308	2600 1715	
	Wet Above Normal	may values may	352 404	286 380	310 465	269 364	212 334	310 486	341 509	460 534	442 588	359 494	497 657	432 639	352 404	286 380	
	Below Normal Dry		757 880	631 736	690 1000	465 700	382 700 700	700 700	700 700	700 700	680 772	510 547	681 708	657 678	757 880	631 736	
hange in	Critical Vernalis Water Quality with Action - mmhos Wet	s (April and May v	1000 alues may not l -1	1000 be reflectiv -1	1000 eofsplit-m 0	700 Nonth opera 0		700 n objective -1	700 s control) -2	700	772	595 0	772	859 0	1000	1000 0	
	Above Normal Below Normal		-1 -1	-2 -6	0	0	0	-5 0	-2 0	17 0	1 2	0	1 1	0	0	1 2	
	Dry Critical n Vernalis Water Quality - mmhos (April and	May values may	-1 -2 not be reflectiv	-8 0 veofsplit-n	0 0 nonth oper	0 0 ations whe	0 0 n objective	0 0 (s control)	0 0	0	1 2	0	1 3	0	1 1	2 0	
	Wet Above Normal	_,	351 404	284 378	310 465	269 364	212 333	310 482	340 507	472 551	442 590	359 494	498 659	432 639	352 405	286 381	
	Below Normal Dry Critical		756 878 998	625 728 1000	690 1000 1000	465 700 700	382 700 700	700 700 700	700 700 700	700 700 700	682 773 773	509 547 595	682 709 775	658 678 859	757 880 1001	633 738 1000	
crement	al Change in NM Storage due to WQ Release	e Change - Acre-fe	eet Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	New Me Feb	Tota
	Wet Above Normal		0	0	0	0	0	0	0	0	0	0	0	0 0	0 0	0	
	Below Normal Dry Critical		0 0 0	0 0 386	0 -36 -97	0 -16 -12	0 -19 15	107 107 223	62 62 297	-2788 -2738 -6209	0 0 0	0 0 0	0 0 0	0 0 0	0 0 0	0 0 -267	-2,61 -2,63 -5,66
crement	al Change in NM Storage due to Vernalis Flo Wet	w Release Chang	ge - Acre-feet	0	0	0	0	0	0	0	0	0	0	0	0	0	
	Above Normal Below Normal Dry		0 0 0	0 -779 -779	0 0	0 0	0 0	-968 0 0	0 0	0 0	0 0	0 0 0	0 0	0 0	0 0	0 218 218	-96 -56 -56
et Incren	Critical tental Change in NM Storage due to Vernalis	s Flow & Quality F	0	0 e - Acre-fee	0	0	0	0	0	0	0	0	0	0	0	0	
	Wet Above Normal	,	0	0	0	0 0 0	0	-968 107	0	0	0	0	0	0	0	0	-96
	Below Normal Dry Critical		0 0 0	-779 -779 386	0 -36 -97	0 -16 -12	0 -19 15	107 107 223	62 62 297	-2788 -2738 -6209	0 0 0	0 0 0	0 0 0	0 0 0	0 0 0	218 218 -267	-3,18 -3,20 -5,66
tal Pote	ntial Delta supply Impact w/o NM Adjustmen	nts - Acre-feet	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Project Jan	Feb	Suppl Tot
	Wet Above Normal Below Normal		0 0 0	-273 -273	0 0	0	0	0 -968	-1341 -1341	1916 1916	0	0	0	0	0 0	76 76 76	37 -58 -58
	Below Normal Dry Critical		0 0 0	-273 -273 -779	0 -110 -228	0 -36 -9	0 -328 -40	-968 -968 -626	-1341 -1341 -849	1916 1916 6043	0 -368 312	0 -223 -39	0 0 634	0 0 0	0 0 0	76 76 567	-58 -1,65 4,98
ew Melo	nes Adjustments - Acre-feet (positive means Wet	increase in supp	ly) 0	0	0	0	0	0	0	0	0	0	0	0	0	0	
	Above Normal Below Normal Dry		0 0 0	0 273 273	0 0 13	0 0 5	0 0 19	968 -107 -107	0 -62 -62	0 2788 2738	0 0 0	0 0 0	0	0 0 0	0 0 0	0 -76 -76	96 2,81 2,80
	Dry Critical al Change in Project Delta Supply due to Act	tion - Acre-feet	0	-386	97	12	-15	-107 -223	-297	6209	0	0	0	0	0	267	5,66
	Wet Above Normal		0	-273 -273	0	0	0	0 0	-1341 -1341	1916 1916	0	0	0	0	0	76 76	37 37
	Below Normal Dry Critical		0 0 0	0 0 -1165	0 -97 -131	0 -31 4	0 -309 -55	-1075 -1075 -849	-1403 -1403 -1146	4704 4654 12252	0 -368 312	0 -223 -39	0 0 634	0 0 0	0 0 0	0 0 834	2,22 1,14 10,65
lav 2			2				Pane 1							-			.,

	B-3-2-C: 50 FALLOWING AGRI Relative to Benchmark (Existing) Condition	n	COMPOSITE								Water	Develop	oment a	nd Disp	osition	Assum	ptions
Disposition Non-Crit 16412 0 0 -7385	Crit 50000 Agriculture-SJRc 0 Wildlife Areas-SJRc 0 Urban-SJRc 0 Agriculture-SJRnc	SJR Continuity Non-Crit 0 -6000 0	Crit 0 Conservatio 0 Conservatio 0 Groundwate 0 Tailwater R	n of Drain S r-SJRc	pills to Wild	ge to GW-S life Areas-S	iJRc JRc	5	SJR Non-Co Non-Crit 0 0 0 0	Crit 0 Cr 0 Cr 0 Cr	onservation onservation roundwater ailwater Rec	of Drain Sp SJRnc	ills to Wildl	ge to GW-S ife Areas-S.	JRnc JRnc		
-7385	0 Wildlife Areas-SJRnc 0 Urban-SJRnc		2000 Fallowing -S	SURC	ĸ	Non-Crit	Crit		8000		allowing-SJI		Crit				
0	es Relative to Benchmark (Exi	isting) Conc	Total Devel	oped Water:		44000	50000	٦	Fotal Disposi	ition:		9027	50000	Basic Hy	/drologi	c Acco	unting
Vater Deve	eloped - Non Critical Years Change in Evaporation/Seepage to GW	isting) cond	Jan 0	Feb 0	Mar 0	Apr 0	May 0	Jun 0	Jul 0	Aug 0	Sep 0	Oct 0	Nov 0	Dec 0	Jan 0	Feb 0	Tota
	Change in Drain Spills to Wildlife Areas Change in Discharge to SJR Streams Change to Flows Upstream of Sack Dam		0 0 0	0 0 0	0 0 0	0 0 0	0 0 0	0 0 0	0 0 0	0 0 0	0 0 0	0 0 0	0 0 0	0 0 0	0 0 0	0 0 0	
	Crop Fallowing Groundwater Total SJR Flows due to Developing Water - Non	Critical Years	1031 0 1031	4639 0 4639	5155 0 5155	344 -750 -406	687 -840 -153	10653 -990 9663	14433 -1200 13233	12715 -900 11815	344 -600 -256	0 -600 -600	0 -120 -120	0 0 0	0 0 0	0 0 0	50,00 -6,00 44,00
	Change in Evaporation/Seepage to GW Change in Drain Spills to Wildlife Areas Change in Discharge to SJR Streams Change to Flows Upstream of Sack Dam		0 0 0	0 0 0	0 0 0	0 0 0	0 0 0	0 0 0	0 0 0	0 0 0	0 0 0	0 0 0	0 0 0	0 0 0	0 0 0	0 0 0	
	Crop Fallowing Groundwater Total (Positive value means flow reduced)		173 0 173	779 0 779	303 0 303	20 0 20	40 0 40	626 0 626	849 0 849	748 0 748	58 0 58	0 0 0	0 0 0	0 0 0	0 0 0	0 0 0	3,59 3,59
	ws from Disposition of Transfer Water - No Incremental Return from Agricultural Transfer Incremental Return from Wildlife Area Transfe Envinromental Water Account Beneficiaries	rees	0 0	0 0	25 0	109 0	165 0	196 0	282 0	208 0	273 0	122 0	33 0	8 0	11 0	20 0	1,45
	Incremental Return from Agricultural Entities Total		0	0 0	0 25	0 109	0 165	0 196	0 282	0 208	0 273	0 122	0 33	0 8	0 11	0 20	1,45
ositive va	to San Joaquin River Flow Before NM Adju lue means flow added)	(cfs)	-feet) -173 -3	-779 -14	-278 -5	89 1	125 2	-431 -7	-566 -9	-540 -9	215 4	122 2	33 1	8 0	11 0	20 0	-2,14
ater Deve	eloped - Critical Years																
	Change in Evaporation/Seepage to GW Change in Drain Spills to Wildlife Areas Change in Discharge to SJR Streams Change to Flows Upstream of Sack Dam		0 0 0	0 0 0	0 0 0	0 0 0	0 0 0	0 0 0	0 0 0	0 0 0	0 0 0	0 0 0	0 0 0	0 0 0	0 0 0	0 0 0	
	Crop Fallowing Groundwater Total		1031 0 1031	4639 0 4639	5155 0 5155	344 0 344	687 0 687	10653 0 10653	14433 0 14433	12715 0 12715	344 0 344	0 0 0	0 0 0	0 0 0	0 0 0	0 0 0	50,00 50,00
	SJR Flows due to Developing Water - Critic Change in Evaporation/Seepage to GW Change in Drain Spills to Wildlife Areas Change in Discharge to SJR Streams	cal Years	0 0 0	0 0 0	0 0 0	0 0 0	0 0 0	0 0 0	0 0 0	0 0 0	0 0 0	0 0 0	0 0	0 0 0	0 0 0	0 0 0	
	Change to Flows Upstream of Sack Dam Crop Fallowing Groundwater		0 173 0	0 779 0	0 303 0	0 20 0	0 40 0	0 626 0	0 849 0	0 748 0	0 58 0	0 0 0	0 0 0	0 0 0	0 0 0	0 0 0	3,59
eturn Flo	Total (Positive value means flow reduced) ws from Disposition of Transfer Water - Cr Incremental Return from Agricultural Transfer Incremental Return from Wildlife Area Transf	rees	173 0 0	779 0 0	303 77 0	20 333 0	40 503 0	626 597 0	849 861 0	748 633 0	58 831 0	0 372 0	0 100 0	0 25 0	0 34 0	0 61 0	3,59 4,42
	Envirnomental Water Account Beneficiaries Incremental Return from Agricultural Entities Total		0	0	0 77	0 333	0 503	0 597	0 861	0 633	0 831	0 372	0 100	0 25	0 34	0 61	4,42
ositive va	to San Joaquin River Flow Before NM Adju lue means flow added)	ustment (Acre (cfs)	-feet) -173 -3	-779 -14	-226 -4	312 5	462 8	-30 0	12 0	-115 -2	773 13	372 6	100 2	25 0	34 1	61 1 V	82 ernalis
	x Vernalis Flow - cfs Wet Above Normal		Jan 7500 5800	Feb 13600 7200	Mar 15700 6200	Apr 13600 5900	May 12000 4600	Jun 7400 2600	Jul 5100 2100	Aug 3100 2000	Sep 2500 1500	Oct 3600 2000	Nov 3000 1800	Dec 4600 2300	Jan 7500 5800	Feb 13600 7200	criticity
	Below Normal Dry Critical Vernalis Flow with Action - cfs		2300 1900 1300	3200 2600 1700	3300 2300 1600	3700 2700 1800	3700 2200 1500	2100 1800 1300	1900 1400 1000	1500 1100 1000	1200 1000 1000	1900 1700 1500	1700 1600 1400	2200 2100 1500	2300 1900 1300	3200 2600 1700	
	Wet Above Normal Below Normal		-3 -3 -3	-14 -14 0	-5 -5 -5	1 1 1	2 2 2	-7 0 -12	-9 -9 -16	-9 -9 -14	4 4 4	2 2 2	1 1 1	0 0 0	0 0 0	0 0 0	
ith-Actio	Dry Critical n Vernalis Flow - cfs Wet		-3 -3 7497	0 -21 13586	-5 -4 15695	1 5 13601	1 7 12002	-12 -5 7393	-16 -5 5091	-13 -5 3091	4 13 2504	2 6 3602	1 2 3001	0 0 4600	0 1 7500	0 1 13600	
	Above Normal Below Normal Dry		5797 2297 1897	7186 3200 2600	6195 3295 2295	5901 3701 2701	4602 3702 2201	2600 2088 1788	2091 1884 1384	1991 1486 1087	1504 1204 1004	2002 1902 1702	1801 1701 1601	2300 2200 2100	5800 2300 1900	7200 3200 2600	
enchmarl	Critical < Vernalis Water Quality - mmhos (April an Wet	d May values ma	1297 ay not be reflection 352	1679 /e of split-m 286	1596 nonth oper 310	1805 ations when 269	1507 n objective 212	1295 s control) 310	995 341	995 460	1013 442	1506 359	1402 497	1500 432	1301 352	1701 286	
	Above Normal Below Normal Dry Critical		404 757 880 1000	380 631 736 1000	465 690 1000 1000	364 465 700 700	334 382 700 700	486 700 700 700	509 700 700 700	534 700 700 700	588 680 772 772	494 510 547 595	657 681 708 772	639 657 678 859	404 757 880 1000	380 631 736 1000	
	Vernalis Water Quality with Action - mmho Wet Above Normal Below Normal	os (April and May	values may not -1 -1 -1	be reflectiv -1 -2 -6	e of split-m 0 -1 -1	nonth opera 0 0 0	itions when 0 0 0	n objective -1 -3 0	es control) -2 -3 0	-2 -2 0	0 -1 -1	0 0 0	0 0 0	0 0 0	0 0 0	0 0 0	
	Dry Critical n Vernalis Water Quality - mmhos (April an	nd May values ma	-1 -2	-8 0	0	0 0 ations whe	0 0 n objective	0	0 0	0	-1 -1	0 0	0 0	0 0	0 0	0 0	
	Wet Above Normal Below Normal Drv		351 404 756 878	284 378 625 728	310 465 690 1000	269 364 465 700	212 334 382 700	310 483 700 700	340 506 700 700	459 531 700 700	441 588 679 771	359 494 510 547	497 657 681 708	432 639 657 678	352 404 757 880	286 380 631 736	
	Critical	na Change A	998	1000	1000	700	700	700	700	700	771	595	772	859	1000	1000 New M	
	al Change in NM Storage due to WQ Releas Wet Above Normal Below Normal	se unange - Acre	0 0 0	Feb 0 0 0	Mar 0 0 0	Apr 0 0 0	May 0 0 0	Jun 0 289	Jul 0 432	Aug 0 293	Sep 0 0 0	Oct 0 0 0	Nov 0 0 0	Dec 0 0 0	Jan 0 0 0	Feb 0 0 0	Tota 1,01
crementa	Dry Critical al Change in NM Storage due to Vernalis Fi Wet	low Release Cha	0 0 Inge - Acre-feet	0 386 0	47 47 0	17 -12 0	35 30 0	289 260	432 350	264 223 0	0	0	0 0	0 0	0	0 14 0	1,08 1,29
	wet Above Normal Below Normal Dry		0 0 0	0 0 -779 -779	0 0 0	0 0 0	0 0 0	-431 0 0	0 0 0	0 0 0	0 0 0	0 0 0	0 0 0	0 0 0	0 0 0	0 20 20	-43 -75 -75
et Increm	Critical ental Change in NM Storage due to Vernal Wet	lis Flow & Qualit	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
i	Above Normal Below Normal Dry		0 0 0	0 -779 -779	0 0 47	0 0 17	0 0 35	-431 289 289	0 432 432	0 293 264	0 0 0	0 0 0	0 0 0	0 0 0	0 0 0	0 20 20	-43 25 32
	Critical ntial Delta supply Impact w/o NM Adjustme	onte . Acro foot	0 Jan	386 Feb	47 Mar	-12 Apr	30 May	260 Jun	350 Jul	223 Aug	0 Sep	0 Oct	0 Nov	0 Dec	0 Project Jan	14	1,29
	Wet Above Normal	anto - Acre-leet	0	-273 -273	0	0	0	0 -431	-566 -566	-540 -540	0	0	0	0	0	7 7	-1,37 -1,80
	Below Normal Dry Critical		0 0 0	-273 -273 -779	0 -97 -226	0 16 312	0 125 462	-431 -431 -30	-566 -566 12	-540 -540 -115	0 215 773	0 118 372	0 0 100	0 0 0	0 0 0	7 7 61	-1,80 -1,42 94
	es Adjustments - Acre-feet (positive mean Wet Above Normal	is increase in su	pply) 0 0	0	0	0	0	0 431	0	0	0	0	0	0	0	0	43
	Below Normal Dry Critical		0 0 0	273 273 -386	0 -16 -47	0 -6 12	0 -35 -30	-289 -289 -260	-432 -432 -350	-293 -264 -223	0	0	0	0 0 0	0	-7 -7 -14	-74 -74 -77 -1,29
crementa	Il Change in Project Delta Supply due to A Wet Above Normal Below Normal	ction - Acre-feet		-273 -273 0	0 0 0	0 0 0	0 0 0	0 0 -720	-566 -566 -998	-540 -540 -833	0 0 0	0 0 0	0 0 0	0 0 0	0 0	7 7 0	-1,37 -1,37 -2,55
	Below Normal Dry Critical		0 0 0	0 0 -1165	0 -114 -273	0 10 325	0 90 432	-720 -720 -289	-998 -998 -338	-833 -804 -337	0 215 773	0 118 372	0 0 100	0 0 0	0 0 0	0 0 47	-2,55 -2,20 -35
121/2	004					-	0000	- 1/									

	B-3-3-C: 50 FALLOWING OUT CO Relative to Benchmark (Existing) Condition	OMPOSITE									Water	Develo	oment a	nd Disp	osition	Assum	ptions
Disposition Non-Crit -33588 0 0 42615	Crit SJI O Agriculture-SJRc O Wildlife Areas-SJRc O Urban-SJRc	0	rit 0 Conservatio 0 Conservatio 0 Groundwate 0 Tailwater Re	n of Drain S r-SJRc	pills to Wild	ge to GW-S life Areas-S	iJRc JRc	<u>8</u>	SJR Non-Co Non-Crit 0 0 0 0	Crit 0 Cr 0 Cr 0 Cr	onservation onservation roundwater ailwater Rec	of Drain Sp SJRnc	oills to Wildli	ge to GW-S ife Areas-S.	JRnc JRnc		
0	0 Wildlife Areas-SJRnc 0 Urban-SJRnc		00 Fallowing -S	JRc		Non-Crit	Crit		8000	8000 Fa	allowing-SJI	Rnc Non-Crit	Crit				
	0 EWA ues Relative to Benchmark (Exist	ing) Conditi				44000	50000		otal Disposi		,	9027		Basic Hy			
water Dev	veloped - Non Critical Years Change in Evaporation/Seepage to GW Change in Drain Spills to Wildlife Areas Change in Discharge to SJR Streams Change to Flows Upstream of Sack Dam Crop Fallowing Groundwater		Jan 0 0 0 1031 0	Feb 0 0 0 4639 0	Mar 0 0 0 5155 0	Apr 0 0 0 344 -750	May 0 0 0 687 -840	Jun 0 0 0 10653 -990	Jul 0 0 0 14433 -1200	Aug 0 0 0 12715 -900	Sep 0 0 0 344 -600	Oct 0 0 0 0 -600	Nov 0 0 0 0 -120	Dec 0 0 0 0 0 0	Jan 0 0 0 0 0	Feb 0 0 0 0 0	Total 0 0 0 50,000 -6,000
Effects to	Total SJR Flows due to Developing Water - Non Crit Change in Evaporation/Seepage to GW Change in Discharge to Wildlife Areas Change to Bischarge to SJR Streams Change to Flows Upstream of Sack Dam Crop Fallowing	tical Years	1031 0 0 0 0 173	4639 0 0 0 779	5155 0 0 0 303	-406 0 0 0 20	-153 0 0 0 40	9663 0 0 0 0 626	13233 0 0 0 849	11815 0 0 0 748	-256 0 0 0 0 58	-600 0 0 0 0	-120 0 0 0 0 0	0 0 0 0 0	0 0 0 0 0	0 0 0 0 0	44,000 0 0 3,597
Return Fl	Groundwater Total (Positive value means flow reduced) pws from Disposition of Transfer Water - Non C Incremental Return from Agricultural Transferees Incremental Return from Wildlife Area Transfereet		0 173 0 0	0 779 0 0	0 303 -52 0	0 20 -223 0	0 40 -338 0	0 626 -401 0	0 849 -578 0	0 748 -425 0	0 58 -558 0	0 0 -250 0	0 0 -67 0	0 0 -17 0	0 0 -23 0	0 0 -41 0	0 3,597 -2,972 0
	Envirnomental Water Account Beneficiaries Incremental Return from Agricultural Entities Total		0	0	0 -52	0 -223	0 -338	0 -401	0 -578	0 -425	0 -558	0 -250	0 -67	0 -17	0 -23	0 -41	0 -2,972
(Positive v	to San Joaquin River Flow Before NM Adjustn alue means flow added)	(cfs)		-779 -14	-355 -6	-244 -4	-378 -6	-1027 -17	-1427 -23	-1173 -19	-616 -10	-250 -4	-67 -1	-17 0	-23 0	-41 -1	-6,569 0
Water Dev	veloped - Critical Years Change in Evaporation/Sepage to GW Change in Discharge to SJR Streams Change in Discharge to SJR Streams Change to Flows Upstream of Sack Dam Crop Fallowing Groundwater Total		0 0 0 1031 0 1031	0 0 0 4639 0 4639	0 0 5155 0 5155	0 0 0 344 0 344	0 0 0 687 0 687	0 0 0 10653 0 10653	0 0 0 14433 0 14433	0 0 0 12715 0 12715	0 0 0 344 0 344	0 0 0 0 0 0 0 0	0 0 0 0 0 0 0 0	0 0 0 0 0 0 0 0	0 0 0 0 0 0 0	0 0 0 0 0 0 0	0 0 0 50,000 0 50,000
Effects to	SJR Flows due to Developing Water - Critical ' Change in Evaporation/Seepage to GW Change in Drain Spills to Wildlife Areas Change in Discharge to SJR Streams Change to Flows Upstream of Sack Dam Crop Fallowing Groundwater	Years	0 0 0 173 0	0 0 0 779 0	0 0 0 303 0	0 0 0 20 0	0 0 0 40 0	0 0 0 626 0	0 0 0 849 0	0 0 0 748 0	0 0 0 58 0	0 0 0 0 0	0 0 0 0 0	0 0 0 0 0	0 0 0 0 0	0 0 0 0 0	0 0 0 3,597 0
Return Fl	Total (Positive value means flow reduced) ws from Disposition of Transfer Water - Critic Incremental Return from Apricultural Transferees Incremental Return from Wildlife Area Transferee Environmental Water Account Beneficiaries Incremental Return from Apricultural Entities		173 0 0	779 0 0	303 0 0	20 0 0	40 0 0	626 0 0	849 0 0	748 0 0	58 0 0	0	0 0 0	0	0	0	3,597 0 0
Net Effect	Total to San Joaquin River Flow Before NM Adjustn alue means flow added)	nent (Acre-fee (cfs)	0	0 -779 -14	0 -303 -5	0 -20 0	0 -40 -1	0 -626 -11	0 -849 -14	0 -748 -12	0 -58 -1	0	0 0 0	0 0 0	0	0 0 0	0 -3,597 0
	rk Vernalis Flow - cfs	(CIS)	-5 Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan		ernalis
	Wet Above Normal Below Normal Dry Critical		7500 5800 2300 1900 1300	13600 7200 3200 2600 1700	15700 6200 3300 2300 1600	13600 5900 3700 2700 1800	12000 4600 3700 2200 1500	7400 2600 2100 1800 1300	5100 2100 1900 1400 1000	3100 2000 1500 1100 1000	2500 1500 1200 1000 1000	3600 2000 1900 1700 1500	3000 1800 1700 1600 1400	4600 2300 2200 2100 1500	7500 5800 2300 1900 1300	13600 7200 3200 2600 1700	
Change ir	Vernalis Flow with Action - cfs Wet Above Normal Below Normal Dry		-3 -3 -3 -3	-14 -14 0	-6 -6 -6	-4 -4 -4	-6 -6 -6	-17 0 -19 -19	-23 -23 -24 -24	-19 -19 -20 -21	-10 -10 -10 -10	-4 -4 -4	-1 -1 -1	0 0 0	0 0 0	-1 -1 0	
With-Action	Critical on Vernalis Flow - cfs Wet Above Normal Below Normal		-3 7497 5797 2297	-21 13586 7186 3200	-6 15694 6194 3294	0 13596 5896 3696	-1 11994 4594 3694	-14 7383 2600 2081	-19 5077 2077 1876	-16 3081 1981 1480	-1 2490 1490 1190	0 3596 1996 1896	0 2999 1799 1699	0 4600 2300 2200	0 7500 5800 2300	0 13599 7199 3200	
Benchma	Dry Critical rk Vernalis Water Quality - mmhos (April and M	lay values may r							1376 981	1079 984	990 999	1696 1500	1599 1400	2100 1500	1900 1300	2600 1700	
	Wet Above Normal Below Normal Dry Critical		352 404 757 880 1000	286 380 631 736 1000	310 465 690 1000 1000	269 364 465 700 700	212 334 382 700 700	310 486 700 700 700	341 509 700 700 700	460 534 700 700 700	442 588 680 772 772	359 494 510 547 595	497 657 681 708 772	432 639 657 678 859	352 404 757 880 1000	286 380 631 736 1000	
Change in	Vernalis Water Quality with Action - mmhos (A Wet Above Normal Below Normal Dry Critical	April and May va	11005 may not 1 -1 -1 -1 -1 -2	-1 -2 -6 -8 0	e of split-m 0 -1 -1 0 0	ionth opera 0 0 0 0	0 0 0 0 0 0	1 objective -1 -5 0 0	-2 -2 0 0 0	-1 -2 0 0	0 1 1 1	0 0 0 0	0 0 0 0	0 0 0 0	0 0 0 0	0 0 0 0	
With-Actie	on Vernalis Water Quality - mmhos (April and N Wet Above Normal Below Normal Drv	lay values may i							340 507 700 700	459 532 700 700	442 589 681 772	359 494 510 547	497 657 681 708	432 639 657 678	352 404 757 880	286 380 631 736	
	Crítical		998	1000	1000	700	700	700	700	700	771	595	772	859	1000	1000 New M	
Incremen	Ial Change in NM Storage due to WQ Release C Wet Above Normal Below Normal Dry Critical	Change - Acre-fe	et Jan 0 0 0 0	Feb 0 0 0 386	Mar 0 0 22 39	Apr 0 0 -9 8	May 0 0 -25 15	Jun 0 87 87 223	Jul 0 21 21 297	Aug 0 49 108 213	Sep 0 0 0 0	Oct 0 0 0 0	Nov 0 0 0 0	Dec 0 0 0 0	Jan 0 0 0 0	Feb 0 0 0 0	Total 0 158 204 1.180
Incremen	al Change in NM Storage due to Vernalis Flow Wet Above Normal Below Normal Dry	Release Change	e - Acre-feet 0 0 0 0	0 0 -779 -779	0 0 0 0	0 0 0 0	0 0 0	0 -1027 0 0	0 0 0	0 0 0	0 0 0 0	0 0 0 0	0 0 0 0	0 0 0 0	0 0 0 0	0 0 -41 -41	0 -1,027 -820 -820
Net Increi	Critical nental Change in NM Storage due to Vernalis F Wet Above Normal Below Normal Dry	low & Quality R	0 0 0	0 0 -779 -779	0 0 0 22	0 0 0 -9	0 0 0 -25	0 -1027 87 87	0 0 21 21	0 0 49 108	0 0 0 0	0 0 0 0	0 0 0 0	0 0 0 0	0 0 0 0	0 0 -41 -41	0 -1,027 -662 -616
Total Pote	Critical model of the supply impact w/o NM Adjustments	- Acre-feet	0 Jan	386 Feb	39 Mar	8 Apr	15 May	223 Jun	297 Jul	213 Aug	0 Sep	0 Oct	0 Nov	0 Dec	0 Project Jan	0 t Delta S Feb	1,180 Supply Total
	Wet Above Normal Below Normal Dry Critical		0 0 0 0 0	-273 -273 -273 -273 -273 -273	0 0 -124 -303	Apr 0 0 -43 -20	-378 -40	0 -1027 -1027 -1027 -626	-1427 -1427 -1427 -1427 -1427 -849	Aug -1173 -1173 -1173 -1173 -748	0 0 -616 -58	0 0 -242 0	000000000000000000000000000000000000000	0 0 0 0 0	Jan 0 0 0 0	-14 -14 -14 -14 0	-2,886 -3,914 -3,914 -5,316 -3,424
New Melo	Res Adjustments - Acre-feet (positive means in Wet Above Normal Below Normal Dry	ncrease in suppl		-779 0 273 273	-303 0 0 -8	-20 0 0 3	-40 0 0 25	-626 0 1027 -87 -87	-849 0 -21 -21	-748 0 -49 -108	-58 0 0 0		0 0 0	0 0 0	0 0 0	0 0 14 14	-3,424 0 1,027 129 91
Incremen	Critical al Change in Project Delta Supply due to Actio Wet Above Normal Below Normal	n - Acre-feet	00000	-386 -273 -273 0	-39 0 0	-8 0 0	-15 0 0	-223 0 0 -1114	-297 -1427 -1427 -1448	-213 -1173 -1173 -1222	0 0 0	0 0 0	0 0 0	0 0 0	0 0 0 0	0 -14 -14 0	-1,180 -2,886 -2,886 -3,784
Moví	Dry Critical		0 0	0 -1165	-132 -342	-40 -28	-353 -55	-1114 -849	-1448 -1146	-1281 -960	-616 -58	-242 0	0	0	0	0	-5,225 -4,604

	C-1-0-S: 130 CONSERVATION elative to Benchmark (Existing) Conditior											Water	Develop	oment a	nd Disp	osition	Assum	ptions
Disposition Non-Crit 0 0 0	Crit 0 Agriculture-SJRc 0 Wildlife Areas-SJRc 0 Urban-SJRc	SJR Continuity Non-Crit 0 0 -6000	0 Co 0 Gr	onservatior oundwater		ills to Wild			<u>s</u>	UR Non-Co Non-Crit 0 0 0	Crit 0 Cr 0 Cr 0 Cr	onservation roundwater	of Drain Sp SJRnc	tion/Seepaç bills to Wildli	ge to GW-S ife Areas-S.	JRnc JRnc		
0 0 0	0 Agriculture-SJRnc 0 Wildlife Areas-SJRnc 0 Urban-SJRnc	15465 42000	42000 Fa	llowing -S.		lc	Non-Crit	Crit		900 8000	8000 Fa	ailwater Rec allowing-SJI	Rnc Non-Crit	tnc Crit				
	o EWA s Relative to Benchmark (Exi	sting) Con			ped Water:		60365	50000		otal Dispos			0		Basic Hy			
C C C C C C C C C C C C C C C C C C C	oped - Non Critical Years hange in Evaporation/Seepage to GW hange in Drain Spills to Wildlife Areas hange in Discharge to SJR Streams hange to Flows Upstream of Sack Dam rop Fallowing roundwater			Jan 0 141 0 1031 0	Feb 0 1054 45 4639 0	Mar 0 1054 90 5155 0	Apr 0 1757 90 344 -750	May 0 2285 99 687 -840	Jun 0 2285 144 10653 -990	Jul 0 2285 162 14433 -1200	Aug 0 2285 162 12715 -900	Sep 0 1406 72 344 -600	Oct 0 914 27 0 -600	Nov 0 0 9 0 -120	Dec 0 0 0 0 0	Jan 0 0 0 0 0	Feb 0 0 0 0 0	Total 0 15,465 900 50,000 -6,000
Effects to S. C C C C C C C C C	otal JR Flows due to Developing Water - Non (hange in Evaporation/Seepage to GW hange in Drain Spills to Wildlife Areas hange in Discharge to SJR Streams hange to Flows Upstream of Sack Dam rop Fallowing	Critical Years		1172 0 141 0 173	5739 0 1054 0 779	6299 0 1054 0 303	1441 0 1757 0 20	2231 0 2285 0 40	12092 0 2285 0 626	15680 0 2285 0 849	14261 0 2285 0 748	1222 0 1406 0 58	341 0 914 0	-111 0 0 0 0 0	0 0 0 0	0 0 0 0 0	000000000000000000000000000000000000000	60,365 0 15,465 0 3,597
T Return Flow	roundwater otal (Positive value means flow reduced) s from Disposition of Transfer Water - No		s	0 314	0 1834	0 1358	0 1778	0 2325	0 2911	0 3133	0 3032	0 1464	0 914	0	0	0	0	0 19,062
Ir <u>E</u> Ir	cremental Return from Agricultural Transfere cremental Return from Wildlife Area Transfere nvirnomental Water Account Beneficiaries cremental Return from Agricultural Entities			0	0	0 0	0 0	0	0	0 0	0	0	0	0	0 0	0	0 0	0
Net Effect to	otal • San Joaquin River Flow Before NM Adju: • means flow added)	stment (Acr (cfs)	e-feet)	0 -314 -5	0 -1834 -33	0 -1358 -22	0 -1778 -30	0 -2325 -38	0 -2911 -49	0 -3133 -51	0 -3032 -49	0 -1464 -25	0 -914 -15	0 0 0	0 0 0	0 0 0	0 0 0	0 -19,062 0
Water Devel C C C C C C C C	oped - Critical Years hange in Evaporation/Seepage to GW hange in Drain Spills to Wildlife Areas hange to Istrage to SJR Streams hange to Flows Upstream of Sack Dam rop Fallowing roundwater			0 0 0 1031 0	0 0 0 4639 0	0 0 0 5155 0	0 0 0 344 0	0 0 0 687 0	0 0 0 10653 0	0 0 0 14433 0	0 0 0 12715 0	0 0 0 344 0	0 0 0 0 0 0 0	0 0 0 0 0 0 0	0 0 0 0 0 0	0 0 0 0 0 0 0	0 0 0 0 0 0 0	0 0 0 50,000 0
Effects to S. C C C C C C C C	otal IR Flows due to Developing Water - Critic hange in Evaporation/Seepage to GW hange in Drain Spills to Wildlife Areas hange to Starage to SJR Streams hange to Flows Upstream of Sack Dam rop Fallowing roundwater	al Years		1031 0 0 0 173 0	4639 0 0 0 779 0	5155 0 0 0 303 0	344 0 0 0 20 0	687 0 0 0 40 0	10653 0 0 0 626 0	14433 0 0 0 849 0	12715 0 0 0 748 0	344 0 0 0 58 0	0 0 0 0 0 0	0 0 0 0 0 0	0 0 0 0 0 0	0 0 0 0 0 0	0 0 0 0 0 0	50,000 0 0 3,597 0
Return Flow Ir Ir Ir E Ir	otal (Positive value means flow reduced) s from Disposition of Transfer Water - Cri coremental Return from Agricultural Transfer cremental Return from Wildlife Area Transfe nvimomental Water Account Beneficiaries cremental Return from Agricultural Entities tal	ees rrees		173 0 0 0	779 0 0 0	303 0 0 0	20 0 0 0	40 0 0 0	626 0 0 0	849 0 0 0	748 0 0 0	58 0 0 0	0 0 0 0	0 0 0 0	0 0 0 0	0 0 0 0	0 0 0 0	3,597 0 0 0
Net Effect to (Positive value)	San Joaquin River Flow Before NM Adjust e means flow added)	stment (Acr (cfs)	e-feet)	-173 -3	-779 -14	-303 -5	-20 0	-40 -1	-626 -11	-849 -14	-748 -12	-58 -1	0 0	0 0	0	0	0 0 Ve	-3,597 0 ernalis
W A B D	Vernalis Flow - cfs /et bove Normal elow Normal fy rij cal			Jan 7500 5800 2300 1900 1300	Feb 13600 7200 3200 2600 1700	Mar 15700 6200 3300 2300 1600	Apr 13600 5900 3700 2700 1800	May 12000 4600 3700 2200 1500	Jun 7400 2600 2100 1800 1300	Jul 5100 2100 1900 1400 1000	Aug 3100 2000 1500 1100 1000	Sep 2500 1500 1200 1000 1000	Oct 3600 2000 1900 1700 1500	Nov 3000 1800 1700 1600 1400	Dec 4600 2300 2200 2100 1500	Jan 7500 5800 2300 1900 1300	Feb 13600 7200 3200 2600 1700	inuno
Change in V W A	ernalis Flow with Action - cfs /et bove Normal elow Normal			-5 -5 -5 -5	-33 -33 0	-22 -22 -22 -25	-30 -30 -30 -42	-38 -38 -38 -52	-49 0 -66 -66	-51 -51 -69 -69	-49 -49 -63 -63	-25 -25 -25 -25	-15 -15 -15 -15	0 0 0	000000000000000000000000000000000000000	000000000000000000000000000000000000000	0 0 0	
C With-Action W A	Vernalis Flow - cfs Vernalis Flow - cfs Vet bove Normal elow Normal			-3 7495 5795 2295	-21 13567 7167 3200	-6 15678 6178 3278	0 13570 5870 3670	-1 11962 4562 3662	-14 7351 2600 2034	-19 5049 2049 1831	-16 3051 1951 1437	-1 2475 1475 1175	0 3585 1985 1885	0 3000 1800 1700	4600 2300 2200	0 7500 5800 2300	0 13600 7200 3200	
D		d May values m	nay not be	1895 1297	2600 1679 e of split-m	2275 1594	2658 1800 ations when	2148 1499	1734 1286	1331 981	1037 984	975 999	1685 1500	1600 1400	2100 1500	1900 1300	2600 1700	
W A B D C	/et bove Normal elow Normal ry ritical			352 404 757 880 1000	286 380 631 736 1000	310 465 690 1000 1000	269 364 465 700 700	212 334 382 700 700	310 486 700 700 700	341 509 700 700 700	460 534 700 700 700	442 588 680 772 772	359 494 510 547 595	497 657 681 708 772	432 639 657 678 859	352 404 757 880 1000	286 380 631 736 1000	
W A B D	ernalis Water Quality with Action - mmho: /et bove Normal elow Normal ry ritical	s (April and Ma	ıy values	may not t -1 -1 -2 -2 -2	e reflective -3 -5 -15 -18 0	of split-m -1 -2 -3 0 0	00000000000000000000000000000000000000	ations whe -3 -7 -8 -5 0	n objective -4 -17 0 0 0	s control) -6 -10 0 0 0	-7 -9 0 0	-6 -8 -8 -7 0	-2 -3 -3 0	0 0 0 0	0 0 0 0	0 0 0 0	0 0 0 0	
With-Action W A B D	Vernalis Water Quality - mmhos (April and /et bove Normal elow Normal	d May values n	nay not be							335 499 700 700 700	453 525 700 700 700	436 581 672 765 771	357 491 507 544 595	497 657 681 708 772	432 639 657 678 859	352 404 757 880 1000	286 380 631 736 1000	
W A B D C	ritical			Jan 0 0 0 0	Feb 0 0 0 386	Mar 0 0 173 39	Apr 0 0 726 8	May 0 0 860 15	Jun 0 1036 1036 223	Jul 0 1097 1097 297	Aug 0 863 863 213	Sep 0 0 0 0	Oct 0 0 0 0	Nov 0 0 0 0	Dec 0 0 0 0	Jan 0 0 0 0	New M Feb 0 0 0 0 0	elones Total 0 2,995 4,755 1,180
W A B D	Change in NM Storage due to Vernalis Fle /et bove Normal elow Normal ry ritical	ow Release Ch	ange - Ac	re-feet 0 0 0 0	0 -1834 -1834 0	0 0 0	0 0 0 0	0 0 0 0	0 -2911 0 0 0	0 0 0 0	0 0 0 0	0 0 0 0	0 0 0 0	0 0 0	0 0 0 0	0 0 0 0	0 0 0	0 -2,911 -1,834 -1,834 0
Net Increme W A B D	ntal Change in NM Storage due to Vernali /et bove Normal elow Normal	s Flow & Quali	ty Releas			0 0 0 173 39	0 0 726 8	0 0 0 860 15	0 -2911 1036 1036 223	0 0 1097 1097 297	0 0 863 863 213	0 0 0 0 0	0 0 0 0 0	0 0 0 0 0	0 0 0 0	0 0 0 0	0 0 0 0 0	0 -2,911 1,161 2,921 1,180
Total Potent W A	ial Delta supply Impact w/o NM Adjustme /et bove Normal elow Normal	nts - Acre-feet		Jan 0 0 0	Feb -642 -642 -642 -642	Mar 0 0 -475	Apr 0 0 -311	May 0 0 -2325	Jun 0 -2911 -2911 -2911	Jul -3133 -3133 -3133 -3133	Aug -3032 -3032 -3032 -3032	Sep 0 0 0 -1464	Oct 0 0 -884	Nov 0 0 0	Dec 0 0 0		E Delta S	
C New Melone W A B	ritical s Adjustments - Acre-feet (positive mean: /et bove Normal elow Normal	s increase in si	upply)	0 0 0	-779 0 642	-303 0 0	-20 0 0	-40 0 0	-626 0 2911 -1036	-849 0 0 -1097	-748 0 0 -863	-58 0 0 0	0 0 0	0 0 0	0 0 0	0 0 0	0 0 0	-3,424 0 2,911 -2,353
Incremental W A	ritical Change in Project Delta Supply due to Ac /et bove Normal elow Normal	tion - Acre-fee	t	0 0 0 0 0	642 -386 -642 -642 0 0	-61 -39 0 0 -536	-254 -8 0 0 0 -565	-860 -15 0 0 -3185	-1036 -223 0 0 -3947 -3947	-1097 -297 -3133 -3133 -4230 -4230	-863 -213 -3032 -3032 -3895 -3895	0 0 0 0 -1464	0 0 0 0 -884	0 0 0 0 0	0 0 0 0 0	0 0 0 0 0	0 0 0 0 0	-3,528 -1,180 -6,807 -6,807 -12,072 -18,706
	ritical			0	-1165	-536 -342	-28	-3185 -55	-849	-4230 -1146	-3895 -960	-1464 -58	-884 0	0	0	0	0	-18,706 -4,604

	C-1-1-C: 130 CONSERVATION Relative to Benchmark (Existing) Condition		COMPOSITE	1							Water	Develo	oment a	nd Disp	osition	Assum	ptions
isposition Non-Crit	Crit	SJR Continuity Non-Crit	Crit					5	JR Non-Co Non-Crit	Crit							
34738 17823	0 Agriculture-SJRc 40000 Wildlife Areas-SJRc	0	0 Conserva	tion of Evapo tion of Drain \$	ration/Seepa Spills to Wild	age to GW-S dlife Areas-S	SJRc SJRc		0	0 C	onservation	of Drain Sp		ge to GW-S ife Areas-S.			
0 -7385 9497	0 Urban-SJRc 0 Agriculture-SJRnc 0 Wildlife Areas-SJRnc	-6000 15465 42000	0 Groundw 0 Tailwater 42000 Fallowing	Recapture-S.	IRc				0 900 8000	0 Ta	roundwater ailwater Rec allowing-SJI	apture-SJF	tnc				
0	0 Urban-SJRnc 0 EWA	42000		eloped Water		Non-Crit 60365	Crit 50000	т	otal Dispos		allowing-001	Non-Crit 54673	Crit 40000				
	es Relative to Benchmark (Exi eloped - Non Critical Years	isting) Cor			Mar	Apr	May	Jun	Jul	Aug	Sep	Oct		Basic Hy	/drologi _{Jan}	Feb	unting Tota
	Change in Evaporation/Seepage to GW Change in Drain Spills to Wildlife Areas			0 0	0	0	0	0	0	0	0	0	0	0	0	0	104
	Change in Discharge to SJR Streams Change to Flows Upstream of Sack Dam			0 45	1054 90	1757 90	2285 99	2285 144	2285 162	2285 162	1406 72	914 27	0 9	0 0	0 0	0 0	15,46 90
	Crop Fallowing Groundwater			0 0	5155 0	344 -750	687 -840	10653 -990	14433 -1200	12715 -900	344 -600	-600	0 -120	0	0	0	50,00 -6,00
ects to	Total SJR Flows due to Developing Water - Non	Critical Years	117	2 5739 0 0	6299	1441 0	2231 0	12092	15680 0	14261 0	1222	341	-111	0	0	0	60,36
	Change in Evaporation/Seepage to GW Change in Drain Spills to Wildlife Areas Change in Discharge to SJR Streams			0 0	0 1054	0 1757	0 2285	0 2285	0 2285	0 2285	0 1406	0 914	0	0	0	0	15,46
	Change to Flows Upstream of Sack Dam Crop Fallowing			0 0	0 303	0 20	0 40	0 626	0 849	0 748	0	0	0	0	0	0	3,59
	Groundwater Total (Positive value means flow reduced)		31	D 0	0 1358	0 1778	0 2325	0 2911	0 3133	0 3032	0 1464	0 914	0 0	0 0	0 0	0 0	19,06
	ws from Disposition of Transfer Water - No Incremental Return from Agricultural Transfer	rees		0 0	53	231	349	415	598	440	577	259	70	18	24	42	3,07
	Incremental Return from Wildlife Area Transfe Envirnomental Water Account Beneficiaries Incremental Return from Agricultural Entities	erees		0 0 0 0	33 0	5	0	0	0	3026 0	165 0	-17 0	282	66 0	220	252	4,03
	Total to San Joaquin River Flow Before NM Adju	ustment (Ac		0 0	87 -1271	236 -1541	349 -1976	415 -2496	598 -2535	3465 433	742 -722	241 -673	352 352	83 83	243 243	295 295	7,10 -11,95
sitive va	lue means flow added)	(cfs			-21	-26	-32	-42	-41	7	-12	-11	6	1	4	5	
	eloped - Critical Years Change in Evaporation/Seepage to GW			0 0	0	0	0	0	0	0	0	0	0	0	0	0	
	Change in Drain Spills to Wildlife Areas Change in Discharge to SJR Streams				0	0	0	0	0	0	0	0	0	0	0	0	
	Change to Flows Upstream of Sack Dam Crop Fallowing Groundwater		103	0 0 1 4639 0 0	0 5155 0	0 344 0	0 687 0	0 10653 0	0 14433 0	0 12715 0	0 344 0	0 0 0	0 0 0	0 0 0	0 0 0	0 0 0	50,00
	Groundwater Total SJR Flows due to Developing Water - Critic	cal Years	103		5155	344	687	10653	14433	12715	344	0	0	0	0	0	50,00
	Change in Evaporation/Seepage to GW Change in Drain Spills to Wildlife Areas			0 0 0 0	0	0 0	0 0	0	0	0	0	0	0	0	0	0	
	Change in Discharge to SJR Streams Change to Flows Upstream of Sack Dam			0 0	0 0	0	0	0 0	0 0	0 0	0	0	0	0	0	0	
	Crop Fallowing Groundwater Total (Positive value means flow reduced)			0 0	303 0 303	20 0 20	40 0 40	626 0	849 0 849	748 0 748	58 0	0	0	0	0	0	3,59
urn Flo	Total (Positive value means flow reduced) ws from Disposition of Transfer Water - Cr Incremental Return from Agricultural Transfer		17	3 779 D 0	303 0	20 0	40 0	626 0	849 0	748	58 0	0	0	0	0	0	3,59
	Incremental Return from Wildlife Area Transfe Envirnomental Water Account Beneficiaries	erees		0 0	75	11	õ	Ő	0	6791	370	-39	634	148	493	567	9,04
	Incremental Return from Agricultural Entities Total			D 0 D 0	0 75	0 11	0	0 0	0 0	0 6791	0 370	0 -39	0 634	0 148	0 493	0 567	9,04
	to San Joaquin River Flow Before NM Adju lue means flow added)	ustment (Ac (cfs	re-feet) -17 s) -		-228 -4	-9 0	-40 -1	-626 -11	-849 -14	6043 98	312 5	-39 -1	634 11	148 2	493 8	567 10	5,45 ernalis
	< Vernalis Flow - cfs Wet		Ja 750		Mar 15700	Apr 13600	May 12000	Jun 7400	Jul 5100	Aug 3100	Sep 2500	Oct 3600	Nov 3000	Dec 4600	Jan 7500	Feb 13600	inana
	Above Normal Below Normal		580 230	0 7200 0 3200	6200 3300	5900 3700	4600 3700	2600 2100	2100 1900	2000 1500	1500 1200	2000 1900	1800 1700	2300 2200	5800 2300	7200 3200	
	Dry Critical		190 130		2300 1600	2700 1800	2200 1500	1800 1300	1400 1000	1100 1000	1000 1000	1700 1500	1600 1400	2100 1500	1900 1300	2600 1700	
	Vernalis Flow with Action - cfs Wet Above Normal		-		-21 -21	-26 -26	-32 -32	-42 0	-41 -41	7	-12 -12	-11 -11	6	1	4	5	
	Below Normal Dry		-	5 0	-21 -23	-26 -38	-32 -32 -47	-62 -62	-41 -64 -64	37 38	-12 -12 -12	-11 -11	6	1	4 4 4	0	
	Critical n Vernalis Flow - cfs		-		-2	0	-1	-14	-19	199	5	-1	11	2	8	15	
	Wet Above Normal		749 579	5 7167	15679 6179	13574 5874	11968 4568	7358 2600	5059 2059	3107 2007	2488 1488	3589 1989	3006 1806	4601 2301	7504 5804	13605 7205	
	Below Normal Dry		229 189	5 2600	3279 2277 1598	3674 2662 1800	3668 2153 1499	2038 1738 1286	1836 1336	1537 1138	1188 988	1889 1689	1706 1606	2201 2101	2304 1904	3200 2600	
nchmar	Critical < Vernalis Water Quality - mmhos (April an Wet	d May values r	129 nay not be reflec 35	tive of split-r					981 341	1199 460	1005 442	1499 359	1411 497	1502 432	1308 352	1715 286	
	Above Normal Below Normal		40 75	4 380	465 690	364 465	334 382	486 700	509 700	534 700	588 680	494 510	657 681	639 657	404 757	380 631	
	Dry Critical		88 100	0 1000	1000 1000	700 700	700 700	700 700	700 700	700 700	772 772	547 595	708 772	678 859	880 1000	736 1000	
	Vernalis Water Quality with Action - mmho Wet Above Normal	os (April and Ma	ay values may no - -	1-3	ve of split-n -1 -2	nonth oper -2 -4	ations whe -3 -7	n objective -4 -15	s control) -6 -11	6 10	-6 -8	-2 -3	1	0	0	0	
	Above Normal Below Normal Dry			2 -15	-2 -3 0	-4 -6 -3	-7 -8 -5	-15 0 0	-11 0 0	10 0 0	-8 -8 -7	-3 -3 -3	1 1 1	0	1	1 2 3	
	Critical n Vernalis Water Quality - mmhos (April an	nd May values r		2 0 tive of split-	0	0 rations whe	0 en objective	0 es control)	0	0	2	0	3	0	1	0	
	Wet Above Normal		35 40	1 283 3 375	309 463	267 360	209 327	306 471	335 498	467 543	436 581	357 491	498 659	432 639	352 405	286 381	
	Below Normal Dry Critical		75 87	7 718	688 1000	459 697	374 695	700 700 700	700 700 700	700 700	672 765	507 545	682 709	658 678	757 880	634 738	
	Critical	Ch	99		1000	700	700	700	700	700	773	595	775	859		1000 New M	
	al Change in NM Storage due to WQ Release Wet Above Normal	se Change - Ac		n Feb 0 0 0 0	Mar 0 0	Apr 0 0	May 0 0	Jun 0 0	Jul O O	Aug 0 0	Sep 0 0	Oct 0 0	Nov 0 0	Dec 0 0	Jan 0 0	Feb 0 0	Tota
	Above Normal Below Normal Dry			D 0 D 0	0 0 130	0 0 735	0 901	1176 1176	1382 1382	-1829 -1890	0	0	0	0	0	0	72 2,43
ementa	Critical Il Change in NM Storage due to Vernalis Fl	low Release Ch		0 386	-97	-12	15	223	297	-6209	0	0	0	0	0	-267	-5,66
	Wet Above Normal			0 0 0 0	0	0	0	0 -2496	0	0	0	0	0	0	0	0	-2,49
	Below Normal Dry			0 -1834 0 -1834	0	0	0	0	0	0	0	0	0	0	0	295 295	-1,53 -1,53
Increm	Critical ental Change in NM Storage due to Vernal Wet	lis Flow & Qual	lity Release Char	D 0 nge-Acre-fee	0 9t	0	0	0	0	0	0	0	0	0	0	0	
	Above Normal Below Normal			0 0 0 -1834	0	0	0	-2496 1176	0 1382	0 -1829	0	0	0	0	0	0 295	-2,49 -81
	Dry Critical			0 -1834 0 386	130 -97	735 -12	901 15	1176 223	1382 297	-1890 -6209	0	0	0	0	0	295 -267	89 -5,66
	ntial Delta supply Impact w/o NM Adjustme	ents - Acre-feet			Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Tot
	Wet Above Normal			0 -642 0 -642	0	0	0	0 -2496	-2535 -2535	433 433	0	0	0	0	0	103 103	-2,64 -5,13
	Below Normal Dry Critical			0 -642 0 -642	0 -445	-270	-1976	-2496 -2496	-2535 -2535	433 433	-722	0 -651	0	0	0	103 103	-5,13
v Melor	Critical les Adjustments - Acre-feet (positive mean Wet	is increase in s	supply)	D -779	-228	-9 0	-40 0	-626 0	-849 0	6043 0	312 0	-39 0	634 0	0	0	567 0	4,98
	wet Above Normal Below Normal			D 0 D 0 D 642	0	0	0	2496 -1176	0 0 -1382	0 0 1829	0	0	0	0	0	0 -103	2,49 -19
	Dry Critical			0 642 0 -386	-46 97	-257 12	-901 -15	-1176 -223	-1382 -297	1890 6209	0	0	0	0	0	-103 -103 267	-1,33 5,66
	I Change in Project Delta Supply due to A	ction - Acre-fee		0 -642	0	0	0	0	-2535	433	0	0	0	0	0	103	-2,64
	Above Normal Below Normal			0 -642	0	0	0 0	0 -3672	-2535 -3917	433 2262	0	0	0	0	0	103 0	-2,64 -5,32
	Dry Critical			0 0 0 -1165	-490 -131	-527 4	-2877 -55	-3672 -849	-3917 -1146	2323 12252	-722 312	-651 -39	0 634	0	0	0 834	-10,533 10,650
<u></u> 2	004							17									

Study: All Values	C-1-2-C: 130 CONSERVATION A Relative to Benchmark (Existing) Condition	AGRICUL	TURE C	омро	SITE							Water	Develo	oment a	nd Disp	osition	Assum	ptions
Disposition Non-Crit 96412 0	Crit 50000 Agriculture-SJRc 0 Wildlife Areas-SJRc	SJR Continuity Non-Crit 0 0	Crit 0 Cor 0 Cor	nservatior	n of Evapora n of Drain Sp	tion/Seepa vills to Wild	ge to GW-S life Areas-S	JRc JRc	<u>s</u>	SJR Non-Co Non-Crit 0 0	Crit 0 Cr 0 Cr	onservation	of Drain Sp	tion/Seepaç bills to Wildli	ge to GW-S ife Areas-S.	JRnc JRnc		
0 -7385 0	0 Urban-SJRc 0 Agriculture-SJRnc 0 Wildlife Areas-SJRnc	-6000 15465 42000			capture-SJR	lc				0 900 8000	0 Ta	roundwater ailwater Rec allowing-SJ	apture-SJF Rnc					
0	0 Urban-SJRnc 0 EWA			al Develo	ped Water:		Non-Crit 60365	Crit 50000	т	otal Disposi	ition:		Non-Crit 89027	Crit 50000				
Water Dev	les Relative to Benchmark (Exis eloped - Non Critical Years	sting) Con	dition	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Basic Hy	Jan	Feb	Total
	Change in Evaporation/Seepage to GW Change in Drain Spills to Wildlife Areas Change in Discharge to SJR Streams			0 0 141	0 0 1054	0 0 1054	0 0 1757	0 0 2285	0 0 2285	0 0 2285	0 0 2285	0 0 1406	0 0 914	0 0 0	0 0 0	0 0 0	0 0 0	0 0 15,465
	Change to Flows Upstream of Sack Dam Crop Fallowing Groundwater			0 1031	45 4639 0	90 5155 0	90 344	99 687	144 10653	162 14433	162 12715	72 344 -600	27 0 -600	9	0	0 0	0	900 50,000
	Total SJR Flows due to Developing Water - Non Ci	ritical Years		0 1172	5739	6299	-750 1441	-840 2231	-990 12092	-1200 15680	-900 14261	1222	341	-120 -111	0	0	0	-6,000 60,365
	Change in Evaporation/Seepage to GW Change in Drain Spills to Wildlife Areas Change in Discharge to SJR Streams			0	0	0	0 0 1757	0	0	0	0	0	0 0 914	0 0 0	0 0 0	0	0 0 0	0
	Change to Block Dame Change to SJK Streams Change to Flows Upstream of Sack Dam Crop Fallowing			141 0 173	1054 0 779	1054 0 303	1757 0 20	2285 0 40	2285 0 626	2285 0 849	2285 0 748	1406 0 58	914 0 0	0	0	0 0 0	0	15,465 0 3,597
	Groundwater Total (Positive value means flow reduced) ws from Disposition of Transfer Water - Non	Critical Veer		0 314	0 1834	0 1358	0 1778	0 2325	0 2911	0 3133	0 3032	0 1464	0 914	0 0	0	0 0	0	0 19,062
	Incremental Return from Agricultural Transferee Incremental Return from Wildlife Area Transfere	es	3	0 0	0	148 0	641 0	969 0	1151 0	1659 0	1220 0	1602 0	718 0	193 0	49 0	66 0	117 0	8,532 0
	Environmental Water Account Beneficiaries Incremental Return from Agricultural Entities Total			0	0	0 148	0 641	0 969	0 1151	0 1659	0 1220	0 1602	0 718	0 193	0 49	0 66	0 117	0 8.532
Net Effect	to San Joaquin River Flow Before NM Adjust alue means flow added)	tment (Aci (cfs	re-feet))	-314 -5	-1834 -33	-1209 -20	-1136 -19	-1356 -22	-1760 -30	-1474 -24	-1812 -29	138	-196 -3	193	49 49 1	66 1	117	-10,530 0
Water Dev	eloped - Critical Years Change in Evaporation/Seepage to GW			0	0	0	0	0	0	0	 0	0	0		0	0	0	0
	Change in Drain Spills to Wildlife Areas 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 Crop Fallowing Groundwater			0 1031	0 4639	0 5155	0 344 0	0 687	0 10653	0 14433	0 12715	0 344 0	0 0	0	0 0	0 0	0	0 50,000
	Total SJR Flows due to Developing Water - Critica	I Years		0 1031	0 4639	0 5155	344	0 687	0 10653	0 14433	0 12715	344	0	0	0	0	0	0 50,000
	Change in Evaporation/Seepage to GW Change in Drain Spills to Wildlife Areas			0 0	0 0	0 0 0	0 0 0	0 0	0 0	0 0	0 0	0 0	0 0	0	0 0	0 0	0 0	0 0 0
	Change in Discharge to SJR Streams Change to Flows Upstream of Sack Dam Crop Fallowing			0 173	0 779	0 303	0 20	0 40	0 626	0 849	0 748	0 58	0	0	0	0	0	0 3,597
	Groundwater Total (Positive value means flow reduced) ws from Disposition of Transfer Water - Criti			0 173	0 779	0 303	0 20	0 40	0 626	0 849	0 748	0 58	0	0	0 0	0	0 0	0 3,597
	Incremental Return from Agricultural Transferen Incremental Return from Wildlife Area Transferen	es		0 0	0 0	77 0	333 0	503 0	597 0	861 0	633 0	831 0	372 0	100 0	25 0	34 0	61 0	4,425 0
	Envirnomental Water Account Beneficiaries Incremental Return from Agricultural Entities Total			0	0	0 77	0 333	0 503	0 597	0 861	0 633	0 831	0 372	0 100	0 25	0 34	0 61	0 4.425
Net Effect (Positive va	to San Joaquin River Flow Before NM Adjust alue means flow added)	tment (Aci (cfs	re-feet))	-173 -3	-779 -14	-226 -4	333 312 5	462 8	-30 0	12 0	-115 -2	773	372 372 6	100 100 2	25 25 0	34 34 1	61 1	828 0
	k Vernalis Flow - cfs Wet			Jan 7500	Feb 13600	Mar 15700	Apr 13600	May 12000	Jun 7400	Jul 5100	Aug 3100	Sep 2500	Oct 3600	Nov 3000	Dec 4600	Jan 7500	Feb 13600	ernalis
	Wet Above Normal Below Normal			7500 5800 2300	7200 3200	6200 3300	13600 5900 3700	4600 3700	2600 2100	2100 2100 1900	2000 1500	2500 1500 1200	2000 1900	3000 1800 1700	4600 2300 2200	7500 5800 2300	13600 7200 3200	
	Dry Critical			1900 1300	2600 1700	2300 1600	2700 1800	2200 1500	1800 1300	1400 1000	1100 1000	1000 1000	1700 1500	1600 1400	2100 1500	1900 1300	2600 1700	
Change In	Vernalis Flow with Action - cfs Wet Above Normal			-5 -5	-33 -33	-20 -20	-19 -19	-22 -22	-30 0	-24 -24	-29 -29	2	-3 -3	3	1 1	1	2	
	Below Normal Dry Critical			-5 -5	0	-20 -23 -4	-19 -32	-22 -38 7	-54 -54	-55 -55	-51 -48	2	-3 -3	3	1 1 0	1	0	
With-Actic	wet			-3 7495	-21 13567	15680	5 13581	, 11978	-5 7370	-5 5076	-5 3071	13 2502	6 3597	2 3003	4601	1 7501	1 13602	
	Above Normal Below Normal Drv			5795 2295 1895	7167 3200 2600	6180 3280 2277	5881 3681 2668	4578 3678 2162	2600 2046 1746	2076 1845 1345	1971 1449 1052	1502 1202 1002	1997 1897 1697	1803 1703 1603	2301 2201 2101	5801 2301 1901	7202 3200 2600	
	Critical k Vernalis Water Quality - mmhos (April and	May values n	nay not be	1297	1679	1596	1805	1507	1295	995	995	1013	1506	1402	1500	1301	1701	
	Wet Above Normal Below Normal			352 404 757	286 380 631	310 465 690	269 364 465	212 334 382	310 486 700	341 509 700	460 534 700	442 588 680	359 494 510	497 657 681	432 639 657	352 404 757	286 380 631	
	Dry Critical			880 1000	736 1000	1000 1000	700 700	700 700	700 700	700 700	700 700	772 772	547 595	708 772	678 859	880 1000	736 1000	
Change in	Vernalis Water Quality with Action - mmhos Wet Above Normal	(April and Ma	ay values n	nay not b -1 -1	e reflective -3 -5	of split-m -1 -2	ionth opera -2 -4	ations when -3 -6	n objective -4 -13	es control) -6 -12	-8 -11	-7 -11	-2 -3	0	0 0	0	0	
	Below Normal Dry			-2 -2	-15 -18	-3 0	-6 -3	-8 -5	0	0	0 0	-11 -9	-2 -2	0	0	0	0 1	
	Critical n Vernalis Water Quality - mmhos (April and Wet	May values r	nay not be	-2 reflectiv 351	0 e of split-m 283	0 onth oper 309	0 ations whe 267	0 n objective 209	0 es control) 306	0 335	0 453	-1 435	0 357	0 497	0 432	0 352	0 286	
	Above Normal Below Normal			403 755	375 617	463 687	360 459	327 374	473 700	497 700	523 700	578 669	491 507	657 681	639 657	404 757	380 632	
	Dry Critical			877 998	718 1000	1000 1000	697 700	695 700	700 700	700 700	700 700	763 771	545 595	707 772	678 859	880 1000	736 1000 New M	lonos
	al Change in NM Storage due to WQ Release Wet	Change - Ac	re-feet	Jan 0	Feb 0	Mar 0	Apr 0	May 0	Jun 0	Jul 0	Aug 0	Sep 0	Oct 0	Nov 0	Dec 0	Jan 0	Feb 0	Total 0
	Above Normal Below Normal			0	0 0	0	0	0	0 1425 1425	0 1888	0 1332	0 0	0	0 0	0 0	0	0	0 4,645 6 449
Increment	Dry Critical al Change in NM Storage due to Vernalis Flor	w Release Ch	nange - Acr	0	386	222 47	776 -12	975 30	1425 260	1888 350	1163 223	0	0	0	0	0	14	6,449 1,296
	Wet Above Normal			0	0 0	0	0	0	-1760	0	0	0	0	0	0	0	0 0 117	0 -1,760 -1,717
	Below Normal Dry Critical			0 0 0	-1834 -1834 0	0 0 0	0 0 0	0 0 0	0 0 0	0 0 0	0 0 0	0 0 0	0 0 0	0 0 0	0 0 0	0 0 0	117 117 0	-1,717 -1,717 0
	nental Change in NM Storage due to Vernalis Wet Above Normal	Flow & Qual	ity Release	Change 0	- Acre-feet	0	0	0	0	0	0	0	0	0	0	0	0	0
	Below Normal Dry			0	-1834 -1834	0 222	0 776	0 975	1425 1425	1888 1888	1332 1163	0	0	0	0	0	117 117	2,928 4,732
	Critical			0	386	47	-12	30	260	350	223	0	0	0	0		14 Delta	
rotal Pote	ntial Delta supply Impact w/o NM Adjustmen Wet Above Normal	ts - Acre-feet		Jan 0 0	Feb -642 -642	Mar 0 0	Apr 0 0	May 0 0	Jun 0 -1760	Jul -1474 -1474	Aug -1812 -1812	Sep 0 0	Oct 0 0	Nov 0 0	Dec 0 0	Jan 0 0	Feb 41 41	Total -3,887 -5,648
	Below Normal Dry			0	-642 -642	0 -423	0 -199	0 -1356	-1760 -1760	-1474 -1474	-1812 -1812	0 138	0 -190	0	0	0	41 41	-5,648 -7,677
	Critical nes Adjustments - Acre-feet (positive means Wet	increase in s	upply)	0	-779 0	-226 0	312 0	462 0	-30 0	12 0	-115 0	773 0	372 0	100 0	0	0	61 0	942
	Above Normal Below Normal			0	0 642	0 0	0	0	1760 -1425	0 -1888	0 -1332	0	0	0	0	0	0 -41	1,760 -4,044
	Dry Critical al Change in Project Delta Supply due to Act	ion - Acre-fee	et.	0 0	642 -386	-78 -47	-272 12	-975 -30	-1425 -260	-1888 -350	-1163 -223	0	0	0	0 0	0	-41 -14	-5,200 -1,296
	Wet Above Normal			0	-642 -642	0	0	0	0	-1474 -1474	-1812 -1812	0	0	0	0	0	41 41	-3,887 -3,887
	Below Normal Dry Critical			0 0 0	0 0 -1165	0 -501 -273	0 -470 325	0 -2331 432	-3186 -3186 -289	-3362 -3362 -338	-3144 -2976 -337	0 138 773	0 -190 372	0 0 100	0 0	0 0	0 0 47	-9,692 -12,877 -354
Mov				ÿ	. 100	2.0				000	501		512	.00	0	Ŭ		004

Study: All Values	C-1-3-C: 130 CONSERVATION OUT Relative to Benchmark (Existing) Condition	COMPOSI	ITE								Water	Develo	pment a	nd Disp	osition	Assum	ptions
Disposition Non-Crit -33588 0	Crit SJR Con O Agriculture-SJRc	Crit Crit 0 0 0 0	Conservation Conservation Groundwate	n of Drain S				1	SJR Non-Cor Non-Crit 0 0 0	Crit 0 C 0 C	onservation onservation roundwater	of Drain Sp	tion/Seepa	ge to GW-S ife Areas-S.	JRnc JRnc		
122615 0 0	50000 Agriculture-SJRnc 154	65 0	Tailwater Re Fallowing -S	capture-SJF	Rc	Non-Crit	Crit		900 8000	0 T	ailwater Rec allowing-SJI	capture-SJF	Rnc Crit				
0	0 EWA		Total Develo	ped Water:		60365	50000		Fotal Disposi	ition:		89027	50000				
Water Dev	ues Relative to Benchmark (Existing) reloped - Non Critical Years) Conditio	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Basic Hy Dec	Jan	Feb	Total
	Change in Evaporation/Seepage to GW Change in Drain Spills to Wildlife Areas Change in Discharge to SJR Streams Change to Flows Upstream of Sack Dam		0 0 141 0	0 0 1054 45	0 0 1054 90	0 0 1757 90	0 0 2285 99	0 2285 144	0 0 2285 162	0 0 2285 162	0 0 1406 72	0 0 914 27	0 0 9	0 0 0	0 0 0	0 0 0	0 0 15,465 900
Effects to	Crop Fallowing Groundwater Total SJR Flows due to Developing Water - Non Critical	Years	1031 0 1172	4639 0 5739	5155 0 6299	344 -750 1441	687 -840 2231	10653 -990 12092	14433 -1200 15680	12715 -900 14261	344 -600 1222	0 -600 341	0 -120 -111	0 0 0	0 0 0	0 0 0	50,000 -6,000 60,365
	Change in Evaporation/Seepage to GW Change in Drain Spills to Wildlife Areas Change in Discharge to SJR Streams Change to Flows Upstream of Sack Dam		0 0 141 0	0 0 1054 0	0 0 1054 0	0 0 1757 0	0 0 2285 0	0 0 2285 0	0 0 2285 0	0 0 2285 0	0 0 1406 0	0 0 914 0	0 0 0	0 0 0	0 0 0	0 0 0	0 0 15,465 0
	Crop Fallowing Groundwater Total (Positive value means flow reduced)		173 0 314	779 0 1834	303 0 1358	20 0 1778	40 0 2325	626 0 2911	849 0 3133	748 0 3032	58 0 1464	0 0 914	0 0 0	0 0 0	0 0 0	0 0 0	3,597 0 19,062
Keturn Fi	ws from Disposition of Transfer Water - Non Critic Incremental Return from Agricultural Transferees Incremental Return from Wildlife Area Transferees Envinomental Water Account Beneficiaries Incremental Return from Agricultural Entities	al Years	0 0 0	0 0 0	-52 0	-223 0	-338 0 0	-401 0	-578 0	-425 0	-558 0 0	-250 0	-67 0	-17 0 0	-23 0	-41 0 0	-2,972 0 0
(Positive v	Total to San Joaquin River Flow Before NM Adjustment alue means flow added)	(Acre-feet) (cfs)	0 -314 -5	0 -1834 -33	-52 -1409 -23	-223 -2001 -34	-338 -2663 -43	-401 -3312 -56	-578 -3711 -60	-425 -3457 -56	-558 -2022 -34	-250 -1164 -19	-67 -67 -1	-17 -17 0	-23 -23 0	-41 -41 -1	-2,972 -22,034 0
	veloped - Critical Years Change in Evaporation/Seepage to GW 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 Change to Flows Upstream of Sack Dam Crop Fallowing Groundwater		0 0 1031 0	0 0 4639 0	0 0 5155 0	0 0 344 0	0 0 687 0	0 0 10653 0	0 0 14433 0	0 0 12715 0	0 0 344 0	0 0 0	0 0 0	0 0 0	0 0 0	0 0 0	0 0 50,000 0
Effects to	Total SJR Flows due to Developing Water - Critical Years Change in Evaporation/Seepage to GW	8	1031 0	4639 0	5155 0	344 0	687 0	10653 0	14433 0	12715 0	344 0	0	0	0	0	0	50,000 0
	Change in Drain Spills to Wildlife Areas Change in Discharge to SJR Streams Change to Flows Upstream of Sack Dam Crop Fallowing		0 0 0 173	0 0 0 779	0 0 0 303	0 0 20	0 0 0 40	0 0 626	0 0 0 849	0 0 0 748	0 0 0 58	0 0 0	0 0 0	0 0 0	0 0 0	0 0 0	0 0 3,597
Return Fle	Groundwater Total (Positive value means flow reduced) ows from Disposition of Transfer Water - Critical Ye Incremental Return from Agricultural Transferees	ars	0 173 0	0 779 0	0 303 0	0 20 0	0 40 0	0 626 0	0 849 0	0 748 0	0 58 0	0	0 0	0	0	0 0	0 3,597 0
	Incremental Return from Wildlife Area Transferees <u>Envirnomental Water Account Beneficiaries</u> Incremental Return from Agricultural Entities		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Total to San Joaquin River Flow Before NM Adjustment alue means flow added)	(Acre-feet) (cfs)	0 -173 -3	0 -779 -14	0 -303 -5	0 -20 0	0 -40 -1	0 -626 -11	0 -849 -14	0 -748 -12	0 -58 -1	0 0 0	0 0 0	0 0 0	0 0 0	0 0 0	0 -3,597 0 ernalis
Benchma	k Vernalis Flow - cfs Wet Above Normal		Jan 7500 5800	Feb 13600 7200	Mar 15700 6200	Apr 13600 5900	May 12000 4600	Jun 7400 2600	Jul 5100 2100	Aug 3100 2000	Sep 2500 1500	Oct 3600 2000	Nov 3000 1800	Dec 4600 2300	Jan 7500 5800	Feb 13600 7200	anana
	Below Normal Dry Critical		2300 1900 1300	3200 2600 1700	3300 2300 1600	3700 2700 1800	3700 2200 1500	2100 1800 1300	1900 1400 1000	1500 1100 1000	1200 1000 1000	1900 1700 1500	1700 1600 1400	2200 2100 1500	2300 1900 1300	3200 2600 1700	
Change ir	Vernalis Flow with Action - cfs Wet Above Normal Below Normal		-5 -5 -5	-33 -33 0	-23 -23 -23	-34 -34 -34	-43 -43 -43	-56 0 -71	-60 -60 -74	-56 -56 -68	-34 -34 -34	-19 -19 -19	-1 -1 -1	0 0 0	0 0 0	-1 -1 0	
With-Actio	Dry Critical on Vernalis Flow - cfs Wet		-5 -3 7495	0 -21 13567	-25 -6 15677	-46 0 13566	-57 -1 11957	-71 -14 7344	-74 -19 5040	-69 -16 3044	-34 -1 2466	-19 0 3581	-1 0 2999	0 0 4600	0 0 7500	0 0 13599	
	Above Normal Below Normal Dry		5795 2295 1895	7167 3200 2600	6177 3277 2275	5866 3666 2654	4557 3657 2143	2600 2029 1729	2040 1826 1326	1944 1432 1031	1466 1166 966	1981 1881 1681	1799 1699 1599	2300 2200 2100	5800 2300 1900	7199 3200 2600	
Benchma	Critical k Vernalis Water Quality - mmhos (April and May va Wet	alues may not	1297 t be reflectiv 352	1679 e of split-m 286	1594 onth opera 310	1800 ations when 269	1499 n objective 212	1286 s control) 310	981 341	984 460	999 442	1500 359	1400 497	1500 432	1300 352	1700 286	
	Above Normal Below Normal Dry Critical		404 757 880 1000	380 631 736 1000	465 690 1000 1000	364 465 700 700	334 382 700 700	486 700 700 700	509 700 700 700	534 700 700 700	588 680 772 772	494 510 547 595	657 681 708 772	639 657 678 859	404 757 880 1000	380 631 736 1000	
Change ir	Vernalis Water Quality with Action - mmhos (April Wet Above Normal Below Normal	and May valu	es may not l -1 -1 -2	be reflective -3 -5 -15	e of split-m -1 -2 -3	onth opera -2 -5 -6	ations when -3 -7 -9	n objective -4 -18 0	es control) -6 -10 0	-7 -8 0	-6 -7 -7	-2 -3 -3	0 0 0	0 0 0	0 0 0	0 0 0	
With-Actio	Dry Critical on Vernalis Water Quality - mmhos (April and May v Wet	alues may no	-2 -2 t be reflectiv 351	-18 0 re of split-m 283	0 0 nonth oper 309	-3 0 ations whe 266	-4 0 n objective 209	0 0 s control) 306	0 0 335	0 0 454	-6 0 436	-3 0 357	0 0 497	0 0 432	0 0 352	0 0 286	
	Above Normal Below Normal Dry Critical		403 755 877 998	375 617 718 1000	463 688 1000 1000	360 459 697 700	326 373 696 700	469 700 700 700	500 700 700 700	434 525 700 700 700	436 582 673 766 771	491 506 544 595	497 657 681 708 772	432 639 657 678 859	404 757 880 1000	380 631 736	
																1000 New M	
Increment	al Change in NM Storage due to WQ Release Chang Wet Above Normal Below Normal Drv	ge - Acre-feet	Jan 0 0 0 0	Feb 0 0 0	Mar 0 0 156	Apr 0 0 709	May 0 0 819	Jun 0 900 900	Jul 0 821 821	Aug 0 700 758	Sep 0 0 0 0	Oct 0 0 0	Nov 0 0 0	Dec 0 0 0	Jan 0 0 0	Feb 0 0 0	Total 0 2,420 4,164
Increment	Critical al Change in NM Storage due to Vernalis Flow Rele Wet	ase Change -	0	386 0	39 0	8	15 0	223 0	297 0	213 0	0	0	0	0	0	0	1,180 0
	Above Normal Below Normal Dry Critical		000000000000000000000000000000000000000	-1834 -1834 0	0 0 0 0	0 0 0 0	0 0 0 0	-3312 0 0 0	0 0 0 0	0 0 0	0 0 0	0 0 0	0 0 0	0 0 0	0 0 0	0 -41 -41 0	-3,312 -1,875 -1,875 0
Net Increr	nental Change in NM Storage due to Vernalis Flow a Wet Above Normal Below Normal	& Quality Rele	ease Change 0 0 0	• - Acre-feet 0 0 -1834	0 0 0	0 0 0	0 0 0	0 -3312 900	0 0 821	0 0 700	0 0 0	0 0 0	0 0 0	0 0 0	0 0 0	0 0 -41	0 -3,312 546
	Dry Critical		0	-1834 386	156 39	709 8	819 15	900 223	821 297	758 213	0	0	0	0 0	Project	-41 0	2,290 1,180
Total Pote	ntial Delta supply Impact w/o NM Adjustments - Ac Wet Above Normal Below Normal	re-feet	Jan 0 0	Feb -642 -642	Mar 0 0	Apr 0 0	May 0 0	Jun 0 -3312 -3312	Jul -3711 -3711 -3711	Aug -3457 -3457 -3457	Sep 0 0	Oct 0 0	Nov 0 0	Dec 0 0	Jan 0 0	Feb -14 -14	Total -7,825 -11,136
New Melo	Below Normal Dry Critical nes Adjustments - Acre-feet (positive means increa	se in supply)	0 0 0	-642 -642 -779	-493 -303	-350 -20	-2663 -40	-3312 -3312 -626	-3711 -3711 -849	-3457 -3457 -748	-2022 -58	-1126 0	0	0 0 0	0	-14 -14 0	-11,136 -17,790 -3,424
	Wet Above Normal Below Normal Dry		0 0 0	0 0 642 642	0 0 -55	0 0 -248	0 0 -819	0 3312 -900 -900	0 0 -821 -821	0 0 -700 -758	0 0 0	0 0 0	0 0 0	0 0 0	0 0 0	0 0 14 14	0 3,312 -1,764 -2,946
Increment	Critical al Change in Project Delta Supply due to Action - A Wet	cre-feet	0	-386 -642	-39 0	-8 0	-15 0	-223 0	-297 -3711	-213 -3457	0	0	0	0	0	0 -14	-1,180 -7,825
	Above Normal Below Normal Dry Critical		0 0 0	-642 0 0 -1165	0 -548 -342	0 -598 -28	0 0 -3482 -55	0 -4212 -4212 -849	-3711 -4532 -4532 -1146	-3457 -4157 -4216 -960	0 -2022 -58	0 0 -1126 0	0 0 0	0 0 0	0 0 0	-14 0 0	-7,825 -12,901 -20,736 -4,604
Movi			-									-	-	-	-	-	,,

	C-2-1-C: 130 GROUNDWATER Relative to Benchmark (Existing) Condition	า	MPOSITE								Water	Develop	oment a	nd Disp	osition	Assum	ptions
Disposition Non-Crit 34738 17823 0	Crit 0 Agriculture-SJRc	SJR Continuity	Crit 0 Conservatio 0 Conservatio 0 Groundwate	n of Drain S	ation/Seepa pills to Wild	ge to GW-S life Areas-S	JRc JRc	5	SJR Non-Co Non-Crit 0 0 0	Crit 0 C 0 C	onservation onservation roundwater-	of Drain Sp	tion/Seepag	je to GW-S fe Areas-S.	JRnc JRnc		
-7385 9497	0 Agriculture-SJRnc 0 Wildlife Areas-SJRnc	0	0 Tailwater Re 000 Fallowing -S	ecapture-SJ	Rc				0 8000	0 Ta	ailwater Rec allowing-SJI	apture-SJR Rnc					
0	0 Urban-SJRnc 0 EWA	atin a) Can di	Total Develo	oped Water:		Non-Crit 60365	Crit 50000	1	Fotal Disposi	tion:		Non-Crit 54673	Crit 40000)			
Vater Dev	Les Relative to Benchmark (Exister reloped - Non Critical Years Change in Evaporation/Seepage to GW	sting) Condi	Jan 0	Feb 0	Mar 0	Apr 0	May 0	Jun 0	Jul 0	Aug 0	Sep 0	Oct 0	Nov 0	Basic Hy Dec	Jan 0	Feb 0	Tota (
	Change in Drain Spills to Wildlife Areas Change in Discharge to SJR Streams Change to Flows Upstream of Sack Dam Crop Fallowing		0 0 0 1031	0 0 0 4639	0 0 0 5155	0 0 0 344	0 0 0 687	0 0 0 10653	0 0 0 14433	0 0 0 12715	0 0 0 344	0 0 0	0 0 0	0 0 0	0 0 0	0 0 0	0 0 50.000
	Groundwater Total SJR Flows due to Developing Water - Non C	Critical Years	0 1031 0	0 4639 0	0 5155 0	1296 1639 0	1451 2138 0	1710 12363 0	2073 16506 0	1555 14270 0	1037 1380 0	1037 1037 0	207 207 0	0	0 0	0 0	10,365 60,365
	Change in Evaporation/Seepage to GW Change in Drain Spills to Wildlife Areas Change in Discharge to SJR Streams Change to Flows Upstream of Sack Dam		0 0 0	0 0 0	0 0 0	0 0 0	0 0 0	0 0 0	0 0 0	0 0 0	0 0 0	0 0 0	0 0 0	0 0 0	0 0 0	0 0 0	0
	Crop Fallowing Groundwater Total (Positive value means flow reduced)		173 0 173	779 0 779	303 0 303	20 0 20	40 0 40	626 0 626	849 0 849	748 0 748	58 0 58	0 0 0	0 0 0	0 0 0	0 0 0	0 0 0	3,597 (3,597
	bws from Disposition of Transfer Water - Not Incremental Return from Agricultural Transfere Incremental Return from Wildlife Area Transfe Envirnomental Water Account Beneficiaries	ees	0 0	0 0	53 33	231 5	349 0	415 0	598 0	440 3026	577 165	259 -17	70 282	18 66	24 220	42 252	3,074 4,032
	Incremental Return from Agricultural Entities Total to San Joaquin River Flow Before NM Adjust	stment (Acre-fe	0 0 eet) -173	0 0 -779	0 87 -216	0 236 216	0 349 309	0 415 -212	0 598 -251	0 3465 2718	0 742 684	0 241 241	0 352 352	0 83 83	0 243 243	0 295 295	7,106 3,510
Positive va	alue means flow added)	(cfs)	-3	-14	-4	4	5	-4	-4	44	11	4	6	1	4	5	
	eloped - Critical Years Change in Evaporation/Seepage to GW Change in Drain Spills to Wildlife Areas Change in Discharge to SJR Streams		0 0 0	0 0 0	0 0 0	0 0 0	0 0 0	0 0 0	0 0 0	0 0 0	0 0 0	0 0 0	0 0 0	0 0 0	0 0 0	0 0 0	0
	Change to Flows Upstream of Sack Dam Crop Fallowing Groundwater Total		0 1031 0 1031	0 4639 0 4639	0 5155 0 5155	0 344 0 344	0 687 0 687	0 10653 0 10653	0 14433 0 14433	0 12715 0 12715	0 344 0 344	0 0 0	0 0 0	0 0 0	0 0 0	0 0 0	50,000 50,000 50,000
	SJR Flows due to Developing Water - Critic Change in Evaporation/Seepage to GW Change in Drain Spills to Wildlife Areas Change in Discharge to SJR Streams	al Years	0 0 0	0 0 0	0 0 0	0 0 0	0 0 0	0 0 0	0 0 0	0 0 0	0 0 0	0 0 0	0 0	0 0 0	0 0 0	0 0 0	(
	Change to Flows Upstream of Sack Dam Crop Fallowing Groundwater Total (Positive value means flow reduced)		0 173 0 173	0 779 0 779	0 303 0 303	0 20 0 20	0 40 0 40	0 626 0 626	0 849 0 849	0 748 0 748	0 58 0 58	0 0 0	0 0 0	0 0 0	0 0 0	0 0 0	3,597 3,597 3,597
eturn Flo	bws from Disposition of Transfer Water - Cri Incremental Return from Agricultural Transfere Incremental Return from Wildlife Area Transfe	ees	0	0	0 75	0 11	40 0 0	0	0 0	0 6791	0 370	0 -39	0 634	0 148	0 493	0 567	3,597 0 9,049
	Envinomental Water Account Beneficiaries Incremental Return from Agricultural Entities Total to San Joaquin River Flow Before NM Adjus	stment (Acre-fi	0 0 eet) -173	0 0 -779	0 75 -228	0 11 -9	0 0 -40	0 0 -626	0 0 -849	0 6791 6043	0 370 312	0 -39 -39	0 634 634	0 148 148	0 493 493	0 567 567	0 9,049 5,453
Positive va	alue means flow added)	(cfs)	-3	-14	-4	0	-1	-11	-14	98	5	-1	11	2	8	10 Ve	ernalis
	k Vernalis Flow - cfs Wet Above Normal Below Normal		Jan 7500 5800 2300	Feb 13600 7200 3200	Mar 15700 6200 3300	Apr 13600 5900 3700	May 12000 4600 3700	Jun 7400 2600 2100	Jul 5100 2100 1900	Aug 3100 2000 1500	Sep 2500 1500 1200	Oct 3600 2000 1900	Nov 3000 1800 1700	Dec 4600 2300 2200	Jan 7500 5800 2300	Feb 13600 7200 3200	
hange in	Dry Critical Vernalis Flow with Action - cfs		1900 1300	2600 1700	2300 1600	2700 1800	2200 1500	1800 1300	1400 1000	1100 1000	1000 1000	1700 1500	1600 1400	2100 1500	1900 1300	2600 1700	
	Wet Above Normal Below Normal Dry		-3 -3 -3	-14 -14 0 0	-4 -4 -3	4 4 3	5 5 5 4	-4 0 -10 -10	-4 -4 -14 -14	44 44 85 85	11 11 11 11	4 4 4	6 6 6	1 1 1	4 4 4 4	5 5 0	
Vith-Actic	Critical on Vernalis Flow - cfs Wet Above Normal		-3 7497 5797	-21 13586 7186	-2 15696 6196	0 13604 5904	-1 12005 4605	-14 7396 2600	-19 5096 2096	199 3144 2044	5 2511 1511	-1 3604 2004	11 3006 1806	2 4601 2301	8 7504 5804	15 13605 7205	
	Below Normal Dry Critical k Vernalis Water Quality - mmhos (April and	d May values may	2297 1897 1297	3200 2600 1679	3296 2297 1598	3704 2703 1800	3705 2204 1499 n objective	2090 1790 1286 s control)	1886 1386 981	1585 1185 1199	1211 1011 1005	1904 1704 1499	1706 1606 1411	2201 2101 1502	2304 1904 1308	3200 2600 1715	
	Wet Above Normal Below Normal	u way values may	352 404 757	286 380 631	310 465 690	ations when 269 364 465	212 334 382	310 486 700	341 509 700	460 534 700	442 588 680	359 494 510	497 657 681	432 639 657	352 404 757	286 380 631	
	Dry Critical Vernalis Water Quality with Action - mmhos	s (April and May v	880 1000	736 1000	1000 1000	700 700	700 700	700 700	700 700	700 700	772 772	547 595	708 772	678 859	880 1000	736 1000	
	Wet Above Normal Below Normal Dry		-1 -1 -1 -1	-1 -2 -6 -8	00000	0 0 0	0 0 0	-1 -2 0	-2 -3 0	11 16 0	0 -1 -1 0	0 0 0	1 1 1	0 0 0	0 0 1 0	0 1 2 3	
Vith-Actic	Critical on Vernalis Water Quality - mmhos (April and Wet	d May values may	-2 not be reflectiv 351	0 ve of split-n 284	0 nonth oper 310	0 ations whe 269	0 n objective 212	0 s control) 310	0 340	0 472	2 442	0 359	3 498	0 432	1 352	0 286	
	Above Normal Below Normal Dry Critical		404 756 878 998	378 625 728 1000	465 690 1000 1000	365 465 700 700	334 382 700 700	484 700 700 700	506 700 700 700	550 700 700 700	588 680 771 773	494 510 548 595	659 682 709 775	639 658 678 859	405 757 880 1001	381 634 738 1000	
ncrement	al Change in NM Storage due to WQ Release Wet	e Change - Acre-f	eet Jan 0	Feb 0	Mar 0	Apr 0	May 0	Jun 0	Jul 0	Aug 0	Sep 0	Oct 0	Nov 0	Dec 0	Jan 0	New Mo Feb	Tota (
	Above Normal Below Normal Dry Critical		0 0 0	0 0 386	0 0 -4 -97	0 0 17 -12	0 0 57 15	0 363 363 223	0 582 582 297	0 -2479 -2540 -6209	0 0 0	0 0 0	0 0 0	0 0 0	0 0 0	0 0 -267	0 -1,534 -1,526 -5,665
ncrement	al Change in NM Storage due to Vernalis Flo Wet Above Normal	ow Release Chan	ge - Acre-feet 0 0	0	0	0	0 0	0 -212	0 0	0 0	0	0	0	0	0	0	-212
	Below Normal Dry Critical nental Change in NM Storage due to Vernali:	s Flow & Quality	0 0 Release Chang	-779 -779 0 e - Acre-fee	0 0 0	0 0 0	0 0 0	0 0 0	0 0 0	0 0 0	0 0 0	0 0 0	0 0 0	0 0 0	0 0 0	295 295 0	-485 -485 0
	Wet Above Normal Below Normal	a quanty	0 0 0	0 0 -779	0 0 0	0 0	0 0 0	0 -212 363	0 0 582	0 0 -2479	0 0	0	0 0	0 0	0 0	0 0 295	0 -212 -2,019
	Dry Critical		0 0	-779 386	-4 -97	17 -12	57 15	363 223	582 297	-2540 -6209	0 0	0 0	0 0	0 0	Project	295 -267	-2,011 -5,665 Supply
	ntial Delta supply Impact w/o NM Adjustmer Wet	nts - Acre-feet	Jan 0	Feb -273	Mar 0	Apr 0	May 0	Jun 0	Jul -251	Aug 2718	Sep 0	Oct 0	Nov 0	Dec 0	Jan 0	Feb 103	Tota 2,29
	Above Normal Below Normal Dry		0 0 0	-273 -273 -273	0 0 -76	0 0 38	0 0 309	-212 -212 -212	-251 -251 -251	2718 2718 2718	0 0 684	0 0 233	0 0 0	0 0	0 0	103 103 103	2,08 2,08 3,27
ew Melo	Critical nes Adjustments - Acre-feet (positive means Wet	s increase in supp	0	-779 0	-228 0	-9 0	-40 0	-626 0	-849 0	6043 0	312 0	-39 0	634 0	0	0	567 0	4,98
	Above Normal Below Normal Dry		0 0 0	0 273 273	0 0 1	0 0 -6	0 0 -57	212 -363 -363	0 -582 -582	0 2479 2540	0 0 0	0	0	0	0	0 -103 -103	212 1,70- 1,70-
ncrement	Critical al Change in Project Delta Supply due to Ac Wet Above Normal	ction - Acre-feet	0	-386 -273 -273	97 0 0	12 0 0	-15 0 0	-223 0 0	-297 -251 -251	6209 2718 2718	0	0	0	0	0	267 103 103	5,665 2,297 2,297
	Below Normal Dry Critical		0 0 0	-273 0 0 -1165	0 -74 -131	0 32 4	0 252 -55	-575 -575 -849	-251 -833 -833 -1146	5197 5258 12252	0 684 312	0 233 -39	0 0 634	0 0 0	0 0 0	0 0 834	2,297 3,789 4,978 10,650
lav 2						-		- 20									

Study: All Values	C-2-2-C: 130 GROUNDWATER AGF Relative to Benchmark (Existing) Condition	RICULTUR	Е СОМРО	OSITE							Water	Develo	oment a	nd Disp	osition	Assum	ptions
Disposition Non-Crit 96412 0 0	Crit SJR C Crit Non 50000 Agriculture-SJRc 0 Wildlife Areas-SJRc	0 0	Conservatio Conservatio Groundwate	n of Drain S	ition/Seepa pills to Wild	ge to GW-S life Areas-S	JRc JRc	5	SJR Non-Co Non-Crit 0 0 0	Crit 0 Cr 0 Cr	onservation onservation roundwater	of Drain Sp	tion/Seepag bills to Wildli	ge to GW-S ife Areas-S.	JRnc JRnc		
-7385 0	0 Agriculture-SJRnc 0 Wildlife Areas-SJRnc 42	0 0	Tailwater Re Fallowing -S	ecapture-SJF	Rc				0 8000	0 Ta	ailwater Rec allowing-SJI	apture-SJF Rnc					
0 0 ΔΙΙ Valı	0 Urban-SJRnc 0 EWA Ies Relative to Benchmark (Existing	n) Conditio	Total Develo	oped Water:		Non-Crit 60365	Crit 50000	1	Fotal Disposi	tion:		Non-Crit 89027	Crit 50000	Basic Hy	/drologi	c Acco	untina
Vater Dev	eloped - Non Critical Years Change in Evaporation/Seepage to GW		Jan 0	Feb 0	Mar 0	Apr 0	May 0	Jun 0	Jul 0	Aug 0	Sep 0	Oct 0	Nov 0	Dec 0	Jan 0	Feb 0	Total 0
	Change in Drain Spills to Wildlife Areas Change in Discharge to SJR Streams Change to Flows Upstream of Sack Dam		0 0 0	0 0 0	0 0 0	0 0 0	0 0 0	0 0 0	0 0 0	0 0 0	0 0 0	0 0 0	0 0 0	0 0 0	0 0 0	0 0 0	0 0 0
	Crop Fallowing Groundwater Total		1031 0 1031	4639 0 4639	5155 0 5155	344 1296 1639	687 1451 2138	10653 1710 12363	14433 2073 16506	12715 1555 14270	344 1037 1380	0 1037 1037	0 207 207	0 0	0 0 0	0 0 0	50,000 10,365 60,365
ffects to	SJR Flows due to Developing Water - Non Critica Change in Evaporation/Seepage to GW	l Years	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Change in Drain Spills to Wildlife Areas Change in Discharge to SJR Streams Change to Flows Upstream of Sack Dam		0 0 0	0 0 0	0 0 0	0 0 0	0 0 0	0 0 0	0 0 0	0 0 0	0 0 0	0 0 0	0 0 0	0 0 0	0 0 0	0 0 0	0 0 0
	Crop Fallowing Groundwater Total (Positive value means flow reduced)		173 0 173	779 0 779	303 0 303	20 0 20	40 0 40	626 0 626	849 0 849	748 0 748	58 0 58	0 0	0 0 0	0 0	0 0 0	0 0 0	3,597 0 3,597
eturn Flo	ws from Disposition of Transfer Water - Non Criti Incremental Return from Agricultural Transferees Incremental Return from Wildlife Area Transferees	ical Years	0	0	148 0	641 0	969 0	1151 0	1659 0	1220 0	1602 0	718 0	193 0	49 0	66 0	117 0	8,532
	Envirnomental Water Account Beneficiaries Incremental Return from Agricultural Entities		0	0	0	0	0	0	0	0	0	0	0	0	0	0	c
et Effect	Total to San Joaquin River Flow Before NM Adjustmen alue means flow added)	t (Acre-feet) (cfs)	0 -173 -3	0 -779 -14	148 -155 -3	641 621 10	969 929 15	1151 524 9	1659 811 13	1220 472 8	1602 1544 26	718 718 12	193 193 3	49 49 1	66 66 1	117 117 2	8,532 4,935 0
ater Dev	eloped - Critical Years Change in Evaporation/Seepage to GW			0	0	0	0		0		0	0	0		0	0	
	Change in Drain Spills to Wildlife Areas Change in Discharge to SJR Streams		0 0	0	0	0	0	0 0	0	0 0	0 0	0 0	0	0	0	0 0	(
	Change to Flows Upstream of Sack Dam Crop Fallowing Groundwater		0 1031 0	0 4639 0	0 5155 0	0 344 0	0 687 0	0 10653 0	0 14433 0	0 12715 0	0 344 0	0 0 0	0 0 0	0 0 0	0 0 0	0 0 0	(50,000
	Total SJR Flows due to Developing Water - Critical Yea Change in Evaporation/Seepage to GW	irs	1031 0	4639 0	5155 0	344 0	687 0	10653 0	14433 0	12715 0	344 0	0	0	0	0	0	50,000 C
	Change in Drain Spills to Wildlife Areas Change in Discharge to SJR Streams		0	0 0 0	0	0	0 0 0	0	0 0 0	0 0 0	0	0 0 0	0	0 0 0	0	0 0 0	0
	Change to Flows Upstream of Sack Dam Crop Fallowing Groundwater		173 0	779 0	303 0	20 0	40 0	626 0	849 0	748 0	58 0	0	0	0	0	0	3,597
eturn Flo	Total (Positive value means flow reduced) ws from Disposition of Transfer Water - Critical \ Incremental Return from Agricultural Transferees	fears	173 0	779 0	303 77	20 333	40 503	626 597	849 861	748 633	58 831	0 372	0 100	0 25	0 34	0 61	3,597
	Incremental Return from Wildlife Area Transferees Envirnomental Water Account Beneficiaries Incremental Return from Agricultural Entities		0	0	0	0	0	0	0	0	0	0	0	0	0	0	c
et Effect	Total to San Joaquin River Flow Before NM Adjustmen	t (Acre-feet)	0 -173	0 -779	-226	333 312	503 462	597 -30	861 12	633 -115	831 773	372 372	100 100	25 25	34 34	61 61	4,425 828
	Ilue means flow added) k Vernalis Flow - cfs	(cfs)	-3 Jan	-14 Feb	-4 Mar	5 Apr	8 May	0 Jun	0 Jul	-2 Aug	13 Sep	6 Oct	2 Nov	0 Dec	1 Jan	Teb	ہ ernalis
	Wet Above Normal		7500 5800	13600 7200	15700 6200	13600 5900	12000 4600	7400 2600	5100 2100	3100 2000	2500 1500	3600 2000	3000 1800	4600 2300	7500 5800	13600 7200	
	Below Normal Dry Critical		2300 1900 1300	3200 2600 1700	3300 2300 1600	3700 2700 1800	3700 2200 1500	2100 1800 1300	1900 1400 1000	1500 1100 1000	1200 1000 1000	1900 1700 1500	1700 1600 1400	2200 2100 1500	2300 1900 1300	3200 2600 1700	
	Vernalis Flow with Action - cfs Wet Above Normal		-3 -3	-14 -14	-3 -3	10 10	15 15	9 0	13 13	8 8	26 26	12 12	3 3	1	1 1	2	
	Below Normal Dry Critical		-3 -3 -3	0 0 -21	-3 -4 -4	10 9 5	15 13 7	-1 -1 -5	-5 -5 -5	-3 -1 -5	26 26 13	12 12 6	3 3 2	1 1 0	1 1 1	0 0 1	
Vith-Actic	n Vernalis Flow - cfs Wet		7497	13586	15697	13610	12015	7409	5113	3108	2526	3612	3003	4601	7501	13602	
	Above Normal Below Normal Dry		5797 2297 1897	7186 3200 2600	6197 3297 2296	5910 3710 2709	4615 3715 2213	2600 2099 1799	2113 1895 1395	2008 1497 1099	1526 1226 1026	2012 1912 1712	1803 1703 1603	2301 2201 2101	5801 2301 1901	7202 3200 2600	
enchmar	Critical k Vernalis Water Quality - mmhos (April and May Wet	values may no	1297 t be reflectiv 352	1679 e of split-m 286	1596 onth opera 310	1805 ations when 269	1507 n objective 212	1295 s control) 310	995 341	995 460	1013 442	1506 359	1402 497	1500 432	1301 352	1701 286	
	Above Normal Below Normal Dry		404 757 880	380 631 736	465 690 1000	364 465 700	334 382 700	486 700 700	509 700 700	534 700 700	588 680 772	494 510 547	657 681 708	639 657 678	404 757 880	380 631 736	
	Critical Vernalis Water Quality with Action - mmhos (Apr	il and May valu	1000	1000	1000 of split-m	700 ionth opera	700	700	700	700	772	595	772	859	1000	1000	
	Wet Above Normal Below Normal		-1 -1 -1	-1 -2 -6	0 0 -1	0 0 0	0 1 1	-1 0 0	-2 -5 0	-2 -4 0	-1 -3 -3	0 0 1	0 0 0	0 0 0	0 0 0	0 0 0	
	Dry Critical n Vernalis Water Quality - mmhos (April and May	values may no	-1 -2 at be reflectiv	-8 0 ve of split-m	0 0 Nonth opera	0 0 ations whe	-1 0 n objective	0 0 s control)	0 0	0 0	-2 -1	1 0	0	0	0 0	1 0	
	Wet Above Normal Below Normal		351 404 756	284 378 625	310 465 690	269 365 465	212 334 382	310 486 700	340 505 700	458 530 700	440 585 677	359 494 510	497 657 681	432 639 657	352 404 757	286 380 632	
	Below Normal Dry Critical		756 878 998	728 1000	1000 1000	465 700 700	382 699 700	700 700 700	700 700 700	700 700 700	769 771	510 548 595	681 707 772	657 678 859	880 1000	736 1000	
	al Change in NM Storage due to WQ Release Cha Wet	nge - Acre-feet	Jan 0	Feb 0	Mar 0	Apr 0	May 0	Jun 0	Jul 0	Aug 0	Sep 0	Oct 0	Nov 0	Dec 0	Jan 0	New Me Feb	elones Total
	Above Normal Below Normal		0	0 0 0	0 0 87	0	0	0 612	0 1088	0 682	0	0	0	0	0	0	0 2,383
ncrement	Dry Critical al Change in NM Storage due to Vernalis Flow Re	lease Change -	0	386	47	58 -12	130 30	612 260	1088 350	513 223	0	0	0	0	0	14	2,489 1,296
	Wet Above Normal Below Normal		0 0 0	0 0 -779	0 0 0	0 0 0	0 0 0	0 524 0	0 0 0	0 0 0	0 0 0	0 0 0	0 0 0	0 0 0	0 0 0	0 0 117	0 524 -663
	Dry Critical sental Change in NM Storage due to Vernalis Flov	v & Quality Pol	0	-779 0	0	0	0	0	0	0	0	0	0	0	0	117 0	-663 0
	Wet Above Normal	. a waanty Kel	0	0	0	0	0	0 524	0 0	0 0	0	0	0	0	0	0 0	0 524
	Below Normal Dry Critical		0 0 0	-779 -779 386	0 87 47	0 58 -12	0 130 30	612 612 260	1088 1088 350	682 513 223	0 0 0	0 0 0	0 0 0	0 0 0	0 0 0	117 117 14	1,720 1,826 1,296
otal Pote	ntial Delta supply Impact w/o NM Adjustments - A	cre-feet	Jan	Feb	Mar	Apr	May	Jun	Jul 811	Aug	Sep	Oct	Nov	Dec	Project	Feb	Tota
	Wet Above Normal Below Normal		0 0	-273 -273 -273	0 0 0	0 0 0	0 0 0	0 524 524	811 811	472 472 472	0 0 0	0 0 0	0 0	0 0	0 0	41 41 41	1,051 1,575 1,575
	Dry Critical nes Adjustments - Acre-feet (positive means incre	ease in supply)	0 0	-273 -779	-54 -226	109 312	929 462	524 -30	811 12	472 -115	1544 773	695 372	0 100	0 0	0	41 61	4,797 942
	Wet Above Normal Below Normal		0 0 0	0 0 273	0	0	0 0	0 -524	0 0 -1088	0 0 -682	0	0 0	0	0 0	0 0	0 0 -41	-524 -2 151
	Dry Critical		0 0 0	273 273 -386	0 -30 -47	0 -20 12	0 -130 -30	-612 -612 -260	-1088 -1088 -350	-682 -513 -223	0 0 0	0 0 0	0 0 0	0 0 0	0 0 0	-41 -41 -14	-2,151 -2,163 -1,296
	al Change in Project Delta Supply due to Action - Wet Above Normal	Acre-feet	0	-273 -273	0	0	0	0	811 811	472 472	0	0	0	0	0	41 41	1,051
	Below Normal Dry Critical		0	0	0 -85	0 89	0 798 432	-88 -88 -289	-278 -278 -338	-210 -41 -337	0 1544	0 695	0	0 0 0	0	0 0 47	-576 2,634 -354
Aoy 2			U	-1165	-273	325	432		-338	-33/	773	372	100	U	U	47	-354

Study: All Values	C-2-3-C: 130 GROUNDWATER OUT Relative to Benchmark (Existing) Condition	COMPOS	BITE								Water	Develo	oment a	nd Disp	osition	Assum	ptions
Disposition Non-Crit -33588 0	Crit SJR Cc O Agriculture-SJRc O Wildlife Areas-SJRc	0 0	it 0 Conservation 0 Conservation 0 Groundwate	n of Drain S				5	SJR Non-Co Non-Crit 0 0 0	Crit 0 Cr 0 Cr	onservation onservation roundwater-	of Drain Sp	tion/Seepag ills to Wildli	ge to GW-S fe Areas-S.	JRnc JRnc		
122615 0 0	50000 Agriculture-SJRnc 0 Wildlife Areas-SJRnc 420 0 Urban-SJRnc	0 0) Tailwater Re) Fallowing -S	capture-SJF	Rc	Non-Crit	Crit		0 8000	0 Ta	ailwater Rec allowing-SJI	apture-SJF	tnc Crit				
0	0 EWA les Relative to Benchmark (Existing) Conditio	Total Develo	ped Water:		60365	50000	1	otal Disposi	tion:		89027	50000	Basic Hy	vdrologi	c Acco	untina
Water Dev	eloped - Non Critical Years Change in Evaporation/Seepage to GW	,	Jan 0	Feb 0	Mar 0	Apr 0	May 0	Jun 0	Jul 0	Aug 0	Sep 0	Oct 0	Nov 0	Dec 0	Jan 0	Feb 0	Total 0
	Change in Drain Spills to Wildlife Areas Change in Discharge to SJR Streams		0 0	0	0	0	0 0	0 0	0	0 0	0 0	0 0	0 0	0 0	0	0 0	0 0
	Change to Flows Upstream of Sack Dam Crop Fallowing		0 1031 0	0 4639 0	0 5155 0	0 344	0 687 1451	0	0 14433	0 12715	0 344	0 0 1037	0 0 207	0	0 0	0 0 0	0 50,000
	Groundwater Total SJR Flows due to Developing Water - Non Critical	Years	1031	4639	5155	1296 1639	2138	1710 12363	2073 16506	1555 14270	1037 1380	1037	207	0	0	0	10,365 60,365
2.1001010	Change in Evaporation/Seepage to GW Change in Drain Spills to Wildlife Areas	- ouro	0	0	0	0	0	0	0	0 0	0	0	0	0	0	0	0
	Change in Discharge to SJR Streams Change to Flows Upstream of Sack Dam		0 0	0	0	0	0 0	0 0	0	0 0	0 0	0 0	0 0	0 0	0	0 0	0
	Crop Fallowing Groundwater Total (Positive value means flow reduced)		173 0 173	779 0 779	303 0 303	20 0 20	40 0 40	626 0 626	849 0 849	748 0 748	58 0 58	0 0	0 0	0 0	0 0 0	0 0 0	3,597 0 3,597
Return Flo	Incremental Return from Agricultural Transferees	cal Years	0	0	-52	-223	-338	-401	-578	-425	-558	-250	-67	-17	-23	-41	-2,972
	Incremental Return from Wildlife Area Transferees Environmental Water Account Beneficiaries Incremental Return from Agricultural Entities Total		0	0	0 -52	0 -223	0 -338	0 -401	0 -578	0 -425	0 -558	0 -250	0 -67	0 -17	0 -23	0 -41	0 -2,972
	to San Joaquin River Flow Before NM Adjustment alue means flow added)	(Acre-feet (cfs)		-779 -14	-355 -6	-223 -244 -4	-378 -6	-1027 -17	-1427 -23	-1173 -19	-616 -10	-250 -250 -4	-67 -1	-17 -17 0	-23 -23 0	-41 -41 -1	-6,569 0
	eloped - Critical Years																
	Change in Evaporation/Seepage to GW 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 Change to Flows Upstream of Sack Dam Crop Fallowing		0 0 1031	0 0 4639	0 0 5155	0 0 344	0 0 687	0 0 10653	0 0 14433	0 0 12715	0 0 344	0 0	0	0 0	0 0	0 0 0	0 0 50,000
	Groundwater Total		1031	4639 0 4639	5155 0 5155	344 0 344	0 687	10653	14433 0 14433	12715 0 12715	344 0 344	0	0	0	0	0	50,000 0 50,000
	SJR Flows due to Developing Water - Critical Year Change in Evaporation/Seepage to GW	s	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Change in Drain Spills to Wildlife Areas Change in Discharge to SJR Streams Change to Flows Upstream of Sack Dam		0 0 0	0 0	0 0 0	0 0	0 0 0	0 0	0 0	0 0 0	0 0	0 0	0 0	0 0	0 0	0 0 0	0
	Crop Fallowing Groundwater		173 0	779 0	303 0	20 0	40 0	626 0	849 0	748 0	58 0	0	0	0	0	0	3,597 0
	Total (Positive value means flow reduced) ws from Disposition of Transfer Water - Critical Ye	ears	173	779	303	20	40	626	849	748	58	0	0	0	0	0	3,597
	Incremental Return from Agricultural Transferees Incremental Return from Wildlife Area Transferees		0 0	0	0 0	0 0	0 0	0 0	0	0 0	0 0	0	0	0 0	0 0	0 0	0 0
	Envirnomental Water Account Beneficiaries Incremental Return from Agricultural Entities Total		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Net Effect (Positive va	to San Joaquin River Flow Before NM Adjustment alue means flow added)	(Acre-feet (cfs)	i) -173 -3	-779 -14	-303 -5	-20 0	-40 -1	-626 -11	-849 -14	-748 -12	-58 -1	0	0	0	0	0	-3,597 0
Benchmai	k Vernalis Flow - cfs		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	ernalis
	Wet Above Normal		7500 5800	13600 7200	15700 6200	13600 5900	12000 4600	7400 2600	5100 2100	3100 2000	2500 1500	3600 2000	3000 1800	4600 2300	7500 5800	13600 7200	
	Below Normal Dry Critical		2300 1900 1300	3200 2600 1700	3300 2300 1600	3700 2700 1800	3700 2200 1500	2100 1800 1300	1900 1400 1000	1500 1100 1000	1200 1000 1000	1900 1700 1500	1700 1600 1400	2200 2100 1500	2300 1900 1300	3200 2600 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 Below Normal		-3 -3	-14 0	-6 -6	-4 -4	-6 -6	0 -19	-23 -24	-19 -20	-10 -10	-4 -4	-1 -1	0	0	-1 0	
	Dry Critical		-3 -3	0 -21	-6 -6	-4 0	-6 -1	-19 -14	-24 -19	-21 -16	-10 -1	-4 0	-1 0	0	0	0 0	
	n Vernalis Flow - cfs Wet Above Normal		7497 5797	13586 7186	15694 6194	13596 5896	11994 4594	7383 2600	5077 2077	3081 1981	2490 1490	3596 1996	2999 1799	4600 2300	7500 5800	13599 7199	
	Below Normal Dry		2297 1897	3200 2600	3294 2294	3696 2696	3694 2194	2081 1781	1876 1376	1480 1079	1190 990	1896 1696	1699 1599	2200 2100	2300 1900	3200 2600	
	Critical k Vernalis Water Quality - mmhos (April and May v	alues may no							981	984	999	1500	1400	1500	1300	1700	
	Wet Above Normal Below Normal		352 404 757	286 380 631	310 465 690	269 364 465	212 334 382	310 486 700	341 509 700	460 534 700	442 588 680	359 494 510	497 657 681	432 639 657	352 404 757	286 380 631	
	Dry Critical		880 1000	736 1000	1000 1000	700 700	700	700 700 700	700	700 700	772	547 595	708	678 859	880 1000	736 1000	
Change in	Vernalis Water Quality with Action - mmhos (April Wet	l and May val	ues may not l -1	oe reflective -1	e of split-m 0	onth opera	0	n objective -1	-2	-1	0	0	0	0	0	0	
	Above Normal Below Normal		-1 -1 -1	-2 -6 -8	-1 -1 0	0	0	-5 0 0	-2 0 0	-2 0 0	1 1 1	0	0	0	0	0 0 0	
	Dry Critical on Vernalis Water Quality - mmhos (April and May v	values mav n	-2	ō	ō	ō	ō	ō	0	0	1	0	0	0	0	0	
	Wet Above Normal		351 404	284 378	310 465	269 364	212 333	310 482	340 507	459 532	442 589	359 494	497 657	432 639	352 404	286 380	
	Below Normal Dry		756 878 998	625 728	690 1000	465 700	382 700	700 700 700	700 700	700 700	681 772 771	510 547	681 708	657 678	757 880	631 736	
	Critical			1000	1000	700	700		700	700		595	772	859		1000 New Mo	
	al Change in NM Storage due to WQ Release Chan Wet Above Normal	iye - Acre-tee	t Jan 0 0	Feb 0 0	Mar 0 0	Apr 0 0	May 0 0	Jun 0 0	Jul O O	Aug 0 0	Sep 0 0	Oct 0 0	Nov 0 0	Dec 0 0	Jan 0 0	Feb 0 0	Total 0 0
	Below Normal Dry		0	0	0 22	0 -9	0 -25	87 87	21 21	49 108	0	0	0	0	0	0	158 204
	Critical al Change in NM Storage due to Vernalis Flow Rele	ease Change	- Acre-feet	386	39	8	15	223	297	213	0	0	0	0	0	0	1,180
	Wet Above Normal Below Normal		0 0 0	0 0 -779	0 0 0	0 0	0 0	0 -1027 0	0 0	0 0	0 0 0	0 0	0	0 0 0	0 0	0 0 -41	0 -1,027 -820
	Dry Critical		0	-779 -779 0	0	0	0	0	0	0	0	0	0	0	0	-41 -41 0	-820 -820 0
Net Incren	nental Change in NM Storage due to Vernalis Flow Wet	& Quality Re	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Above Normal Below Normal Dry		0 0 0	0 -779 -779	0 0 22	0 0 -9	0 0 -25	-1027 87 87	0 21 21	0 49 108	0 0 0	0 0	0 0 0	0 0	0 0	0 -41 -41	-1,027 -662 -616
	Dry Critical		0	-779 386	39	-9 8	-25 15	223	21 297	108 213	0	0	0	0	Project	0	1,180
Total Pote	ntial Delta supply Impact w/o NM Adjustments - Ad Wet	cre-feet	Jan 0	Feb -273	Mar 0	Apr 0	May 0	Jun 0	Jul -1427	Aug -1173	Sep 0	Oct 0	Nov 0	Dec 0	Jan 0	Feb -14	Total -2,886
	Above Normal Below Normal		0	-273 -273	0	0	0	-1027 -1027	-1427 -1427	-1173 -1173	0	0	0	0	0	-14 -14	-3,914 -3,914
	Dry Critical	t · ·	0	-273 -779	-124 -303	-43 -20	-378 -40	-1027 -626	-1427 -849	-1173 -748	-616 -58	-242 0	0 0	0 0	0 0	-14 0	-5,316 -3,424
	nes Adjustments - Acre-feet (positive means increa Wet Above Normal	ase in supply) 0	0	0	0	0	0 1027	0	0	0	0	0	0	0	0	0 1,027
	Below Normal Dry		0	273 273	0 -8	0	0 25	-87 -87	-21 -21	-49 -108	0	0	0	0	0	14 14	129 91
	Critical al Change in Project Delta Supply due to Action - A	Acre-feet	0	-386	-39	-8	-15	-223	-297	-213	0	0	0	0	0	0	-1,180
	Wet Above Normal		0	-273 -273	0	0	0	0	-1427 -1427	-1173 -1173	0	0	0	0	0	-14 -14	-2,886 -2,886
	Below Normal Dry Critical		0 0 0	0 0 -1165	0 -132 -342	0 -40 -28	0 -353 -55	-1114 -1114 -849	-1448 -1448 -1146	-1222 -1281 -960	0 -616 -58	0 -242 0	0 0 0	0 0 0	0 0 0	0 0 0	-3,784 -5,225 -4,604
Movia			5									-	-	-	-	-	,,

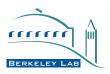
	C-3-1-C: 130 FALLOWING REF Relative to Benchmark (Existing) Condition	1	POSIT	E								Water	Develop	oment a	nd Disp	osition	Assum	ptions
Disposition Non-Crit 34738 17823 0 -7385		SJR Continuity Non-Crit 0 0 -6000 15465	0 Co 0 Gr	onservation oundwate	of Evapora of Drain Sp -SJRc capture-SJF	oills to Wild	ge to GW-S life Areas-S	iJRc JRc	5	<u>JR Non-Con</u> Non-Crit 0 0 0 900	Crit 0 C 0 C 0 G	onservation onservation roundwater ailwater Rec	of Drain Sp SJRnc	ills to Wildli	je to GW-S fe Areas-S.	JRnc IRnc		
9497	0 Wildlife Areas-SJRnc 0 Urban-SJRnc			illowing -S		i.	Non-Crit	Crit		8000		allowing-SJI		Crit				
0 All Valu	0 EWA Ies Relative to Benchmark (Exist	sting) Con		tal Develo	ped Water:		60365	50000	١	otal Disposi	tion:		54673	40000 E	Basic Hy	drologi	c Acco	unting
Water Dev	eloped - Non Critical Years Change in Evaporation/Seepage to GW	3,		Jan 0	Feb 0	Mar 0	Apr 0	May 0	Jun 0	Jul 0	Aug 0	Sep 0	Oct 0	Nov 0	Dec 0	Jan 0	Feb 0	Total 0
	Change in Drain Spills to Wildlife Areas Change in Discharge to SJR Streams			0 141	0 1054	0 1054	0 1757	0 2285	0 2285	0 2285	0 2285	0 1406	0 914	0	0	0	0	0 15,465
	Change to Flows Upstream of Sack Dam Crop Fallowing			0 1031	45 4639	90 5155	90 344	99 687	144 10653	162 14433	162 12715	72 344	27 0	9 0	0	0	0	900 50,000
Effecte to	Groundwater Total S IB Flows due to Developing Water New C	Critical Veero		0 1172	0 5739	0 6299	-750 1441	-840 2231	-990 12092	-1200 15680	-900 14261	-600 1222	-600 341	-120 -111	0	0	0	-6,000 60,365
Enects to	SJR Flows due to Developing Water - Non C Change in Evaporation/Seepage to GW Change in Drain Spills to Wildlife Areas	cilical fears		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Change in Discharge to SJR Streams Change to Flows Upstream of Sack Dam			141 0	1054 0	1054 0	1757 0	2285 0	2285 0	2285 0	2285 0	1406 0	914 0	0	0	0	0	15,465 0
	Crop Fallowing Groundwater			173 0	779 0	303 0	20 0	40 0	626 0	849 0	748 0	58 0	0	0	0	0	0	3,597 0
Return Flo	Total (Positive value means flow reduced) ws from Disposition of Transfer Water - No		6	314	1834	1358	1778	2325	2911	3133	3032	1464	914	0	0	0	0	19,062
	Incremental Return from Agricultural Transfere Incremental Return from Wildlife Area Transfe Envirnomental Water Account Beneficiaries			0	0	53 33	231 5	349 0	415 0	598 0	440 3026	577 165	259 -17	70 282	18 66	24 220	42 252	3,074 4,032
	Incremental Return from Agricultural Entities Total			0	0	0 87	0 236	0 349	0 415	0 598	0 3465	0 742	0 241	0 352	0 83	0 243	0 295	0 7,106
(Positive va	to San Joaquin River Flow Before NM Adjust alue means flow added)	stment (Acr (cfs)	e-feet)	-314 -5	-1834 -33	-1271 -21	-1541 -26	-1976 -32	-2496 -42	-2535 -41	433 7	-722 -12	-673 -11	352 6	83 1	243 4	295 5	-11,955 0
Water Dev	eloped - Critical Years																	
	Change in Evaporation/Seepage to GW Change in Drain Spills to Wildlife Areas Change in Discharge to SJR Streams			0 0 0	0 0 0	0 0	0 0 0	0 0 0	0 0 0	0 0 0	0 0	0 0	0 0 0	0 0	0 0	0 0	0 0	0 0 0
	Change to Flows Upstream of Sack Dam Crop Fallowing			0 1031	0 4639	0 5155	0 344	0 687	0 10653	0 14433	0 12715	0 344	0	0	0	0	0	0 50,000
	Groundwater Total			0	0 4639	0	0	0	0	0	0	0	0 0	0 0	0	0	0 0	0 50,000
Effects to	SJR Flows due to Developing Water - Critic Change in Evaporation/Seepage to GW	al Years		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Change in Drain Spills to Wildlife Areas Change in Discharge to SJR Streams			0 0 0	0 0 0	0 0	0	0 0 0	0	0 0 0	0 0	0 0	0 0 0	0 0	0 0	0 0	0	0
	Change to Flows Upstream of Sack Dam Crop Fallowing Groundwater			173 0	779 0	303 0	0 20 0	40 0	626 0	849 0	748 0	58 0	0	0	0	0	0 0 0	3,597 0
Return Flo	Total (Positive value means flow reduced) ws from Disposition of Transfer Water - Cri	tical Years		173	779	303	20	40	626	849	748	58	ő	ő	Ő	Ő	Ő	3,597
	Incremental Return from Agricultural Transfere Incremental Return from Wildlife Area Transfe	ees		0 0	0 0	0 75	0 11	0 0	0 0	0	0 6791	0 370	0 -39	0 634	0 148	0 493	0 567	0 9,049
	Environmental Water Account Beneficiaries Incremental Return from Agricultural Entities Total			0	0	0	0	0	0	0	0	0 370	0	0 634	0	0	0	0 9.049
Net Effect (Positive vi	to San Joaquin River Flow Before NM Adjus alue means flow added)	stment (Acr (cfs)	e-feet)	0 -173 -3	-779 -14	75 -228 -4	11 -9 0	-40 -1	-626 -11	0 -849 -14	6791 6043 98	312 5	-39 -39 -1	634 11	148 148 2	493 493 8	567 567 10	5,453 0
	k Vernalis Flow - cfs			Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan		ernalis
	Wet Above Normal			7500 5800	13600 7200	15700 6200	13600 5900	12000 4600	7400 2600	5100 2100	3100 2000	2500 1500	3600 2000	3000 1800	4600 2300	7500 5800	13600 7200	
	Below Normal Dry			2300 1900	3200 2600	3300 2300	3700 2700	3700 2200	2100 1800	1900 1400	1500 1100	1200 1000	1900 1700	1700 1600	2200 2100	2300 1900	3200 2600	
Change in	Critical Vernalis Flow with Action - cfs			1300	1700	1600	1800	1500	1300	1000	1000	1000	1500	1400	1500	1300	1700	
	Wet Above Normal Below Normal			-5 -5 -5	-33 -33 0	-21 -21 -21	-26 -26 -26	-32 -32 -32	-42 0 -62	-41 -41 -64	7 7 37	-12 -12 -12	-11 -11 -11	6 6	1 1 1	4 4 4	5 5 0	
	Dry Critical			-5 -5 -3	0 -21	-23	-38 0	-32 -47 -1	-62 -14	-64 -19	38 199	-12	-11	6 11	1	4 8	0 15	
With-Actic	n Vernalis Flow - cfs Wet			7495	13567	15679	13574	11968	7358	5059	3107	2488	3589	3006	4601	7504	13605	
	Above Normal Below Normal			5795 2295	7167 3200	6179 3279	5874 3674	4568 3668	2600 2038	2059 1836	2007 1537	1488 1188	1989 1889	1806 1706	2301 2201	5804 2304	7205 3200	
Benchmar	Dry Critical k Vernalis Water Quality - mmhos (April and	May values m	av not be	1895 1297	2600 1679	2277 1598	2662 1800 ations when	2153 1499 n objective	1738 1286 s control)	1336 981	1138 1199	988 1005	1689 1499	1606 1411	2101 1502	1904 1308	2600 1715	
Benefitina	Wet Above Normal	a may valace n		352 404	286 380	310 465	269 364	212 334	310 486	341 509	460 534	442 588	359 494	497 657	432 639	352 404	286 380	
	Below Normal Dry			757 880	631 736	690 1000	465 700	382 700	700 700	700 700	700 700	680 772	510 547	681 708	657 678	757 880	631 736	
	Critical Vernalis Water Quality with Action - mmhos	s (April and Ma	y values	1000 may not b					700 n objective		700	772	595	772	859	1000	1000	
	Wet Above Normal Below Normal			-1 -1 -2	-3 -5 -15	-1 -2 -3	-2 -4 -6	-3 -7 -8	-4 -15 0	-6 -11 0	6 10 0	-6 -8 -8	-2 -3 -3	1	0 0 0	0	0 1 2	
	Dry Critical			-2 -2	-18 0	0	-3 0	-5 0	0	0	0	-7 2	-3 0	1 3	0	0	3	
With-Actic	n Vernalis Water Quality - mmhos (April and Wet	d May values n	nay not b	351	283	309	267	209	306	335	467	436	357	498	432	352	286	
	Above Normal Below Normal Drv			403 755 877	375 617 718	463 688 1000	360 459 697	327 374 695	471 700 700	498 700 700	543 700 700	581 672 765	491 507 545	659 682 709	639 658 678	405 757 880	381 634 738	
	Critical			998	1000	1000	700	700	700	700	700	765	595	709	859	1001	1000 New M	lonos
Increment	al Change in NM Storage due to WQ Release Wet	e Change - Acr	e-feet	Jan 0	Feb 0	Mar 0	Apr 0	May 0	Jun 0	Jul 0	Aug 0	Sep 0	Oct 0	Nov 0	Dec 0	Jan 0	Feb 0	Total 0
	Above Normal Below Normal			0	0	0	0	0	0 1176	0 1382	0 -1829	0	0	0	0	0	0	0 729
	Dry Critical			0	0 386	130 -97	735 -12	901 15	1176 223	1382 297	-1890 -6209	0	0	0	0	0	0 -267	2,434 -5,665
Increment	al Change in NM Storage due to Vernalis Flo Wet	ow Release Ch	ange - Ac	cre-feet	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Above Normal Below Normal Dry			0 0	0 -1834 -1834	0 0	0 0	0 0 0	-2496 0 0	0 0 0	0 0	0 0 0	0 0 0	0 0	0 0	0	0 295 295	-2,496 -1,539 -1,539
	Critical nental Change in NM Storage due to Vernalis	s Flow & Quali	ty Releas	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Wet Above Normal			0 0	0	0	0	0	0 -2496	0 0	0	0	0	0	0	0	0	0 -2,496
	Below Normal Dry Critical			0 0 0	-1834 -1834 386	0 130 -97	0 735 -12	0 901 15	1176 1176 223	1382 1382 297	-1829 -1890 -6209	0 0	0 0 0	0 0	0	0 0	295 295 -267	-811 895 -5.665
Total D-1		nte - Aaro f			386 Feb	-97 Mar				297 Jul			Oct			Project	Delta S	Supply
oldi Pote	ntial Delta supply Impact w/o NM Adjustmer Wet Above Normal	ms - Acre-feet		Jan 0 0	Feb -642 -642	Mar 0 0	Apr 0 0	May 0 0	Jun 0 -2496	Jul -2535 -2535	Aug 433 433	Sep 0 0	Oct 0 0	Nov 0 0	Dec 0 0	Jan 0 0	Feb 103 103	Total -2,641 -5,137
	Below Normal Dry			0 0	-642 -642	0 -445	0 -270	0 -1976	-2496 -2496	-2535 -2535	433 433	0 -722	0 -651	0	0	0	103 103	-5,137 -9,200
New Melo	Critical nes Adjustments - Acre-feet (positive means	s increase in si	upply)	0	-779	-228	-9	-40	-626	-849	6043	312	-39	634	0	0	567	4,985
	Wet Above Normal			0	0 0	0	0	0	0 2496	0	0 0	0	0	0	0	0	0 0	0 2,496
	Below Normal Dry Critical			0 0 0	642 642 -386	0 -46 97	0 -257 12	0 -901 -15	-1176 -1176 -223	-1382 -1382 -297	1829 1890 6209	0 0 0	0 0 0	0 0	0 0	0 0 0	-103 -103 267	-190 -1,333 5,665
ncrement	Critical al Change in Project Delta Supply due to Ac Wet	tion - Acre-fee	t	0	-386	97	12	-15	-223	-297	433	0	0	0	0	0	103	-2,641
	Above Normal Below Normal			0	-642 0	0	0	0	0 -3672	-2535 -2535 -3917	433 2262	0	0	0	0	0	103 103 0	-2,641 -5,327
	Dry Critical			0	0 -1165	-490 -131	-527 4	-2877 -55	-3672 -849	-3917 -1146	2323 12252	-722 312	-651 -39	0 634	0	0	0 834	-10,533 10,650
Mov	222.4						-		22									

	C-3-2-C: 130 FALLOWING AGR Relative to Benchmark (Existing) Condition		ECOM	POSITI	E							Water	Develop	oment a	nd Disp	osition	Assum	ptions
Non-Crit 96412 0 -7385		SJR Continuity Non-Crit 0 0 -6000 15465	0 Co 0 Gr	onservation roundwate	n of Evapora n of Drain Sp r-SJRc capture-SJF	oills to Wild	ge to GW-S life Areas-S	iJRc JRc	S	<u>SJR Non-Co</u> Non-Crit 0 0 0 900	Crit 0 C 0 C 0 G	onservation onservation roundwater- ailwater Rec	of Drain Sp SJRnc	tion/Seepaç bills to Wildli	ge to GW-S fe Areas-S.	JRnc IRnc		
-7385 0 0	0 Agriculture-SJRnc 0 Wildlife Areas-SJRnc 0 Urban-SJRnc			allwater Re allowing -S		(C	Non-Crit	Crit		8000		allowing-SJF		cnc Crit				
0	o EWA es Relative to Benchmark (Exis	sting) Con		otal Develo	ped Water:		60365	50000	1	otal Disposi	tion:		89027	50000	Basic Hy	drologi	c Acco	untina
ater Deve	Hoped - Non Critical Years Change in Evaporation/Seepage to GW	sting) con	union	Jan 0	Feb 0	Mar 0	Apr 0	May 0	Jun 0	Jul 0	Aug 0	Sep 0	Oct 0	Nov 0	Dec 0	Jan 0	Feb 0	Tota
	Change in Drain Spills to Wildlife Areas Change in Discharge to SJR Streams			0 141	0 1054	0 1054	0 1757	0 2285	0 2285	0 2285	0 2285	0 1406	0 914	0	0 0	0	0	0 15,465
	Change to Flows Upstream of Sack Dam Crop Fallowing			0 1031	45 4639	90 5155	90 344	99 687	144 10653	162 14433	162 12715	72 344	27 0	9 0	0 0	0	0	900 50,000
	Groundwater Fotal			0 1172	0 5739	0 6299	-750 1441	-840 2231	-990 12092	-1200 15680	-900 14261	-600 1222	-600 341	-120 -111	0	0	0	-6,000 60,365
	SJR Flows due to Developing Water - Non C Change in Evaporation/Seepage to GW Change in Drain Spills to Wildlife Areas	critical fears		0	0	0	0	0	0	0	0	0	0	0	0	0	0	(
	Change in Discharge to SJR Streams Change to Flows Upstream of Sack Dam			141 0	1054 0	1054 0	1757 0	2285 0	2285 0	2285 0	2285 0	1406 0	914 0	0	0	0	0	15,46
	Crop Fallowing Groundwater			173 0	779 0	303 0	20 0	40 0	626 0	849 0	748 0	58 0	0	0	0	0	0	3,59
turn Flo	Fotal (Positive value means flow reduced) ws from Disposition of Transfer Water - Nor ncremental Return from Agricultural Transfere		s	314 0	1834 0	1358 148	1778 641	2325 969	2911 1151	3133 1659	3032 1220	1464 1602	914 718	0 193	0 49	0 66	0 117	19,062 8,532
ļ	ncremental Return from Wildlife Area Transfe Envirnomental Water Account Beneficiaries ncremental Return from Agricultural Entities			0 0	0	0	0	0	0	0	0	0	0	0	43 0 0	0	0	0,00
t Effect t	Total o San Joaquin River Flow Before NM Adjus		e-feet)	0 -314	0 -1834	148 -1209	641 -1136	969 -1356	1151 -1760	1659 -1474	1220 -1812	1602 138	718 -196	193 193	49 49	66 66	117 117	8,533 -10,530
	lue means flow added)	(cfs)) 	-5	-33	-20	-19	-22	-30	-24	-29	2	-3	3	1	1	2	
	Change in Evaporation/Seepage to GW Change in Drain Spills to Wildlife Areas			0	0	0	0	0	0	0	0	0	0	0	0	0	0	(
	Change in Discharge to SJR Streams Change to Flows Upstream of Sack Dam			0	0	0	0	0 0	0	0	0	0	0	0	0 0	0	0	0
	Crop Fallowing Groundwater			1031 0	4639 0	5155 0	344 0	687 0	10653 0	14433 0	12715 0	344 0	0	0	0	0	0	50,000
ects to S	Fotal SJR Flows due to Developing Water - Critic: Change in Evaporation/Seepage to GW	al Years		1031 0	4639 0	5155 0	344 0	687 0	10653 0	14433 0	12715 0	344 0	0	0	0	0	0	50,000
	Change in Drain Spills to Wildlife Areas Change in Discharge to SJR Streams			0 0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Change to Flows Upstream of Sack Dam Crop Fallowing			0 173	0 779	0 303	0 20	0 40	0 626	0 849	0 748	0 58	0	0	0	0	0	3,59
	Groundwater Fotal (Positive value means flow reduced)	tion Va		0 173	0 779	0 303	0 20	0 40	0 626	0 849	0 748	0 58	0	0	0 0	0	0 0	3,597
1	vs from Disposition of Transfer Water - Crit ncremental Return from Agricultural Transferen ncremental Return from Wildlife Area Transfe	ees		0	0	77 0	333 0	503 0	597 0	861 0	633 0	831 0	372 0	100 0	25 0	34 0	61 0	4,425
	Envirnomental Water Account Beneficiaries ncremental Return from Agricultural Entities			0	0	0	0	0	0	0	0	0	0	0	0	0	0	(
Effect t	Fotal o San Joaquin River Flow Before NM Adjus lue means flow added)	stment (Acr (cfs)	e-feet)	0 -173 -3	0 -779 -14	77 -226 -4	333 312 5	503 462 8	597 -30 0	861 12 0	633 -115 -2	831 773 13	372 372 6	100 100 2	25 25 0	34 34 1	61 61 1	4,425 828
chmark	Vernalis Flow - cfs			Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	ernalis
	Vet Above Normal Below Normal			7500 5800 2300	13600 7200 3200	15700 6200 3300	13600 5900 3700	12000 4600 3700	7400 2600 2100	5100 2100 1900	3100 2000 1500	2500 1500 1200	3600 2000 1900	3000 1800 1700	4600 2300 2200	7500 5800 2300	13600 7200 3200	
1	Dry Critical			1900 1300	2600 1700	2300 1600	2700 1800	2200 1500	1800 1300	1400 1000	1100 1000	1000	1700 1500	1600 1400	2100 1500	1900 1300	2600 1700	
	Vernalis Flow with Action - cfs Net			-5	-33	-20	-19	-22	-30	-24	-29	2	-3	3	1	1	2	
1	Above Normal Below Normal			-5 -5 -5	-33 0 0	-20 -20 -23	-19 -19 -32	-22 -22 -38	0 -54 -54	-24 -55 -55	-29 -51 -48	2 2 2	-3 -3 -3	3 3 3	1	1	2 0 0	
	Dry Critical 1 Vernalis Flow - cfs			-5	-21	-23 -4	-32	-38	-54	-55	-48 -5	13	-3	2	1 0	1	1	
1	Net Above Normal			7495 5795	13567 7167	15680 6180	13581 5881	11978 4578	7370 2600	5076 2076	3071 1971	2502 1502	3597 1997	3003 1803	4601 2301	7501 5801	13602 7202	
1	Below Normal Dry			2295 1895	3200 2600	3280 2277	3681 2668	3678 2162	2046 1746	1845 1345	1449 1052	1202 1002	1897 1697	1703 1603	2201 2101	2301 1901	3200 2600	
chmark	Critical : Vernalis Water Quality - mmhos (April and Net	d May values m	nay not b	1297 e reflectiv 352	1679 e of split-m 286	1596 onth opera 310	1805 ations when 269	1507 n objective 212	1295 s control) 310	995 341	995 460	1013 442	1506 359	1402 497	1500 432	1301 352	1701 286	
	Above Normal Below Normal			404 757	380 631	465 690	364 465	334 382	486 700	509 700	534 700	588 680	494 510	657 681	639 657	404 757	380 631	
	Dry Critical			880 1000	736 1000	1000 1000	700 700	700 700	700 700	700 700	700 700	772 772	547 595	708 772	678 859	880 1000	736 1000	
1	Vernalis Water Quality with Action - mmhos Net Above Normal	s (April and Ma	ıy values	may not t -1 -1	e reflective -3 -5	of split-m -1 -2	onth opera -2 -4	itions when -3 -6	n objective -4 -13	-6	-8 -11	-7 -11	-2 -3	0	0	0	0	
1	above Normal Below Normal Dry			-1 -2 -2	-5 -15 -18	-2 -3 0	-4 -6 -3	-6 -8 -5	-13 0 0	-12 0 0	-11 0 0	-11 -11 -9	-3 -2 -2	0	0	0	0	
h-Actio	Crítical n Vernalis Water Quality - mmhos (April and	d May values n	nay not b	-2 e reflectiv	0 e of split-m	0 ionth oper	0 ations whe	0 n objective	0 Is control)	0	0	-1	0	0	0	0	0	
	Net Above Normal Below Normal			351 403 755	283 375 617	309 463 687	267 360 459	209 327 374	306 473 700	335 497 700	453 523 700	435 578 669	357 491 507	497 657 681	432 639 657	352 404 757	286 380 632	
1	selow Normal Dry Critical			755 877 998	617 718 1000	1000 1000	459 697 700	374 695 700	700 700 700	700 700 700	700 700 700	763 771	507 545 595	681 707 772	678 859	757 880 1000	632 736 1000	
	I Change in NM Storage due to WQ Release	e Change - Acr	e-feet	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		New Me Feb	elones _{Tota}
	Vet Above Normal			0 0	0	0 0	0	0	0	0	0	0	0	0	0 0	0	0	C
1	Below Normal Dry Critical			0 0	0 0 386	0 222 47	0 776 -12	0 975 30	1425 1425 260	1888 1888 350	1332 1163 223	0 0	0 0	0	0 0 0	0 0	0	4,645 6,449 1,296
ementa	Critical I Change in NM Storage due to Vernalis Flo Wet	ow Release Ch	ange - Ao		386	47	-12 0	30 0	260 0	350 0	223	0	0	0	0	0	14 0	1,296
í	Above Normal Below Normal			0	0 -1834	0	0	0	-1760 0	0	0	0	0	0	0	0	0 117	-1,760 -1,717
	Dry Critical State Change in NM Starsge due to Vernali	o Elou:: 0 0	4v D-1	0 0	-1834 0	0	0 0	0	0	0 0	0	0	0	0	0	0	117 0	-1,717 C
,	ental Change in NM Storage due to Vernalis Net Above Normal	a riow & Quali	ry rteleas	e Change 0 0	- Acre-feet 0 0	0	0	0	0 -1760	0	0	0	0	0	0	0	0	-1.760
	Below Normal Dry			0	-1834 -1834	0 222	0 776	0 975	1425 1425	1888 1888	1332 1163	0	0	0	0	0	117 117	2,928 4,732
	Critical Itial Delta supply Impact w/o NM Adjustmer	nte - Aaro f		0 Jan	386 Feb	47 Mar	-12 Apr	30 May	260 Jun	350 Jul	223	0 Sep	0 Oct	0 Nov	0 Dec	0 Project	14 Delta S Feb	
1	itial Delta supply impact w/o NM Adjustmer Net Above Normal	ina - Acre-reet		Jan 0 0	-642 -642	Mar 0 0	Apr 0 0	May 0 0	Jun 0 -1760	Jul -1474 -1474	Aug -1812 -1812	Sep 0 0	0 0	NOV 0 0	0 0	Jan 0 0	Feb 41 41	Tota -3,887 -5,648
	Below Normal Dry			0 0	-642 -642	0 -423	0 -199	0 -1356	-1760 -1760	-1474 -1474	-1812 -1812	0 138	0 -190	0	0 0	0	41 41	-5,64 -7,67
/ Melon	Critical es Adjustments - Acre-feet (positive means	s increase in si	upply)	0	-779	-226	312	462	-30	12	-115	773	372	100	0	Ó	61	94
	Vet Above Normal Selow Normal			0 0 0	0 0 642	0 0 0	0 0 0	0 0	0 1760 -1425	0 0 -1888	0 0 -1332	0 0	0 0 0	0	0 0	0 0	0 0 -41	1,76 -4.04
1	Below Normal Dry Critical			0 0	642 642 -386	0 -78 -47	0 -272 12	0 -975 -30	-1425 -1425 -260	-1888 -1888 -350	-1332 -1163 -223	0	0 0	0 0	0 0	0	-41 -41 -14	-4,04 -5,20 -1,29
rementa	I Change in Project Delta Supply due to Ac Wet	tion - Acre-fee	t	0	-642	0	0	-30	0	-1474	-1812	0	0	0	0	0	41	-3,887
i	Above Normal Below Normal			0 0	-642 0	0	0	0	0 -3186	-1474 -3362	-1812 -3144	0	0	0	0	0	41 0	-3,887 -9,692
	Dry Critical			0 0	0 -1165	-501 -273	-470 325	-2331 432	-3186 -289	-3362 -338	-2976 -337	138 773	-190 372	0 100	0 0	0	0 47	-12,877 -354
~~ ?	224						-		24									

	C-3-3-C: 130 FALLOWING OUT COM Relative to Benchmark (Existing) Condition	IPOSITE									Water	Develo	oment a	nd Disp	osition	Assum	ptions
Disposition Non-Crit -33588	SJR Cor	Crit Crit	Conservation	of Evapora	ition/Seepa	ae to GW-S	JRc	5	SJR Non-Con Non-Crit 0	Crit	onservation	of Evapora	tion/Seepac	ie to GW-S	IRnc		
0 0 122615	0 Wildlife Areas-SJRc 0 Urban-SJRc -60	0 00	Conservation Groundwater Failwater Re	n of Drain Sp r-SJRc	pills to Wild				0 0 900	0 C 0 G	onservation roundwater ailwater Rec	of Drain Sp SJRnc	oills to Wildli	fe Areas-SJ	IRnc		
0	0 Wildlife Areas-SJRnc 420 0 Urban-SJRnc	00 42000 F	Fallowing -S	JRc	ιc.	Non-Crit	Crit		8000	8000 Fa	allowing-SJI	Rnc Non-Crit	Crit				
	0 EWA ues Relative to Benchmark (Existing)					60365	50000		otal Disposi			89027		Basic Hy			
water Dev	reloped - Non Critical Years Change in Evaporation/Seepage to GW Change in Drain Spills to Wildlife Areas		Jan 0 0	Feb 0 0	Mar 0 0	Apr 0 0	May 0 0	Jun 0 0	Jul 0 0	Aug 0 0	Sep 0 0	Oct 0 0	Nov 0 0	Dec 0 0	Jan 0 0	Feb 0 0	Total 0 0
	Change in Discharge to SJR Streams Change to Flows Upstream of Sack Dam Crop Fallowing		141 0 1031	1054 45 4639	1054 90 5155	1757 90 344	2285 99 687	2285 144 10653	2285 162 14433	2285 162 12715	1406 72 344	914 27 0	0 9 0	0 0 0	0	0 0 0	15,465 900 50,000
	Groundwater Total		0 1172	0 5739	0 6299	-750 1441	-840 2231	-990 12092	-1200 15680	-900 14261	-600 1222	-600 341	-120 -111	0	0	0	-6,000 60,365
Effects to	SJR Flows due to Developing Water - Non Critical Change in Evaporation/Seepage to GW Change in Drain Spills to Wildlife Areas	Years	0	0	0	0	0	0 0	0	0	0	0	0	0	0	0 0	0
	Change in Discharge to SJR Streams Change to Flows Upstream of Sack Dam Crop Fallowing		141 0 173	1054 0 779	1054 0 303	1757 0 20	2285 0 40	2285 0 626	2285 0 849	2285 0 748	1406 0 58	914 0 0	0 0	0 0	0 0	0 0 0	15,465 0 3,597
	Groundwater Total (Positive value means flow reduced)		0 314	0 1834	0 1358	0 1778	0 2325	0 2911	0 3133	0 3032	0 1464	0 914	0	0	0	0	0 19,062
Return Fie	wes from Disposition of Transfer Water - Non Critica Incremental Return from Agricultural Transferees Incremental Return from Wildlife Area Transferees	al Years	0	0	-52 0	-223 0	-338 0	-401 0	-578 0	-425 0	-558 0	-250 0	-67 0	-17 0	-23 0	-41 0	-2,972 0
	Envirnomental Water Account Beneficiaries Incremental Return from Agricultural Entities Total		0	0	0 -52	0 -223	0 -338	0 -401	0 -578	0 -425	0 -558	0 -250	0 -67	0 -17	0 -23	0 -41	0 -2,972
(Positive v	to San Joaquin River Flow Before NM Adjustment alue means flow added)	(Acre-feet) (cfs)	-314 -5	-1834 -33	-1409 -23	-2001 -34	-2663 -43	-3312 -56	-3711 -60	-3457 -56	-2022 -34	-1164 -19	-67 -1	-17 0	-23 0	-41 -1	-22,034
	reloped - Critical Years Change in Evaporation/Seepage to GW		0	0		0	0		0	0	0	0	0	0	0	0	0
	Change in Drain Spills to Wildlife Areas Change in Discharge to SJR Streams		0 0	0	0	0	0	0	0 0	0 0	0	0	0	0	0 0	0 0	0
	Change to Flows Upstream of Sack Dam Crop Fallowing Groundwater		0 1031 0	0 4639 0	0 5155 0	0 344 0	0 687 0	0 10653 0	0 14433 0	0 12715 0	0 344 0	0 0 0	0 0 0	0 0 0	0 0 0	0 0 0	0 50,000 0
Effects to	Total SJR Flows due to Developing Water - Critical Years Change in Evaporation/Seepage to GW	5	1031 0	4639 0	5155 0	344 0	687 0	10653	14433	12715	344 0	0	0	0	0	0	50,000 0
	Change in Drain Spills to Wildlife Areas Change in Discharge to SJR Streams		0	0	0	0	0	0	0	0	0	0	0	0	0	0 0	0
	Change to Flows Upstream of Sack Dam Crop Fallowing Groundwater		0 173 0	0 779 0	0 303 0	0 20 0	0 40 0	0 626 0	0 849 0	0 748 0	0 58 0	0 0	0 0	0 0 0	0 0	0 0 0	0 3,597 0
Return Fle	Total (Positive value means flow reduced) ows from Disposition of Transfer Water - Critical Yes	ars	173	779	303 0	20 0	40	626 0	849 0	748	58	0 0	0 0	0 0	0 0	0 0	3,597
	Incremental Return from Agricultural Transferees Incremental Return from Wildlife Area Transferees Envirnomental Water Account Beneficiaries		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Net Effect	Incremental Return from Agricultural Entities Total to San Joaquin River Flow Before NM Adjustment	(Acre-feet)	0 0 -173	0 0 -779	0 0 -303	0 0 -20	0 0 -40	0 0 -626	0 0 -849	0 0 -748	0 0 -58	0 0 0	0 0 0	0 0 0	0 0 0	0 0 0	0 0 -3,597
(Positive v	alue means flow added)	(cfs)	-3	-14	-5	0	-1	-11	-14	-12	-1	Ő	Ö	0	Ő	0	ernalis
Benchma	k Vernalis Flow - cfs Wet Above Normal		Jan 7500 5800	Feb 13600 7200	Mar 15700 6200	Apr 13600 5900	May 12000 4600	Jun 7400 2600	Jul 5100 2100	Aug 3100 2000	Sep 2500 1500	Oct 3600 2000	Nov 3000 1800	Dec 4600 2300	Jan 7500 5800	Feb 13600 7200	
	Below Normal Dry		2300 1900	3200 2600	3300 2300	3700 2700	3700 2200	2100 1800	1900 1400	1500 1100	1200 1000	1900 1700	1700 1600	2200 2100	2300 1900	3200 2600	
Change ir	Critical Vernalis Flow with Action - cfs Wet		1300 -5	-33	1600 -23	1800 -34	1500 -43	1300 -56	1000 -60	-56	-34	1500 -19	1400 -1	1500 0	1300 0	1700 -1	
	Above Normal Below Normal Dry		-5 -5 -5	-33 0	-23 -23 -25	-34 -34 -46	-43 -43 -57	0 -71 -71	-60 -74 -74	-56 -68 -69	-34 -34 -34	-19 -19 -19	-1 -1 -1	0 0 0	0 0 0	-1 0 0	
With-Actio	Critical on Vernalis Flow - cfs		-3	-21	-6	0	-1	-14	-19	-16	-1	0	0	0	0	0	
	Wet Above Normal Below Normal		7495 5795 2295	13567 7167 3200	15677 6177 3277	13566 5866 3666	11957 4557 3657	7344 2600 2029	5040 2040 1826	3044 1944 1432	2466 1466 1166	3581 1981 1881	2999 1799 1699	4600 2300 2200	7500 5800 2300	13599 7199 3200	
Bonohma	Dry Critical rk Vernalis Water Quality - mmhos (April and May va	aluce may not	1895 1297	2600 1679	2275 1594	2654 1800	2143 1499	1729 1286 s control)	1326 981	1031 984	966 999	1681 1500	1599 1400	2100 1500	1900 1300	2600 1700	
Benchina	Wet Above Normal	alues may not	352 404	286 380	310 465	269 364	212 334	310 486	341 509	460 534	442 588	359 494	497 657	432 639	352 404	286 380	
	Below Normal Dry Critical		757 880 1000	631 736 1000	690 1000 1000	465 700 700	382 700 700	700 700 700	700 700 700	700 700 700	680 772 772	510 547 595	681 708 772	657 678 859	757 880 1000	631 736 1000	
Change in	Vernalis Water Quality with Action - mmhos (April Wet Above Normal	and May value	s may not b -1 -1	-3 -5	e of split-m -1 -2	onth opera -2 -5	tions when -3 -7	-4 -18	-6 -10	-7 -8	-6 -7	-2 -3	0	0	0	0	
	Below Normal Dry		-2 -2	-15 -18	-3 0	-6 -3	-9 -4	0	0	0 0	-7 -6	-3 -3	0	0	0	0 0	
With-Actio	Critical on Vernalis Water Quality - mmhos (April and May va Wet	alues may not	-2 be reflectiv 351	0 eofsplit-m 283	0 Ionth oper 309	0 ations when 266	0 n objective 209	0 s control) 306	0 335	0 454	0 436	0 357	0 497	0 432	0 352	0 286	
	Above Normal Below Normal		403 755 877	375 617 718	463 688 1000	360 459 697	326 373 696	469 700 700	500 700 700	525 700 700	582 673 766	491 506 544	657 681 708	639 657 678	404 757 880	380 631 736	
	Dry Critical		998	1000	1000	700	700	700	700	700	766	595	708	859	1000	1000 New M	elones
Increment	al Change in NM Storage due to WQ Release Chang Wet	ge - Acre-feet	Jan 0 0	Feb 0	Mar 0	Apr 0	May 0	Jun 0	Jul 0	Aug 0	Sep 0	Oct 0	Nov 0	Dec 0	Jan 0	Feb 0	Total 0 0
	Above Normal Below Normal Dry		0	0	0 0 156	0 709	0 0 819	900 900	0 821 821	700 758	0	0	0	0 0 0	0 0 0	0	2,420 4,164
Increment	Critical al Change in NM Storage due to Vernalis Flow Rele Wet	ase Change - A	0 Acre-feet	386	39 0	8	15 0	223 0	297 0	213 0	0	0	0	0	0	0	1,180 0
	Above Normal Below Normal		0	0 -1834	0	0	0	-3312 0	0	0	0	0	0	0	0	0 -41	-3,312 -1,875
Net Increr	Dry Critical nental Change in NM Storage due to Vernalis Flow a	& Quality Relea	0 0 ase Change	-1834 0 - Acre-feet	0	0	0	0	0	0	0	0 0	0	0	0 0	-41 0	-1,875 0
	Wet Above Normal Below Normal		0 0 0	0 0 -1834	0 0	0 0	0 0 0	0 -3312 900	0 0 821	0 0 700	0 0	0 0	0	0 0 0	0 0	0 0 -41	0 -3,312 546
	Dry Critical		0	-1834 -1834 386	156 39	709 8	819 15	900 223	821 297	758 213	0	0	0	0	0	-41 -41 0	2,290 1,180
Total Pote	ntial Delta supply Impact w/o NM Adjustments - Ac	re-feet	Jan	Feb	Mar	Apr	May	Jun	Jul -3711	Aug	Sep	Oct	Nov	Dec	Project	Feb	Total
	Wet Above Normal Below Normal		0 0 0	-642 -642 -642	0 0 0	0 0 0	0 0 0	0 -3312 -3312	-3711 -3711 -3711	-3457 -3457 -3457	0 0 0	0 0 0	0 0 0	0 0 0	0 0 0	-14 -14 -14	-7,825 -11,136 -11,136
New Molo	Dry Critical nes Adjustments - Acre-feet (positive means increa	se in sunslu)	0	-642 -779	-493 -303	-350 -20	-2663 -40	-3312 -626	-3711 -849	-3457 -748	-2022 -58	-1126 0	0	0	0	-14 0	-17,790 -3,424
	Wet Above Normal		0	0 0	0	0	0	0 3312	0 0	0	0	0	0	0	0	0	0 3,312
	Below Normal Dry Critical		0 0 0	642 642 -386	0 -55 -39	0 -248 -8	0 -819 -15	-900 -900 -223	-821 -821 -297	-700 -758 -213	0 0 0	0 0 0	0 0 0	0 0 0	0 0 0	14 14 0	-1,764 -2,946 -1,180
Increment	al Change in Project Delta Supply due to Action - A Wet	cre-feet	0	-642	0	0	0	0	-3711	-3457 -3457	0	0	0	0	0	-14	-7,825
	Above Normal Below Normal Dry		0	-642 0 0	0 -548	0 0 -598	0 0 -3482	0 -4212 -4212	-3711 -4532 -4532	-4157 -4216	0 0 -2022	0 -1126	0	0	0	-14 0 0	-7,825 -12,901 -20,736
Mové	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 <u>nwquinn@lbl.gov</u> 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

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

- 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

			Status		Potential Occurrence in the Study Area ^d												
Common Name	Scientific Name	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					<u> </u>					<u> </u>			•	I			
Akali mariposa lily	Calochortus striatus	SC	None	1B		Х											
Alkali milk- vetch	Astragalus tener var. tener	None	None	1B				Х				Х	Х		Х		
Alkalli mariposa lily	Calochortus striatus	SC	None	1B												Х	
Alpine sterptanthus	Streptanthus gracilis	SC	None	1B	Х											Х	
Arburua Ranch jewelflower	Streptanthus insignis ssp. lyonii	SC	None	1B				Х									
Arcuate bush mallow	Malacothamnus arcutatus	SLC	None	1B											Х		
Aromatic canyon gooseberry	Ribes menziesii var. ixoderme	SLC	None	1B	Х	Х										Х	
Bakersfield cactus	Opuntia treleasei	Е	None	None		Х											
Bakersfield saltbush	Atriplex tularensis	None	Е	1B		Х											
Beach layia	Layia carnosa	Е							Х								
Beaked clarkia	Clarkia rostrata	SC	None	1B				Х									
Beaked clarkia	Clarkia rostrata	SC	None	1B									Х				
Beaked clarkia	Clarkia rostrata	SC	None	1B									Х				
Ben Lomond buckwheat	Eriogonum nudum var. decurrents	SC	None	1B											Х		

 Table C-1

 Special-Status Species with the Potential to Occur in the Project Area

Table C-1 (continued)

		Status					Potential Occurrence in the Study Area ^d												
Common Name	Scientific Name	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	Е	None	1B						Х									
Ben Lomond wallflower	Erysimum teretifolium	Е	Е	1B						Х									
Big tarplant	Blepharizonia plumosa ssp. plumosa	SC	None	1B								Х	Х						
Big-scale balsamroot	Balsamorhiza macrolepis var. macrolepis	SLC	None	1B											Х				
Bodie Hills rock cress	Arabis bodiensis	SC	None	1B	Х											Х			
Boggs Lake hedge-hyssop	Gratiola heterosepala	None	Е	1B	Х			Х				Х		Х					
Brandegee's wooly-star	Eriastrum brandegeae	SC	None	1B											Х				
Brittlescale	Atriplex depressa	SC	None	1B	X	Х			X				X	Х		Х			
Cache Peak buckwheat	Eriogonum kennedyi var. pinicola	SC	None	1B		Х													
Calico monkeyflower	Mimulus pictus	SC	None	1B		Х										Х			
Caliente clarkia	Clarkia tembloriensis ssp. Calientensis	SC	None	1B		Х													
California jewelflower	Aulanthus californicus	Е	None	None	Х	Х	Х									Х			

Table C-1 (continued)

		Potential Occurrence in the Study Area ^d														
Common Name	Scientific Name	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		Х										
California seablite	Suaeda californica	Е	None	1B											Х	
California tortula moss	Tortula californica	SLC	None	None		Х										
Capper-fruited tropidocarpum	Tropidocarpum capparideum	SC	None	1A								Х			Х	
Carpenteria	Carpenteria californica	SC	Т	1B	Х									Х		
Carrizo (=Jared's) peppergrass	Lepidium jaredii var. jaredii	SC	None	1B		Х										
Chaparral harebell	Campanula exigua	SLC	None	1B									Х		Х	
Charlotte's phacelia	Phacelia nashiana	SC	None	1B		Х										Х
Clustered lady's-slipper	Cypripedium fasciculatum	SC	None	4											Х	
Coastal dunes milk vetch	Astragulus tener var. titi	E	Ε	1B					Х							
Colusa grass	Neostapfia colusana	Т	Ε	1B				Х					Х			
Comanche layia	Layia leucopappa	SC	None	1B		Х										
Common moonwort	Botrychium lunaria	SC	None	2										Х		
Congdon's tarplant	Hemizonia parryi ssp. congdonii	SC	None	None											Х	

Table C-1 (continued)

		Potential Occurrence in the Study Area ^d														
Common Name	Scientific Name	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	Е	None	1B					Х						Х	
Cottony buckwheat	Eriogonum gossypinum	SLC	None	4	Х		Х									
Coyote ceanothus	Ceanothus ferrisae	E	None	1B											Х	
Curly-leaved monardella	Monardella undulata	SC	None	4											Х	
Dedecker's lupine	Lupinus padre- crowleyi	SC	R	1B												Х
Delta coyote- thistle	Eryngium racemosum	SC	Е	1B								Х	Х			
Delta coyote- thistle	Eryngium racemosum	SC	Ε	1B				Х								
Delta tule pea	Lathyrus jepsonii var. jepsonii	SC	None	1B	Х										Х	
Delta tule pea	Lathyrus jepsonii var. jepsonii	SC	None	1B								Х				
Diamond- petaled California poppy	Eschscholzia rhombipetala	SC	None	1B									Х			
Diamond- petaled California poppy	Eschscholzia rhombipetala	SC	None	1B		Х										
Dwarf calycadenia	Calycadenia villosa	SC	None	1B		Х										

			Status					Poten	tial Occ	urrence	e in the	e Study	y Area	d		
Common Name	Scientific Name	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		Х	Х									Х
Ewan's larkspur	Delphinium hansenii ssp. ewanianum	SC	None	4										Х		Х
Field ivesia	Ivesia campestis	SLC	None	1B	Х											Х
Flax-like monardella	Monardella linoides ssp. oblonga	SC	None	1B		Х										Х
Forked fiddleneck	Amsinckia vernicosa var. furcata	SLC	None	4	Х	Х	Х									
Fragrant fritillary	Fritillaria liliacea	SC	None	1B											Х	
Fragrant fritillary	Fritillaria liliacea	SC	None	1B											Х	
Franciscan onion	Allium peninsulare var. francisanum	SLC	None	1B											Х	
Fresno County bird's-beak	Cordylanthus tenuis ssp. barbatus	SC	None	4	Х											
Ft. Tejon woolly- sunflower	Erioiphyllum lanatum var. halllii	SC	None	1B		Х										
Gairdner's yampah	Perideridi gairdneri ssp. gairdneri	SC	None	4		Х									Х	

			Status	-				Poten	tial Occ	urrence	e in the	e Study	y Area	d		
Common Name	Scientific Name	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	Т	None	1B					Х							
Greene's popcorn flower	Plagiobothrys reticulatus var. rossianorum	SC	None	None		Х									Х	
Greene's tuctoria	Tuctoria greenei	Е	R	1B	Х			Х				Х	Х	Х		Х
Greenhorn adobe-lily	Fritillaria striata	None	Т	1B		Х										Х
Hairless allocarya	Plagiobothrys glaber	SC	None	1A				Х							Х	
Hairy Orcutt grass	Orcuttia pilosa	Е	Е	1B				Х					X	X		
Hall's bush mallow	Malacothamnus hallii	SLC	None	1B				Х							Х	
Hall's bush mallow	Malacothamnus hallii	SC	None	1B									Х			
Hall's tarplant	Deinandra halliana	SC	None	1B	Х	Х										
Hartweg's golden sunburst	Pseudobahia bahiifolia	E	E	1B	Х								Х	Х		
Heartscale	Atriplex cordulata	SC	None	1B	Х	Х	Х		Х			Х	Х	Х		Х
Henderson's bent grass	Agrostis hendersonii	SC	None	3				Х								
Hispid bird's- beak	Cordylanthus mollis ssp. hispidus	SCq	None	1B		Х		Х								

			Status	-			-	Poten	tial Occ	urrenc	e in the	e Study	y Area	d		
Common Name	Scientific Name	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											Х	
Hoover's calycadenia	Calycadenia hooveri	SLC	None	1B				Х					Х	Х		
Hoover's cryptantha	Cryptantha hooveri	SLC	None	1B				Х				Х	Х	Х		
Hoover's eriastrum	Eriastrum hooveri	D	None	4	Х	Х	Х				Х					Х
Hoover's spurge	Chamaesyce hooveri	Т	None	1B				Х								Х
Indian Valley bush mallow	Malacothamnus aboriginum	SLC	None	1B	Х											
Interior California larkspur	Delphinium californicum ssp. interius	SC	None	1B		Х		Х				Х			Х	
Kaweah brodiaea	Brodiaea insignis	None	Е	1B												Х
Kaweah Lakes fawn-lily	Erythronium grandiflorum ssp. pusaterii	SLC	None	None												Х
Keck's checker- mallow	Sidalcea keckii	E	None	1B	Х	Х										Х
Kelso Creek monkeyflower	Mimulus shevockii	SC	None	1B		Х										
Kern Canyon clarkia	Clarkia xaniana	SLC	None	1B		Х										
Kern mallow	Eremaiche kernensis	Е	None	1B		Х										

			Status	-				Poten	tial Occ	urrenc	e in the	e Study	y Area	d		
Common Name	Scientific Name	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												Х
Kern River daisy	Erigeron multiceps	SC	None	1B	Х											Х
Kernville poppy	Eschscholzia procera	SC	None	3		Х										
King's gold	Twisselmannia californica	SC	None	1B		Х	Х									
Kings Mountain manzanita	Arctostaphylos regismontana	SLC	None	1B											Х	
Kings River buckwheat	Eriogonum nudum var. regirivum	SC	None	1B	Х											
Large- flowered fiddleneck	Amsinckia grandiflora	Е	Е	1B								Х				
Large- flowered linanthus	Linanthus grandiflorus	SC	None	4				Х						Х	Х	
Legenere	Legenere limosa	SC	None	1B									Х			
Lemmon's jewelflower	Caulanthus coulteri var. lemmonii	SLC	None	1B	Х	Х	Х					Х	Х			
Lesser saltscale	Atriplex minuscula	SC	None	1B	Х	Х		Х						Х		Х
Little mousetail	Myosurus minimus ssp. apus	SC	None	3												Х

			Status					Poten	tial Occ	urrence	e in the	e Study	y Area	d		
Common Name	Scientific Name	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								Х				
Loma Prieta hoia	Hoita strobilina	SC	None	1B											Х	
Long-petaled lewisia	Lewisia longipetala	SC	None	1B	Х											
Lost Hills saltbush	Atriplex vallicola	SC	None	1B	Х	Х	Х	Х								
Madera linanthus	Linanthus serrulatus	SLC	None	1B	Х	Х								Х		Х
Maple-leaved checkerbloom	Sidalcea malachroides	SLC	None	1B											Х	
Mariposa pussy-paws	Calyptridium pulchellum	Т	None	1B	Х											
Mariposa pussy-paws	Calyptridium pulchellum	Т	None	1B										Х		
Mason's lilaeopsis	Lilaeopsis masonii	SC	R	1B								Х				
Mason's nestraw	Stylocline masonii	SC	None	1B		Х										
Menzie's wallflower	Erysimum manziesii	Е	Е	1B					Х							
Merced monardella	Monardella leucocephala	SC	None	1A				Х								
Merced phacelia	<i>Phacelia ciliata</i> var. <i>opaca</i>	SC	None	1B				Х								
Metcalf Canyon jewelflower	Streptanthus albidus ssp. albidus	E	None	1B											Х	
Monarch gilia	Gilia yorkii	SLC	None	1B	Х											

			Status					Poten	tial Occ	urrence	e in the	e Study	y Area	d		
Common Name	Scientific Name	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	Х									Х		
Monterey spinfelower	Chorizanthe pungens var. pungens	Т	None	1B						Х						
Mouse buckwheat	Eriogonum nudum var. murinum	SC	None	1B	Х											Х
Mt. Diablo phacelia	Phacelia phacelioides	SC	None	1B											Х	
Mt. Diablo phacelia	Phacelia phacelioides	SC	None	1B									Х			
Mt. Hamilton coreopsis	Coreopsis hamiltonii	SC	None	1B									Х		Х	
Mt. Hamilton harebell	Campanula sharsmithiae	SC	None	1B									Х		Х	
Mt. Hamilton jewelflower	Steptanthus callistus	SLC	None	1B											Х	
Mt. Hamilton lomatium	Lomatium observatorium	SLC	None	1B											Х	
Mt. Hamilton lomatium	Lomatium observatorium	SLC	None	1B									Х			
Mt. Hamilton thistle	Cirsium fontinale var. campylon	SC	None	1B									Х		Х	
Munz's tidy- tips	Layia munzii	SC	None	1B	Х	Х										
Napa western flax	Hesperolinon serpentinum	SC	None	1B									Х			

			Status					Poten	tial Occ	urrenc	e in the	e Study	y Area	d		
Common Name	Scientific Name	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		Х										Х
Obovate- leaved thornmint	Acanthomintha obovata ssp. obovata	SC	None	4	Х											
Oil neststraw	Stylocline citroleum	SC	None	1B		Х										
Orange lupine	Lupinus citrinus var. citrinus	SC	None	1B	Х									Х		
Oregon meconella	Meconella oregana	SC	None	1B											Х	
Owens Peak lomatium	Lomatium shevockii	SC	None	1B		Х										
Pacific cordgrass	Spartina foliosa	SLC	None	None											Х	
Pale-yellow layia	Layia heterotricha	SC	None	1B	Х	Х	Х									
Palmate- bracted bird's beak	Cordylathus palmatus	E	E	1B	Х							Х		Х		
Palmer's mariposa lily	Calochortus palmeri var. palmeri	SC	None	1B		Х										
Panoche peppergrass	Lepidium jaredii var. album	SC	None	1B	Х	Х										
Parasol clover	Trifolium bolanderi	SC	None	1B	Х									Х		

			Status	-				Poten	tial Occ	urrenc	e in the	e Study	y Area	d		
Common Name	Scientific Name	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												Х
Pincushion navarretia	Naverretia myersii spp. myersii	SC	None	1B				Х								
Piute buckwheat	Eriogonum breedlovei var. breedlovei	SC	None	4		Х										
Piute cypress	Cupressus nevadensis	SC	None	None		Х										Х
Piute Mountains jewelflower	Streptanthus cordatus var. piutensis	SC	None	1B		Х										
Piute Mountains navarretia	Navaretia setiloba	SC	None	1B		Х										Х
Point Reyes bird's-beak	Cordylanthus maritimus ssp. palustris	SC	None	1B											Х	
Prostrate navarretia	Navarretia prostrata	SC	None	1B				Х								
Purple mountain- parsley	Oreonana purpurascens	SLC	None	1B												Х
Ramshaw sand-verbena	Abronia alpina	С	None	1B												Х
Raven's milk- vetch	Astragalus monoensis var. ravenii	SC	None	1B	Х											

			Status					Poten	tial Occ	urrenco	e in the	e Study	y Area	d		
Common Name	Scientific Name	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										Х		
Rayless layia	Layia discoidea	SC	None	1B	Х											
Recurved larkspur	Delphinium recurvatum	SC	None	1B	Х	Х	Х	Х								Х
Red rock poppy	Eschscholzia minutiflora ssp. twisselmannii	SC	None	1B		Х										
Red-flowered lotus	Lotus rubriflorus	SC	None	1B									Х			
Robust spineflower	Chorizanthe robusta var. robusta	E	None	1B											Х	
Rock sanicle	Sanicula saxatilis	SC	R	1B											Х	
Salinas Valley popcorn flower	Plagiobothrys uncinatus	SC	None	1B											Х	
San Benito evening primrose	Camisonia benitensis	Т	None	1B	Х						Х	Х				
San Benito spineflower	Chorizanthe biloba var. immemora	SC	None	1B	Х											
San Francisco Bay spineflower	Chorizanthe cuspidata var. cuspidata	SC	None	1B											Х	
San Francisco wallflower	Erysimum fransiscanum	SC	None	4											Х	

			Status					Poten	tial Occ	urrenc	e in the	e Study	y Area	d		
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San Joaquin adobe sunburst	Pseudohagia peirsonii	Т	Е	1B	Х											Х
San Joaquin Valley Orcutt grass	Orcuttia inaequalis	Т	E	1B	Х			Х					Х	Х		Х
San Joaquin woolly-threads	Monolopia congondii	Е	None	1B	Х	Х	Х				Х					Х
Santa Clara Valley dudleya	Dudleya setchellii	Е	None	1B											Х	
Santa Cruz cypress	Cupressus abramsiana	Е	Е	1B						Х						
Santa Cruz manzanita	Arctostaphylos andersonii	SC	None	1B											Х	
Santa Cruz Mts. Beardtongue	Penstemon rattanii var. kleei	SLC	None	1B											Х	
Santa Cruz tarplant	Holocarpha macradenia	Т	Е	1B						Х						
Scalliped moonwort	Botrychium crenulatum	SC	None	2												Х
Scott's Valley spineflower	Chorizanthe robusta (var. hartwegii)	E	None	1B						Х						
Sequoia gooseberry	Ribes tularense	SLC	None	1B												Х
Serpentine bedstraw	Galium andrewsii ssp. gatense	SLC	None	4	Х										Х	
Sharsmith's onion	Allium sharsmithae	SC	None	1B									Х		Х	

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Shevock's copper-moss	Schizymenium shevockii	SLC	None	1B	Х										Х	
Shirley Meadows mariposa lily	Calochortus westonii	SC	None	1B		Х										S
Short-leaved hulsea	Hulsea brevifolia	SLC	None	1B	Х									Х		Х
Showy Indian clover	Trifolium amoenum	Е	None	1B											Х	
Showy madia	Madia radiata	SC	None	1B	Х	Х	Х					Х				
Slender moonwort	Botrychium lineare	С	None	1B	Х									Х		
Slender- stalked monkeyflower	Mimulus gracilipes	SLC	None	1B	Х											
Slough thistle	Cirsium crassicaule	SC	None	1B		Х	Х					Х				
Small's southern clarkia	Clarkia australis	SC	None	1B										Х		
Smooth lessingia	Lessingia micradenia var. glabrata	SC	None	1B											Х	
South Bay clarkia	Clarkia concinna ssp. automixa	SC	None	1B											Х	
South Coast Range morning-glory	Calystegia collina ssp. venusta	SC	None	4	Х											
Spiny-sepaled coyote-thistle	Eryngium spinosepalum	SC	None	1B	Х								Х	Х		Х

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			Status	-		-		Poten	tial Occ	urrenc	e in the	e Study	y Area	d	-	-
Common Name	Scientific Name	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	Т	Е	1B												Х
Stinkbells	Fritillaria agrestis	SLC	None	4	Х								Х			
Subtle orache	Atriplex subtilis	SLC	None	1B	Х	Х	Х	Х						Х		Х
Succulent (fleshy) owl's clover	<i>Castilleja</i> <i>campestris</i> ssp. <i>succulenta</i>	Т	E	1B	Х			Х				Х	X	Х		
Suisun Marsh aster	Aster lentus	SC	None	1B								Х				
Talus fritillary	Fritillaria falcata	SC	None	1B									X		Х	
Tehipite Valley jewelflower	Streptanthus fenestratus	SLC	None	1B	Х											
Tejon poppy	Eschscholzia lemmonii spp. Kernensis	SC	None	1B		Х										
Temblor buckwheat	Eriogonum temblorense	SC	None	1B		Х										
Tiburon buckwheat	Eriogonum caninum	SLC	None	None											Х	
Tiburon paintbrush	Castilleja affinis ssp. neglecta	E	Т	1B											Х	
Tidestrom's lupine	Lupinus tidestromii	Е	Е	1B						X						
Tulare horkelia	Horkelia tularensis	SLC	None	1B												Х
Twisselmann's buckwheat	Eriogonum twisselmannii	SC	R	1B												Х

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Twisselmann's nemacladus	Nemaclaudus twisselmannii	SC	R	1B		Х										Х
Valley sagittaria	Sagittaria sanfordii	SC	None	1B	Х			Х				Х				
Valley spearscale	Atriplex joaquiniana	SC	None	1B				Х				Х			Х	Х
Vernal pool saltbush	Atriplex persistens	SC	None	1B				Х					Х			Х
Walker Pass milk-vetch	Astragalus erterae	SC	None	1B		Х										
Water sack clover	Trifolium depauperatum var. hydrophilum	SC	None	1B											Х	
Western leatherwood	Dirca occidentalis	SLC	None	1B											Х	
White-rayed pentachaeta	Pentachaeta bellidiflora	Е	Е	1B						Х						
Yosemite lewisia	Lewisia disepala	SC	None	1B	Х	Х								Х		Х
Yosemite woolly- sunflower	Eriophyllum nubigenum	SC	None	1B										Х		
INVERTEBRA								r	T	1						
Antioch Dunes anthicid beetle	Anthicus antiochensis	SC	None	NA								Х	Х			
Bay checkerspot butterfly	Euphydryas editha bayensis	Т	None	NA											Х	

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Bohart's blue butterfly	Philotiella speciosa bohartorum	SC	None	NA	Х									Х		
California linderiella fairy shrimp	Linderiella occidentalis	SC	None	NA	Х	Х	Х	Х				Х	Х	Х	Х	Х
Ciervo aegialian scarab beetle	Aegialia concinna	SC	None	NA	Х		Х	Х								
Conservancy fairy shrimp	Branchinecta conservatio	Е	None	NA				Х	Х		Х	Х	Х			
Curved-foot hygrotus diving beetle	Hygrotus curvipes	SC	None	NA								Х				
Denning's cryptic caddisfly	Cryptochia denningi	SC	None	NA												Х
Doyen's rigonascuta dune wevil	Trigonoscuta doyeni	SC	None	NA			Х									
Dry Creek cliff strider bug	Oravelia pege	SC	None	NA	Х											
Edgewood blind harvestman	Calicina (Sitalcina) minor	SC	None	NA											Х	
Hom's microblind harvestman	Microcina homi	SC	None	NA											Х	
Hopping's blister beetle	Lytta hoppingi	SC	None	NA	Х	Х										Х

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Jung's microblind harvestman	Microcina juni	SC	None	NA											Х	
Kern primrose sphinx moth	Euproserpinus euterpe	Т	None	NA		Х										
Kern shoulderband snail	Helminthoglypt a callistoderma	SC	None	NA		Х										
Kings Canyon cryptochian caddisfly	Cryptochia excella	SC	None	NA	Х											Х
Leech's skyline diving beetle	Hydroporus leechi	SC	None	NA										Х		
Longhorn fairy shrimp	Branchinecta longiantenna	Е	None	NA		Х		Х	Х		Х	Х	Х	Х		
Mid-valley fairy shrimp	Branchinecta mesovallensis	SC	None	NA	Х			Х				Х	Х	Х		
Moestan blister beetle	Lytta moesta	SC	None	NA	Х	Х						Х	Х			Х
Molestan blister beetle	Lytta molesta	SC	None	NA	Х	Х	Х	Х				Х	Х			Х
Morrison's blister beetle	Lytta morrisoni	SC	None	NA	Х	Х										Х
Mt. Hermon june beetle	Polyphylla barbata	Е	None	NA						Х						
Ohlone tiger beetle	Cicindela ohlone	Е	None	NA						Х						
Opler's longhorn moth	Adela oplerella	SC	None	NA											Х	

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Ricksecker's water scavenger beetle	Hydrochara rickseckeri	SC	None	NA											Х	
Sacramento anthicid beetle	Anthicus sacramento	SC	None	NA								Х	Х			
San Emigdio blue butterfly	Plebulina emigdionis	SC	None	NA		Х										Х
San Joaquin dune beetle	Coelus grailis	SC	None	NA	Х		Х	Х								
San Joaquin tiger beetle	Cicindela tranquebarica		None	NA	Х											Х
Sierra pygmy grasshopper	Tetrix sierrana	SC	None	NA	Х									Х		
Smith's blue butterfly	Euphilotes enoptoes smithi	Е	None	NA					X							
Tehachapi Mt. silverspot butterfly	Speyeria egleis tehachapina	SC	None	NA		Х										
Unsilvered fritiallary butterfly	Speyeria adiaste adiaste	SC	None	NA											Х	
Valley elderberry longhorn beetle	Desmocerus californicus dimorphus	FT	None	NA	X	Х	X	Х				Х	Х	Х		Х
Vernal pool fairy shrimp	Branchinecta lynchi	FT	None	NA	Х	Х	Х	Х	Х		Х	Х	Х	Х	Х	Х
Vernal pool tadpole shrimp	Lepidurus packardi	Е	None	NA	Х		Х	Х			Х		Х	Х		Х

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Wawona riffle beetle	Atractelmis wawona	SC	None	NA										Х		
Wooly hydroporus diving beetle	Hydroporus hirsutus	SC	None	NA	Х											
Yosemite mariposa sideband snail	Monadenia hillebrandi yosemitensis	SC	None	NA										Х		
Zayante band- winged grasshopper	Trimerotropis infantilis	Е	None	NA						Х						
FISH																
California golden trout	Oncorhynchus mykiss aquabonita	SC	None	NA												Х
Chinook salmon, Sacramento Valley winter- run ESU	Oncorhynchus tshawytscha	Е	E	NA								XX				
Chinook salmon, Central Valley fall/late fall- run ESU	Oncorhynchus tshawytscha	С	SC	NA				Х				X	Х		Х	
Chinook salmon, Central Valley spring-run ESU	Oncorhynchus tshawytscha	Т	Т	NA											Х	

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Coho salmon, Central California Coast ESU	Oncorhynchus kisutch	Т	E	NA											Х	
Delta smelt	Hypomesus transpacificus	D	Т	NA	Х		Х	Х				Х	Х	Х	Х	Х
Green sturgeon	Acipencer medirostris	SC	SC	NA	Х			Х				Х	Х	Х	Х	
Hardhead	Mylopharodon conocephalus	None	SC	NA	Х	Х	Х	Х				Х	Х	Х		Х
Kern brook lamprey	Lampetra hubbsi	SC	SC	NA	Х	Х	Х	Х				Х	Х	Х		Х
Kern River rainbow trout	Oncorhynchus mykiss gilberti	SC	None	NA		Х										
Lahontan cutthroat trout	Oncorhynchus clarki henshawi	Т	None	NA	Х									Х		
Little Kern golden trout	Oncorhynchus aquabonita whitei	Т	None	NA												Х
Longfin smelt	Spirinchus thaleichthys	SC	SC	NA	Х	Х		Х				Х	Х	Х	Х	
Pacific lamprey	Lampetra tridentata	SC	None	NA	Х			Х				Х	Х			
Paiute cutthroat trout	Oncorhynchus clarki seleniris	Т	None	NA	Х									Х		
River lamprey	Lampetra ayresi	SC	SC	NA	Х			Х				Х		Х		
Sacramento splittail	Pogonichthys macrolepidotus	SC	None	NA	Х		Х	Х				Х	Х	Х	Х	Х

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Steelhead, Central Valley ESU	Oncorhynchus mykiss irideus	Т	None	NA				Х				Х	Х	Х		
Steelhead, South Central California ESU	Oncorhynchus mykiss	Т	None	NA	Х											
Tidewater goby	Eucyclogobius newberryi	Е	SC	NA					X	Х					Х	
AMPHIBIANS	Bufo	Е	SC	NA	r			i	X							
Arroyo toad	вијо californicus		SC	NA					Λ							
Breckenridge Mt. slender salamander	Batrachoseps sp.	SC	None	NA		Х										
California red- legged frog	Rana aurora draytonii	Т	SC	NA	Х	Х	Х	Х	Х	Х	Х	Х	Х	Х	Х	Х
California tiger salamander	Ambystoma californiense	С	SC,P	NA	Х	Х	Х	Х	Х	Х	Х	Х	Х	Х	X (PT)	Х
Foothill yellow-legged frog	Rana boylii	SC	SC,P	NA	Х	Х	Х	Х				Х	Х	Х	Х	Х
Kern Canyon slender salamander	Batrochoseps simatus	SC	Т	NA		Х										Х
Mount Lyell salamander	Hydromantes platycephalus	SC	SC	NA	Х									Х		Х
Mountain yellow-legged frog	Rana mucosa	FE	SC	NA	Х	Х								Х		Х

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Relictual slender salamander	Batrachoseps relictus	SC	SC	NA		Х										Х
Santa Cruz long-toed salamander	Ambystoma macrodactylum	Е	SE,P	NA					Х	Х						
Tehachapi slender salamander	Batrachoseps stebbinsi	SC	ST	NA		Х										
Western spadefoot	Scaphiopus hammondii	SC	SC	NA	Х	Х	Х	Х				Х	Х	Х	Х	Х
Yellow- blotched ensatina	Ensatina excholtzii corceator	SC	SC	NA		Х										Х
Yosemite toad	Bufo canorus	С	SC	NA	Х									Х		
REPTILES					a											
Alameda whipsnake	Masticophis lateralis euryxanthus	Т	ST	NA								Х			Х	
Blunt-nosed leopard lizard	Gambelia (Crotaphytus) silus	E	SE,P	NA	Х	Х	Х	Х	Х		Х			Х		Х
California horned lizard	Phrynosoma coronatum frontale	SC	SC,P	NA	Х	Х	Х	Х				Х	Х	Х	Х	Х
Giant garter snake	Thamnophis gigas	Т	ST	NA	Х		Х	Х				Х	Х	Х		Х
Northern sagebrush lizard	Sceloporus graciosus graciosus	SC	None	NA										Х		

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Northwestern pond turtle	Clemmys marmorata marmorata	SC	SC,P	NA	Х	Х	Х	Х				Х	Х	Х	Х	Х
Rosy boa	Lichanura trivirgata	SC	SC	NA		Х										
San Francisco garter snake	Thamnophis sirtalis tetrataenia	E	Е	NA		Х				Х					Х	
San Joaquin coachwhip	Masicophis flagellum ruddocki	SC	SC	NA	Х	Х	Х	Х				Х	Х		Х	Х
Sierra night lizard	Xantusia vigilis sierrae	SC	SC	NA		Х										
Silvery legless lizard	Anniella pulchra pulchra	SC	SC	NA	Х	Х	Х	Х				Х	Х	Х	Х	
Southern rubber boa	Charina bottae umbratica	None	SC	NA		Х										
Southwestern pond turtle	Clemmys marmorata pallida	SC	SC,P	NA	Х	Х	Х	Х				Х	Х	Х	Х	Х
BIRDS				•					•	•						
Alameda (South Bay) song sparrow	Melospiza melodia pusillula	SC	SC	NA											Х	
Aleutian Canada goose	Branta canadensis leucopareia	Т	SC	NA	Х	Х	Х	Х				Х	Х	Х		Х
Allen's hummingbird	Selasphorus sasin	SC	SC	NA											Х	
American bittern	Botaurus lentiginosus	SC	None	NA	Х		Х	Х				Х	Х	Х	Х	Х

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American dipper	Cinclus mexicanus	SLC	None	NA	Х	Х								Х		Х
American peregrine falcon	Falco peregrinus anatum	D	SC	NA	Х	Х	Х	Х				Х	Х	Х	Х	Х
Bald eagle	Haliaeetus leucocephalus	PD	Е	NA	Х	Х	Х	Х	Х	Х	Х	Х	Х	Х	Х	Х
Bank swallow	Riparia riparia	None	Т	NA	Х		Х	Х				Х	Х	Х		Х
Bell's sage sparrow	Amphispiza belli belli	SC	SC	NA			Х	Х				Х	Х	Х	Х	Х
Black rail	Laterallus jamaicensis corturniculus	SC	T,FP	NA								Х			XX	
Black skimmer	Rynchops niger	SC	SC	NA											Х	
Black swift	Cypseloides niger	SC	SC	NA	Х	Х								Х	Х	Х
California brown pelican	Pelecanus occidentalis californicus	E	E	NA					Х	Х					Х	
California clapper rail	Rallus longirostris obsoletus	E	E,FP	NA					Х	Х					Х	
California condor	Gymnogyps californianus	Е	Е	NA	Х	Х	Х		Х							Х
California least tern	Sterna antillarum (albifrons) browni	E	E,FP	NA					Х						Х	
California spotted owl	Strix occidentalis occidentalis	SC	SC	NA	Х	Х								Х		Х

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California thrasher	Toxostoma redivivum	SC	None	NA	Х	Х	Х	Х				X	Х	Х	Х	Х
Costa's hummingbird	Calypte costae	SC	SC	NA	Х	Х	Х	Х					Х	Х	Х	Х
Ferruginous hawk	Buteo regalis	SC	SC	NA	Х	Х	Х	Х				Х	Х	Х	Х	Х
Flammulated owl	Otus flammeolus	SC	None	NA	Х	Х								Х		Х
Greater sandhill crane	Grus canadensis tabida	SC	Т	NA	Х	Х	Х	Х				Х	Х	Х		Х
Harlequin duck	Histrionicus histrionicus	SC	None	NA										Х		
Lawrence's goldfinch	Carduelis lawrencei	SC	None	NA	Х	Х	Х	Х				Х	Х	Х	Х	Х
Least bell's vireo	Vireo belliii pusillus	Е	Е	NA		Х			Х		Х				Х	
Lewis' woodpecker	Melanerpes lewis	SC	None	NA	Х	Х		Х				Х	Х		Х	Х
Little willow flycatcher	Epidonax traillii brewsteri	None	E	NA	Х	Х	X	Х				Х	Х	Х	Х	Х
Loggerhead shrike	Lanius ludovicianus	SC	SC	NA	Х	Х	Х	Х				Х	Х	Х	Х	Х
Long-billed curlew	Numenius americanus	SC	SC	NA	Х	Х	Х	Х					Х	Х	Х	Х
Marbled godwit	Limosa fedoa	SC	None	NA								Х	Х			
Marbled murrelet	Brachyramphus marmoratus	Т	Е	NA					Х	Х					Х	

			Status					Poten	tial Occ	urrenc	e in the	e Study	y Area	d		
Common Name	Scientific Name	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	Х	Х	Х	Х				Х	Х	Х	Х	Х
Northern goshawk	Accipiter gentilis	SC	SC	NA	Х	Х								Х		Х
Nutall's woodpecker	Picoides nutallii	SLC	None	NA	Х	Х		Х				Х	Х	Х		Х
Oak titmouse	Baelophus inornatus	SLC	None	NA	Х	Х		Х				Х	Х	Х		Х
Olive-sided flycatcher	Contopus borealis (cooperi)	SC	None	NA	Х							Х	Х	Х	Х	Х
Red knot	Calidris canutus	SC	None	NA											Х	
Red-breasted sapsucker	Spyrapicus ruber	SC	None	NA	Х							Х		Х	Х	Х
Rufous hummingbird	Selasphorus rufus	SC	None	NA	Х	Х	Х	Х				Х	Х	Х	Х	Х
Salt marsh common yellowthroat	Geothlypis trichas sinuosa	SC	SC	NA											Х	
San Joaquin LeConte's thrasher	Toxostoma lecontei macmillanorum	SC	None	NA	Х	Х	Х									Х
Southwest willow flycatcher	Empidonax traillii extimus	E	Е	NA		Х										
Swainson's hawk	Buteo Swainsoni	None	Т	NA	Х	Х	Х	Х				Х	Х	Х		
Tricolored blackbird	Agelaius tricolor	SC	SC	NA	Х	Х	Х	Х				Х	Х	Х	Х	Х
Vaux's swift	Chaetura vauxi	SC	SC	NA	Х	Х	Х	Х					Х	Х	Х	Х

Final EIS/EIR

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			Status		Potential Occurrence in the Study Area ^d						d					
Common Name	Scientific Name	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
Western burrowing owl	Athene cunicularia hypugea	SC	SC	NA	X	Х	X	Х				Х	Х	Х	Х	Х
Western snowy plover	Charadruis alexandrinus nivosus	Т	SC	NA					Х	Х					Х	
Whimbrel	Numenius phaeopus	SC	None	NA											Х	
White-faced ibis	Plegadis chihi	SC	None	NA	Х	Х	Х	Х				Х	Х	Х		Х
White-headed woodpecker	Picoides albolarvatus	SC	None	NA	Х	Х								Х		Х
White-tailed (black- shouldered) kite	Elanus leucurus	SC	FP	NA	X	X	X	Х				Х	Х	Х	Х	Х
Yellow-billed cuckoo	Coccyzus americanus	С	None	NA	Х	Х	Х	Х	Х	Х	Х	Х	Х	Х		Х
MAMMALS																
American marten	Martes americana	SC	None	NA	Х									Х		Х
Buena Vista Lake shrew	Sorex ornatus relictus	Е	None	NA		Х										
California wolverine	Gulo gulo luteus	None	SC	NA	Х									Х		
Fisher	Martes pennanti	SC	SC	NA	Х	Х								Х		Х
Fresno kangaroo rat	Dipodomys nitratoides exilis	E	Е	NA	Х		Х							Х		Х

		Status						Poten	tial Occ	urrenc	e in the	e Study	y Area	d		
Common Name	Scientific Name	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
Fringed myotis bat	Myotis thysanodes	SC	None	NA	Х	Х	Х	Х				Х		Х	Х	Х
Giant kangaroo rat	Dipodomys ingens	E	None	NA	Х	X	Х	X			Х					Х
Greater western mastiff-bat	Eumops perotis californicus	SC	SC	NA	Х	Х	Х	X				Х	Х	Х	Х	Х
Long-eared myotis bat	Myotis evotis	SC	None	NA	Х	X	Х	X				Х	Х	Х	Х	Х
Long-legged myotis bat	Myotis volans	SC	None	NA	Х	X	Х	X				Х	Х	Х	Х	Х
Merced kangaroo rat	Dipodomys heermanni dixoni	SC	None	NA				X				Х	Х	Х		
Mohave ground squirrel	Spermohilus mohavensis	None	Т	NA		Х										
Mt. Lyell shrew	Sorex lyelli	SC	SC	NA	Х											
Pacific western big- eared bat	Corynorthinus (Plecotus) townsendii townsendii	SC	SC	NA	Х	Х	Х	Х				Х	Х	Х	Х	Х
Pale Townsend's big-eared bat	Corynorthinus (Plecotus) townsendii pallescens	SC	None	NA	Х			Х						Х		Х
Riparian brushrabbit	Sylvilagos bachmavi riparius	E	E	NA				Х				Х	Х		Х	

		Status						Poten	tial Occ	urrenc	e in the	e Study	y Area	d		
Common Name	Scientific Name	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	Reitherodontom vs raviventris	Е	E,FP	NA											Х	
Salt marsh vagrant shrew	Sorex vagrans halicoetes	SC	SC	NA											Х	
San Francisco dusky-footed woodrat	Neotoma fuscipes annectens	SC	SC	NA											Х	
San Joaquin antelope squirrel	Ammonspermop hilus nelsoni	SC	Т	NA	X	X	X	X						Х		Х
San Joaquin kit fox	Vulpes macrotis mutica	Е	Т	NA	Х	X	Х	X	Х		Х	Х	Х	Х	Х	Х
San Joaquin pocket mouse	Perognathus inornatus	SC	None	NA	Х	Х	Х	X				Х	Х			Х
San Joaquin pocketmouse	Perognathus inornatus	PE	SC	NA				X						Х		
San Joaquin Valley woodrat	Neotoma fuscipes riparia	E	None	NA	Х			XX			Х	Х	Х			
Short-nosed kangaroo rat	Dipodomys nitratoides brevinasus	SC	None	NA	Х	X	Х	Х						Х		Х
Sierra Nevada bighorn sheep	Ovis canadensis californiana	Е	Е	NA	Х	X										Х
Sierra Nevada red fox	Vulpes vulpes necator	SC	SC	NA	Х	Х								Х		Х
Sierra Nevada snowshoe hare	Lepus americanus tahoensis	SC	SC	NA										Х		
Small-footed myotis bat	Myotis ciliolabrum	SC	N/A	SC	Х	Х	Х	Х				Х	Х	Х	Х	

		Status						Poten	tial Occ	currenc	e in th	e Study	y Area	d		
Common Name	Scientific Name	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	Х	Х	Х							Х		Х
Southern sea otter	Enhydra lutris nereis	Т	None	NA					Х	Х						
Spotted bat	Euderma maculatum	SC	SC	NA	Х	Х		X						Х		Х
Tehachapi white-eared pocket mouse	Perognathus inoratus	SC	SC	NA		Х										
Tipton kangaroo rat	Dipodomys nitratoides nitratoides	Е	Е	NA	Х	Х	Х									Х
Tulare grasshopper mouse	Onychomys torridus tulatensis	SC	SC	NA	Х	Х	Х									Х
Yuma myotis bat	Myotis yumanensis	SC	SC	NA	Х		Х	Х				Х	Х	Х	Х	Х

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

^cCalifornia 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

			Status			ntial O the Stuc			
Common Name	Scientific Name	Federal ^a	State ^b	CNPS ^c	Fresno County	Merced County	Stanislaus County	Madera County	Potential to Adversely Affect Yes/No
INVERTEBRA	ATES		-						
Conservancy fairy shrimp	Branchinecta conservatio	Е	None	NA		Х	Х		No
Delta green ground beetle	Elaphrus viridus	Т	None	NA					No
Longhorn fairy shrimp	Branchinecta longiantenna	Е	None	NA		Х	Х	Х	No
Valley elderberry longhorn beetle	Desmocerus californicus dimorphus	FT	None	NA	Х	Х	Х	Х	No
Vernal pool fairy shrimp	Branchinecta lynchi	FT	None	NA	Х	Х	Х	Х	No
Vernal pool tadpole shrimp	Lepidurus packardi	Е	None	NA	Х	Х	Х	Х	No
AMPHIBIANS	5								
California red-legged frog	Rana aurora draytonii	Т	SC,P	NA	Х	Х	Х	Х	No
California tiger salamander	Ambystoma californiense	С	SC,P	NA	Х	X	Х	Х	No
Western spadefoot	Scaphiopus hammondii	SC	SC,P	NA	Х	Х	Х	Х	No

Table D-1 Special-Status Species Likely to Occur in the Exchange Contractors Service Area

Table D-1	(continued)
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			Status			ccurren ly Area			
Common Name	Scientific Name	Federal ^a	State ^b	CNPS°	Fresno County	Merced County	Stanislaus County	Madera County	Potential to Adversely Affect Yes/No
REPTILES	1	•	1			1	1	1	
Blunt-nosed leopard lizard	Gambelia (Crotaphytus) silus	E	E	NA	Х	Х		Х	No
Giant garter snake	Thamnophis gigas	Т	Т	NA	Х	Х	Х	Х	No
Northwestern pond turtle	Clemmys marmorata marmorata	SC	SC,P	NA	Х	Х	Х	Х	No
Southwestern pond turtle	Clemmys marmorata pallida	SC	SC,P	NA	Х	Х	Х	Х	No
BIRDS					•		•	•	
Aleutian Canada goose	Branta canadensis leucopareia	Т	None	NA	Х	Х	Х	Х	No
American peregrine falcon	Falco peregrinus anatum	D	E	NA	Х	Х	Х	Х	No
Bald eagle	Haliaeetus leucocephalus	PD	Е	NA	Х	Х	Х	Х	No
California condor	Gymnogyps californianus	Е	Е	NA	Х				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	Х	Х	Х	Х	No

			Status		ntial Oo the Stud				
Common Name	Scientific Name	Federal ^a	State ^b	CNPS ^c	Fresno County	Merced County	Stanislaus County	Madera County	Potential to Adversely Affect Yes/No
Golden eagle	Aquila chrysaetos	None	SC, FP	NA					No
Least bell's vireo	Vireo belliii pusillus	Е	Е	NA					No
Loggerhead shrike	Lanius ludovicianus	SC	SC	NA	Х	Х	Х	Х	No
Long-billed curlew	Numenius americanus	SC	SC	NA	Х	Х	Х	Х	No
Long-eared owl	Asio otus	None	SC	NA					No
Merlin	Falco columbarius	None	SC	NA					No
Mountain plover	Charadrius montanus	SC	None	NA	Х	Х	Х	Х	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	Т	NA	Х	Х	Х	Х	Yes
Tricolored blackbird	Agelaius tricolor	SC	SC	NA	Х	Х	Х	Х	No

Table D-1 (continued)

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			Status			curren ly Area			
Common Name	Scientific Name	Federal ^a	State ^b	CNPS ^c	Fresno County	Merced County	Stanislaus County	Madera County	Potential to Adversely Affect Yes/No
Western burrowing owl	Athene cunicularia hypugea	SC	SC	NA	Х	Х	Х	Х	No
Western least bittern	Ixobrychus exilis hespris	None	SC	NA					No
Western snowy plover	Charadruis alexandrinus nivosus	Т	SC	NA					No
Whimbrel	Numenius phaeopus	SC	None	NA					No
White-faced ibis	Plegadis chihi	SC	None	NA	Х	Х	Х	Х	No
White-tailed (black- shouldered) kite	Elanus leucurus	SC	FP	NA	Х	Х	Х	Х	No
Yellow warbler	Dendroica petechia	None	SC	NA					No
MAMMALS									
Buena Vista Lake shrew	Sorex ornatus relictus	Е	None	NA					No
Fresno kangaroo rat	Dipodomys nitratoides exilis	Е	E	NA	Х			Х	No
Giant kangaroo rat	Dipodomys ingens	Е	Е	NA					No
Pacific western big- eared bat	Corynorthinus (Plecotus) townsendii townsendii	SC	SC	NA	Х	Х	Х	Х	No
Pallid bat	Antrozous pallidus	None	SC	NA					No

Table D-1 (continued)

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			Status		ntial Oo the Stud				
Common Name	Scientific Name	Federal ^a	State ^b	CNPSe	Fresno County	Merced County	Stanislaus County	Madera County	Potential to Adversely Affect Yes/No
Riparian brush rabbit	Sylvilagus bachmani riparius	PE	E	NA			Х		No
Riparian woodrat	Neotoma fuscipes riparia	PE	SC	NA			Х	Х	No
San Joaquin antelope squirrel	Ammonspermo philus nelsoni	SC	Т	NA	Х	Х		Х	No
San Joaquin kit fox	Vulpes macrotis mutica	E	Т	NA	Х	Х	Х	Х	No
Tipton kangaroo rat	Dipodomys nitratoides nitratoides	Е	E	NA	Х				No
Tulare grasshopper mouse	Onychomys torridus tulatensis	SC	None	NA	Х				No

Table D-1 (continued)

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

			Status		Pot		Occur udy A	rence i rea ^e	n the	
Common Name	Scientific Name	Federal ^a	State ^b	CNPS ^c	Fresno County	Kern County	Kings County	Merced County	Tulare County	Potential to Adversely Affect Yes/ No
PLANTS										
Alkali milk- vetch	Astragalus tener var. tener	None	None	1B				X		No
Brittlescale	Atriplex depressa	SC	None	1B	X	Х			Х	No
Colusa grass	Neostapfia colusana	Т	E	1B				Х		No
Greene's tuctoria	Tuctoria greenei	Е	Rare	1B	X			Х	Х	No
Hairy Orcutt grass	Orcuttia pilosa	Е	E	1B				X		No
Heartscale	Atriplex cordulata	SC	None	1B	Х	Х	X		Х	No
Hispid bird's- beak	Cordylanthus mollis ssp. hispidus	SCq	None	1B		Х		Х		No
Hoover's cryptantha	Cryptantha hooveri	SLC	None	1B				Х		No
Hoover's eriastrum	Eriastrum hooveri	D	None	4	Х	Х	X		Х	No
Lesser saltscale	Atriplex minuscula	SC	None	1B	Х	Х		Х	Х	No
Lost Hills saltbush	Atriplex vallicola	SC	None	1B	Х	Х	Х	Х		No
Palmate- bracted bird's beak	Cordylanthus palmatus	E	E	1B						No

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Table D-2 (c	continued)
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			Status	Pote	ential (Stu	Decuri udy A		n the		
Common Name	Scientific Name	Federal ^a	State ^b	CNPS ^c	Fresno County	Kern County	Kings County	Merced County	Tulare County	Potential to Adversely Affect Yes/ No
San Joaquin woolly- threads	Lembertia congdonii	Е	None				Х			No
Valley sagittaria	Sagittaria sanfordii	SC	None	1B	Х			Х		No
Valley spearscale	Atriplex joaquinana	SC	None	1B				Х	Х	No
INVERTEBR A	INVERTEBRATES									
California linderiella fairy shrimp	Linderiella occidentalis	SC	None	NA	Х	Х	Х	Х	Х	No
Conservancy fairy shrimp	Branchinecta conservatio	Е	None	NA				Х		No
Longhorn fairy shrimp	Branchinecta longiantenna	Е	None	NA		Х		Х		No
Molestan blister beetle	Lytta molesta	SC	None	NA	Х	Х	Х	Х	Х	No
Valley elderberry longhorn beetle	Desmocerus californicus dimorphus		None	NA	X	Х	Х	X	Х	No
Vernal pool fairy shrimp	Branchinecta lynchi	FT	None	NA	Х	Х	Х	Х	Х	No
Vernal pool tadpole shrimp	Lepidurus packardi	E	None	NA	Х		Х	Х	Х	No

Table D-2 (continued)

			Status		Pote	ential (Stu	Decuri udy Ai		n the	
Common Name	Scientific Name	Federal ^a	State ^b	CNPS ^c	Fresno County	Kern County	Kings County	Merced County	Tulare County	Potential to Adversely Affect Yes/ No
FISH								•	•	
Chinook salmon, Central Valley fall/late fall- run ESU	Oncorhynchus tshawytscha	С	SC	NA					X	No
Green sturgeon	Acipencer medirostris	С	SC	NA	Х			Х		No
Hardhead	Mylopharodon conocephalus	None	SC	NA	Х	Х	Х	Х	Х	Yes
Kern brook lamprey	Lampetra hubbsi	SC	SC	NA	Х	Х	Х	Х	Х	No
Pacific lamprey	Lampetra tridentata	SC	None	NA	Х			Х		No
River lamprey	Lampetra ayresi	SC	SC	NA	Х			Х		No
Sacramento splittail	Pogonichthys macrolepidotus	SC	None	NA	Х		Х	Х	Х	No
Steelhead, Central Valley ESU	Oncorhynchus mykiss irideus	Т	None	NA				Х		No
AMPHIBIANS									_	
California red-legged frog	Rana aurora draytonii	Т	SC,P	NA	Х	Х	Х	X	Х	No
California tiger salamander	Ambystoma californiense	С	SC,P	NA	Х	Х	Х	Х	Х	No
Foothill yellow-legged frog	Rana boylii	SC	SC,P	NA	Х	Х	Х	X	X	No

					D ((1	
			Pote	ential (Stu	Jecuri udy Ai		n the			
			Status			51	ř	Ca		
Common Name	Scientific Name	Federal ^a	State ^b	CNPS ^c	Fresno County	Kern County	Kings County	Merced County	Tulare County	Potential to Adversely Affect Yes/ No
Western spadefoot	Scaphiopus hammondii	SC	SC,P	NA	Х	Х	Х	X	Х	No
REPTILES	nummonum	L		1						
Blunt-nosed leopard lizard	Gambelia (Crotaphytus) silus	Е	Е	NA	X	Х	Х	X	Х	No
California horned lizard	Phrynosoma coronatum frontale	SC	SC,P	NA	Х	Х	Х	Х	Х	No
Giant garter snake	Thamnophis gigas	Т	ST	NA	Х		Х	Х	Х	Yes
Northwestern pond turtle	Clemmys marmorata marmorata	SC	SC,P	NA	Х	Х	Х	Х	Х	No
San Joaquin coachwhip	Masicophis flagellum ruddocki	SC	None	NA	Х	Х	Х	Х	Х	No
Silvery legless lizard	Anniella pulchra pulchra	SC	None	NA	Х	Х	Х	Х		No
Southwestern pond turtle	Clemmys marmorata pallida	SC	SC,P	NA	Х	Х	Х	Х	Х	No
BIRDS	· · · · · · · · · · · · · · · · · · ·			-	1			i	-	
Aleutian Canada goose	Branta canadensis leucopareia	Т	None	NA	Х	Х	Х	Х	Х	No
American peregrine falcon	Falco peregrinus anatum	D	E	NA	Х	Х	Х	Х	Х	No
American white pelican	Pelecanus erythrorhynchos	None	SC	NA						No

Table D-2 (continued)

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			Status		Pote	ential (Stu	Occuri udy Ai		n the	
Common Name	Scientific Name	Federal ^a	State ^b	CNPS ^c	Fresno County	Kern County	Kings County	Merced County	Tulare County	Potential to Adversely Affect Yes/ No
Bald eagle	Haliaeetus leucocephalus	PD	Е	NA	Х	Х	Х	Х	Х	No
Bank swallow	Riparia riparia	None	Т	NA	Х		Х	Х	Х	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	Х	Х	Х	X	Х	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	Х	Х	Х	Х	Х	No
Least bittern	Ixobrychus exilis	None	SC	NA						No
Little willow flycatcher	Epidonax traillii brewsteri	None	E	NA	Х	Х	Х	Х	Х	No
Loggerhead shrike	Lanius ludovicianus	SC	SC	NA	Х	Х	Х	X	Х	No
Long-billed curlew	Numenius americanus	SC	SC	NA	Х	Х	Х	Х	Х	No
Long-eared owl	Asio otus	None	SC	NA						No

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			Status	Pote	ential (Stu	Jecuri udy Ai		n the		
			Status			51	, v	l Ca		
Common Name	Scientific Name	Federal ^a	State ^b	CNPS ^c	Fresno County	Kern County	Kings County	Merced County	Tulare County	Potential to Adversely Affect Yes/ No
Marbled godwit	Limosa fedoa	SC	None	NA						No
Mountain plover	Charadrius montanus	SC FPT	None	NA	Х	Х	Х	Х	Х	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	Т	NA	Х	Х	Х	Х		No
Tricolored blackbird	Agelaius tricolor	SC	SC	NA	Х	Х	Х	Х	Х	No
Western burrowing owl	Athene cunicularia hypugea	SC	SC	NA	Х	Х	Х	Х	Х	No
Western snowy plover	Charadruis alexandrinus nivosus	Т	SC	NA						No
Whimbrel	Numenius phaeopus	SC	None	NA						No
White-faced ibis	Plegadis chihi	SC	None	NA	Х	Х	Х	Х	Х	No
Yellow- breasted chat	Icteria virens	None	SC	NA						No

Table D-2 (continued)

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		Status			Pote	ential (Stu	Occuri udy Ai		n the	
Common Name	Scientific Name	Federal ^a	State ^b	CNPS ^c	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	petenna er ensterr									
Buena Vista Lake shrew	Sorex ornatus relictus	Е	None	NA		Х				No
Fresno kangaroo rat	Dipodomys nitratoides exilis	E	Е	NA	X		Х		Х	No
Fringed myotis bat	Myotis thysanodes	SC	None	NA	X	Х	Х	Х	Х	No
Greater western mastiff-bat	Eumops perotis californicus	SC	SC	NA	Х	Х	Х	Х	Х	No
Long-eared myotis bat	Myotis evotis	SC	None	NA	Х	Х	Х	Х	Х	No
Long-legged myotis bat	Myotis volans	SC	None	NA	Х	Х	Х	Х	Х	No
Merced kangaroo rat	Dipodomys heermanni dixoni	SC	None	NA				Х		No
Pacific western big- eared bat	Corynorthinus (Plecotus) townsendii townsendii	SC	SC	NA	X	Х	Х	X	Х	No
Pallid bat	Antrozous pallidus	None	SC	NA						No
Riparian brushrabbit	Syvilagus bachmani riparius	Е	Е	NA				X		No
San Joaquin antelope squirrel	Ammonspermo- philus nelsoni	SC	Т	NA	Х	Х	Х	Х	Х	No

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			Status		Pote	ential (Stu	Decuri udy Ai		n the	
Common Name	Scientific Name	Federal ^a	State ^b	CNPS ^c	Fresno County	Kern County	Kings County	Merced County	Tulare County	Potential to Adversely Affect Yes/ No
San Joaquin kit fox	Vulpes macrotis mutica	Е	Т	NA	Х	Х	Х	Х	Х	No
San Joaquin pocket mouse	Perognathus inornatus	SC	None	NA	Х	Х	Х	Х	Х	No
San Joaquin Valley woodrat	Neotoma fuscipes riparia	Ε	None	NA	Х			Х		No
Short-nosed kangaroo rat	Dipodomys nitratoides brevinasus	SC	None	NA	Х	Х	Х	X	Х	No
Small-footed myotis bat	Myotis ciliolabrum	SC	NA	SC	Х	Х	Х	Х		No
Spotted bat	Euderma maculatum	SC	None	NA	Х	Х		Х	Х	No
Yuma myotis bat	Myotis yumanensis	SC	SC	NA	Х		Х	Х	Х	No

Table D-2 (continued)

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

^cCalifornia 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

			Status		Pot	tential		ence in ea ^e	the St	udy	
Common Name	Scientific Name	Federal ^a	State ^b	CNPS°	San Benito County	San Joaquin County	Stanislaus County	Madera County	Santa Clara County	Tulare County	Potential to Adversely Affect Yes/No
PLANTS											
Alkali milk- vetch	Astragalus tener var. tener	None	None	1B		X	Х		Х		No
Arcuate bush mallow	Malacothamnus arcutatus	SLC	None	1B					Х		No
Bakersfield cactus	Opuntia treleasei	Е	None	None		Х					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	Е	1B		X		Х			No
Brandegee's wooly-star	Eriastrum brandegeae	SC	None	1B					Х		No
Brittlescale	Atriplex depressa	SC	None	1B			Х	X		Х	No
California jewelflower	Aulanthus californicus	Е	None	None						Х	No
California seablite	Suaeda californica	Е	None	1B					Х		No
Capper-fruited tropidocarpum	Tropidocarpum capparideum	SC	None	1A		X			Х		No
Carrizo peppergrass	Lepidium jaredii var. jaredii	SC	None	1B		Х					No

Table D-3Special-Status Species Likely to Occur in Agricultural and
Municipal and Industrial Areas Within the Project Area

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			Status		Pot	tential		ence in ea ^e	the Stu	ıdy	
Common Name	Scientific Name	Federal ^a	State ^b	CNPS ^e	San Benito County	San Joaquin County	Stanislaus County	Madera County	Santa Clara County	Tulare County	Potential to Adversely Affect Yes/No
Chaparral harebell	Campanula exigua	SLC	None	1B			Х		Х		No
Clustered lady's-slipper	Cypripedium fasciculatum	SC	None	4					Х		No
Colusa grass	Neostapfia colusana	Т	Е	1B			Х				No
Comanche layia	Layia leucopappa	SC	None	1B		Х					No
Congdon's tarplant	Hemizonia parryi ssp. congdonii	SC	None	None					Х		No
Contra Costa goldfields	Lasthenia conjugens	Е	None	1B					Х		No
Coyote ceanothus	Ceanothus ferrisae	Е	None	1B					Х		No
Curly-leaved monardella	Monardella undulata	SC	None	4					Х		No
Delta tule pea	Lathyrus jepsonii var. jepsonii	SC	None	1B					Х		No
Fragrant fritillary	Fritillaria liliacea	SC	None	1B					Х		No
Franciscan onion	Allium peninsulare var. francisanum	SLC	None	1B					Х		No
Forked fiddleneck	Amsinckia vernicosa var. furcata	SLC	None	4							No
Gairdner's yampah	Perideridi gairdneri ssp. gairdneri	SC	None	4					Х		No

Table D-3 (continued)

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Table D-3	(continued)
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			Status		Pot	tential		ence in ea ^e	the St	udy	
Common Name	Scientific Name	Federal ^a	State ^b	CNPS°	San Benito County	San Joaquin County	Stanislaus County	Madera County	Santa Clara County	Tulare County	Potential to Adversely Affect Yes/No
Greene's popcorn flower	Plagiobothrys reticulatus var. rossianorum	SC	None	None					Х		No
Greene's tuctoria	Tuctoria greenei	Е	Rare	1B		X	Х	Х		Х	No
Hairless allocarya	Plagiobothrys glaber	SC	None	1A					Х		No
Hairy Orcutt grass	Orcuttia pilosa	Е	Е	1B			Х	Х			No
Hall's bush mallow	Malacothamnus hallii	SLC	None	1B					Х		No
Hartweg's golden sunburst	Pseudobahia bahiifolia	E	E	1B			X	Х			No
Heartscale	Atriplex cordulata	SC	None	1B		X	Х	Х		Х	No
Hoover's button-celery	Eryngium aristulatum var. hooveri	SC	None	1B					Х		No
Hoover's calycadenia	Calycadenia hooveri	SLC	None	1B			Х	Х			No
Hoover's eriastrum	Eriastrum hooveri	D	None	4					Х	Х	No
Hoover's spurge	Chamaesyce hooveri	Т	None	1B						Х	No
Interior California larkspur	Delphinium californicum ssp. interius	SC	None	1B		Х			Х		No
Kaweah brodiaea	Brodiaea insignis	None	Е	1B						Х	No

Table D-3	(continued)
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			Status		Pot	tential	Occurr Ar	ence in ea ^e	the Stu	udy	
Common Name	Scientific Name	Federal ^a	State ^b	CNPS°	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						Х	No
Kernville poppy	Eschscholzia procera	SC	None	3		Х					No
Kings Mountain manzanita	Arctostaphylos regismontana	SLC	None	1B					Х		No
Large-flowered fiddleneck	Amsinckia grandiflora	Е	Е	1B		Х					No
Large-flowered linanthus	Linanthus grandiflorus	SC	None	3				Х	Х		No
Lesser saltscale	Atriplex minuscula	SC	None	1B				Х		Х	No
Little mousetail	Myosurus minimus ssp. apus	SC	None	3						Х	No
Loma Prieta hoia	Hoita strobilina	SC	None	1B					Х		No
Lost Hills saltbush	Atriplex vallicola	SC	None	1B							No
Maple-leaved checkerbloom	Sidalcea malachroides	SLC	None	1B					Х		No
Mason's neststraw	Stylocline masonii	SC	None	1B		Х					No
Metcalf Canyon jewelflower	Streptanthus albidus ssp. albidus	Е	None	1B					Х		No

			Status		Pot	tential		ence in ea ^e	the St	udy	
Common Name	Scientific Name	Federal ^a	State ^b	CNPS°	San Benito County	San Joaquin County	Stanislaus County	Madera County	Santa Clara County	Tulare County	Potential to Adversely Affect Yes/No
Mono Hot Springs evening primrose	Camissonia sierrae ssp. alticola	SC	None	1B				X			No
Mt. Diablo phacelia	Phacelia phacelioides	SC	None	1B					Х		No
Mt. Hamilton coreopsis	Coreopsis hamiltonii	SC	None	1B			Х		Х		No
Mt. Hamilton harebell	Campanula sharsmithiae	SC	None	1B			Х		Х		No
Mt. Hamilton jewelflower	Steptanthus callistus	SLC	None	1B					Х		No
Mt. Hamilton lomatium	Lomatium observatorium	SLC	None	1B					Х		No
Mt. Hamilton thistle	Cirsium fontinale var. campylon	SC	None	1 B			Х		Х		No
Nine Mile Canyon phacelia	Phacelia novenmillensis	SC	None	1B						Х	No
No common name	Schizymenium shevockii	SLC	None	1B					Х		No
Obovate-leaved thornmint	Acanthomintha obovata ssp. obovata	SLC	None	4							No
Oil neststraw	Stylocline citroleum	SC	None	1B		Х					No
Oregon meconella	Meconella oregana	SC	Е	1B					Х		No
Pacific cordgrass	Spartina foliosa	SLC	None	None					Х		No

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			Status		Pot	tential		ence in ea ^e	the Stu	udy	
Common Name	Scientific Name	Federal ^a	State ^b	CNPS°	San Benito County	San Joaquin County	Stanislaus County	Madera County	Santa Clara County	Tulare County	Potential to Adversely Affect Yes/No
Pale-yellow layia	Layia heterotrica	SC	None	1B	Х	Х	Х				No
Palmate- bracted bird's beak	Cordylathus palmatus	Е	E	1B		X		Х			No
Panoche peppergrass	Lepidium jaredii var. album	SC	None	1B							No
Point Reyes bird's-beak	Cordylanthus maritimus ssp. palustris	SC	None	1B					Х		No
Recurved larkspur	Delphinium recurvatum	SC	None	1B						Х	No
Robust spineflower	Chorizanthe robusta var. robusta	Е	None	1B					Х		No
Rock sanicle	Sanicula saxatilis	SC	Rare	1B					Х		No
Salinas Valley popcorn flower	Plagiobothrys uncinatus	SC	None	1B					Х		No
San Benito evening primrose	Camisonia benitensis	Т	None	1B		X					No
San Francisco Bay spineflower	Chorizanthe cuspidata var. cuspidata	SC	None	1B					Х		No
San Francisco wallflower	Erysimum fransiscanum	SC	None	4					Х		No
San Joaquin Valley Orcutt grass	Orcuttia inaequalis	Т	E	1B			Х	Х		Х	No

Table D-3 (continued)

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			Status		Pot	tential		ence in ea ^e	the Stu	udy	
Common Name	Scientific Name	Federal ^a	State ^b	CNPS°	San Benito County	San Joaquin County	Stanislaus County	Madera County	Santa Clara County	Tulare County	Potential to Adversely Affect Yes/No
San Joaquin woolly-threads	Monolopia congondii	Е	None	1B						Х	No
Santa Clara Valley dudleya	Dudleya setchellii	E	None	1B					Х		No
Santa Cruz manzanita	Arctostaphylos andersonii	SC	None	1B					Х		No
Santa Cruz Mts. beardtongue	Penstemon rattanii var. kleei	SLC	None	1B					Х		No
Serpentine bedstraw	Galium andrewsii ssp. gatense	SLC	None	4					Х		No
Sharsmith's onion	Allium sharsmithae	SC	None	1B			Х		Х		No
Showy Indian clover	Trifolium amoenum	Е	None	1B					Х		No
Slender moonwort	Botrychium lineare	С	None	1B				Х			No
Slough thistle	Cirsium crassicaule	SC	None	1B		Х					No
Smooth lessingia	Lessingia micradenia var. glabrata	SC	None	1B					Х		No
South Bay clarkia	Clarkia concinna ssp. automixa	SC	None	1B					Х		No
Succulent (fleshy) owl's clover	Castilleja campestris ssp. succulenta	Т	Е	1B		X	X	Х			No
Talus fritillary	Fritillaria falcata	SC	None	1B			Х		Х		No

Table D-3 (continued)

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			Pot	tential			the Stu	udy			
			Status	[1	Ar	ea ^e			
Common Name	Scientific Name	Federal ^a	State ^b	CNPS°	San Benito County	San Joaquin County	Stanislaus County	Madera County	Santa Clara County	Tulare County	Potential to Adversely Affect Yes/No
Tiburon buckwheat	Eriogonum canium	SLC	None	None							No
Tiburon paintbrush	Castilleja affinis ssp. neglecta	Е	Т	1B					Х		No
Valley sagittaria	Sagittaria sanfordii	SC	None	1B		Х					No
Valley spearscale	Atriplex joaquiniana	SC	None	1B		Х			Х	Х	No
Water sack clover	Trifolium depauperatum var. hydrophilum	SC	None	1B					Х		No
Western leatherwood	Dirca occidentalis	SLC	None	1B					Х		No
INVERTEBRA	TES		•			•	•	•	•		
California linderiella fairy shrimp	Linderiella occidentalis	SC	None	NA		X	X	Х	X	Х	No
Conservancy fairy shrimp	Branchinecta conservatio	Е	None	NA	Х	Х	Х				No
Longhorn fairy shrimp	Branchinecta longiantenna	E	None	NA	Х	Х	Х	Х			No
Midvalley fairy shrimp	Branchinecta mesovallensis	SC	None	NA		Х	Х	Х			No
Valley elderberry longhorn beetle	Desmocerus californicus dimorphus	Т	None	NA		Х	Х	Х		Х	No
Vernal pool fairy shrimp	Branchinecta lynchi	FT	None	NA	Х	Х	Х	Х	Х	Х	No

Table D-3 (continued)

Table D-3	(continued)
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			Status		Pot	tential		ence in ea ^e	the St	udy	
Common Name	Scientific Name	Federal ^a	State ^b	CNPS°	San Benito County	San Joaquin County	Stanislaus County	Madera County	Santa Clara County	Tulare County	Potential to Adversely Affect Yes/No
Vernal pool tadpole shrimp	Lepidurus packardi	Е	None	NA	Х		Х	Х		Х	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	Т	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	Т	E	NA					X		No
Delta smelt	Hypomesus transpacificus	D	Т	NA		Х	Х	Х	Х	Х	No
Hardhead	Mylopharodon conocephalus	None	SSC	NA							No
Lahontan cutthroat trout	Oncorhynchus clarki henshawi	Т	None	NA				Х			No
Paiute cutthroat trout	Oncorhynchus clarki seleniris	Т	None	NA				Х			No
Sacramento splittail	Pogonichthys macrolepidotus	SC	None	NA		Х	Х	Х	Х	Х	No

		Status		Pot	tential		ence in ea ^e	the Stu	udy		
Common Name	Scientific Name	Federal ^a	State ^b	CNPS°	San Benito County	San Joaquin County	Stanislaus County	Madera County	Santa Clara County	Tulare County	Potential to Adversely Affect Yes/No
Steelhead, Central Valley ESU	Oncorhynchus mykiss irideus	Т	None	NA		X	X	Х			No
AMPHIBIANS					-		•	•			•
California red- legged frog	Rana aurora draytonii	Т	SC,P	NA	Х	Х	Х	Х	Х	Х	No
California tiger salamander	Ambystoma californiense	С	SC,P	NA	Х	Х	Х	Х	X (PT)	Х	No
Western spadefoot	Scaphiopus hammondii	SC	SC,P	NA		Х	Х	Х	Х	Х	No
REPTILES						_	_	_	_		
Alameda whipsnake	Masticophis lateralis euryxanthus	Т	T,P	NA		Х			Х		No
Blunt-nosed leopard lizard	Gambelia (Crotaphytus) silus	Е	SE	NA	Х			Х		Х	No
Giant garter snake	Thamnophis gigas	Т	ST	NA		Х	Х	Х		Х	No
Northwestern pond turtle	Clemmys marmorata marmorata	SC	SC,P	NA		X	Х	Х	Х	Х	No
Southwestern pond turtle	Clemmys marmorata pallida	SC	SC,P	NA		X	Х	Х	Х	Х	No
BIRDS											
Aleutian Canada goose	Branta canadensis leucopareia	Т	None	NA		Х	Х	Х		Х	No

					Po	tential	Occurr	ence in	the St	udv	
			Status		10	tentiar ·		ence m	the se	uuy	
Common Name	Scientific Name	Federal ^a	State ^b	CNPS°	San Benito County	San Joaquin County	Stanislaus County	Madera County	Santa Clara County	Tulare County	Potential to Adversely Affect Yes/No
American bittern	Botaurus lentiginosus	SC	None	NA		Х	Х	Х	Х	Х	No
American dipper	Cinclus mexicanus	SLC	None	NA				X			No
American peregrine falcon	Falco peregrinus anatum	D	SE	NA		Х	X	Х	X	Х	No
Bald eagle	Haliaeetus leucocephalus	PD	Е	NA	Х	Х	Х	X	Х	Х	No
Bewick's wren	Thryomanes bewickii	SC	None	NA							No
Black rail	Laterallus jamaicensis corturniculus	SC	T,FP	NA		Х			Х		No
California condor	Gymnogyps californianus	Е	SE	NA						Х	No
California thrasher	Toxostoma redivivum	SC	None	NA		X	X	X	Х	Х	No
Ferruginous hawk	Buteo regalis	SC	SC	NA		X	Х	X	Х	Х	No
Greater sandhill crane	Grus canadensis tabida	SC	None	NA		X	X	X		Х	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

					Pot	tential	Occurr	ence in	the Stu	udy	
			Status				Ar	eae		-	
Common Name	Scientific Name	Federal ^a	State ^b	CNPS°	San Benito County	San Joaquin County	Stanislaus County	Madera County	Santa Clara County	Tulare County	Potential to Adversely Affect Yes/No
Lark sparrow	Chondestes grammacus	SC	None	NA							V
Least bell's vireo	Vireo belliii pusillus	Е	SE	NA	Х				Х		No
Lewis' woodpecker	Melanerpes lewis	SC	None	NA		Х	Х		Х	Х	No
Little willow flycatcher	Epidonax traillii brewsteri	None	E	NA		X	X	X	Х	Х	No
Loggerhead shrike	Lanius ludovicianus	SC	SC	NA		Х	Х	Х	Х	Х	No
Long-billed curlew	Numenius americanus	SC	SC	NA			Х	Х	Х	Х	No
Marbled godwit	Limosa fedoa	SC	None	NA		Х	Х				No
Marbled murrelet	Brachyramphus marmoratus	Т	Е	NA					Х		No
Mountain plover	Charadrius montanus	SC	None	NA		Х	Х	Х	Х	Х	No
Northern Harrier	Circus cyaneus	None	SC	NA							No
Nutall's woodpecker	Picoides nutallii	SLC	None	NA		Х	Х	Х		Х	No
Oak titmouse	Baelophus inornatus	SLC	None	NA		Х	Х	Х		Х	No
Red knot	Calidris canutus	SC	None	NA					Х		No
Rufous hummingbird	Selasphorus rufus	SC	None	NA		Х	Х	Х	Х	Х	No

Table D-3	(continued)
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			Pot	tential		ence in ea ^e	the Stu	udy			
Common Name	Scientific Name	Federal ^a	State ^b	CNPS°	San Benito County	San Joaquin County	Stanislaus County	Madera County	Santa Clara County	Tulare County	Potential to Adversely Affect Yes/No
San Joaquin LeConte's thrasher	Toxostoma lecontei macmillanorum	SC	None	NA						Х	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	Т	NA		Х	Х	Х			No
Tricolored blackbird	Agelaius tricolor	SC	SC	NA		Х	Х	Х	Х	Х	No
Western burrowing owl	Athene cunicularia hypugea	SC	SC	NA		X	Х	Х	Х	Х	No
Western least bittern	Ixobrychus exilis hesperis	SC	SC	NA							No
Whimbrel	Numenius phaeopus	SC	None	NA					Х		No
White-faced ibis	Plegadis chihi	SC	None	NA		Х	Х	Х		Х	No
White-tailed (black- shouldered) kite	Elanus leucurus	SC	FP	NA		X	X	Х	Х	Х	No
Yellow-billed cuckoo	Coccyzus americanus	С	None	NA	Х	Х	Х	Х		Х	No
MAMMALS					-						
Fresno kangaroo rat	Dipodomys nitratoides exilis	E	E	NA				Х		Х	No

			Status		Po	tential		rence in rea ^e	the St	udy	
Common Name	Scientific Name	Federal ^a	State ^b	CNPS°	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		Х	Х	Х	No
Giant kangaroo rat	Dipodomys ingens	Е	None	NA	Х					Х	No
Greater western mastiff-bat	Eumops perotis californicus	SC	SC	NA		X	X	X	X	Х	No
Long-eared myotis bat	Myotis evotis	SC	None	NA		Х	X	Х	Х	Х	No
Long-legged myotis bat	Myotis volans	SC	None	NA		X	X	Х	Х	Х	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	Х	Х	No
Pale Townsend's big-eared bat	Corynorthinus (Plecotus) townsendii pallescens	SC	None	NA				X		Х	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	Reitherodontom ys raviventris	Е	E,FP	NA					Х		No

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					Do	tential	0.000.000	onao in	the St	udu	
			Status		ro	tential		ence m ea ^e	the St	uay	
Common Name	Scientific Name	Federal ^a	State ^b	CNPS ⁶	San Benito County	San Joaquin County	Stanislaus County	Madera County	Santa Clara County	Tulare County	Potential to Adversely Affect Yes/No
Salt marsh vagrant shrew	Sorex vagrans halicoetes	SC	SC	NA					Х		No
San Joaquin antelope squirrel	Ammonspermop hilus nelsoni	SC	Т	NA				Х		Х	No
San Joaquin kit fox	Vulpes macrotis mutica	Е	Т	NA	Х	Х	Х	Х	Х	Х	No
San Joaquin pocketmouse	Perognathus inornatus	PE	SC	NA		Х	Х	Х		Х	No
San Joaquin Valley woodrat	Neotoma fuscipes riparia	Е	SC	NA	Х	Х	Х				No
Short-nosed kangaroo rat	Dipodomys nitratoides brevinasus	SC	None	NA				Х		Х	No
Small-footed myotis bat	Myotis ciliolabrum	SC	SC	NA		Х	Х	Х	Х		No
Southern grasshopper mouse	Onychomys torridus ramona	SC	SC	NA				Х		Х	No
Spotted bat	Euderma maculatum	SC	SC	NA				Х		Х	No
Tipton kangaroo rat	Dipodomys nitratoides nitratoides	E	E	NA						Х	No
Tulare grasshopper mouse	Onychomys torridus tulatensis	SC	SC	NA						Х	No
Yuma myotis bat	Myotis yumanensis	SC	SC	NA		X	Х	Х	Х	Х	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