2. ALTERNATIVES INCLUDING PROPOSED ACTION

This section describes the range of alternatives that were identified as potential options to the proposed action. In order to determine if each alternative was reasonable and practicable in meeting the project's purpose and need, evaluation criteria were developed. A screening process, utilizing the evaluation criteria, was employed to select those alternatives which were determined to be reasonable and practicable thus warranting detailed impact analyses.

2.1 PROPOSED ACTION (PREFERRED ALTERNATIVE)

2.1.1 Description

The proposed action/proposed project is a 12-year, long-term water supply program, outlined in the San Joaquin River Agreement, for instream flows in the San Joaquin River system and has three components:

- Vernalis Adaptive Management Plan (VAMP) Flow: Water from the San Joaquin River Group Authority (Authority), for achieving the VAMP 31-day pulse flow (April-May), is guaranteed water from Authority member agencies and is capped at 110,000 acre-feet in any year (Table 2.1-1). There is also the potential for additional water from willing sellers who are members of the Authority for VAMP implementation above the 110,000 acre-feet required under the Agreement.

- October Flow: Additional water (12,500 acre-feet) from Merced Irrigation District (Merced ID) would be available for delivery during October of all years.

- OID: Additional water (15,000 acre-feet) from Oakdale Irrigation District (OID) would be available, plus the difference between water made available for the VAMP pulse flow by OID (11,000 acre-feet) and what is actually used. This water provided by OID would be used for various fish and wildlife benefits including supplemental instream flows on the Stanislaus during the months when fish are present, ramping of flow changes on the Stanislaus following high flow periods, implementing pre-VAMP and post-VAMP ramping objectives during the spring flow period, water for fall attraction flows, temperature control in the lower Stanislaus River during the summer and fall periods, and/or banked in New Melones Reservoir for the purpose of using the additional water to augment flows in subsequent dry years. The final decision for the use of this water for fish and wildlife purposes would be made by the Service annually, following consultation with other Federal and State agencies.

Each of these components is described in greater detail in Section 2.1.3. The proposed project is for the Authority to make water available over the period 1999–2010 for release to the San Joaquin River and its tributaries. The proposed releases vary both in total amount and in the tributaries as

shown in Table 2.1-1 and explained as a single- or double-step target flow in Section 2.1.3.1, depending on hydrologic conditions.

The Agreement obligates the Authority to provide water at Vernalis, and members of the Authority have flexibility under the Division Agreement (Table 2.1-1) on a year to year basis for who would provide the water.

Table 2.1-1: HIERARCHY FOR THE PROVISION OF THE PULSE FLOW (31-DAY P

Entity (in order of providing flow)	First 50,000 AF	Next 23,000 AF	Next 17,000 AF	Next 20,000 AF	Totals 110,000 AF
Merced	25,000	11,500	8,500	10,000	55,000
OID/SSJID	10,000	4,600	3,400	4,000	22,000
Exchange Contractors	5,000	2,300	1,700	2,000	11,000
MID/TID	10,000	4,600	3,400	4,000	22,000

Note: Water is available in the amounts listed such that the water needed is distributed throughout the system. For purposes of this analysis, these are the flows that were used. The San Joaquin River Technical Committee (Operations Group) will determine best management of flow releases during the pulse flow period to achieve target flows.

2.1.2 Location

The affected portions of the San Joaquin River and its tributaries (Stanislaus, Tuolumne, and Merced Rivers) are located in the Central Valley of California (Figure 2.1-1). The rivers and related storage and conveyance facilities are located in the following counties: Fresno, Madera, Mariposa, Merced, San Joaquin, Stanislaus, and Tuolumne. The project area is defined by river as follows:

- **San Joaquin River**: From Vernalis to point of release by the San Joaquin River Exchange Contractors Water Authority. The point of release is most often north of the town of Los Banos, but releases could be made as far upstream as the Mendota Pool.

- **Stanislaus River**: From its confluence with the San Joaquin River to and including New Melones Dam and Reservoir.

- **Tuolumne River**: From its confluence with the San Joaquin River to and including New Don Pedro Dam and Reservoir.

- **Merced River**: From its confluence with the San Joaquin River to and including New Exchequer Dam/Lake McClure.

These rivers are located between the communities of Stockton on the north and Mendota on the south. Figure 2.1-1 illustrates the project area and vicinity.

2.1.3 Characteristics

The specific characteristics of the proposed project (preferred alternative) consist of three flow components.

2.1.3.1 VAMP Flows

VAMP flows are guaranteed water supplies for the April-May pulse flow from the Authority of up to 110,000 acre-feet per year to support VAMP. The Authority proposes to cause to flow in the San Joaquin River at Vernalis during each April and May, a 31-day pulse flow period, the amount of water needed to achieve the Target Flow (described below) or up to 110,000 acre-feet, whichever is less. Additional water (in excess of the required water, possibly up to a total of 160,000 acre-feet) necessary to achieve VAMP Test Target Flow may be available on a "willing seller basis."[1]

- The Pulse Flow Period is defined as a period of 31 continuous days during the months of April and May. This is anticipated to be the period that most of the juvenile anadromous fish migrate out of the tributaries, through the Delta, and into the Pacific Ocean in order to complete their life cycle. It is expected to occur most often between mid-April and mid-May. The timing of the pulse flow is to coincide with the peak period of time when naturally spawned smolts are migrating out of the San Joaquin River Basin.

- The Target Flow is a specific flow regime between 2,000 and 7,000 cubic feet per second (cfs) for the Pulse Flow Period. It consists of the existing flow, plus either a single-step incremental increase in flow (over existing flow) or a double-step increase, depending on hydrologic conditions.

The 31-day out-migration Target Flow would be established as follows:

Single-Step Target Flow. Unless modified by the subsequently listed criteria, the annual 31-day out-migration Target Flow equals:

Existing Flow (cfs)	Target Flow (cfs)
0–1,999	2,000
2,000–3,199	3,200
3,200–4,449	4,450
4,450–5,699	5,700
5,700–6,999	7,000
7,000 or greater	Existing flow

When the existing flow exceeds 7,000 cfs, the Authority would use its best efforts to maintain a constant or stable flow rate during the Pulse Flow Period to the extent reasonably possible through cooperating in development of an operations plan and coordination of operations during the Spring Pulse Flow. During high flow events such as those occurring in Spring 1998 (20,000

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[1] The need for "up to" 160,000 acre-feet derives from the mathematics of the double-step target flows and the 110,000 acre-feet cap as described in Appendix A, Hydrologic Analysis. In the maximum exposure case where the "existing flow" is 4,450 cfs and the double-step increment requires a target flow of 7,000 cfs, the required flow would amount to approximately 2,550 cfs to get to 7,000 cfs. This amounts to approximately 156,800 acre-feet for the 31-day period. The SJRA identifies that willing sellers could provide the 50,000 acre-feet over and above the 110,000 acre-feet cap when it is available. Additional NEPA/CEQA analysis would be required, as who would provide the water and on which river is not known at this time.

cfs), it may not be possible to maintain a constant flow rate at Vernalis during the 31-day pulse flow period.

Double-Step Target Flow. In any year when the sum of the current year's 60-20-20 Indicator and previous year's 60-20-20 Indicator is seven or greater, an annual 31-day out-migration flow target will be the Target Flow one level higher than that established by the single-step Target Flow. The 60-20-20 Indicator is the numeric adjunct to the State Water Resource Control Board's (SWRCB's) San Joaquin Valley Water Year Hydrologic Classification that is used to establish Target Flows and certain responsibilities of the parties to the Agreement. The San Joaquin Valley Water Year Hydrologic Classification was developed as an index of wetness and water supply availability within the San Joaquin River basin. The index is mathematically derived as the summation of 0.6 times the current year's April–July San Joaquin Valley unimpaired runoff, plus 0.2 times the current year's October–March unimpaired runoff, plus 0.2 times the lesser of 4.5 or the previous year's index (thus the "60-20-20" reference). The streams used in the index are the Stanislaus, Tuolumne, Merced and the San Joaquin. The index defines five different year types: wet, above normal, below normal, dry and critical. Each of these year types has been designated a numeric indicator by the Agreement.

The 60-20-20 Indicator for VAMP is as follows:

SJR Basin 60-20-20 Classification	60-20-20 Indicator
Wet	5
Above Normal	4
Below Normal	3
Dry	2
Critical	1

For example, assuming a dry year followed by a wet year results in the sum of 7 (i.e., 2 + 5 = 7). Assuming the single-step Target Flow is 5,700 cfs, one step higher would be 7,000 cfs.

If achieving the double-step requires more than the 110,000 acre-feet of supplemental water, additional water from willing sellers on the San Joaquin, Stanislaus, Tuolumne, and Merced rivers (approximately 50,000 acre-feet) may be acquired by the Bureau of Reclamation (Reclamation) for the Pulse Flow Period, and it would require additional NEPA/CEQA analysis.

Sequential Dry Year Relaxation. During years when the sum of the current year's 60-20-20 indicator and the previous two years' 60-20-20 Indicator is four (4) or less, the Authority's members will not be required to make water available above existing flow, except as may be provided by Merced and Oakdale Irrigation Districts or any of the districts under the willing sellers provision of the SJRA. Reclamation has continuing obligations to meet San Joaquin River flows pursuant to the March 6, 1995 Biological Opinion and may acquire water in excess of the amounts to be provided by Authority members under the Agreement.

Operations Plan. Reclamation and the California Department of Water Resources (DWR) will develop an operations plan in conjunction with tributary facilities operators (the San Joaquin River Technical Committee). By February 15 of each year 1999–2010, the initial version of this

plan will be described. The plan would be evaluated for NEPA/CEQA compliance, and related actions not covered in this EIS/EIR or other NEPA/CEQA documentation would be evaluated at that time for potential environmental impacts. Then in early April, flow and export targets would be finalized and releases scheduled to meet the target flows at Vernalis. The operations plan is to be updated periodically.

2.1.3.2 October Flow

Merced ID would provide 12,500 acre-feet of water to enhance flows in October to attract adult salmon returning into the tributaries to spawn. It would be released from storage or provided as re-operated flood control releases.

2.1.3.3 Oakdale Irrigation District

Contained within the Agreement is the provision that Reclamation would purchase up to 15,000 acre-feet of water from OID. In addition, Reclamation will purchase any remaining share from OID after it has met its commitment (11,000 acre-feet) to support the target flows at Vernalis. The Agreement states that this water may be used for any authorized purpose of the New Melones Project. The water would be held in storage and subsequently reallocated to these authorized uses in subsequent years.

If this water is purchased under the authority of Central Valley Project Improvement Act (CVPIA) Section 3406 (b)(3), its use would be to "...supplement the quantity of water dedicated to fish and wildlife purposes...." It could also be used to firm up other environmental purposes of the New Melones Project and CVPIA. The environmental purposes of New Melones which could benefit from the additional water provided by OID would include the following: instream flows on the Stanislaus, ramping of flow changes on the Stanislaus, implementation of VAMP and post-VAMP ramping objectives under CVPIA, releases of water to meet San Joaquin base flows consistent with X2 requirements, releases of water to provide fall attraction flows, salinity control at Vernalis, temperature control in the lower Stanislaus, and improved carryover storage in New Melones for the purpose of reducing risk of future shortage. Full use of the acquired OID water for environmental purposes may result in New Melones Project supplies being available for other purposes. The specific allocation of the New Melones Project supplies will be addressed in future interim operations plans and ultimately in the long-term operations plan for New Melones Reservoir.

2.1.4 Sources of Water

The sources for the water provided to Reclamation under the San Joaquin River Agreement are: re-regulation or surface water storage, groundwater, tailwater recovery, and conservation. The amounts of water available by source per the Agreement (Table 2.1-2) represent a potential range to reflect varying hydrologic conditions that could occur over the 12-year period of the proposed project. The total amount of water for all three components described in Section 2.1.1 is up to 137,500 acre-feet.

Table 2.1-2 includes only the 110,000 acre-feet for the VAMP Target Flow. It does not include the 50,000 acre-feet above the 110,000 acre-feet cap that may be needed for the maximum exposure case (see Section 2.1.3.1).

A brief discussion of these types of sources follows.

Regulation or Surface Water Storage. Much of the water would come from changes in existing diversions or release patterns at non-Central Valley Project (CVP) facilities pursuant to the sellers' applicable water rights. Water may also be provided from willing sellers that have water stored in New Melones Reservoir. The end of year storage could change, depending on the amount of water provided by re-regulation or within the year pattern of storage during the year.

Groundwater. Several districts pump groundwater to meet part of their water delivery needs. Although surface water storage is the principal source of water to meet instream flow objectives under the Agreement, some willing sellers may be able to rely on groundwater supplies directly or indirectly to replace surface water depending on hydrologic conditions.

Table 2.1-2: SOURCES OF AVAILABLE WATER FOR PROPOSED PROJECT (TAF)

Source	Exchange Contractors	OID[1]	SSJID	MID	TID	Merced ID[2]	All
Regulation or Surface Water Storage	0	0-26	0-11	0-11	0-11	0-67.5	0-126.5
Groundwater	0-11	0-15	0	0	0	0[3]	0-26
Tailwater Recovery[4]	0-11	0-15	0	0	0	0-5[5]	0-31
Conservation	0-11	0-20	0-5	0[6]	0-11	0[6]	0-47
Range of Available Water	0-11.0	0-26.0	0-11.0	0-11.0	0-11.0	0-67.5	0-137.5[7]

Notes:

Water includes 15,000 acre-feet for release at any time during the year.

Water includes 12,500 acre-feet for delivery in October for fall attraction flow.

No groundwater will be provided directly for meeting VAMP target flows. Groundwater would be pumped to help meet potential water supply impacts from increased releases from New Exchequer Reservoir (Lake McClure).

Tailwater is not used as a direct release to canals/rivers for pulse flow. Rather it replaces other water released.

Merced ID will attempt to recover greater quantities of tailwater; however, the current tailwater quantities are small and drain to areas that are not hydraulically connected to the San Joaquin River.

Conservation projects will be undertaken on an "as needed" basis to improve operations and reduce unrecoverable losses. These projects may include improvements to canals and other projects.

Total includes the 110,000 acre-feet for the Spring Pulse Flow plus the additional water in notes 1 and 2 above.

Tailwater Recovery. Reuse of tailwater flows is defined as the act or act(s) 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 recovered water would be reused within the political boundaries of the agency or agencies from which it originated.

Conservation. Water conservation measures are those that would result in water savings from increased water management efficiencies. Conserved water is water that has historically been used and is now available for use as a result of implementing specific conservation measures that create a water savings by reducing water uses or losses. These savings can be achieved by reducing losses to evaporation, transpiration, percolation, or surface outflows. For example, lining canals reduces water lost to percolation. Savings can also be achieved by implementation of different means of water distribution such as drip irrigation.

2.1.5 Scope of Project

The proposed project would occur on an annual basis over the period 1999 through 2010. The results of the experimental studies would be evaluated to help determine the appropriate Vernalis flow objective after 2010. The Agreement covers the 12-year period 1999-2010. Any project for the post-2010 period would be subject to additional NEPA and CEQA analyses.

This EIS/EIR addresses only the underlying action in the SJRA of providing for San Joaquin River water identified in the Agreement for VAMP and for other related flows in the San Joaquin River.

Non-flow aspects of VAMP and other aspects of CVPIA-related water operations are related actions that are not within the scope of this document and have independent applicability to NEPA or in some cases have no NEPA requirement. This document evaluates the impacts of the flows on the environment with a focus on potential impacts to the following resources and concerns: surface water, groundwater, biological resources (vegetation, wildlife, fisheries), land use (including agriculture), recreation, cultural resources, Indian Trust Assets, and environmental justice. This EIS/EIR focuses on potentially significant impacts and addresses non-significant issues at a reduced level of detail. Cumulative and other short- and long-term impacts are evaluated as well. What is being evaluated herein is the underlying action of providing water and its subsequent release for instream flow according to the amounts and schedule of the Agreement.

There are several related projects contained in the Agreement that are not part of the project being evaluated herein. DWR's barrier at the head of Old River is part of the Interim South Delta Program (ISDP) and is addressed in separate NEPA/CEQA proceedings (DWR 1996). Finally, export targets and operations are outside of the scope of the water supply action and this document. Exports of water from the Delta include actions under the CVPIA and are included in the range of actions evaluated in the 1997 Draft PEIS. This range of actions includes both no export and export of acquired water for streams under Section 3406(b)(3). Also, see Figure 1.5-1, programs for the cumulative analysis.

The combined Central Valley Project/State Water Project (CVP/SWP) exports for the VAMP are set at 1,500, 2,250, or 3,000 cfs (as provided in the Agreement) during the April through May, 31-day Pulse Flow Period, or the exports are further constrained by other Delta criteria. These export targets (Table 2.1-3) are necessary to complete the salmon survival studies which constitute the monitoring and adaptive management component of VAMP. The combination of flow and export targets are consistent with the existing Biological Opinions. Export limits would be included in the operations plan described in Section 2.1.3.1. If the operations plan is unacceptable to any Party in the Agreement, then the export limits in Table 2.1-3 shall not apply during that calendar year. However, Reclamation and DWR shall not be constrained in the operation of their respective project.

Table 2.1-3: VAMP TARGET FLOWS AND EXPORT RATES

Exports	**Vernalis Flow Rate - cfs**				
	7,000	5,700	4,450	3,200	2,000
1,500 cfs	X		X	X	X
2,250 cfs		X			
3,000 cfs	X				

2.1.6 Required Approvals and Permits

No alterations of stream channels would occur under the proposed action. No permit is required from the U.S. Army Corps of Engineers to implement the flows. There are SWRCB permits required for the water purchases for release to the rivers. The SJRGA agencies have filed a petition for a change in place and purpose of use to preserve or enhance wetlands habitat, fish and wildlife resources, and recreation in or on the water pursuant to Water Code Section 1707. OID and SSJID are applying/filing petitions for a change in place and purpose of use for exchanges with Modesto Irrigation District (MID). A description of environmental commitments from Federal and State agencies is provided in Section 5.3.

2.2 OTHER REASONABLE ALTERNATIVE

In addition to the no action and proposed action, one other alternative was determined to meet the project's purpose and need, the SWRCB Water Right Priority system. This alternative is assumed to be identical to Flow Alternative 3 in the SWRCB's *Draft Environmental Impact Report for Implementation of the 1995 Bay/Delta Water Quality Control Plan* (1995 WQCP DEIR; SWRCB 1997). Detailed analyses of this alternative are included in Chapter 4. This alternative has the capabilities to meet the SWRCB's 1995 Water Quality Control Plan Vernalis flow objectives assigned to water right holders based on a water right priority system. Under this alternative, water right holders share responsibility to implement flow objectives. Junior appropriative water right holders are required to cease diversions before senior appropriative water right holders are affected (based on the 'first-in-time, first-in-right" principle).

Under this Water Right Priority Alternative, the SWRCB analysis assumes water right holders are assigned to groups based on their priority (see SWRCB 1997; Table II-5 and II-6). Groups of appropriators are directed to cease both diversions to storage and direct diversions when flow is inadequate to meet outflow objectives. The number of groups of water right holders receiving notification is based on the amount of water necessary to ensure that the SWP and CVP storage releases do not exceed their downstream inbasin and export delivery obligations (SWRCB 1997; pg. II-17) and the amount of water necessary to meet the flow objectives at Vernalis. A detailed description of the water right holders, their relative priority, and the calculations used to determine water availability under this alternative (and its subalternatives) is provided in the DEIR (SWRCB 1997; Chapter II and Chapter IV, Section F).

2.3 NO ACTION ALTERNATIVE

The No Action alternative represents existing conditions plus reasonably foreseeable future conditions that would exist without the proposed action. This No Action alternative is the benchmark for comparison of impacts of the other alternatives, and assumes the following conditions:

- Implementation, to the extent possible, of the SWRCB's 1995 Water Quality Control Plan through operations of the CVP and SWP.

- Adherence by the CVP and SWP to the March 6, 1995 delta smelt and February 12, 1993 winter- run chinook salmon Biological Opinions.

- November 1997 Draft Anadromous Fish Restoration Program (AFRP) actions for instream flows in Clear Creek and below Keswick and Nimbus reservoirs, and a Trinity River maximum release of 340 TAF. No additional AFRP Delta actions other than the 1995 WQCP.

- New Melones is operated consistent with the Interim Plan of Operation, dated May 1, 1997.

- San Joaquin River tributary (Merced and Tuolumne rivers) minimum instream flows pursuant to existing agreements and regulatory requirements (for example, Davis-Grunsky and FERC). Operations of the tributaries are also governed by existing required flood control protocols.

- Current level of hydrology and operations in the San Joaquin Valley, including delivery of Level 4 refuge supplies.

The No Action alternative does not always meet the requirements for fishery flows contained in the 1987 Stanislaus Fishery Agreement between Reclamation and California Department of Fish and Game (DFG). The Interim Operations Plan (USBR 1997c) does not prescribe a specific allocation of fishery water in critical years. However, the Interim Operations Plan is adaptive; and while other releases not specifically allocated for the fishery assist in meeting the 1987 agreement, it is understood that critical fishery flows will need to be addressed on a case by case basis. The interim plan is to be revised and a long-term operation plan developed for New Melones Reservoir through the Stanislaus River Stakeholders process. Assumptions used in the hydrologic modeling for the SJRA flows contained in this EIS/EIR are not statements of Reclamation's policy for the long-term operations plan.

2.4 ALTERNATIVES CONSIDERED BUT ELIMINATED FROM DETAILED STUDY

A list of 26 alternatives was developed based on current knowledge of the basin, knowledge of other initiatives (e.g., 1995 WQCP DEIR, CVPIA PEIS, etc.), and information gained in the public scoping process. Three public meetings were held where concerns, input and suggestions from stakeholders were solicited, recorded, and considered in formulating the list of alternatives.

The alternatives were screened during a two step process. During the first step, all 26 alternatives were considered and screened using evaluation criteria that are based on the project's purpose and need as explained in Chapter 1. This culminated in six alternatives which were considered in more detail. Comments were solicited from four resource agencies and members of the Authority regarding the concerns about potential impacts, which eliminated most of the remaining alternatives from further consideration. A final screening resulted in the final alternatives to receive a detailed impact analysis in this EIS/EIR.

2.4.1 Description of Each Alternative

Each of the 26 alternatives was assigned a number and an acronym to facilitate the screening process described in a subsequent section of this chapter.

1: NA No Action: See description in Section 2.3.

2: REC Recirculation: Responsibility for meeting Vernalis flow objectives for anadromous fish is with the CVP through releases from New Melones and releases into the San Joaquin River from the Delta-Mendota Canal (DMC) via the Newman Wasteway. Increased pumping of Tracy is required. Combined use of SWP/CVP points of diversion are allowed.

3: FR Friant Releases: Water would be made available from the CVP through releases into the San Joaquin River from Friant Dam.

4: CFR Combined Federal Releases: Water would be made available from the CVP through a combination of releases from: (a) the Stanislaus River (New Melones Reservoir), (b) Friant Dam, and (c) the Delta-Mendota Canal (via Newman Wasteway).

5: NM New Melones Reservoir: Responsibility for meeting Vernalis flow objectives would be solely the CVP through releases into the Stanislaus River from New Melones Reservoir.

6: HH Hetch Hetchy Reservoir: The City and County of San Francisco would re-operate Hetch Hetchy (and New Don Pedro Reservoir would be re-operated) with releases into the Tuolumne River.

7: EFS Ecological Fair-Share: Responsibility for meeting Vernalis flow objectives would be based on the unimpaired flow of all tributaries to the San Joaquin River (Stanislaus, Tuolumne, Merced, upper San Joaquin rivers). Water would come from willing sellers/willing buyers. This alternative is similar to the SWRCB Flow Alternative 5.

8: WCT Worst Case by Tributaries: This alternative would assign responsibility for meeting Vernalis flow objectives solely to each of the water right holders within the San Joaquin River Basin. This taking of water could be done through various administrative, legal, or legislative actions.

Alt 8a: Stanislaus River has all the responsibility
Alt 8b: Tuolumne River has all the responsibility.
Alt 8c: Merced River has all the responsibility.
Alt 8d: Upper San Joaquin River above the Merced confluence has all the responsibility.

9: RSL Re-operate San Luis Reservoir: The SWP and CVP would make water available through re-operation of San Luis Reservoir and releases into the San Joaquin River from the DMC via the Newman Wasteway similar to recirculation. However, increased pumping at Tracy is not required. Combined use of SWP/CVP points of diversion would be allowed.

10: CRR Conservation Plus Re-operation of Reservoirs: Responsibility for meeting Vernalis flow objectives is met equally on Stanislaus, Tuolumne and Merced rivers, and Upper San Joaquin River Basin (Friant Dam). Water would be obtained through conservation efforts within each basin and subsequent re-operation of reservoirs.

11: GW Groundwater: Responsibility for meeting Vernalis flow objectives is met equally on Stanislaus, Tuolumne and Merced rivers, and Upper San Joaquin River Basin (Friant Dam). Water would be obtained through groundwater pumping within each basin and possible re-operation of reservoirs.

12: ASF Additional Storage Facilities: Water would be made available by altering and re-operating existing facilities to accommodate more storage and provide more flow:

Alternative 12a: Raise New Melones Reservoir on the Stanislaus River.
Alternative 12b: Raise New Don Pedro Reservoir on the Tuolumne River.
Alternative 12c: Raise Hetch Hetchy Reservoir and Cherry Lake on the Tuolumne River.
Alternative 12d: Raise New Exchequer Dam/Lake McClure on the Merced River.
Alternative 12e: Raise Friant Dam/Millerton Lake on the Upper San Joaquin River.

13: WRP SWRCB Water Right Priority System: See above (Section 2.2) for description.

14: ESP East Side Project: As once proposed by Reclamation, this project was to have been an extension of the Folsom Canal along the Sierra Foothills from Folsom Dam to the San Joaquin River, including new reservoirs.

15: CON Condemnation by Federal and/or State: Vernalis flow objectives would be met by condemnation of water rights associated with each project. Each scenario would start with junior appropriators and move to senior water rights holders until sufficient water was obtained to meet Vernalis flow objectives or until all the available water is condemned.

Alternative 15a: Condemn Stanislaus River water rights and re-operate New Melones Reservoir.
Alternative 15b: Condemn Tuolumne River water rights and re-operate New Don Pedro Reservoir.
Alternative 15c: Condemn San Francisco's water rights on the Tuolumne River and re-operate New Don Pedro Reservoir.
Alternative 15d: Condemn Merced River water rights and re-operate Lake McClure.
Alternative 15e: Condemn Upper San Joaquin River water rights and re-operate Friant Dam.
Alternative 15f: Condemn San Joaquin River Exchange Contractors Water Authority water rights.

Alternative 15g: Condemn San Joaquin River basin water rights based on water right priority system. See SWRCB's DEIR, Flow Alternative 3.

16: MAQ Mountain aquifers used: Water would be obtained from pumping of perched aquifers located in the Sierras with possible re-operation of projects.

17: POB Purchases outside the SJR Basin with Delta re-operations: Water from outside the San Joaquin River Basin would be purchased or otherwise acquired. This alternative would include water transfers and possible Delta facility re-operation, and it may not make water available at Vernalis.

18: SJR Acquire water from the SJRGA (VAMP and other flows in the SJRA): This is the proposed project/preferred alternative (see Section 2.1 above for description).

19: URW Reclaimed wastewater from municipal and/or large industrial sewage treatment plants: Vernalis flow objectives would be met by using reclaimed wastewater within the San Joaquin River Basin. Treated effluent from municipal or industrial sites would need to be stored on-site and then conveyed into the San Joaquin River system in April–May and in October.

20: WMR Weather modification and re-operation: Vernalis flow objectives would be met by using weather modification processes to increase San Joaquin River Basin precipitation, increase storage/yield, and re-operate reservoirs.

21: ESL Eliminate seepage losses from San Joaquin River: In this alternative, seepage losses in the upper San Joaquin River (between the Mendota Pool and Friant Dam) would be eliminated to increase effective flow. Responsibility for meeting Vernalis flow objectives would fall solely on the CVP through subsequent re-operation of Friant Dam.

22: DDW Desalt drainage water: Vernalis flow objectives would be met by treatment and desalinization of agricultural drainage water providing increases in storage/yield, and possible re-operation of reservoirs.

23: PWD Purchase one or more water districts and their water rights: Vernalis flow objectives would be met by purchasing one or more of the water districts on the Stanislaus, Tuolumne, Merced, San Joaquin rivers (upper San Joaquin and Exchange Contractors) and using the acquired water rights to meet the VAMP water needs at Vernalis.

24: BFC Buy out Federal contracts: Vernalis flow objectives would be met by purchasing the CVP contracts serviced by New Melones Reservoir and Friant Dam (including the Exchange Contractors) and using the acquired contracts to meet the VAMP water needs at Vernalis.

25: SWP State Water Project re-operation (State would cease their project during pulse flows): Vernalis flow objectives would be met by re-operation of the State Water Project,

curtailment of exports, re-operation of San Luis Reservoir, and releases of water into the San Joaquin River via the Delta-Mendota Canal.

26: WSB Willing Sellers/Willing Buyers: Vernalis flow objectives would be achieved via water purchases (similar to the interim water acquisitions now occurring) based on willing sellers/willing buyers in all tributaries to the San Joaquin River (Stanislaus, Toulumne, Merced, upper San Joaquin River). This would be a market driven alternative in that the prices offered for water would determine which and how many buyers would be willing to provide water to meet the Vernalis fish flow objectives. Water availability, acquisition needs, water prices, and sellers would vary throughout the project lifetime.

2.4.2 Screening of Alternatives

Both NEPA and CEQA require that an EIS or EIR identify and analyze only reasonable alternatives. These reasonable alternatives are developed through a systematic evaluation of all alternatives based on a set of pre-defined screening criteria to evaluate their feasibility. A general definition of feasibility is: capable of being accomplished in a successful manner within a reasonable period of time, taking into account economic, environmental, legal, social, and technological factors. Alternatives may not be rejected merely because they are beyond an agency's authority, would require new legislation, or would be too costly. For CEQA, reasonable alternatives are to be limited to only those that would avoid or substantially lessen at least one of the significant environmental effects of the proposed project. NEPA requirements to review and screen alternatives as options, prior to completing the impact analyses, were utilized. The results of the review are incorporated into this chapter. The CEQA requirement to select a short list of reasonable, practicable alternatives was also addressed during screening by taking into consideration the following areas of potential environmental concern or impact: surface water quality and quantity, groundwater, vegetation and wildlife, fisheries, land use including agriculture, recreation, and energy production.

The following screening criteria are comprised of objectives related to the Purpose and Need Statement (see Section 1.1) and other criteria.

2.4.2.1 Screening Criteria from Project Objectives

VAMP criteria: Is there sufficient water availability necessary to meet VAMP flow criteria for 31-day pulse flow in April/May (for downstream emigration of fall-run chinook salmon smolts in the San Joaquin Basin)? Increased water needs to be available to meet VAMP criteria under varying hydrological conditions.

Reliable water supplies: Are there reliable water supplies available for VAMP and related flows over the term of the Agreement and proposed action (1999–2010)? Water will be needed starting in April 1999, and reliance on a series of 1-year acquisitions is not acceptable over the long term.

Implement in Near Term: Is implementation possible in the near term, both physically and legally? Are the facilities to store and convey the water in place or can they be provided quickly (within a year)? Is the alternative likely to be subject to protracted litigation such that it cannot be implemented in the near term?

Fall Attraction Flows: Water must be available for fall attraction flows (October) for upstream migration of fall-run chinook salmon adults.

Water at Vernalis: Water from the alternative has to be made available as flow at Vernalis (at Airport Way Bridge) on the San Joaquin River. Vernalis is the point of entry into the Delta on the San Joaquin River where flow measurements are taken. The water must be available at Vernalis as required by the SWRCB.

2.4.2.2 Other Criteria

No new TES Does the alternative have the potential to contribute to triggering of a threatened or endangered listing of any species? A reasonable outcome or positive effect is that the alternative would not lead to the listing of new species as threatened or endangered under the Endangered Species Act (ESA) or California Endangered Species Act (CESA) or cause a species to be of special concern under CESA.

Impacts to 3rd parties: Does the alternative have minimal or mitigable impacts to third parties (for example, economic, social, cultural, environmental justice), a type of indirect impact, due to flow releases? This would potentially include impacts to downstream water users.

Cost: Would the alternative have a reasonable cost for implementation? Major construction of new facilities is assumed to be costly. Cost alone cannot be used to exclude an alternative.

State Water Law: Is the alternative reasonable and implementable under California Water Law? Does the alternative comply with all state and federal laws?

Different from SJRA: Is the alternative a distinctly different approach from the preferred alternative of making water available for the SJRA including VAMP (No. 18)?

2.4.2.3 Initial Screening

The results of the initial screening (Table 2.4-1, alternative screening matrix) summarize the evaluation of all 26 alternatives, including the no action (1:NA), the preferred action (18:VAM), and the other reasonable alternative (13:WRP). The resultant selection of the reasonable, practicable alternatives (1:NA, 18:SJR, and 13:WRP) are analyzed in detail in the impacts

section of this EIS/EIR (Chapter 4). Each of the 26 alternatives have been examined against the criteria and scored as follows:

+ = a potentially positive effect or is reasonable relative to the criterion
_ = a neutral or no impact
- = a potentially negative effect or is unreasonable relative to the criterion
? = unknown effect or not enough information presently available
Y = yes
N = no

The greater the number of positive effects, and the fewer the negative effects, the more feasible (reasonable or practicable) the alternative becomes. "Reasonable (or "unreasonable") relative to a criterion applies when a positive or negative effect is not applicable. For example, a reasonable response to scoring for cost means that a large financial investment is unlikely in relation to the cost of implementation or of new facilities. The cost criterion is not simply positive or negative but rather reasonable or unreasonable.

The alternatives screening matrix was developed based upon specific knowledge, published reports, and professional judgement and is presented in Table 2.4-1. In short, the set of 26 potential alternatives was reduced to six for further evaluation using this matrix.

TABLE 2.4-1 INITIAL SCREENING OF ALTERNATIVES FOR

	Screening Criteria									
Alternative	**VAMP Criteria**	**Reliable Water Supplies**	**Implementable in Near Term**	**Fall Attrac. Flows**	**Water at Vernalis**	**No new TES**	**Impacts to 3rd Parties**	**Cost**	**State Water Law**	**Different from SJRA?**
1: NA	–	–	+	–	–	–	–	–	–	Y
2: REC	–	–	–	–	+	–	–	–	_	Y
3: FR	–	–	–	–	+	_	–	–	+	Y
4: CFR	+	+	– /_	+	+	+	–	–	+	Y
5: NM	–	–	–	+	–	_	–	+	_	Y
6: HH	–	–	–	+	+	_	–	–	?	Y
7: EFS	+	+	–	+	+	+	–	–	–	Y
8: WCT	–	–	–	+	+	_	–	–	–	Y
9: RSL	–	–	–	–	+	_	–	–	_	Y
10: CRR	–	–	–	–	–	+	_	–	+	N
11: GW	–	–	+ / ?	–	–	+	–	–	–	N
12: ASF	+	+	–	+	+	–	_	–	+	Y
13: WRP	+	+	+	+	+	+	–	–	?	Y / ?
14: ESP	+	+	–	+	– / +	–	–	–	+	Y
15: CON	+	+	–	+	+	+	–	–	+	?
16: MAQ	–	–	–	–	–	–	–	–	–	Y
17: POB	–	–	–	–	–	–	–	–	–	Y
18: SJR	+	+	+	+	+	+	+	+	+	N
19: URW	–	–	–	–	–	–	_	–	+	Y
20: WMR	–	–	–	–	–	?	–	–	?	Y
21: ESL	+	–	–	–	+	–	–	–	+	Y
22: DDW	+	+	–	–	+	+	+	–	+	Y
23: PWD	+	+	–	+	+	+	–	–	–	Y
24: BFC	+	+	–	+	+	+	–	–	+	Y
25. SWP	+	+	–	+	+	+	–	–	–	Y
26. WSB	+	+	–	+	+	+	–	–	–	N/?

\+ Potentially positive effects or reasonable.
_ Potentially neutral or no effect.
– Potentially negative effects or unreasonable.
?Unknown or not enough information presently available.
Y Yes.
N No.

2.4.2.4 Secondary Screening

In addition to the no-action and proposed-action alternatives, the following alternatives were examined by several agencies and districts (SJRA/Cooperating Agency Steering Committee) during secondary screening using the criteria (see Section 2.4.2.1): Recirculation, Willing Seller/Willing Buyer, Worst Case by Tributary, and SWRCB Water Right Priority System. The additional review led to the following conclusions:

Recirculation (2:REC)

This alternative could cause major adverse impacts to fisheries and endangered species. Preliminary modeling for this alternative has been completed by DWR and described in a draft report *(SJRIO Studies of San Joaquin River Recirculation and Reoperation of Wetland Discharge and Tile Drainage)* (DWR 1998). The modeling included determining the flows from the Tuolumne, Merced and Stanislaus rivers which are regulated in part by FERC agreements or FERC orders. The amount of additional water needed to meet the Vernalis spring pulse flows was determined. For modeling purposes, this additional water was supplied by releases from the DMC to the San Joaquin River via the Newman Wasteway, which was then recovered by re-exporting an equivalent volume of water from the Delta. This recirculation was superimposed on the flows and pumping that would occur in the absence of the supplemental water. Due to flow time delays, the system would be primed at the beginning of the pulse flow period with water from San Luis Reservoir (which would be re-filled during the end of the pulse flow). Tile drainage water, discharged through Salt and Mud sloughs, would be partially withheld (for example, 50 percent between March 1 and April 15) and released during the pulse flow between April 15 and May 15.

This alternative involved no reduction in export pumping, since it required maximum pumping all the time (to achieve the increase in flow during the pulse flow period). Therefore, this alternative was in direct conflict with the stated purpose and need for the project. Recirculation also had problems providing fall attraction flows for the same reasons (for example, increased flows at Vernalis were accompanied by increased exports, so gain in net systems flows were questionable). Consequently, this alternative was dropped from further consideration.

Willing Seller/Willing Buyer (26:WSB)

This alternative evolved from alternative 7, Ecological Fair Share, specifically the willing seller/willing buyer component. While this could be considered as the No Action alternative (for example, no sellers), this also could be considered to be the same as providing flows under the San Joaquin River Agreement for VAMP (where all the willing sellers in the basin were identified). The range of possibilities was considered by looking at the No Action and the Agreement. There are an infinite number of subtle options in between these two alternatives, and the impacts could vary greatly because the water would come from different places. The major difference between this alternative and the Agreement is that the sellers and the impacts may vary but in an unknown, and undefinable way. This entire alternative would be similar to the status quo in that a series of one year acquisitions would occur. It is not practically possible to get water out of Friant Dam. Therefore, this alternative involves subtle differences in

allocation of the other three tributaries. In essence, all willing sellers have identified themselves (and have signed the statement of support for the San Joaquin River Agreement); other combinations of willing sellers, therefore, are not reasonable. Under the interim acquisition program, the only sellers that stepped forward are those included in the Agreement. As a result, this alternative was not carried forward for detailed analysis.

Worst Case by Tributary (8:WCT)

This alternative represents an alternative scenario to the Willing Seller/Willing Buyer wherein either the Stanislaus, Tuolumne, Merced, or Upper San Joaquin rivers (above Merced) would provide all of the water. This alternative arose from the "Ecological Fair Share" concept based on historical unimpaired flows put forward in the 1995 WQCP DEIR (SWRCB 1997; Flow Alternative 5). Multiple parties could be responsible for meeting flow requirements on a tributary. The Service is not necessarily in favor of the alternative as stated, but the Service would consider a distribution of water across the tributaries based on unimpaired flows (Jewell 1998). There are significant legal, administrative, and technical feasibility problems with implementing this alternative. It is not an achievable alternative, as there simply is not enough water from any single tributary to meet the purpose and need of the project. As a result, this alternative was not carried forward for detailed analysis, since it was neither reasonable nor implementable.

Summary of Findings

After secondary screening, two reasonable practicable alternatives remained: the preferred alternative (SJRA, Alternative 18) and the SWRCB Water Rights Order (Alternative 13). The other alternatives were excluded because they either had several to many potentially significant negative effects or were not significantly different from the SJRA or the SWRCB Water Rights Priority System. Both of these reasonable, practicable alternatives had significant positive effects in all or almost all of the screening criteria and were, therefore, considered for more detailed environmental impact analysis in Chapter 4.

2.5 SUMMARY COMPARISON OF ALTERNATIVES

Table ES-1, contained in the Executive Summary, provides a summary comparison of abbreviated impact statements for the proposed action and the alternative action.

Full impact statements are provided in Sections 4.2 through 4.11. Table 2.5-1 below is an abbreviated comparison of characteristics of the No Action, SJRA, and Water Right Priority System alternatives. In summary, the SJRA alternative (proposed action) is the environmentally superior alternative because it has the fewest significant and potentially significant impacts on the environment.

Table 2.5-1: COMPARISON OF NO ACTION, PROPOSED ACTION AND ALTERNATIVE ACTION FOR MEETING FLOW OBJECTIVES FOR THE SAN JOAQUIN RIVER AGREEMENT

	No Action	SJRA Proposed Action	Water Right Priority System Alternative
Spring Pulse Flow	0	VAMP Target	1995 WQCP
October Flow	0	12,500 AF	28,000 AF subject to conditions of 1995 WQCP
Number of Potentially Affected Sellers	Unknown	6	up to 38
Type of Action	Current regulatory action with willing sellers	Willing sellers	Regulatory
Period of Action	Annual, continues current practices	12 years	Permanent with 3 year review
Consensus Driven	No	Yes	No
Supports a Scientific Study	No	Yes	No