RECLAMATION

Managing Water in the West

Delta-Mendota Canal Recirculation

Initial Alternatives Information Report

U.S. Department of the Interior
Bureau of Reclamation
Mid-Pacific Region
Sacramento, California

California Department of Water Resources
Sacramento, California

March 2008

Mission Statements

The mission of the Department of the Interior is to protect and provide access to our Nation’s natural and cultural heritage and honor our trust responsibilities to Indian Tribes and our commitments to island communities.

The mission of the Bureau of Reclamation is to manage, develop, and protect water and related resources in an environmentally and economically sound manner in the interest of the American public.

The mission of the California Department of Water Resources is to manage the water resources of California in cooperation with other agencies, to benefit the State's people, and to protect, restore, and enhance the natural and human environments.

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Prepared for Reclamation by URS Corporation under Contract No. 06CS204097A.

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Executive Summary

Introduction and Background

The U.S. Department of the Interior, Bureau of Reclamation (Reclamation) is evaluating the feasibility of using recirculation strategies to improve water quality and flows in the lower San Joaquin River (SJR). Specifically, Reclamation is evaluating the feasibility of the Delta-Mendota Canal (DMC) Recirculation Project, which involves recirculating water from the Sacramento-San Joaquin River Delta (Delta) through the Central Valley Project (CVP) pumping and conveyance facilities to the SJR, upstream from Vernalis, the point at which SJR enters the Delta.

This Initial Alternatives Information Report (IAIR), which is a component of the overall DMC Recirculation Project Feasibility Study (Study), describes the planning process used to develop initial alternatives for the Study. The Study will culminate in an Environmental Impact Statement/Environmental Impact Report (EIS/EIR) and a Feasibility Report, including a Record of Decision (ROD) and Notice of Determination (NOD). Reclamation is the Federal lead agency for National Environmental Policy Act compliance and the California Department of Water Resources (DWR) is the State lead agency for California Environmental Quality Act compliance.

Purpose of Report

The purpose of this IAIR (Report) is to identify the initial alternatives that will be carried forward for additional review in the plan formulation and feasibility report phases of the Study. Reclamation has completed technical and pilot studies that provide the information required for the analyses performed in this IAIR. More detailed alternatives will be developed from these initial alternatives during the next phases of the Study.

Study Purpose

The purpose of the Study is to identify and evaluate the feasibility of implementing DMC recirculation as a means of accomplishing the objectives defined in the authorizing language. The Study, which is identified in the authorizing legislation as part of Reclamation's overall Program to Meet Standards, will determine whether Reclamation can, through the use of excess capacity in export pumping and conveyance facilities, provide greater flexibility in meeting the existing water quality standards and flow objectives for which

the CVP has responsibility, reduce the demand on water from New Melones Reservoir (for use to improve water quality and flow), and assist the Secretary of the Interior (Secretary) in meeting any obligation to CVP water contractors using the New Melones Reservoir.

Study Authorization

The Study is authorized by the 2004 CALFED Bay-Delta Authorization Act (Public Law 108-361, Water Supply, Reliability, and Environmental Improvement Act [October 25, 2004; 118 Stat. 1681; 22 pages]). Section 103(d)(2)(D)(i)) directs the Secretary to "develop and initiate implementation of a program to meet all existing water quality standards and objectives for which the CVP has responsibility."

Section 103(d)(2)(D)(ii) states, "In developing and implementing the program, the Secretary shall include, to the maximum extent feasible, the measures described in clauses (iii) through (vii)." In addition, Section 103(d)(2)(D)(iii) states, "The Secretary shall incorporate into the program a recirculation program to provide flow, reduce salinity concentrations in the San Joaquin River, and reduce the reliance on the New Melones Reservoir for meeting water quality and fishery flow objectives through the use of excess capacity in export pumping and conveyance facilities."

Finally, Section 103(d)(2)(D)(vi) states, "The purpose of the authority and direction provided to the Secretary under this subparagraph is to provide greater flexibility in meeting the existing water quality standards and objectives for which the Central Valley Project has responsibility so as to reduce the demand on water from New Melones Reservoir used for that purpose and to assist the Secretary in meeting any obligation to Central Valley Project contractors from the New Melones Project."

Funding authorization for the Study is provided by Section 103(f)(1)(G), which states, "Funds may be used to conduct feasibility studies, evaluate, and, if feasible, implement the recirculation of export water to reduce salinity and improve dissolved oxygen in the San Joaquin River."

Through Public Law 108-361 authorization, Reclamation will also satisfy requirements of the State Water Resources Control Board (SWRCB) to prepare a Plan of Action (POA) to evaluate the potential impacts of recirculating water from the DMC through the Newman Wasteway.

Through *Water Rights Decision 1641* (SWRCB 2000, as revised; hereafter referred to as D-1641), the SWRCB amended Reclamation's water rights permits to allow CVP water to be diverted at the Harvey O. Banks Pumping Plant (Banks Pumping Plant), subject to DWR's permission, as part of joint operations of the State and Federal export facilities. This joint operation of the

CVP and State Water Project (SWP) is commonly referred to as the Joint Point of Diversion. As part of the amendment of permits under D-1641, the SWRCB required Reclamation to prepare a POA. The SWRCB also directed Reclamation to address the following issues:

- The potential impacts of changes in water composition on Delta native fish and on the imprinting of juvenile fall run Chinook salmon and steelhead in the SJR Basin.
- The potential effects of increased exports on in-Delta hydrodynamics and fish entrainment at the SWP and CVP export facilities.
- The potential effects of salt and contaminant loading in the SJR Basin due to the recirculation of water through the Newman Wasteway.
- The impacts on water deliveries to the SJR Exchange Contractors Water Authority and other contractors receiving water from the DMC, the California Aqueduct, and the San Luis Reservoir (SLR).
- The capacity of the physical facilities to implement recirculation, including a description of any needed structural/channel modifications, a cost estimate, and a determination of the potential of the conserved water (compared to other alternatives) to meet Delta flow and Vernalis Adaptive Management Plan (VAMP) requirements.
- The potential for improvements in water quality in the SJR as a result of recirculation.

The POA for the Study was submitted by Reclamation on December 15, 2000 (Reclamation 2000), and approved by the SWRCB in a letter dated March 21, 2001 (SWRCB 2001). However, the Study received Congressional authorization and funding in October 2004 with the passage of Public Law 108-361. In April 2006, Reclamation submitted a revised POA (Reclamation 2006a) to the SWRCB that included a long-term schedule for completing a Study in compliance with D-1641.

Scope of IAIR

This IAIR documents existing data, including information and reports that have been developed by Reclamation and others, and provides additional analyses as needed to explain the formulation of initial alternatives to address the DMC Recirculation Project objectives. This IAIR includes the following topics:

- Description of existing and likely future water resources and related conditions in the Study area as well as related problems, needs, and opportunities being addressed in the Study.

- Development of planning objectives to address identified problems, needs, and opportunities.
- Identification of the planning constraints, guiding principles, and criteria for the Study.
- Development of resource management measures to address planning objectives.
- Formulation and evaluation of initial project alternatives, including a No-Action Alternative, that complies with the CALFED ROD (CALFED 2005) and does not conflict with CALFED objectives, solution principles, or policies. The plan formulation and evaluation process must comply with the Federal *Economic and Environmental Principles and Guidelines for Water and Related Land Resources Implementation Studies* (P&Gs) (Water Resources Council 1983).
- Description of the potential alternatives and the screening process used to identify a recommended set of initial alternatives to be further developed in the Study.
- Identification of potential major future actions for the Study.

This report will help serve as a basis for completing the Plan Formulation Report (PFR), EIS/EIR, and Feasibility Report.

Study Area

The Study area is defined as the lower main stem of the SJR below its confluence with the Merced River, the areas served by the Merced, Tuolumne, and Stanislaus Rivers on the western side of the Sierra Nevada Mountains, and the areas served by the DMC, which includes approximately 30 water agencies. The Study area also includes the south Delta which serves as a source of water supply for agricultural and urban uses within the Delta area.

The DMC is on the western side of California's San Joaquin Valley. It runs for approximately 120 miles, beginning near Tracy at the southern edge of the Delta and terminating at the Mendota Pool on the SJR, at Mendota. The DMC is part of the Federal CVP Delta export facilities, which also include the C.W. "Bill" Jones Pumping Plant (Jones Pumping Plant) (formerly known as the Tracy Pumping Plant); the Westley, Newman, Volta and Firebaugh Wasteways; the O'Neill Pumping Plant; the O'Neill Forebay; and the SLR.

The facilities and features that may be used directly for recirculation include, but may not be limited to, the Jones Pumping Plant, the DMC, the Westley or Newman Wasteway, and the SJR below its confluence with the Merced River.

Recirculation may also impact the operations of other CVP facilities, either directly or indirectly, including the SLR and the New Melones Reservoir on the Stanislaus River (see Figure ES-1).

The DMC generally runs parallel to the California Aqueduct, a State-owned facility providing primarily agricultural water to southern portions of the San Joaquin Valley and urban water to Southern California. SWP facilities that may be used for recirculation include the Banks Pumping Plant, California Aqueduct, and portions of the SLR.

Figure ES-1. Delta-Mendota Canal Recirculation Study Area

Related Studies, Projects, and Programs and Without Project Conditions

Other related studies, projects, and programs that may affect or be affected by the DMC Recirculation Project were reviewed to determine how to incorporate them into the Study. Related studies include:

- New Melones Interim Plan of Operations
- Best Management Practices Plan for Wetlands Discharges
- South Delta Improvements Program
- North/Central Delta Water Quality and Fisheries Improvement Study
- San Luis Drainage Features Re-Evaluation Project
- Central Valley Project Improvement Act Land Retirement Program
- San Luis Reservoir Low-Point Improvement Project
- San Joaquin River Restoration Program
- West Side Regional Drainage Plan
- San Joaquin River Improvement Project
- Lower San Joaquin River Salinity and Boron Total Maximum Daily Load (TMDL) Program
- Port of Stockton Deep Water Ship Channel Dissolved Oxygen TMDL

Where such projects are deemed reasonably foreseeable they will be incorporated into the future without project conditions to be used as the basis for the environmental evaluation. The reasonably foreseeable standard has been interpreted to include projects that have undergone required environmental review and have obtained funding appropriation to ensure implementation.

For projects that have yet to complete environmental review or obtain funding, such as the San Joaquin River Restoration Program (SJRRP) or the San Luis Drainage Feature Re-evaluation Project, additional analysis will be conducted to determine the sensitivity of the results of the environmental review to the future without project assumptions.

Major assumptions for existing and Future No-Action Conditions for water supply facilities and operations are based on the CalSim II Common Assumptions Common Model Package (CACMP) (Version 8D) developed

jointly by Reclamation, DWR and other stakeholders for the CALFED surface storage investigations. Major assumptions include:

- 2030 level of development for water demand
- Continuation of VAMP
- Implementation of the San Joaquin River Salinity Management Plan
- Changes to CVP/SWP coordinated operations
- Conveyance of Level 2 refuge water supplies at Banks Pumping Plant
- Continuation of Environmental Water Account

Common Assumptions also include a Supplemental Future No-Action Condition where adjustments to some facility operations are assumed. Differences between the Future No-Action and the Supplemental Future No-Action Conditions include increasing pumping at Banks Pumping Plant to an 8,500-cubic-feet-per-second capacity, and increased Level 2 refuge water supply. The basis for the assumptions for Future No-Action and Supplemental Future No-Action Conditions are provided in the CACMP report.

Future water quality conditions will tier off the future water supply conditions. Future conditions for the lower SJR will include phase-in for the selenium TMDL limits and salt limits included in the Use Agreement for the Grasslands Bypass Project, which expires in 2009. This agreement could be extended; however, it is likely that load and concentration limits for selenium in Mud Slough would not be met without selenium treatment of drainage water. A likely course of action would be to stop the discharges into Mud Slough. As a result, discharges from the Grassland Bypass Project (which includes significant proportions of salt, selenium, and boron) were assumed to end after 2009.

Plan Formulation Approach

All elements of the Study are being prepared to conform to Federal P&Gs (Water Resources Council 1983). This section presents the plan formulation process and the identified planning criteria, objectives, constraints, and principles used to guide the Study.

This IAIR is one in a series of documents to be developed for the Study. The next document is the PFR, followed by the EIS/EIR and Feasibility Report. The PFR will present the results of the initial alternatives evaluation and further refine the alternatives. The Feasibility Report will evaluate and compare the final alternatives and identify a recommended plan. After the receipt of public comments on the Draft EIS/EIR, the Feasibility Report and final EIS/EIR will

be prepared, followed by the ROD and NOD. All of these documents detail the plan formulation process for the Study.

As shown on Figure ES-2, emphasis in the planning phases change as the Study progresses. Initially, emphasis is placed on defining problems, needs, and opportunities, and compiling and forecasting conditions in the Study area to support the development of DMC Recirculation Project objectives. The emphasis of the Study then shifts to defining resource management measures and combining them to formulate and evaluate alternatives, which are used later to prepare the environmental document and Feasibility Report.

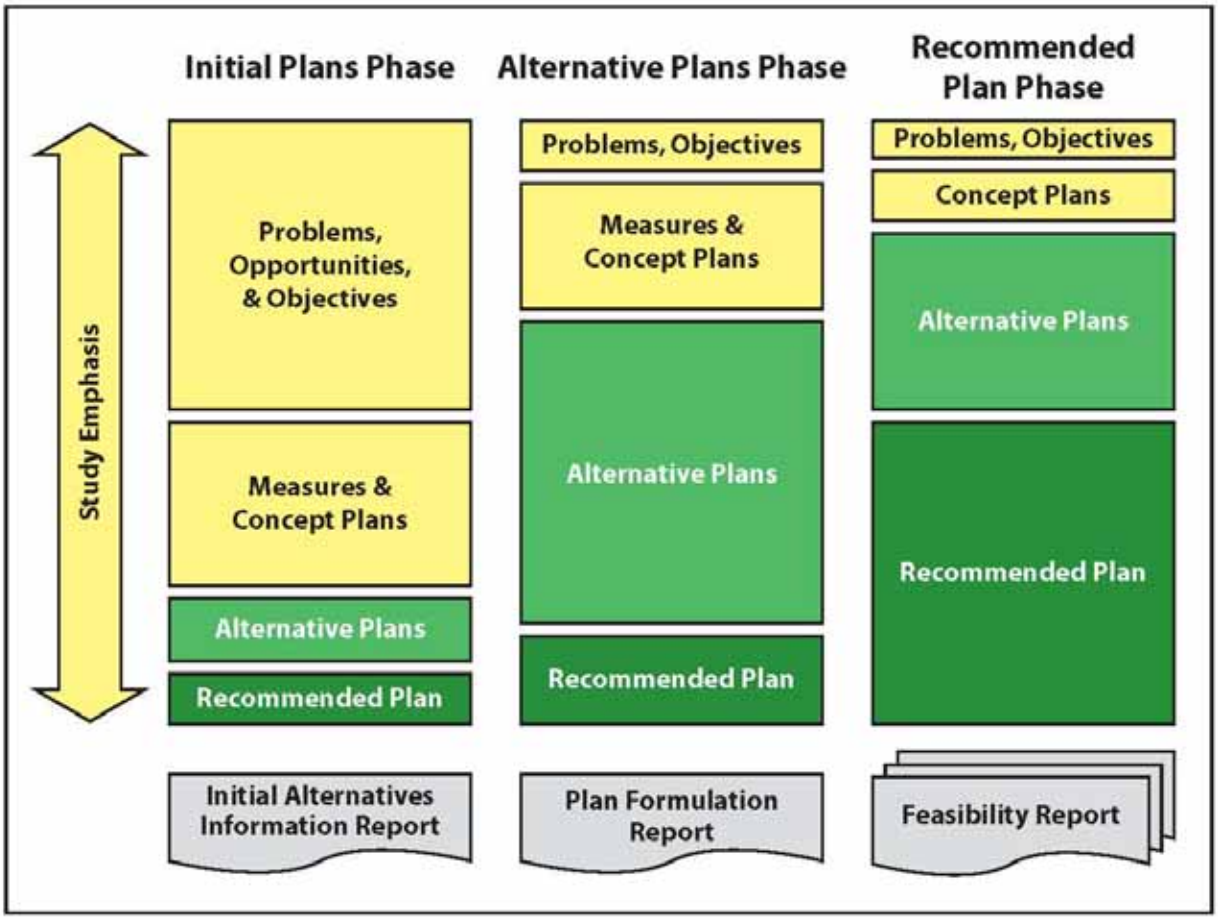

Figure ES-2. Federal Planning Process

Problems, Needs, and Opportunities

The primary problems and needs for the DMC Recirculation Project are responding to flow and water quality requirements. Other opportunities may include improvements in water supply reliability, prevention of further groundwater overdraft, improvements in anadromous fish survivability, and

supplements to south Delta water levels. Table ES-1 describes the problems, needs, and opportunities for the DMC Recirculation Project.

Table ES-1. Problems, Needs, and Opportunities Relative to Project Objectives

Problems, Needs, and Opportunities	
Problems and Needs	
Flow Objectives	Provide flow for meeting fishery flow objectives at Vernalis and in south Delta channels. Provide operational flexibility to improve the reliability of meeting the flow requirements at the Vernalis gauging station.
Water Quality Objectives	The lower SJR has been listed as an impaired water body by the SWRCB and EPA because of its high concentrations of salts, boron, and selenium, as well as toxicity, and low concentrations of dissolved oxygen in the DWSC (EPA 2006a). As of 04-01-05, D-1641 requires DWR and Reclamation either to meet an EC objective of 0.7 mmhos/cm from April through August or to have completed construction of permanent operable barriers (or equivalent measures) in the southern Delta and an operations plan to protect southern Delta agriculture. Implementation of the SDIP has been delayed and salinity objectives of 0.7 mmhos/cm for agricultural water use in the interior southern Delta locations are often not achieved.
Other Opportunities	
Water Supply Reliability	Improve water supply reliability for Stanislaus River users and CVP export contractors. The recirculation of water to improve water quality and flows may have the potential to improve water supply reliability for CVP contractors in the Delta export areas and the Stanislaus River.
Groundwater Overdraft	Reduce groundwater overdraft. MID and OID pump groundwater from the Merced, Modesto, and Eastern San Joaquin County groundwater basins to help meet demand during drought conditions and some basins are in a state of overdraft. Westside water users rely on deep groundwater pumping and saline surface supplies to supplement inadequate contract deliveries.
Anadromous Fish Survivability	Augment flow to improve anadromous fish survivability. D-1641 requires an evaluation of potential imprinting impacts on juvenile fall run Chinook salmon and steelhead in the San Joaquin Basin that may result from recirculation. Determine if improving the flow in the SJR through recirculation poses a greater benefit or liability relative to anadromous fish.
South Delta Water Levels	Improve south Delta water levels. Low SJR flows combined with high export rates and low tides can cause south Delta water levels to become so low as to constrain diversions for irrigation.

Notes:
[1] The SWRCB is currently reviewing the southern Delta salinity objectives for agriculture. Any changes in the objective will impact the need for, or implementation of, the DMC Recirculation Project.

Key:
CVP = Central Valley Project
D-1641 = State Water Resources Control Board Decision 1641
Delta = Sacramento-San Joaquin River Delta
DWR = California Department of Water Resources
DWSC = Stockton Deep Water Ship Channel
EC = electrical conductivity
EPA = U.S. Environmental Protection Agency
MID = Merced Irrigation District
mmhos/cm = micromhos per centimeter
OID = Oakdale Irrigation District
Reclamation = Bureau of Reclamation
SDIP = South Delta Improvements Project
SJR = San Joaquin River
SWRCB = State Water Resources Control Board

DMC Recirculation Project Objectives

On the basis of the identified problems, needs, and opportunities, the following objectives were developed.

- Objective A – Provide supplemental flow in the lower SJR for meeting fishery flow objectives through the use of excess capacity in export pumping and conveyance facilities.
- Objective B – Provide lower salinity water to the lower SJR for meeting water quality objectives at Vernalis through the use of excess capacity in export pumping and conveyance facilities.
- Objective C – Provide greater flexibility in meeting the existing water quality standards and objectives for which the CVP has responsibility so as to reduce the demand on water from New Melones Reservoir used for that purpose and to assist the Secretary in meeting any obligation to CVP contractors from the New Melones Project.
- Objective D – Use recirculation to improve dissolved oxygen in the SJR.
- Objective E – Provide lower salinity water to the SJR for meeting water quality objectives at interior South Delta stations through the use of excess capacity in export pumping and conveyance facilities.

Resource Management Measures

The resource management measures considered consisted primarily of facilities to be used to obtain and release water to the SJR. These include elements of Delta pumping, conveyance pathways, storage, and operations.

Resource management measures were screened by their ability to address at least one objective without adverse impact on other objectives. Measures were analyzed for the degree to which they fulfill a specific objective and were rated on a scale from low to high.

Resource management measures that were considered but eliminated are not precluded from reconsideration in future Study activities. Future events may create conditions that require the reconsideration of particular measures eliminated under this IAIR.

Table ES-2. Summary of Resource Measure Screening Evaluation

Measure	Status	Comment	Objectives
Delta Pumping			
Jones Pumping Plant	Retained	Excess capacity, used for pilot project.	A, B, C, D, E
Banks Pumping Plant	Retained	Use requires no impact to SWP water deliveries.	A, B, C, D, E
Conveyance			
DMC	Retained	Excess capacity, used for pilot project.	A, B, C, D, E
California Aqueduct	Retained	Used to replace recirculated CVP water in SLR.	A, B, C, D, E
Newman Wasteway	Retained	Used for pilot project.	A, B, C, D, E
Westley Wasteway	Retained	Requires outlet conveyance analysis.	A, B, C, D, E
Mendota Pool	Eliminated	Would require sustained flow below Sack Dam for efficient delivery to Vernalis.	
Friant Reservoir	Eliminated	Requires reliance on implementation of SJRRP. Potential changes in recirculation requirements to be included as sensitivity analysis.	
Firebaugh and Volta Wasteways	Eliminated	Potential adverse water quality effects from saline shallow groundwater.	
Natural Creeks	Eliminated	Requires new outlet structures and potential adverse effects from benthic sediment scour.	
Refuge Pathway	Eliminated	Potential adverse effects on SJR water quality (salinity, organic carbon), refuge operation conflicts.	
Storage			
SLR	Retained	Use for temporary storage of recirculation water.	A, B, C
New Melones Operational Releases			
Release recirculation eater before New Melones releases	Retained	Assist in bounding operational choices	A, B, C
Release recirculation water after New Melones releases	Retained	Assist in bounding operational choices	A, B, C

Key:
CVP = Central Valley Project
DMC = Delta-Mendota Canal
SJR = San Joaquin River
SJRRP = San Joaquin River Restoration Program
SLR = San Luis Reservoir
SWP = State Water Project

Delta Pumping

Jones Pumping Plant would be the primary facility to supply water for recirculation. Banks Pumping Plant would be used through the use of Joint Point of Diversion to replace water in SLR that was withheld from storage or released from storage.

Conveyance Pathways

Conveyance from the DMC or SLR to the SJR upstream of Vernalis is required to meet Objectives A and B. The following pathways are identified for further analysis:

Newman Wasteway

Newman Wasteway has been successfully used in the 2004 pilot recirculation project and will be retained for further analysis.

Westley Wasteway

Westley Wasteway is located closer to Vernalis and, therefore, may have the potential for lower water losses due to bank infiltration or consumptive riparian uses. However, existing channel constraints in Westley Wasteway and its path to the SJR will require additional analysis to determine what improvements are needed to support use of the Westley Wasteway (Figure ES-3).

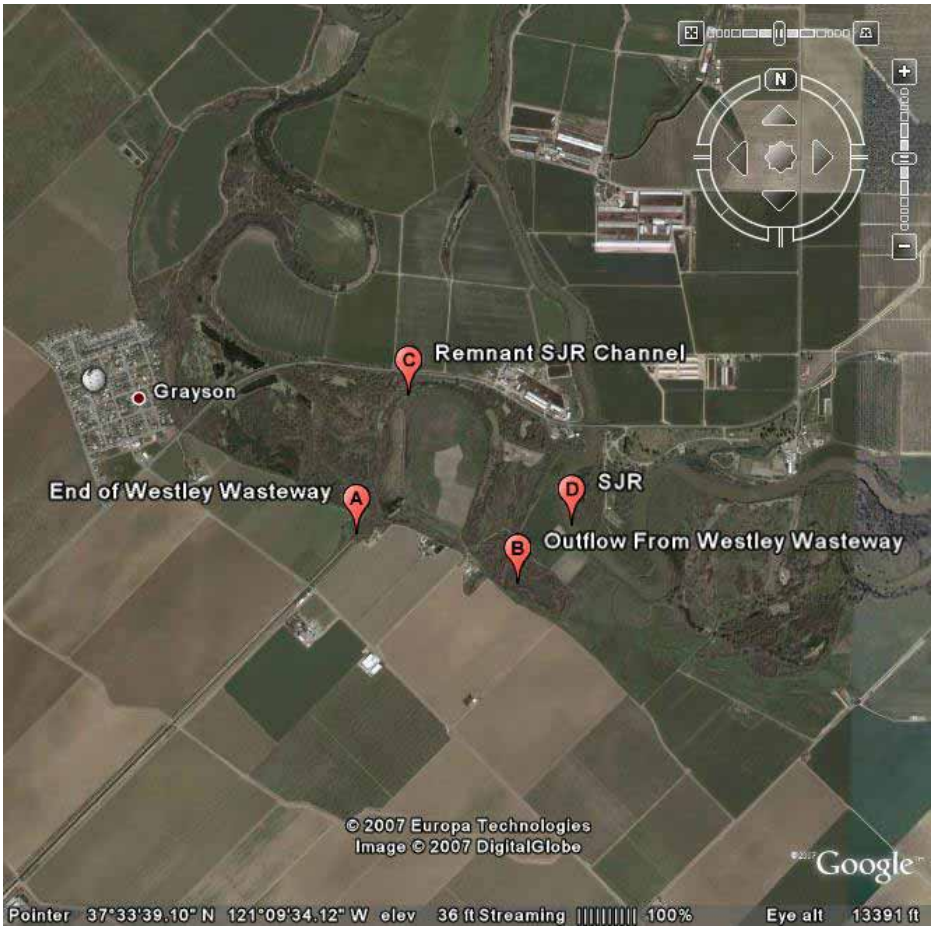

Figure ES-3. Westley Wasteway Outlet Relative to the SJR

The following conveyance pathways were considered but eliminated:

Mendota Pool

Releases to Mendota Pool were considered but eliminated because of the portions of the SJR downstream of Sack Dam that are currently dry during summer months and year-round in most years. A considerable volume of water would be required to establish a consistent flow due to significant instream losses. In addition, the portion of the river immediately upstream of the confluence with the Merced River is very slow moving and receives discharges from Mud and Salt Sloughs. Increasing flow could increase the resuspension and transport of previously deposited benthic sediment and result in greater transport of groundwater seepage to the downstream portion of the SJR.

Friant Dam

Releases from Friant Dam were also considered but eliminated because they are outside of the authorized project. It is noted that one goal of the SJRRP is to provide water for fish migration in the SJR which could potentially reduce the need for recirculation. Assuming restoration flow as a means of meeting the project objectives was eliminated as it would rely on implementation and coordination with the SJRRP. However, a sensitivity analysis will be performed to determine whether additional flows released from Friant are likely to improve either flows or water quality at Vernalis.

Federal Refuges

Releasing water through Federal refuges was eliminated due to the high organic carbon and salinity load in the refuges resulting from waterfowl, habitat, and evaporation that occurs in the refuges. Refuges are currently developing real-time operational criteria to release water during periods of high river flow when assimilative capacity is high in the SJR. Additionally, water needs at Vernalis generally do not occur at the same period that refuges are releasing water for habitat management.

Other DMC Wasteways

Other DMC wasteways downstream of Newman (Firebaugh and Volta) were not included for further consideration due to concerns that increased flow in these wasteways might increase transport of selenium and salt, which are known to be elevated in the shallow groundwater in the vicinity of the wasteways and are already a concern in the SJR. Additional concerns with the hydrologic connectivity of these wasteways to the SJR further lowered the desirability of using these wasteways.

Natural Creeks

Using natural creeks adjacent to the DMC, such as Del Puerto or Orestimba Creeks, were eliminated from further consideration due to the need for new outlet works and potential environmental impacts associated with the sediments in the creeks. As noted in its letter dated December 11, 2006, total suspended solids and turbidity are concerns of the Central Valley Regional Water Quality

Control Board (CVRWQCB) and would generally preclude paths that would increase these parameters.

Storage

Incidental use of stored water in SLR may be required for any release alternative due to the need to ensure water deliveries in the lower DMC are adequate. Additional measures using storage in SLR will be considered to allow noncoincident pumping and release, thereby improving flexibility in using both the Jones and Banks Pumping Plants.

Initial Alternatives

Initial alternatives were formulated from the resource management measures described in the previous section.

The theoretical combinations of physical facilities, conveyance pathways, and operational strategies could create a nearly endless list of potential alternatives. The performance of initial alternatives can be bracketed, however, by careful selection of a combination of resource management measures to encompass the range of potential impacts and benefits.

Figure ES-4 graphically illustrates the general construct of the initial alternatives. Table ES-3 presents the initial alternatives that have been identified for further study. Three main alternatives are identified based on the specific overall objective they serve or major facilities they use. The main alternatives include:

- Alternative 1 – Supplement Current Operation - Recirculation flows are added on top of New Melones releases, which typically remain at current levels.
- Alternative 2 – CVP Alone - Only Jones Pumping Plant is used for recirculation flows or to place water in storage.
- Alternative 3 – Enhance New Melones Water Supply - New Melones releases are added as necessary on top of recirculation flows.

Each of these main alternatives contains either two or five operational scenarios. The operational scenarios vary in the priority for use of the facilities to transport water for recirculation in relation to other existing uses and are designed to optimize a particular objective such as achieving water quality standards or minimizing impacts to Westside CVP contractors.

Figure ES-4 also provides an overview of the entire set of initial alternatives and operational scenarios. Figure ES-5 presents an overview of which facilities are used and how the scenarios vary in operational priorities.

Table ES-3. Initial Alternatives for Analysis

Alt	Delta Pumping Facilities	Delta Recirculation Pumping Priority Relative to other CVP Obligations	Conveyance	Recirculation Release Timing	Priority w/Existing New Melones Delta Operation
1A	Jones/Banks	High (no SWP impact)	Newman/Westley	Real-time and stored	After
1B	Jones/Banks	Low (no SWP/CVP south of Delta impact)	Newman/Westley	Real-time	After
2A	Jones	High (no SWP impact)	Newman/Westley	Real-time and stored	After
2B	Jones	Low (no SWP/CVP south of Delta impact)	Newman/Westley	Real-time	After
2C	Jones	Medium (no SWP; some CVP south of Delta impact)	Newman/Westley	Real-time and stored	Before
2D	Jones	High (no SWP impact)	Newman/Westley	Real-time and stored	Before
2E	Jones	Low (no SWP/CVP south of Delta impact)	Newman/Westley	Real-time	Before
3A	Jones/Banks	High (no SWP impact)	Newman/Westley	Real-time and stored	Before
3B	Jones/Banks	Low (no SWP/CVP south of Delta impact)	Newman/Westley	Real-time	Before

Key:
Banks = Harvey O. Banks Pumping Plant
Jones = C.W. "Bill" Jones Pumping Plant
CVP = Central Valley Project
SWP = State Water Project
Delta = Sacramento-San Joaquin River Delta

Following is a description of each initial alternative and operational scenario.

Alternative 1 – Supplement Current Operation

This alternative adds recirculation to the current operation in the basin. Recirculation would be used as an additional tool to help meet current water quality standards and flow objectives. Under this assumption, the current level of releases from New Melones for water quality and flow compliance would largely remain unchanged. Banks Pumping Plant would be used to replace water in the SLR lost due to recirculation. Variants include different Jones Pumping Plant pumping priorities relative to other CVP obligations.

Alternative 2 – CVP Alone

This alternative focuses the tools available to serve project goals on CVP facilities (inclusive of institutional arrangements such as wheeling). Recirculation flow would be limited to water that can be pumped at Jones Pumping Plant. Variants include different Jones Pumping Plant pumping priorities relative to other CVP obligations and if recirculation releases would be in use prior to or after New Melones SJR releases.

Alternative 3 – Enhance New Melones Water Supply

This alternative strives to evaluate the dual project objectives of water quality and flow compliance and the enhancement of the New Melones water supply. The discriminating difference between this alternative and Alternative 1 is that the recirculation component occurs prior to a New Melones release for SJR

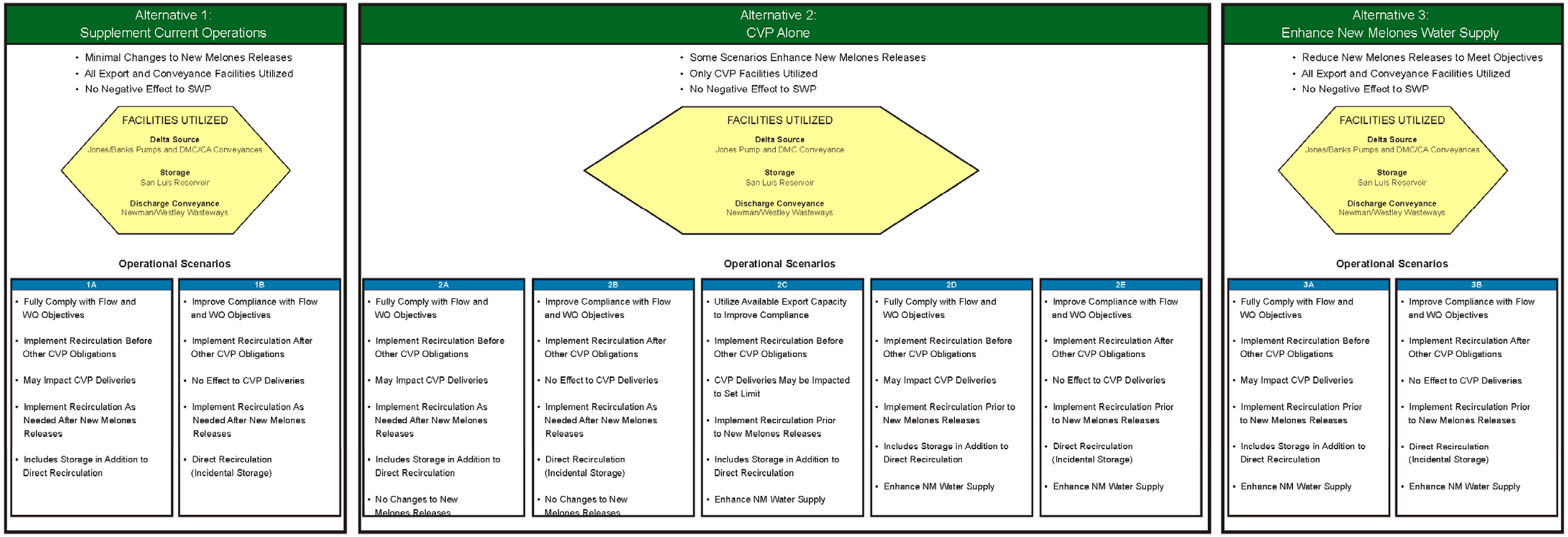

Figure ES-4. Range of Alternatives

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water quality and flow requirements. In this alternative, New Melones supplements recirculation only if necessary.

The results of evaluation of this alternative will provide insight into the amount of New Melones water supply that could be enhanced by a lesser reliance on New Melones for compliance to Delta water quality and flow requirements. Banks Pumping Plant would be used to replace water in the SLR lost due to recirculation. Variants include different Jones Pumping Plant pumping priorities relative to other CVP obligations.

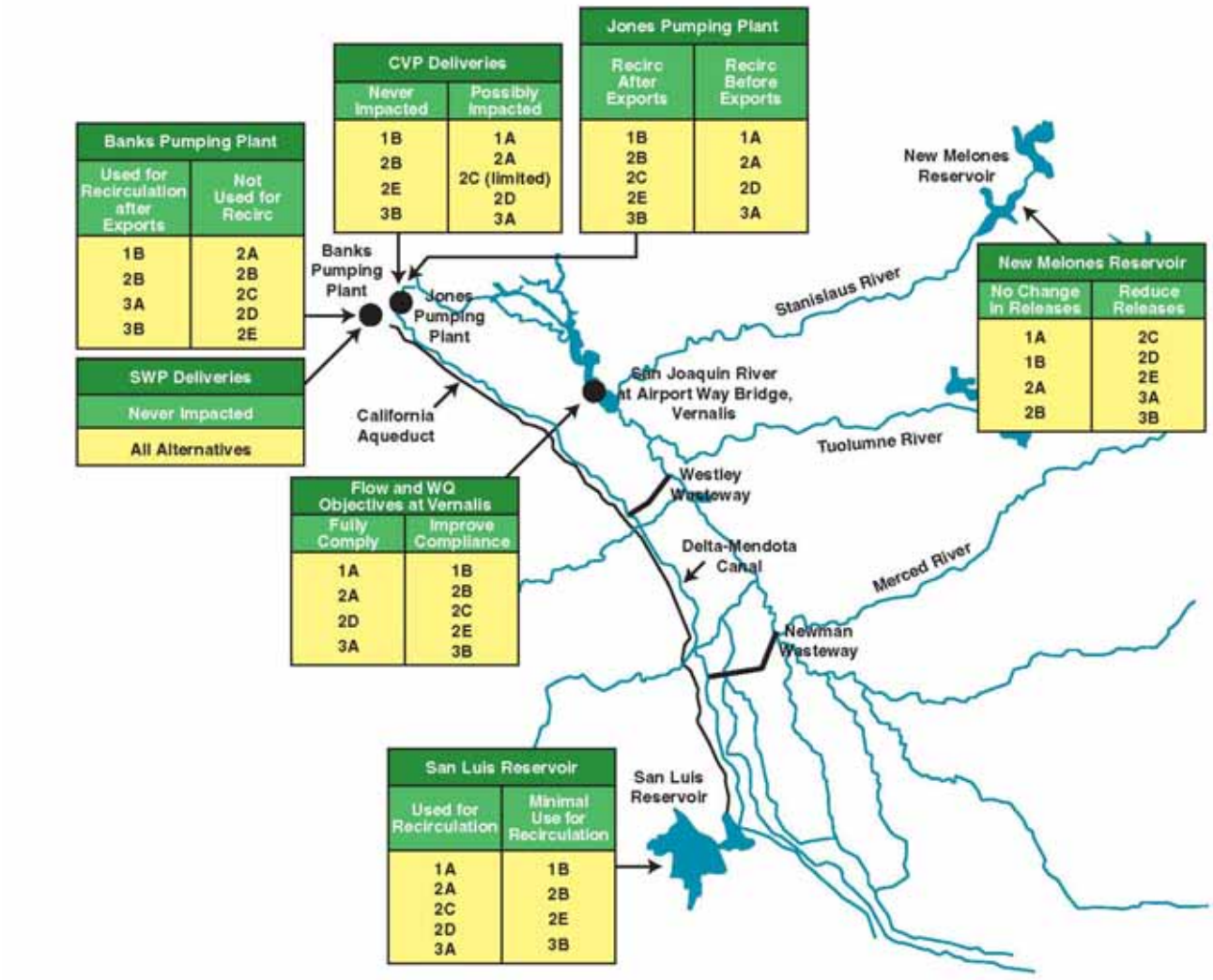

Figure ES-5. Alternative Components

Comparison Criteria

All elements of the Study are being prepared to conform to the Federal P&Gs (Water Resources Council 1983). Each initial alternative must be formulated with consideration of the following four criteria identified in the P&Gs: completeness, effectiveness, efficiency, and acceptability.

Evaluation Metrics

Evaluation of each initial alternative for the different affected resources will be conducted in the PFR. The effects of the different alternatives for each resource area will be compared using a series of metrics developed specifically for the Study. Table ES-4 provides a list of the evaluation metrics and components.

During the development of the PFR these evaluation metrics will be further developed and categorized into the four overall comparison criteria. Technical studies will be conducted to evaluate how well each alternative performs against the metrics and form the basis of the alternative comparison.

Table ES-4. Evaluation Metrics

Metric	Component	Geographic Area
Achieving Project Goals		
	EC	SJR Vernalis, Interior South Delta
	Flow	SJR Vernalis
	Reliance on New Melones	New Melones
	Dissolved oxygen	SJR @ DWSC
	Water levels in South Delta	South Delta
Water Supply		
	CVP contractors deliveries	Delta export area, Stanislaus delivery area
	SJR tributary effects	Tributaries
	Storage level changes	SLR, Sacramento Basin
Water Quality		
	Dissolved oxygen	SJR, DWSC
	Selenium	SJR
	EC	SJR, X2, other Delta/key locations
	Toxics	SJR
	Bromide	Delta M&I diversions
	Dissolved organic carbon	Delta M&I diversions
Fisheries		
	Change in exports	Delta
	Timing of export	Delta
	Dissolved oxygen	DWSC
	Temperature	SJR
	Turbidity	SJR
	Toxics	SJR
	Channel hydraulics	Delta

Metric	Component	Geographic Area
	Source water cueing	SJR
	Flooded channel area	SJR
	Instream habitat	Tributaries
	Recreational fishing	SLR
Threatened and Endangered Species		
	Number of protected species potentially adversely affected	Affected area
	Number of protected species potentially beneficially affected	Affected area
	Magnitude of adverse effect	Affected area
	Percentage of habitat area affected	Affected area
Energy		
	Energy use	CVP, SWP
Economics		
	Cost	Affected area
	Benefit	Affected area
Implementability		
	Operational complexity	Affected operation

Key:
CVP = Central Valley Project
EC = electrical conductivity
Delta = Sacramento-San Joaquin River Delta
DWSC = Stockton Deep Water Ship Channel
M&I = municipal and industrial
SJR = San Joaquin River
SLR = San Luis Reservoir
SWP = State Water Project

Fish Imprinting and Straying

Recirculation through the DMC would introduce additional water from the Sacramento River into the SJR, potentially creating straying problems for anadromous fish. Fishery agencies have expressed concern that returning adult Chinook salmon and steelhead from the Sacramento River could stray into the SJR. Another possibility is that outmigrating smolts exposed to recirculated water during the spring could imprint on the Sacramento River source water fraction and then stray into the Sacramento River on returning as adults.

The DMC Recirculation Project's Technical Fishery Working Group is currently working with resource management agencies to identify methods to evaluate the straying issue. The steps in the evaluation include a literature review of mechanisms surrounding homing and migration for anadromous salmonids and a more thorough assessment of baseline straying rates in the SJR tributaries and elsewhere in the Central Valley through the review of coded-wire-tag returns from other tributaries. The Long-Term CVP Operations Criteria and Plan and Biological Opinion are being reviewed to provide insights into the straying issues.

Another potential method to evaluate straying would be to assess the effects on straying of comparable examples of intra-basin water transfers within the Central Valley (from the American River to the Cosumnes River and the Yuba

River to Deer Creek) or even inter-basin transfers from the Eel River to the Russian River or from the Trinity River to the Sacramento River. These empirical examples may provide data or some insights as to the significance of the straying issue relative to water transfers and could provide a corollary to the effects of DMC recirculation.

No field studies are being proposed at this time. Radio-tagged adult salmon have been tracked in the past to assess straying; however, captured adult salmon from the Delta could be from any of the tributaries. The ability to determine if straying occurs requires proper identification of the natal river. No benign way exists to correctly associate a field-captured salmon to its natal river.

Study Management and Outreach

Overall management of the Study occurs through a Project Management Team (PMT). Following is a brief description of the PMT, and the various teams that have been established to support the PTM, along with a brief description of critical outreach efforts to date.

Project Management Team

The PMT consists of a project manager from Reclamation; project management from DWR; an interdisciplinary team consisting of engineering, environmental resources, reservoir water operations, public involvement, and project support resources; the consultant team; and representatives from participating resource agencies. The PMT establishes necessary teams and working groups such as a Collaborative Interagency Team; directs public involvement activities and coordinates general public input; and coordinates results of the Study.

Stakeholder and Public Outreach Team

The Stakeholder Outreach Team includes representatives from Reclamation, DWR, and the consultant team. This team will initiate two distinct outreach efforts. One will provide outreach targeted to the needs of stakeholders; the other will target the general public.

Stakeholder Workshops

Stakeholders bring a high level of experience and local knowledge to the process. Workshops have had and will continue to have a major role in engaging stakeholders into the overall study process. To date, a series of workshops has been held and future workshops will be scheduled during critical milestones in the Study. Workshops have been held to explain the results of efforts done to date and gain input of future study efforts.

Public Scoping

Public scoping meetings were held in April 2007 to solicit input from the public, stakeholders, and various agencies on the alternatives, concerns, and issues to be address in the EIS/EIR. A Notice of Intent to prepare an EIS/EIR

was published in the Federal Register on March 30, 2007, and a Notice of Preparation was filed with the California State Clearing House on March 28, 2007. The scoping meetings provided an introduction and overview of the Study; information on the planning process, alternatives development, and environmental resources; and provided opportunities for input.

Future Actions

The plan formulation process will continue following release of the IAIR with the preparation of the PFR. The purpose of the PFR is to further refine the initial alternatives and compare and evaluate the alternatives. The PFR will include water supply modeling to quantify the timing and amount of recirculation that can be achieved under the different initial alternatives. The change in physical characteristics (flow and quality) at various locations in the system will be used as the basis for the environmental analysis for key resources for each alternative. These alternatives will be compared to each other, the No-Action Alternative, and existing conditions to assist in further refinement of selected alternatives and development of cost and benefits. Figure ES-6 presents a report schedule timeline.

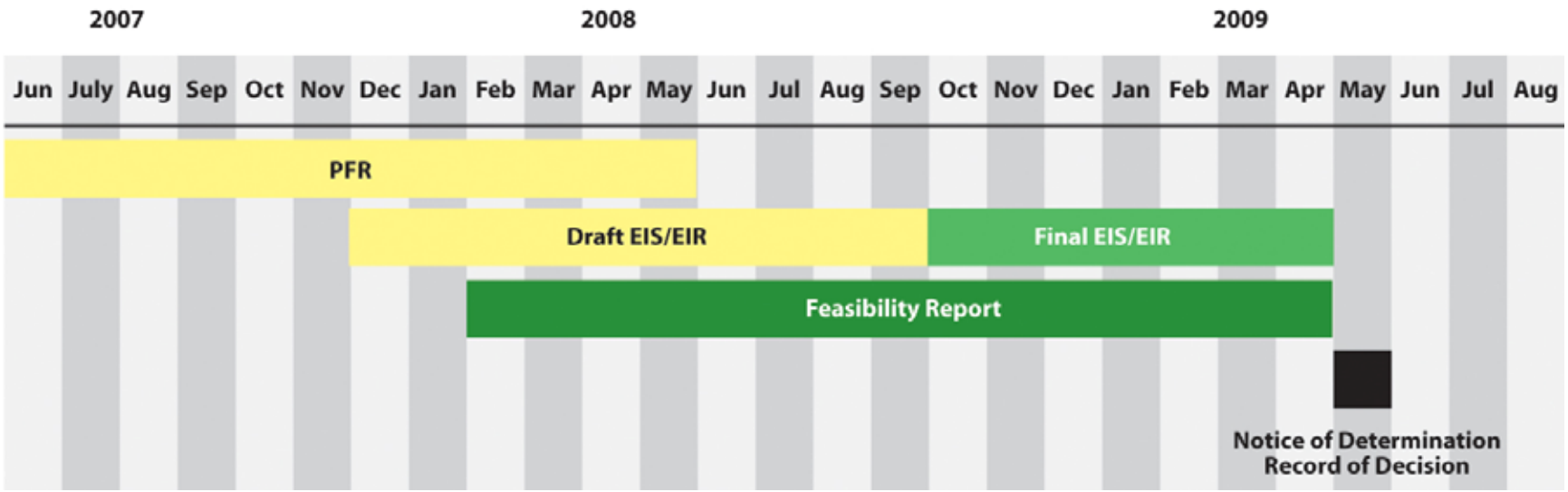

Figure ES-6. Report Schedule Timeline

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Abbreviations and Acronyms

AF	acre-feet
APE	area of potential effects
Authority	San Luis & Delta Mendota Water Authority
Basin Plan	Water Quality Control Plan for the Sacramento River and San Joaquin River Basins
Banks Pumping Plant	Harvey O. Banks Pumping Plant
Bay/Delta Plan	Water Quality Control Plan San Francisco Bay/ Sacramento-San Joaquin Delta Estuary (May 1995)
CACMP	Common Assumptions Common Model Package
CalSim II	California Simulation Model II
CEQA	California Environmental Quality Act
cfs	cubic feet per second
CIT	Collaborative Interagency Team
Corps	U.S. Army Corps of Engineers
CVP	Central Valley Project
CVPIA	Central Valley Project Improvement Act
CVRWQCB	Central Valley Regional Water Quality Control Board
D-XXXX	State Water Resources Control Board Water Rights Decision XXXX
Delta	Sacramento-San Joaquin River Delta
DFG	California Department of Fish and Game
DMC	Delta-Mendota Canal
DRMS	Delta Risk Management Strategy
DSM2	Delta Simulation Model 2
DWR	California Department of Water Resources
DWSC	Port of Stockton Deep Water Ship Channel
EC	electrical conductivity
EIR	Environmental Impact Report
EIS	Environmental Impact Statement
EPA	U.S. Environmental Protection Agency
ESA	Endangered Species Act
Exchange Contractors	San Joaquin River Exchange Contractors Water Authority
EWA	Environmental Water Account
FERC	Federal Energy Regulatory Commission
GDA	Grassland Drainage Area
HORB	Head of Old River Barrier

IAIR	Initial Alternatives Information Report
ID	irrigation district
Interior	U.S. Department of the Interior
IPO	Interim Plan of Operations
Jones Pumping Plant	C.W. “Bill” Jones Pumping Plant
Low Point Project	San Luis Reservoir Low Point Improvement Project
M&I	municipal and industrial
mg/L	milligram(s) per liter
NED	National Economic Development (account)
NEPA	National Environmental Policy Act
NMFS	National Marine Fisheries Service
NOD	Notice of Determination
NODOS	North-of-the-Delta Offstream Storage Investigation
NRDC	Natural Resources Defense Council
OCAP	Operations Criteria and Plan
PFR	Plan Formulation Report
PMT	Project Management Team
POA	Plan of Action
PTMS	Program to Meet Standards
P&Gs	Economic and Environmental Principles and Guidelines for Water and Related Land Resources Implementation Studies
Reclamation	Bureau of Reclamation
RWQCB	Regional Water Quality Control Board
ROD	Record of Decision
SDIP	South Delta Improvements Program
Secretary	Secretary of the Interior
Service	U.S. Fish and Wildlife Service
SJR	San Joaquin River
SJRA	San Joaquin River Agreement
SJRGA	San Joaquin River Group Authority
SJRIP	San Joaquin River Improvement Project
SJRRP	San Joaquin River Restoration Program
SJRWQMG	San Joaquin River Water Quality Management Group
SLR	San Luis Reservoir
SLWRI	Shasta Lake Water Resources Investigation
Study	DMC Recirculation Project Feasibility Study
SWP	State Water Project
SWRCB	State Water Resources Control Board

TMDL	total maximum daily load
TOP	transitional operation plan
VAMP	Vernalis Adaptive Management Plan
WAP	Water Acquisition Program
WQO	water quality objective

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Chapter 1
Introduction and Background

The U.S. Department of the Interior (Interior), Bureau of Reclamation (Reclamation) is evaluating the feasibility of using recirculation strategies to improve water quality and flows in the lower San Joaquin River (SJR). Specifically, Reclamation is evaluating the feasibility of the Delta-Mendota Canal (DMC) Recirculation Project, which involves recirculating water from the Sacramento-San Joaquin River Delta (Delta) through the Central Valley Project (CVP) pumping and conveyance facilities to the SJR, upstream from Vernalis, the point at which SJR enters the Delta.

This Initial Alternatives Information Report (IAIR), which is a component of the overall DMC Recirculation Project Feasibility Study (Study), describes the planning process used to develop initial alternatives for the Study. The Study will culminate in an Environmental Impact Statement/Environmental Impact Report (EIS/EIR) and a Feasibility Report, including a Record of Decision (ROD) and Notice of Determination (NOD). Reclamation is the Federal lead agency for National Environmental Policy Act (NEPA) compliance and the California Department of Water Resources (DWR) is the State lead agency for California Environmental Quality Act compliance (CEQA).

Reclamation has completed technical and pilot studies that provide the information required for the analysis performed in this IAIR. Consequently, this IAIR documents existing data, including information and reports that have been developed by Reclamation and others, and provides additional analyses as needed to explain the formulation of initial alternatives to address the planning objectives established for the DMC Recirculation Project. More detailed alternatives will be developed from these initial alternatives during the next phases of the Study. This IAIR includes the following topics:

- Background and scope
- Problems, needs, opportunities, planning objectives, criteria, and constraints
- Scope and major features of the initial alternatives considered
- Initial alternatives
- Evaluation criteria that will be used to screen initial alternatives

This report will help serve as a basis for completing the Study, including the Plan Formulation Report (PFR), environmental document, and Feasibility Report.

Purpose of Report

The purpose of this IAIR (Report) is to identify the initial alternatives that will be carried forward for additional review in the plan formulation and feasibility phases of the Study. Reclamation has completed technical and pilot studies that provide the information required for the analyses performed in this IAIR. More detailed alternatives will be developed from these initial alternatives during the next phases of the Study.

Study Purpose

The purpose of the Study is to identify and evaluate the feasibility of implementing DMC recirculation as a means of accomplishing the objectives defined in the authorizing language. The Study, which is identified in the authorizing legislation as part of Reclamation's overall Program to Meet Standards (PTMS), will determine whether Reclamation can, through the use of excess capacity in export pumping and conveyance facilities, provide greater flexibility in meeting the existing water quality standards and flow objectives for which the CVP has responsibility, reduce the demand on water from New Melones Reservoir (for use to improve water quality and flow), and assist the Secretary of the Interior (Secretary) in meeting any obligation to CVP water contractors using the New Melones Reservoir.

Study Authorization

The Study is authorized by the CALFED Bay-Delta Authorization Act of 2004 (Public Law 108-361, Water Supply, Reliability, and Environmental Improvement Act [October 25, 2004; 118 Stat. 1681; 22 pages]).
Section 103(d)(2)(D)(i) directs the Secretary to "develop and initiate implementation of a program to meet all existing water quality standards and objectives for which the Central Valley Project has responsibility."
Section 103(d)(2)(D)(ii) states, "In developing and implementing the program, the Secretary shall include, to the maximum extent feasible, the measures described in clauses (iii) through (vii)." In addition, Section 103(d)(2)(D)(iii) states, "The Secretary shall incorporate into the program a recirculation program to provide flow, reduce salinity concentrations in the San Joaquin River, and reduce the reliance on the New Melones Reservoir for meeting water quality and fishery flow objectives through the use of excess capacity in export pumping and conveyance facilities."

Finally, Section 103(d)(2)(D)(vi) states, "The purpose of the authority and direction provided to the Secretary under this subparagraph is to provide greater flexibility in meeting the existing water quality standards and objectives for which the Central Valley Project has responsibility so as to reduce the demand on water from New Melones Reservoir used for that purpose and to assist the Secretary in meeting any obligation to CVP contractors from the New Melones Project."

Funding authorization for this Study is provided by Section 103(f)(1)(G), which states, "Funds may be used to conduct feasibility studies, evaluate, and, if feasible, implement the recirculation of export water to reduce salinity and improve dissolved oxygen in the San Joaquin River."

Through Public Law 108-361 authorization, Reclamation also will satisfy requirements of the State Water Resources Control Board (SWRCB) to prepare a Plan of Action (POA) to evaluate the potential impacts of recirculating water from the DMC through the Newman Wasteway.

Through *Water Rights Decision 1641* (SWRCB 2000, as revised; hereafter referred to as D-1641), SWRCB amended Reclamation's water rights permits to allow CVP water to be diverted at the Harvey O. Banks Pumping Plant (Banks Pumping Plant), subject to DWR's permission, as part of joint operations of the State and Federal export facilities.

This joint operation of the CVP and State Water Project (SWP) is commonly referred to as the Joint Point of Diversion. As part of the amendment of permits under D-1641, the SWRCB required Reclamation to prepare a POA. The SWRCB directed Reclamation to address the following specific issues:

- The potential impacts of changes in water composition on Delta native fish and on the imprinting of juvenile fall run Chinook salmon and steelhead in the SJR Basin

- The potential effects of increased exports on in-Delta hydrodynamics and fish entrainment at the SWP and CVP export facilities

- The potential effects of salt and contaminant loading in the SJR Basin due to the recirculation of water through the Newman Wasteway

- The impacts on water deliveries to the San Joaquin River Exchange Contractors Water Authority (Exchange Contractors) and other contractors receiving water from the DMC, the California Aqueduct, and the San Luis Reservoir (SLR)

- The capacity of the physical facilities to implement recirculation, including a description of any needed structural/channel modifications, a cost estimate, and a determination of the potential of the conserved

water (compared to other alternatives) to meet Delta flow and Vernalis Adaptive Management Plan (VAMP) requirements

- The potential for improvements in water quality in the SJR as a result of recirculation.

The POA for the Study was submitted by Reclamation on December 15, 2000 (Reclamation 2000) and approved by the SWRCB in a letter dated March 21, 2001 (SWRCB 2001). However, the Study received Congressional authorization and funding in October 2004 with the passage of Public Law 108-361. In April 2006, Reclamation submitted a revised POA (Reclamation 2006a) to the SWRCB that included a long-term schedule for completing a study in compliance with D-1641.

Study Area

The Study area is defined as the lower main stem of the SJR below its confluence with the Merced River, the areas served by the Merced, Tuolumne, and Stanislaus Rivers on the western side of the Sierra Nevada Mountains, and the areas served by the DMC, which includes approximately 30 water agencies. The Study area also includes the south Delta which serves as a source of water supply for agricultural and urban uses within the Delta area.

The Study area includes several irrigation districts (IDs) served by the SJR tributaries, including the Modesto ID and Turlock ID on the Tuolumne River, the Merced ID on the Merced River, the South San Joaquin ID, and Stockton East Water District and Oakdale ID on the Stanislaus River.

Immediately downstream from the confluence with the Stanislaus River, the SJR becomes part of the Delta, which serves as a source of water supply for agricultural and urban uses within the Delta area. Therefore, the south Delta will be considered part of the Study area.

The DMC is on the western side of California's San Joaquin Valley. It runs for approximately 120 miles, beginning near Tracy at the southern edge of the Delta and terminating at the Mendota Pool on the SJR, at Mendota.

The areas served by the DMC include primarily agricultural lands on the western side of the San Joaquin Valley, from Tracy in the north to Kettleman City in the south, and primarily urban uses in the San Felipe Unit of the CVP, in San Benito and Santa Clara Counties, west of the Coast Range.

The DMC generally runs parallel to the California Aqueduct, a State-owned conveyance facility providing primarily agricultural water to southern portions of the San Joaquin Valley and primarily urban water to Southern California. The DMC is part of the Federal CVP Delta export facilities, which also include

the C.W. “Bill” Jones Pumping Plant (Jones Pumping Plant) (formerly known as the Tracy Pumping Plant), the Westley and Newman Wasteways, the O’Neill Pumping Plant, the O’Neill Forebay, and the SLR.

The facilities and features that may be used directly for recirculation include, but may not be limited to, the Jones Pumping Plant, the DMC, the Westley or Newman Wasteway, and the SJR below its confluence with the Merced River. Recirculation also may impact the operations of other CVP facilities, either directly or indirectly, including the SLR and the New Melones Reservoir on the Stanislaus River (see Figure 1-1).

Figure 1-1. Delta-Mendota Canal Recirculation Study Area

Scope of IAIR

This IAIR documents existing data, including information and reports that have been developed by Reclamation and others, and provides additional analyses as needed to explain the formulation of initial alternatives to address the DMC Recirculation Project objectives.

This IAIR includes the following topics:

- Description of existing and likely future water resources and related conditions in the Study area and related problems, needs, and opportunities being addressed in the Study.
- Development of planning objectives to address identified problems, needs, and opportunities.
- Identification of the planning constraints, guiding principles, and criteria for the Study.
- Development of resource management measures to address planning objectives.
- Formulation and evaluation of initial project alternatives, including a No-Action Alternative, that complies with the CALFED ROD (CALFED 2005) and does not conflict with CALFED objectives, solution principles, or policies. The plan formulation and evaluation process must comply with the Federal Economic and Environmental Principles and Guidelines for Water and Related Land Resources Implementation Studies (P&Gs) (Water Resources Council 1983).
- Description of the potential alternatives and the screening process used to identify a recommended set of initial alternatives to be further developed in the Study.
- Identification of potential major future actions for the Study.

Since this IAIR is an initial component of the Study process, conclusions and recommendations regarding further evaluations are expected to evolve as the Study process progresses.

Report Organization

In addition to this introduction, the IAIR includes several chapters. Chapters 2, 3, and 4 highlight related studies, projects, and programs; define without project conditions; and describes fundamental problems being addressed in the Study. Chapter 5 describes the plan formulation process;

defines planning objectives for the Study; and identifies planning constraints, principles, and criteria. Chapter 6 describes potential resources management measures that could address the planning objectives and identifies measures carried forward for inclusion into initial alternatives.

Chapter 7 describes preliminary alternatives that will be further considered and analyzed in developing the PFR and Feasibility Report. Chapter 8 presents the method to be used for comparison of initial alternative. Chapter 9 addresses potential straying problems for anadromous fish. Chapter 10 describes the study management and public involvement approach. Chapter 11 describes the next steps to be completed during plan formulation and Chapter 12 presents references used in the preparation of this report.

Chapter 2
Related Studies, Projects, and Programs

This chapter describes related studies, projects, and programs that have the potential to affect or be affected by the DMC Recirculation Project. How these studies will be incorporated into the baseline and future without project conditions is described in Chapter 3.

Program to Meet Standards

Public Law 108-361 requires Reclamation to develop a program to meet all existing water quality standards and objectives for which the CVP has responsibility. Three actions, in addition to DMC Recirculation Project, have been identified for consideration relative to achieving this goal on the SJR: Best Management Practices for wetlands, water acquisitions from willing sellers, and an updated New Melones Reservoir Plan of Operations. The status of these projects and their potential to affect the use of DMC Recirculation Project are described in this chapter. The results of prior DMC recirculation studies will be incorporated into later chapters relative to alternatives development and evaluation.

Best Management Practices Plan for Wetlands Discharges

Grassland Water District is developing a comprehensive flow and salinity monitoring system and the application of a decision support system to improve the management of seasonal wetlands in the San Joaquin Valley and to manage releases of high-salinity water. The models that are used develop salinity balances at regional and local scales. The regional scale concentrates on deliveries to and exports from Grassland Water District; the local scale focuses on an individual wetland unit, where more intensive monitoring is being conducted (Harris 2001).

The U.S. Fish and Wildlife Service (Service) is also developing Best Management Practices for wildlife management areas that receive Federal water to reduce potential impacts to the SJR when the areas are drained for habitat management.

Water Acquisition Program

The Central Valley Project Improvement Act (CVPIA) requires the acquisition of water for protecting, restoring, and enhancing fish and wildlife populations. To meet water acquisition needs under the CVPIA, Interior has developed a Water Acquisition Program (WAP), which is a joint effort by Reclamation and the Service (Interior 2003).

The WAP acquires water to meet two purposes: Level 4 refuge water supplies and instream flows. Since the DMC Recirculation Project involves both augmentation of instream flows in the SJR and the use of Jones Pumping Plant capacity, which also may be used to convey Level 4 refuge water, the WAP has the potential to impact or be impacted by the DMC Recirculation Project.

As a part of CVPIA long-range planning efforts to increase stream flows, the Service is conducting ongoing studies related to three key issues: biological needs of anadromous fish, hydrological characteristics of targeted streams (including reservoir operations), and economic considerations. Information from these studies will be used to establish which streams have the highest priority need for additional flows and how much water is needed on each of those streams.

To date, the WAP has acquired water primarily from the San Joaquin River Group Authority (SJRGA) and its member agencies. These acquisitions provide additional spring and fall fishery flows on the Stanislaus, Tuolumne, Merced, and lower San Joaquin rivers.

New Melones Interim Plan of Operations

Reclamation is developing an updated operating plan for New Melones Dam and Reservoir that establishes how available water supplies will be managed within and outside of the Stanislaus River Basin. New Melones operations may affect or be affected by the DMC Recirculation Project, depending on the operations priorities used in an alternative.

Water availability for the New Melones Project differs significantly from what was expected when New Melones Dam was constructed. New Melones Dam is about 0.75 mile downstream from the original Melones Dam, built by the Oakdale and South San Joaquin IDs in 1926. The initial construction of New Melones Dam began in July 1966, and the reservoir was first filled in 1983.

Original estimates anticipated that approximately 200,000 acre-feet (AF) of water per year would be available after pre-existing obligations were met. As a result of those estimates, contracts were negotiated with Stockton East Water District and the Central San Joaquin Water Conservation District for up to 155,000 AF per year. During the drought of 1987 to 1992, pre-existing obligations were not always met, and there were times when water was not available to service those contracts (Reclamation, undated).

The operating criteria for New Melones Reservoir are governed by the New Melones authorization statutes (Flood Control Acts of December 1944 [Public Law 78-534, December 22, 1944] and October 1962 [Public Law 87-874, October 23, 1962]), Stanislaus River water rights, instream fish and wildlife flow requirements, temperature and dissolved oxygen requirements, Vernalis water quality and flow requirements from SWRCB’s D-1641, CVP contracts,

and flood control requirements. The Stanislaus River section in Chapter 3 provides specific details of these flow requirements.

Water released from New Melones Dam and power plant is re-regulated at Tulloch Reservoir and either diverted at Goodwin Dam or released from Goodwin Dam to the lower Stanislaus River. Releases into the lower Stanislaus River provide water for riparian water rights and to meet instream fishery flow, water temperature, and instream dissolved oxygen objectives. Upon entering the SJR, the Stanislaus River water generally improves the flow and water quality conditions at Vernalis.

D-1422, issued in 1973, provided the primary operational criteria for New Melones Reservoir. The decision permits Reclamation to appropriate water from the Stanislaus River for irrigation, municipal and industrial (M&I) uses, but it requires the operation of New Melones Reservoir to include releases for existing water rights, fish and wildlife enhancement, and the maintenance of water quality conditions on the Stanislaus River and lower SJR.

In June 1987, Reclamation and the California Department of Fish and Game (DFG) executed an agreement that specified interim releases from New Melones Dam to maintain instream flows that would be beneficial to fishery resources and habitat downstream from the dam. It increased the annual water for fisheries release by changing 98,300 AF from the maximum to the minimum required, and it allowed for releases as high as 302,100 AF in wetter years.

The 1987 agreement also established a program of studies intended to identify long-term instream flow and to determine measures to improve the survival of Chinook freshwater life stages. The program is conducted jointly by Reclamation, DFG, and the Service.

The Interim Plan of Operations (IPO) was developed as a joint effort between Reclamation and the Service, in conjunction with the Stanislaus River Basin Stakeholders. The process of revising an operations plan began in 1995, with a goal to develop a long-term management plan, but the focus shifted in 1996 to developing an interim operations plan. Although the IPO was meant to be a short-term plan for 1997 and 1998, it continues in effect. The IPO defines categories of water supply based on storage and projected inflow and then allocates annual water releases for fisheries, water rights settlement, water quality, Vernalis flow objectives, and use by CVP contractors.

Reclamation is currently developing a Revised Plan of Operations for New Melones Reservoir to replace the IPO. The end result of the process will be a report that describes the revised plan development and defines how New Melones Reservoir will be operated to meet regulatory commitments and demands for use of CVP supplies from the Stanislaus River.

Development of a long-term plan of operations for New Melones Reservoir will require balancing the competing needs in the basin. In addition to existing demands, ongoing and newly authorized projects and programs are underway that may change the regulatory requirements of the CVP and resulting demands on New Melones Reservoir.

Because many of these activities will require several years to develop meaningful results, a near-term revision process will be initiated simultaneously to develop a transitional operation plan (TOP). Development of the TOP will incorporate updated hydrologic and water quality information and will be based on a specified level of risk for drought occurrence during the life of the TOP (Reclamation 2005). The TOP was expected to be implemented in 2007 and be in place for 8-10 years; however, the TOP was not completed at the time of this report.

CALFED Bay-Delta Program

The CALFED Bay-Delta Program was established in 1995. CALFED is a consortium of five State and ten Federal agencies with management and regulatory responsibilities in the Bay-Delta. The State and Federal agencies have pledged to: (1) coordinate their implementation of water quality standards to protect the Bay-Delta; (2) coordinate the operation of the SWP and CVP, which both involve transporting fresh water through the Delta to points south; and (3) develop a process to establish a long-term Bay-Delta solution that will address four categories of problems: ecosystem quality, water quality, water supply reliability, and levee system vulnerability (CALFED 2000a). For water quality, primary concerns have focused on the effects of elevated salts, organic carbon, and bromide on drinking water and agricultural supplies coming from the Bay-Delta. The *CALFED Bay-Delta Program Final Environmental Impact Statement/Environmental Impact Report* was released in 2000 (CALFED 2000a).

CALFED Bay-Delta Conveyance

CALFED identified several conveyance improvements as part of its multi-program solution. The major conveyance improvement programs with the potential to affect the need and use of the DMC Recirculation Project are described in this section.

South Delta Improvements Program

While Stage 1 of the South Delta Improvements Program (SDIP) will not change water deliveries from the Delta, Stage 2 of SDIP could affect the quantity and timing of available capacity at Jones and/or Banks pumping plants to implement DMC Recirculation. SDIP is one element of the preferred CALFED Program which was identified in the CALFED ROD as part of the

programmatic solution to achieve the goals of water supply reliability, water quality, ecosystem restoration, and levee system integrity. The program is described in detail in the December 2006 SDIP Final EIS/EIR. The proposed project is to be implemented in two stages, the first being the physical/structural component and the second relating to changes in Delta exports. Only Stage 1 is proposed at this time.

Stage 1 will include making a decision on the physical/structural component. The physical/structural component includes:

- Replacing the seasonal barrier with a permanent operable fish control gate on the head of Old River
- Replacing the three seasonal temporary agricultural control barriers with permanent operable gates on Middle River, Grant Line Canal, and Old River
- Dredging portions of Middle River and Old River and possibly West, Grant Line, Victoria, and North canals to improve flows in the south Delta channels

Stage 2 is being deferred and will include making a decision on the operational component of SDIP after the pelagic organism decline is remedied.

North/Central Delta Water Quality and Fisheries Improvement Study

Franks Tract is a 3,300-acre flooded island in the Central Delta, north of the community of Bethel Island. The land was historically reclaimed for agricultural use through the construction of levees. In 1936 and 1938, the levees surrounding Franks Tract failed, resulting in flooding of the island. Franks Tract includes the Franks Tract State Recreation Area, owned and managed by the California Department of Parks and Recreation.

This recreation area is popular with recreational fishermen and boaters. Given its location in the Central Delta and its relatively deep bathometry, Franks Tract plays a key role in determining the quality of South Delta water that is available for in-Delta use and for export by the CVP and SWP. Franks Tract is one component of several conveyance improvements intended to increase the quality and reliability of water supply and water transport through the Delta.

In addition to its role in influencing water quality in the South Delta, however, Franks Tract is thought to contribute to the colonization and spread of invasive species, such as the aquatic plant *Egeria densa* and clam *Corbicula fulminea*.

In 2004, Congress provided Reclamation with authorization to conduct a feasibility study in Public Law 108-361, which states that “funds may be expended for feasibility studies and actions at Franks Tract to improve water quality in the Delta.” In 2007, Reclamation and DWR initiated the feasibility

study to further develop alternatives and evaluate their environmental impacts and effectiveness in meeting water supply reliability and water quality improvement goals of the project. The feasibility study is scheduled to be completed by late 2009.

Actions at Franks Tract could affect the need for the DMC Recirculation Project to meet water quality standards in the SJR below Vernalis and in the South Delta. Depending on which alternative is selected and implemented, water quality at the CVP and SWP pumping facilities may be improved, increasing the quality of DMC water and thereby reducing the volume of water needed to meet the Vernalis water quality objective (WQO).

CALFED Bay-Delta Storage Investigations

CALFED is evaluating the development of new surface water storage as a potential water management tool to meet the objectives of the CALFED Bay-Delta Program. The CALFED Surface Storage Program, which is included in the CALFED ROD (CALFED 2000c), identified 52 potential reservoir sites for screening.

The following sections will address four of the surface storage sites identified during the CALFED screening process that are in various stages of feasibility studies: Shasta Lake Water Resources Investigation (SLWRI), Los Vaqueros enlargement, the North-of-the-Delta Offstream Storage (NODOS) Investigation, and the Upper San Joaquin River Basin Storage Investigation.

In addition, this section will identify other CALFED programs and investigations that are being conducted to increase water supply reliability and improve water quality. Each of the surface storage projects has the potential to impact either the water quality in the SJR and South Delta or the availability of pumping capacity at Jones and Banks Pumping Plants.

Shasta Lake Water Resources Investigation

The SLWRI, a Reclamation, Mid-Pacific Region feasibility-level study is being conducted under the general authority of Public Law 96-375 and the CALFED Bay-Delta Authorization Act, also known as Public Law 108-361. These statutes direct the Secretary to engage in feasibility studies related to enlarging Shasta Dam and Reservoir. The SLWRI primary study area encompasses Shasta Dam and Reservoir; inflowing rivers and streams, including the Sacramento River, McCloud River, Pit River; and Squaw Creek; and the Sacramento River downstream to Red Bluff Diversion Dam.

The problems and needs in the study area were translated into primary and secondary planning objectives. The SLWRI’s primary objectives are to increase the survival of anadromous fish populations in the Sacramento River, primarily upstream from the Red Bluff Diversion Dam; and increase water supplies and

supply reliability for agricultural, M&I, and environmental purposes to help meet future water demands, with a focus on enlarging Shasta Dam and Reservoir. The secondary objectives include, to the extent possible, preserving, restoring, and enhancing ecosystem resources in the Shasta Lake area and along the upper Sacramento River; reducing flood damages and improving public safety along the Sacramento River; developing additional hydropower capabilities at Shasta Dam; and preserving and increasing recreational opportunities at Shasta Lake.

The IAIR was completed in 2004 and a Notice of Intent to prepare an EIS was published in 2005 (Federal Register 2005).

Los Vaqueros Expansion Investigation

Contra Costa Water District, Reclamation, and DWR have jointly undertaken a series of studies to analyze the feasibility of expanding Los Vaqueros Reservoir while adhering to reservoir expansion principles established by the district. The project has two primary objectives and one secondary objective:

Primary Objectives

- Develop water supplies for environmental water management that supports fish protection, habitat management, and other environmental water needs.

- Increase water supply reliability for water providers within the San Francisco Bay Area, to help meet M&I water demands during drought periods and emergencies or to address shortages due to regulatory and environmental restrictions.

Secondary Objective

- Improve the quality of water deliveries to M&I customers in the San Francisco Bay Area, without impairing the project's ability to meet the environmental and water supply reliability objectives stated above.

Several interim planning documents have been produced, such as the IAIR in September 2005, the Initial Economic Evaluation for Plan Formulation in July 2006, and the Design, Estimate, and Construction Review Report in September 2007.

North-of-the-Delta Offstream Storage Investigation

The NODOS Investigation is a feasibility study being conducted by DWR and Reclamation. The NODOS Investigation is evaluating potential offstream surface water storage projects in the Sacramento Valley to enhance water management flexibility, increase the reliability of supplies, reduce diversions on the Sacramento River during critical fish migration periods, and provide storage and operational benefits to other CALFED programs including Delta water quality and the Environmental Water Account (EWA).

In evaluating these objectives, the NODOS Investigation will address opportunities for ancillary hydropower generation benefits, recreation, and flood damage reduction. Congress provided NODOS feasibility study authority to Reclamation in the Omnibus Appropriations Act of 2003 (Public Law 108-7) and reaffirmed this authority in the Water Supply, Reliability, and Environmental Improvement Act of 2004 (Public Law 108-361).

The feasibility study will identify Federal and State interests in a new offstream reservoir that could provide up to 1.8 million AF of storage for water supply reliability to the region for urban, agricultural, and environmental uses. Project planning will culminate in a Feasibility Report and EIS/EIR.

Upper San Joaquin River Basin Storage Investigation

The Upper San Joaquin River Basin Storage Investigation is a feasibility study being performed by Reclamation and DWR. The objectives of the investigation are to enhance water temperature and flow conditions in the SJR and increase water supply reliability for agricultural and urban water users in the Friant Division, San Joaquin Valley areas, and other regions.

Federal authorization for the investigation was provided initially in Public Law 108-7, the omnibus appropriations legislation for fiscal year 2003. Subsequent authorization was provided in Public Law 108-361, the Water Supply, Reliability, and Environmental Improvement Act of 2004. Section 227 of the State of California Water Code authorizes DWR to participate in water resources investigations. The study area encompasses the SJR watershed upstream from Friant Dam and the portions of the San Joaquin and Tulare Lake hydrologic regions served by the Friant-Kern and Madera canals.

Environmental Water Account

The EWA was established in 2000 by the CALFED ROD, and is described in detail in the EWA Operating Principles Agreement attachment to the ROD. In 2004, the EWA was extended to operate through the end of 2007, and is expected to again be extended, probably through 2011.

The EWA's original purpose was to enable diversion of water by the SWP and CVP from the Delta to be reduced at times when aquatic life may be harmed, while preventing the uncompensated loss of water to SWP and CVP contractors. The EWA replaced any water loss due to curtailment of pumping by purchase of surface water or groundwater supplies from willing sellers and by taking advantage of regulatory flexibility and certain operational assets.

Five agencies administer the EWA: DWR and Reclamation (the Project Agencies) and the Service, National Marine Fisheries Service (NMFS), and DFG (the Management Agencies). The Project Agencies acquire assets for the EWA; the Management Agencies recommend how the assets should be used to

benefit the at-risk native fish species of the Bay-Delta estuary. Operation of the EWA Program is guided by the EWA Team, which is comprised of technical and policy representatives from each of the five EWA agencies. The EWA Team coordinates its activities with the Water Operations Management Team.

The EWA will no longer operate in the same manner as it did from 2000 through 2007. The operation has changed effective in 2008 in response to the declining availability of public funding to acquire water assets and increasing asset needs for fishery protection. The EWA as extended is now a limited EWA that has fewer assets at its disposal and will focus on providing those assets to support the VAMP and related actions such as the post-VAMP shoulder. The EWA assets will include the following:

- Assuming implementation of the Lower Yuba River Accord, 60,000 AF of water released annually from the Yuba River to the Delta would be an EWA asset through 2015, with a possible extension through 2025.
- EWA's operational assets that averaged 82,000 AF per year from 2001 to 2006 and ranged from 0 to 150,000 AF, depending on Delta hydrological and biological conditions.
- EWA will also have the ability to carry up to 100,000 AF of debt to the SWP in support of VAMP and related actions.

CALFED Record of Decision

Other projects listed in the CALFED ROD that have the potential to influence the DMC Recirculation Project are described in this section.

Water Quality Evaluation, Stage 1

The CALFED ROD requires the CALFED agencies to implement several major elements of the Water Quality Program. These elements are described hereafter:

- Address drainage problems in the San Joaquin Valley to improve downstream water quality.
- Implement source controls in the Delta and its tributaries.
- Invest in treatment technology demonstration.
- Control runoff into the California Aqueduct and other similar conveyances.
- Address water quality problems at the North Bay Aqueduct.
- Study recirculation of export water to reduce salinity and improve dissolved oxygen in the SJR.

Each of these elements is in various stages of implementation.

Ecosystem Restoration Program

As directed in the CALFED ROD, CALFED implemented a comprehensive Ecosystem Restoration Program. The goal of this program is to maintain, improve, and increase aquatic and terrestrial habitats and to improve ecological health and functions in the Delta. It is intended to support sustainable populations of diverse and valuable native plant and animal species.

The Ecosystem Restoration Program has proposed substantial actions to rehabilitate the natural processes in the Bay-Delta and its watershed to support, with minimal ongoing human intervention, natural aquatic and associated terrestrial biotic communities, in ways that favor native members of those communities.

Other Reclamation Projects and Programs

Several other Reclamation projects and programs have the potential to contribute to the DMC Recirculation Project objectives, independent of implementing recirculation.

Operations Criteria and Plan

The long-term CVP Operations Criteria and Plan (OCAP), prepared by Reclamation and DWR in 2004, serves as a baseline description of the facilities and operating environment of the CVP and SWP. The OCAP identifies the many factors influencing the physical and institutional conditions and decision-making process under which the projects currently operate. Regulatory and legal requirements are explained; alternative operating models and strategies are described. The immediate objective is to provide operations information for the Federal Endangered Species Act (ESA), Section 7 consultation.

In 2005, results of annual surveys designed to indicate population levels of several pelagic organisms, including the Delta smelt, were showing a precipitous decline. Reclamation reinitiated Federal ESA consultation on OCAP with the Service based on new information regarding the Delta smelt, including the apparent decline in the population.

The consultation process requires the Service to determine whether or not the operation of the projects would jeopardize the continued existence of the Delta smelt, and to identify reasonable and prudent measures for the action agency to implement, thereby minimizing any adverse effects of the projects. Until the consultation process is complete, Reclamation is implementing the remedial actions required by a December 2007 court order (Federal District Court, Eastern District of California, in Natural Resources Defense Council (NRDC) v. Kempthorne).

However, the Court's remedial actions have limitations. These actions affect the operation of the pumps, which is only one of the factors affecting the Delta smelt. Also, because these actions were developed in litigation, they have not been subject to a careful scientific peer review. Therefore, it is uncertain whether they will be effective in protecting the smelt and be incorporated into the new OCAP.

Delta issues affecting salmon, steelhead, and sturgeon are likely to come to the forefront in the coming months based on a parallel lawsuit against the NMFS. Reinitiation of ESA consultation on OCAP with the NMFS is also in process.

San Luis Drainage Feature Re-Evaluation Project

The purpose of the San Luis Drainage Feature Re-evaluation Project is to identify a plan to provide agricultural drainage service to the CVP's San Luis Unit in accordance with the Ninth District Circuit Court decision that Reclamation provide drainage service to the San Luis Unit. This project could affect SLR's operations by altering the schedule for water deliveries.

Drainage service has been defined as managing the regional shallow groundwater table by collecting and disposing shallow groundwater from the rootzone of drainage-impaired lands and/or reducing contributions of water to the shallow groundwater table through land retirement. The related ROD, signed in March 2007, selected the In-Valley/Water Needs Alternative for implementation. This alternative includes collection systems, reuse areas, treatment, and disposal facilities, as well as the retirement of 194,000 acres of farmland. The In-Valley/Water Needs Alternative would retire enough lands to balance the internal water demand of the San Luis Unit with the expected available supply.

Reclamation is finalizing an estimate of project costs, which is expected to confirm the need for authorizing legislation to increase the appropriation ceiling for funding beyond what was authorized by the San Luis Act of June 3, 1960.

CVPIA Land Retirement Program

The CVPIA (Interior 1992) authorized the purchase of land, water, and other property interests from willing sellers who received CVP water. Land retirement (i.e., the removal of lands from irrigated agriculture) is proposed as one strategy to reduce drainage-related problems. In this approach, lands characterized by low productivity, poor drainage, shallow water tables, and high groundwater selenium concentrations will be retired from irrigated agriculture through a willing seller program. Retirement of such lands will achieve program goals to reduce drainage, enhance fish and wildlife resources, and make water available for other CVPIA purposes.

A multiagency team consisting of representatives from Reclamation, the Service, and the Bureau of Land Management has been assembled to accomplish the goals of the program. The program targets lands within the

entire San Joaquin Valley, including those that do not have a direct discharge to the SJR; therefore, will not affect the DMC Recirculation Project. Lands that will have the largest effect on the water quality of the SJR include salt-impacted lands in the San Luis Unit, along the western side of the San Joaquin Valley.

San Luis Reservoir Low-Point Improvement Project

Reclamation, in cooperation with the Santa Clara Valley Water District and San Luis & Delta Mendota Water Authority (Authority), are currently conducting a feasibility study (Reclamation 2006c) to address the delivery schedule uncertainty and water supply reliability problems associated with the SLR low point. The low point issue arises when water levels fall below the functional low point, creating a water quality restriction that has the potential to interrupt a portion of the San Felipe Division's water supply. The objective of the San Luis Reservoir Low-Point Improvement Project (Low Point Project) is to optimize the water supply benefit of SLR while reducing additional risks to water users by:

- Avoiding supply interruptions when water is needed by increasing the certainty of meeting the requested delivery schedule throughout the year to south-of-Delta contractors dependent on SLR.
- Increasing the reliability and quantity of yearly allocations to south-of-Delta contractors dependent on SLR.
- Announcing higher allocations earlier in the season to south-of-Delta contractors dependent on SLR without sacrificing accuracy of the allocation forecasts.

Potential solutions may include physical modifications to existing facilities, construction of new facilities, changes to operations, or some combination of these solutions. Since the DMC Recirculation Project may impact reservoir levels and the use of SLR storage, the Low Point Project feasibility study could be affected by the DMC Recirculation Project.

The Low Point Project study area includes the SLR and the service area of the Authority, which is also included in the DMC Recirculation Project Study. Members of the Authority are CVP contractors within the West San Joaquin, San Felipe, and Delta Divisions of the CVP. These contractors either receive CVP deliveries from the SLR or have annual water deliveries that are likely to be influenced by SLR operations.

San Joaquin River Restoration Settlement

A litigation Settlement among the NRDC, Friant Water Users Authority, Interior, and the U.S. Department of Commerce in the case of NRDC v. Rodgers was approved in late 2006 by the U.S. District Court in Sacramento (Reclamation 2006d; Reclamation et al. 2006). The Settlement ended an 18-year legal dispute over the operation of Friant Dam and resolved longstanding legal

claims brought by a coalition of conservation and fishing groups led by the NRDC.

The Settlement provides for substantial river channel improvements and sufficient water flow to sustain a salmon fishery upstream from the confluence of the Merced River tributary, while providing water supply certainty to Friant Division water contractors. These additional flows are likely to change the magnitude and timing of recirculation flows necessary to assist in meeting standards.

At the heart of the Settlement is a commitment to provide continuous flows in the SJR to sustain naturally reproducing Chinook salmon and other fish populations in the 153-mile stretch of the SJR between Friant Dam and the Merced River. Accomplishing this goal will require funding and constructing extensive channel and structural improvements in many areas of the river, including some that have been without flows (except for occasional flood releases) for decades.

Restoring continuous flows to the approximately 60 miles of dry river will occur in phases through the San Joaquin River Restoration Program (SJRRP). Planning, design work, and environmental reviews will begin immediately, and interim flows for experimental purposes will start in 2009. The flows will be increased gradually over the next several years, with salmon being re-introduced by December 31, 2012. The Settlement continues in effect until 2026, with the U.S. District Court retaining jurisdiction to resolve disputes and enforce the settlement. After 2026, the court, in conjunction with the SWRCB, will consider any requests by the parties for changes to the restoration flows. Full implementation of the Federal actions in the Settlement requires enactment of authorizing legislation.

Vernalis Adaptive Management Plan

The 1995 Water Quality Control Plan for the Sacramento River and San Joaquin River Basins (Basin Plan) included salinity standards and required spring pulse flows intended primarily to assist out-migrating salmon from all of the tributaries. The affected parties, including State and Federal project operators, fishery agencies, water agency stakeholders, and environmental stakeholders, ultimately negotiated the San Joaquin River Agreement (SJRA), which implemented the VAMP, a 12-year study program involving defined pulse-flow levels, export pumping limits, installation of the Head of Old River Barrier (HORB), and water purchases from the water rights holders on the tributaries.

DMC recirculation could be used to replace or supplement releases from eastside tributaries to achieve the pulse flow requirements. In addition, the proportion of eastside versus DMC water in the SJR may affect the straying potential of salmon returning to the river.

The VAMP, officially initiated in 2000 as part of D-1641, is a water supply program designed to protect juvenile Chinook salmon migrating from the SJR through the Delta. VAMP is also a scientific experiment to determine how salmon survival rates change in response to alterations in SJR flows and SWP/CVP exports with the installation of the HORB. VAMP provides for a 31-day pulse flow (target flow) in the SJR at the Vernalis gage, along with a corresponding reduction in SWP/CVP exports. Specific details regarding VAMP water sources and flows are provided in the SJRA section of Chapter 3.

San Joaquin River Water Quality Management Group

The San Joaquin River Water Quality Management Group (SJRWQMG) is an informal group of stakeholders[1] coming together to develop cooperative solutions to achieve the WQOs targeted by Total Maximum Daily Load (TMDL). In 2005, the SJRWQMG published its *Summary Recommendations of the San Joaquin River Water Quality Management Group for Meeting the Water Quality Objectives for Salinity Measured at Vernalis and Dissolved Oxygen in the Stockton Deep Water Ship Channel* (SJRWQMG 2005).

In its recommendations, it states that "due to the highly modified nature of the SJR, complete solutions to both salinity/boron and dissolved oxygen problems are not readily available by approaching the problem through a load reduction strategy alone." Therefore, the primary objective of the group is to: "Prepare and implement a plan to meet the WQOs for salt and boron at Vernalis and dissolved oxygen at the Port of Stockton Deep Water Ship Channel (DWSC) in coordination with CALFED Stage I objectives."

The SJRWQMG's recommendations to achieve the salinity objectives at Vernalis and to improve the ability to meet dissolved oxygen levels in the DWSC are outlined in the below.

Salinity

- Fully implement the West Side Regional Drainage Plan.
- Further evaluate and pursue managed wetland drainage management actions to mitigate impacts of February through April drainage releases.
- Develop a real-time water quality management coordination group involving lower SJR operators, lower SJR dischargers, and DWR to coordinate reservoir release and SWP/CVP operators (HORB and New

[1] Participants in the SJRWQMG include Reclamation, DWR, Central California ID, Friant Water Users Authority, Grassland Water District, James ID, Merced ID, Modesto ID, Oakdale ID, San Luis Canal Company, Exchange Contractors, San Joaquin County and Delta Water Quality Coalition, San Joaquin County Resource Conservation District, Exchange Contractors, San Joaquin Valley Drainage Authority, SJRGA, the Authority, South San Joaquin ID, South Delta Water Agency, State Water Contractors, Stockton East Water District, Tranquility ID, Turlock ID, Venice Island RD 2023, California Farm Bureau, and Western Growers.

Melones operations) to realize opportunities to improve water quality and increase the utility of stored water releases.

Dissolved Oxygen

- Pursue additional use of the HORB to augment flows in the lower SJR and the DWSC, consistent with the need to maintain adequate in-Delta water quality, water level, and fishery protection.
- Support continued implementation of the City of Stockton's ammonia removal project at the Stockton Waste Water Treatment Plant.
- Install the demonstration aeration project in the DWSC and continue the newly implemented upstream monitoring efforts to understand dissolved oxygen load-producing discharges.
- Evaluate additional actions necessary for dissolved oxygen compliance at the DWSC following implementation and analysis of all of these actions.
- Establish a forum to evaluate ongoing changes in the water quality baseline and suggest further management actions to continue progress on water quality improvement.

The San Joaquin River Water Quality Action Implementation Group[2] is a subset of the agencies that make up the SJRWQMG; it includes additional regulatory agencies. The agencies coordinate individual actions of participating agencies that will collectively improve water quality on the lower SJR. These actions include, but are not limited to, the aforementioned SJRWQMG. The agencies also work to identify and assist in implementing actions that will achieve long-term water quality improvement and monitor baseline changes affecting water-quality improvement.

One of the actions overseen by the implementation group is the SJR Real-Time Water Quality Management Program. The program uses telemetered stream stage and salinity data and computer models to simulate and forecast water quality conditions along the Lower SJR. Its primary goal is to increase the frequency of meeting SJR WQOs for salinity, thereby reducing the number and/or magnitude of high quality releases made specifically to meet SJR salinity objectives.

The SJR Real-Time Water Quality Management Program will also aid in determining the assimilative capacity of the SJR by using real-time load allocations. The assimilative capacity is the mass load of a pollutant that can be

[2] The participating agencies include Central Valley RWQCB, DFG, California Department of Food and Agriculture, California Bay-Delta Authority, DWR, EPA, NMFS, State Water Contractors, SWRCB, Exchange Contractors, the Authority, Stockton East, SJRGA, City of Stockton, City and Port of Stockton, Reclamation, and the Service.

safely discharged to a receiving water body without exceeding the WQO or standard for that pollutant (Quinn 2005).

The U.S. Environmental Protection Agency (EPA) approved the TMDL for salt and boron on February 8, 2007. The Basin Plan Amendments (CVRWQCB 2004) describes the real-time load allocations. Typically, fixed TMDL loads are established to meet WQOs during low-flow conditions. Historically, more salt has been added to the Central Valley Basin than has been exported. To maintain a salt balance by exporting the maximum amount of salt while still meeting WQOs, the approved TMDL provides for additional real-time load allocations in lieu of base load allocations.

"Real-time load allocations are based on real-time flow and water quality conditions and on a weekly or monthly forecast of assimilative capacity. Since real-time flow and water quality conditions are not known ahead of time, the real-time allocations must be formulaic. A coordinated effort is therefore needed to forecast assimilative capacity and allocate the available loading capacity (real-time loading allocation) to dischargers. Monitoring and modeling is needed to predict short-term assimilative capacity and to meter out discharges to the lower SJR in a manner that will not cause water quality exceedances" (CVRWQCB 2004).

West Side Regional Drainage Plan

The West Side Regional Drainage Plan, an integrated plan adopted by the Authority, is designed to eliminate irrigated agricultural drainage water from, and enhance water supply reliability for, about 100,000 acres in the Grasslands drainage area. The program began as a successful effort to reduce selenium discharges to the SJR. It is now being proposed for expansion to go beyond regulatory requirements and eliminate selenium and salt discharges to the SJR while maintaining the productivity of production agriculture in the region and enhancing water supplies to lands remaining in production. To the extent this program is successful, it will reduce salinity and may reduce the amount of water released from storage or recirculation that is necessary to maintain salinity standards. It also may result in reduced total flows in the SJR (Exchange Contractors et al. 2003).

This plan includes water demand reduction, groundwater pumping and management, and water transfer elements to provide for drainage source control and improve water supply reliability for the partners executing this plan (Exchange Contractors et al. 2003).

DWR and SWRCB have provided funding for the Westside Regional Drainage Plan under the Integrated Regional Water Management Grants Program (DWR, undated), funded by Proposition 50, Chapter 8.

San Joaquin River Improvement Project

Panoche Drainage District obtained funding in 1998, based on Proposition 13, to apply drainage water to pasture and alfalfa fields as part of the Grassland Area Farmers' efforts to meet selenium load targets. Phase 1 of the San Joaquin River Improvement Project (SJRIP) included purchasing about 4,000 acres of farmland and using drainwater to irrigate the salt-tolerant crops grown on this land. Additional funds have been obtained to continue the SJRIP, including Proposition 13 funds to implement the Grassland Integrated Drainage Management Project to install subsurface drains and plant salt tolerant crops, and funding from Reclamation and water districts to install drainage systems, construct an irrigation system, and plant halophytes (Summers Engineering, Inc. 2004). Additional expansion and development of the SJRIP is planned to take place through 2009.

SWRCB and Regional Water Quality Control Boards

The SWRCB was created by the Legislature in 1967. The SWRCB's mission is to "preserve, enhance, and restore the quality of California's water resources and ensure their proper allocation and efficient use for the benefit of present and future generations." The joint authority for water allocation and water quality protection enables the SWRCB to provide comprehensive protection for California's waters.

The following are requirements of the SWRCB that may affect or be affected by the DMC Recirculation Project.

TMDL Program

Clean Water Act Section 303(d) requires each state to identify waters that will not achieve water quality standards after application of effluent limits. For each water and pollutant, the State is required to propose a priority for development of a load-based (as opposed to concentration-based) limit for nonpoint source discharges, the TMDL. The TMDL determines how much of a given pollutant can be discharged from a particular nonpoint source without causing water quality standards to be violated. Table 2-1 shows a complete listing of the constituents for TMDL implementation and their priority on the SJR and the Delta.

High-priority constituents for TMDL implementation in the SJR include boron, chlorpyrifos, diazinon, electrical conductivity (EC), and selenium. EC (a measure of salt concentrations) in the SJR is a concern for many water users. The Central Valley Regional Water Quality Control Board (CVRWQCB) recently adopted TMDLs for salt and boron for the Lower SJR designed to reduce the loading of salt to the river (and subsequently reduce the concentrations in the river), and a TMDL for dissolved oxygen depletion in the Stockton DWSC on the SJR. A TMDL for the SJR is already in place for

selenium. The final TMDL for diazinon and chlorpyrifos in the Lower SJR was adopted by the CVRWRCB and approved by SWRCB and EPA.

Table 2-1. TMDL Priority List for Potentially affected Waters

Receiving	SJR	Delta
Boron	H	–
Chlordane	–	L
Chlorpyrifos	H	–
Copper	–	M
DDT	L	L
Diazinon	H	M
Dieldrin	–	L
Dioxin compounds	–	M
Dissolved oxygen	H	–
Electrical conductivity	H	H
Exotic species	–	H
Furan compounds	–	H
Group A Pesticides	L	–
Mercury	L	H
Nickel	–	L
PCBs	–	M
PCBs (dioxin-like)	–	H
Pesticides	–	–
Selenium	H	L
Unknown toxicity	–	M

Key:
Delta = Sacramento-San Joaquin River Delta
DDT = dichlorodiphenyltrichloroethane
H = high-priority constituent
L = low-priority constituent
M = medium-priority constituent
PCBs = polychlorinated biphenyls
SJR = San Joaquin River
TMDL = total maximum daily load

Salinity Management Policy

Delta water quality standards for operation of CVP and SWP facilities were established by the SWRCB in the 1995 Basin Plan and D-1641. WQOs in the 1995 Basin Plan include objectives established to protect M&I, agricultural, and fish and wildlife beneficial uses. The 1995 Basin Plan for the Southern Delta (SJR at Airport Way Bridge, Vernalis) expressed the salinity objective as a maximum 30-day running average of mean daily EC for the protection of agricultural beneficial uses. Additional salinity objectives are established for fish and wildlife beneficial uses in the SJR within the Delta.

The salinity and boron TMDL (for SJR at Vernalis) Basin Plan Amendment (CVRWQCB 2004) was adopted by the CVRWQCB in 2004. Under the implementation program, allowable discharges are to be based on the assimilative capacity (or flow rate). In addition to managing discharges of

salinity and boron, the TMDL allows dischargers to increase the assimilative capacity by providing clean freshwater flows. Modeling conducted as part of previous investigations by Reclamation indicated that under some recirculation alternatives, such as the VAMP flow compliance, salinity might increase in some locations (such as Vernalis) and decrease in other locations (such as below the Newman Wasteway) as a result of the substitution of Merced River releases for DMC releases (Reclamation 2003).

In January 2007, the SWRCB initiated a series of workshops to consider the southern Delta salinity objectives for agriculture that are contained in the 1995 Basin Plan, the current Basin Plan for the San Francisco Bay/Delta Estuary. As a result of these workshops, the SWRCB will, if there is adequate justification, develop and manage a thorough study or studies of the sources, concentrations, loads, and effects of salinity and methods for its control in the southern Delta. The SWRCB presented a strawman proposal that outlined a process for gathering additional data and reviewing the salinity objectives over the next year. Any changes to the water quality standards in the South Delta will impact the need for, or implementation of, the DMC Recirculation Project.

Revisions to Applicable Water Quality Control Plans

The applicable Basin Plans for the DMC recirculation project area are the *Water Quality Control Plan for Sacramento and San Joaquin River Basins,* which was prepared by the CVRWQCB (2005a), and the *Water Quality Control Plan for San Francisco Bay/Sacramento-San Joaquin Delta Estuary,* which was prepared by the SWRCB (1995).

The most-recent Basin Plan revisions were completed in September 2004 and August 2006. The amendments most relevant to DMC recirculation include the following:

- *An Adoption of WQOs and an Implementation Plan for the Regulation of Agricultural Subsurface Drainage in the Grassland Area* (CVRWQCB 2007; in effect 1/10/97, but not yet approved by SWRCB)

- *Amending for the Control of Salt and Boron Discharges into the Lower San Joaquin River* (CVRWQCB 2004; in effect 7/28/06 and approved by the EPA on 2/8/07)

- *Amending for Factors Contributing to the Dissolved Oxygen Impairment in the Stockton Deep Water Ship Channel* (CVRWQCB 2005a; in effect 8/23/06)

The Lower SJR has been divided into seven major geographic subareas. In some cases the subarea has been divided further into minor subareas to provide a greater level of detail. The CVRWQCB will use these areas to apportion salt and boron TMDL load allocations to each of the subareas. The amended Basin

Plan is very specific in outlining priorities for implementing load allocations, time schedules for implementation, and the calculation of real-time salt load allocations. A supply water credit is provided to irrigators in the Grassland and Northwest Side subareas that receive water from the DMC (CVRWQCB 2006).

The Regional Water Quality Control Boards (RWQCBs) have the primary responsibility for formulating and adopting Basin Plan s for their respective regions (Water Code §13240), but the SWRCB also is authorized (Water Code §13170) to adopt Basin Plans. When the SWRCB adopts a Basin Plan, it supersedes regional Basin Plans for the same waters to the extent of any conflict; however, historically, the SWRCB's Bay-Delta plans established or amended primarily those objectives for which implementation includes the regulation of water diversion and use[3] (i.e., situations in which water supply activities affect water quality).

The May 1995 Water Quality Control Plan San Francisco Bay/Sacramento-San Joaquin Delta Estuary (Bay/Delta Plan) can be viewed on the SWRCB Web site at www.swrcb.ca.gov/plnspols/index.html.

The SWRCB issued the *Revised Draft Water Quality Control Plan for the San Francisco Bay/Sacramento-San Joaquin Delta Estuary* on November 29, 2006 (SWRCB 2006). The revised Bay/Delta Plan can be viewed at www.waterrights.ca.gov/baydelta/2006controlplan.html.

The SWRCB adopted the amended Bay/Delta Plan on December 13, 2006. The regulatory portions of the amended Bay/Delta Plan will be submitted to the Office of Administrative Law and to EPA for approval. The November 29, 2006 revisions state:

> *"At the time of this 2006 update to the Plan there are a number of emerging issues that this Plan either does not currently regulate or may not fully regulate because circumstances and scientific knowledge are changing: the State Water Board will immediately begin a process to evaluate and prioritize water quality control planning activities to address the following emerging issues:*
>
> 1. *Pelagic Organism Decline*
> 2. *Climate Change*
> 3. *Delta and Central Valley Salinity*
> 4. *San Joaquin River Flows"*

The SWRCB notes in the 2006 Revised Bay/Delta Plan that information suggests that climate change could have an effect on water supply and water quality. The SWRCB plans to be responsive to water agencies submitting plans and applications for water projects, such as the SDIP, or potential future conveyance structures, such as a Delta peripheral canal.

[3] Some of the Bay-Delta objectives require water quality regulation as well as water supply regulation (SWRCB, 1995).

Both the Basin Plan and the Bay/Delta Plan will be updated in the future to reflect changes in salinity management in the Central Valley. The CVRWQCB and the SWRCB joined together in January 2006 with several other regulatory agencies to form the Central Valley Salinity Policy Group. Presentations given by the CVRWQCB and the SWRCB on November 30, 2006, described the current salinity "crisis" in the Central Valley. The Environmental Program Manager of the SWRCB stated that if the salinity issue is not managed, we could expect to lose beneficial use of waters, which will result in lost economies.

The Central Valley Salinity Policy Group laid out a draft schedule for a Salinity Management Plan that will include public participation in technical workshops through 2007. The group will perform a technical assessment of data and modeling efforts, identify data gaps, and conduct comprehensive technical modeling for the next three years. The group expects that after evaluating cost and effectiveness and selecting alternatives, it will be able to prepare draft Basin Plan amendments by the year 2013. Presentation documents and meeting notices for the Group are posted at

www.swrcb.ca.gov/rwqcb5/cv-salts/index.html#new.

The revised Bay/Delta Plan references the Salinity Management Plan, noting that it will take 40 to 50 years to develop and fully implement the plan. The SWRCB will continue to coordinate updates of the Bay/Delta Plan with ongoing development of the Salinity Management Plan.

The 2006 Revised Bay/Delta Plan notes that, "The San Joaquin River flow objectives are not changed in the 2006 Revised Bay/Delta Plan due to lack of scientific information on which to base any changes."[4] The SWRCB may revise the Program of Implementation based on a workshop that will take place in the summer of 2007. The focus of the workshop will be the DFG SJR salmon escapement model and peer review of the model.

Port of Stockton Deep Water Ship Channel Dissolved Oxygen TMDL

The SJR experiences regular periods of low dissolved oxygen concentrations in the DWSC from the City of Stockton downstream to Disappointment Slough. These conditions occur most often during the months of June through October, though severe conditions have occurred in the winter months, as well. Data also show that the frequency and severity of low dissolved oxygen concentrations are generally worse during drier water years. These conditions often violate the Basin Plan WQO for dissolved oxygen in the DWSC between the City of Stockton and Turner Cut. Constituents of concern for dissolved oxygen include nutrients and organic content.

[4] The Program of Implementation for the Pulse Flow Objectives is amended in the 2006 Plan to allow for staged implementation of the objectives by conducting the VAMP until 2011. These changes are consistent with the current implementation of the objectives since 2000 pursuant to D-1641.

In 2005, the CVRWQCB passed Resolution No. R5-2005-0005, *Amending the Water Quality Control Plan for the Sacramento River and San Joaquin River Basins for the Central Valley Program for Factors Contributing to the Dissolved Oxygen Impairment in the Stockton Deep Water Ship Channel* (CVRWQCB 2005a).

A TMDL for the control of dissolved oxygen was adopted in 2006; it identifies three main factors that contribute to the low dissolved oxygen problem:

- Loads of oxygen-demanding substances from upstream sources
- Geometry of the DWSC that increases oxygen depletion
- Reduced flow through the DWSC

The TMDL allocates responsibility for excess net oxygen demand as follows:

- 30 percent as a waste load allocation for the City of Stockton Regional Wastewater Control Facility
- 60 percent as a load allocation for nonpoint sources of algae and/or precursors in the watershed
- 10 percent as a reserve for unknown sources and impacts, and known or new sources that have no reasonable potential to impact

The source area for loads of oxygen-demanding substances and their precursors being addressed by this TMDL includes the SJR watershed that drains downstream from Friant Dam and upstream from the confluence of the SJR and Disappointment Slough. The exception is the western slope of the Sierra Nevada foothills, above the major reservoirs of New Melones Reservoir on the Stanislaus, Don Pedro Reservoir on the Tuolumne, Lake McClure on the Merced, New Hogan Reservoir on the Calaveras, Comanche Reservoir on the Mokelumne, and those portions of the SJR watershed that fall within Mariposa, Tuolumne, Calaveras, and Amador Counties.

The TMDL requires that entities responsible for point and nonpoint sources of oxygen-demanding substances and their precursors within the TMDL source area perform studies by December 2008 to identify and quantify the following:

- Sources of oxygen-demanding substances and their precursors in the dissolved oxygen TMDL source area
- Growth or degradation mechanisms of these oxygen-demanding substances in transit through the source area to the DWSC
- The impact of these oxygen-demanding substances on dissolved oxygen concentrations in the DWSC under a range of environmental

conditions and considering the effects of chemical, biological, and physical mechanisms that add or remove dissolved oxygen from the water column in the DWSC

This study is currently being completed through a grant obtained from CALFED by the San Joaquin Valley Drainage Authority.

Proposition 13 includes $40 million in bond funds to address dissolved oxygen impairment in the DWSC. Approximately $14.4 million of this $40 million has been identified to fund the oxygen-demanding substance and precursor studies. An additional $1.2 million is being provided from various watershed stakeholders. Approximately $24 million of Proposition 13 funds are available to pay for projects such as the design and construction of an aeration device.

The State Water Contractors, Port of Stockton, the Authority, San Joaquin Valley Drainage Authority, and SJRGA have proposed to develop an operating entity for an aeration device and have indicated their commitment to execute a funding agreement among themselves and other interested parties (subject to ultimate approval of the respective governing boards) that would provide the mechanism to support the operation of a permanent aerator (CVRWQCB 2005a).

DWR Bay-Delta Office South Delta Branch is conducting the DWSC Demonstration Dissolved Oxygen Project. This project is a multiple-year study of the effectiveness of elevating dissolved oxygen concentrations in the channel; dissolved oxygen concentrations in the channel drop as low as 2 to 3 milligrams per liter (mg/L) during warmer and lower water flow periods in the SJR. The low dissolved oxygen levels can adversely affect aquatic life including the health and migration of anadromous fish (e.g., salmon).

The objective of the study is to maintain dissolved oxygen levels above the minimum recommended levels specified in the Basin Plan. The Basin Plan WQOs for dissolved oxygen are 6.0 mg/L in the SJR (between Turner Cut and Stockton, September 1 through November 30) and 5.0 mg/L the remainder of the year.

Agricultural Discharge Control Programs

Discharges from nonpoint sources in California such as irrigated agriculture are becoming subject to increased regulatory oversight. In July 2003, the CVRWQCB adopted a Conditional Waiver of Waste Discharge Requirements for Discharges from Irrigated Lands (Ag Waiver - Resolution No. 2003-0105 passed by the CVRWQCB). The Ag Waiver requires discharges (including growers and IDs) to develop water quality monitoring programs to achieve the following objectives:

- Assess the impacts of waste discharges from agricultural and irrigation facilities to surface water.

- Determine the degree of implementation of management practices to reduce discharges of specific wastes that impact water quality.
- Determine the effectiveness of management practices and strategies to reduce discharges of wastes that impact water quality.
- Determine concentration and load of waste discharges to surface waters.
- Evaluate compliance with existing narrative and numeric WQOs to determine if additional implementation of management practices is necessary to improve and/or protect water quality.

These programs are being implemented through coalitions of growers for specific geographic areas and by individual discharger groups (primarily IDs).

California Department of Water Resources

Since the Delta is the center of many statewide water-related issues, DWR is highly involved in Delta planning, in the Delta Vision, and Delta Risk Management Strategy (DRMS) (DWR, undated).

Delta Vision

Delta Vision broadens the focus of work formerly done through CALFED to address issues impacting natural resources, infrastructure, land use, and governance in the Delta. The intent of Delta Vision is to develop a strategy for a sustainable Delta ecosystem in support of the environmental and economics functions of the Delta. The Delta Vision Blue Ribbon Task Force, appointed by the Governor, will make recommendations for a sustainable Delta. The task force will provide recommendations by January 1, 2008, and will evaluate existing and proposed land and water uses, ecosystem functions, and management practices in the Delta and develop a strategic plan for the Delta.

The task force is required to make recommendations on: sustainable ecosystem functions, including aquatic and terrestrial flora and fauna; sustainable land use and land-use patterns; sustainable transportation uses, including streets, roads and highways and waterborne transportation; sustainable utility uses, including aqueducts, pipelines, and power transmission corridors; sustainable water supply uses; sustainable recreation uses, including current and future recreational and tourism uses; sustainable flood management strategies; and other aspects of sustainability deemed desirable by the committee (Office of the Governor 2006).

Delta Risk Management Strategy

DRMS was included in the Preferred Program Alternative of the CALFED ROD to investigate the sustainability of the Delta. DRMS will assess major

risks to Delta resources from floods, seepage, subsidence, and earthquakes. Levees protect 700,000 acres in the Delta, and in the past 100 years, there have been 162 levee failures. At risk within the Delta is drinking water for almost 70 percent of Californians, critical environmental and agricultural resources, homes and businesses, and infrastructure, including highways, rail lines, natural gas fields, and gas and fuel pipelines.

The DRMS will evaluate the consequences and develop recommendations for managing the risk in the Delta. In addition, Assembly Bill 1200 requires that DWR evaluate the potential impacts on water supply from the Delta resulting from subsidence, earthquakes, floods, climate change, and sea level rise, or a combination of these. The DRMS will provide much of this information (DWR, the Corps, and DFG, undated).

Proposition 84 – Water Quality, Safety and Supply, Flood Control, Natural Resource Protection, Park Improvements, Bonds, Initiative Statute

Proposition 84, passed by the voters of California on November 7, 2006, funds projects relating to safe drinking water, water quality and supply, flood control, waterway and natural resource protection, water pollution and contamination control, State and local park improvements, public access to natural resources, and water conservation efforts. This proposition provides funding for emergency drinking water, and exempts such expenditures from public contract and procurement requirements to ensure immediate action for public safety. It authorizes $5,388,000,000 in general obligation bonds to fund projects and expenditures, to be repaid from the State's General Fund.

Chapter 2, Section 75029 of the legislation states that the sum of $130 million shall be available to the DWR for grants to implement Delta water quality improvement projects that protect drinking water supplies. Eligible projects are (a) projects that reduce or eliminate discharges of salt, dissolved organic carbon, pesticides, pathogens and other pollutants to the SJR; (b) projects that reduce or eliminate discharges of bromide, dissolved organic carbon, salt, pesticides, and pathogens from discharges to the Sacramento River; (c) projects at Franks Tract and other locations in the Delta that will reduce salinity or other pollutants at agricultural and drinking water intakes; and (d) projects identified in the June 2005 Delta Region Drinking Water Quality Management Plan, with a priority for design and construction of the relocation of drinking water intake facilities for in-Delta water users.

Section 75029(a) specifically indicates: "Projects that reduce or eliminate discharges of salt, dissolved organic carbon, pesticides, pathogens and other pollutants to the San Joaquin River. Not less than forty million ($40,000,000) shall be available to implement projects to reduce or eliminate discharges of subsurface agricultural drain water from the west side of the San Joaquin Valley for the purpose of improving water quality in the San Joaquin River and the Delta." This funding may result in additional implementation of Westside

Drainage Management projects to reduce salinity in the SJR and assist in meeting Vernalis WQOs.

Chapter 3
Without-Project Conditions

This chapter describes the basis for the existing conditions and future without-project conditions to be used in the formulation and evaluation of the alternatives.

Existing Conditions

Existing conditions are the conditions that exist at the time the Study is initiated. For the CEQA environmental analysis, initial conditions are those that exist at the time of the filing of the NOP.

Physical Environment

The Study is focused primarily on the SJR's lower reaches located between the confluences of the Merced River with the SJR downstream and where the SJR flows into the Delta. Figure 1-1 shows the location of the major facilities discussed in this section of the IAIR. The intent of DMC Recirculation is to improve water quality in this reach of the river by releasing water pumped from the Delta into the SJR upstream of Vernalis. Physical facilities would be required to move water from the Delta to the SJR. Facilities necessary for recirculation, described below, include a Delta pumping facility, conveyance facility, release facility, and an optional storage facility.

San Joaquin River and Tributaries

The following sections provide a detailed description of the SJR and its major tributaries. The authorizing language for the Study (see Purpose of Study in Chapter 1) implies the potential to withdraw additional water from the Delta for recirculation. This action has the potential to influence operations on the Sacramento River and upstream portions of the CVP and SWP. A more general description of these areas is provided following discussion of the SJR, Delta, CVP/SWP export facilities, and the SLR.

San Joaquin River below Friant Dam Flows in the SJR below Friant Dam are controlled by the operations at Friant Dam. Millerton Lake was formed by the completion of Friant Dam on the Upper SJR in 1949. Millerton Lake has a gross pool capacity of 521,000 AF. The dam and reservoir provide flood control, conservation storage, diversions to the Madera and Friant-Kern Canals, and recreational uses. The dam and reservoir are located 25 miles northeast of Fresno, California. Releases from Friant Dam to the SJR are currently made to meet downstream water rights and for flood control purposes. Minimum required releases below Friant Dam for riparian and contractor uses are assumed

to be a constant annual requirement, consistent with recent records of operations. Table 3-1 provides the monthly and annual minimum required release below Friant Dam.

Table 3-1. Minimum Required Release from Friant Dam to SJR (1,000 acre-feet)

Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Total
10.1	7.4	6.7	4.5	5.0	6.6	9.0	10.9	12.9	14.4	15.7	13.4	116.7

The minimum required release volumes maintain flow in the SJR from Friant Dam to Gravelly Ford. Gravelly Ford, located downstream of Friant Dam, is a sandy and gravelly section of the SJR that is subject to high losses of river flow. The section of the SJR between Gravelly Ford and Mendota Pool, a reach of approximately 17 miles, is generally dry except when releases are made from Friant Dam for flood control. Release patterns are expected to change as a result of a recent litigation settlement regarding operations of Friant Dam. The timing of such changes will depend on the completion of environmental and engineering studies that are expected to be initiated in 2007.

Flood control operations for Millerton Lake and the SJR below the dam are based on the rain-flood space reservation requirements specified by the U.S. Army Corps of Engineers (Corps). The flood control operation during the snowmelt runoff period recognizes the competing objectives of water supply and flood control. The operation attempts to maximize water supply carry-over storage (into summer) while reducing the potential for downstream flooding. Flood control releases from Friant Dam can be significant volumes of water, but typically occur outside of the months of concern for water quality in SJR's lower reaches.

Mendota Pool (River Mile 204) Mendota Pool is an institutional and physical hub of CVP operations. Prior to the CVP, long established diversions (substantively the Exchange Contractors) occurred at Mendota Pool and along the SJR from water originating from the upper SJR and occasional overflow from the Tulare Lake Basin. As a condition of the diversion of SJR flow by the Friant Division, Reclamation provided a substitute supply for these diverters from the CVP via the DMC. Currently, except during flood, the SJR above Mendota Pool is dry beginning at Gravelly Ford.

During flood control operations, water that passes Gravelly Ford and exceeds demands at Mendota Pool (not being met from Fresno Slough flow) is diverted from the SJR to Chowchilla Bypass. When flow in Chowchilla Bypass reaches its capacity of 6,500 cubic feet per second (cfs), remaining water in the SJR flows into Mendota Pool. Chowchilla Bypass runs northwest, intercepts flows in the Fresno River, and discharges to the Chowchilla River.

East Side Bypass begins at the Chowchilla River and runs northwesterly to rejoin the SJR above Fremont Ford. Together, Chowchilla and East Side bypasses intercept flows of the San Joaquin, Fresno, and Chowchilla Rivers, and other lesser east side SJR tributaries, to provide flood protection for downstream communities and agricultural lands. These bypasses are located in highly permeable soils, and much of the floodwater recharges groundwater.

Flows in the SJR that are not diverted to Chowchilla Bypass enter Mendota Pool. Mendota Pool was formed in 1871 by the construction of Mendota Dam on the SJR by water rights holders, and is the point at which the SJR turns northward. Mendota Pool has a storage capacity of approximately 50,000 AF and serves as a forebay for diversions. The DMC, which conveys CVP water from the Delta to the Exchange Contractors and other entities, terminates at the Mendota Pool. Water also occasionally enters Mendota Pool from the south via Fresno Slough (sometimes referred to as James Bypass), which conveys overflows from the Kings River in the Tulare Lake Basin to the SJR. Reclamation uses a portion of the flow in Fresno Slough to supply water to Mendota Wildlife Management Area.

Mendota Pool to Sack Dam (River Miles 204 to 182) This portion of the SJR is sand-bedded and meandering, and contains perennial flows of up to 600 cfs, due to water deliveries from the DMC, through the SJR channel, and to the Sack Dam diversion into Arroyo Canal. Agriculture is the primary land use in this reach, and the river is confined by local dikes and canals on both banks.

Sack Dam to Sand Slough (River Miles 182 to 168) This reach extends from Sack Dam (River Mile 182) downstream to the Sand Slough Control Structure (River Mile 168). It is sand-bedded and meandering, and is usually dewatered due to the diversion at Sack Dam. It is bounded on the western bank by the Poso and Riverside Canals and on the eastern bank by local dikes. Flows in this reach are usually negligible due to the Sack Dam diversion, but flood control flows are periodically conveyed.

Sand Slough to Merced River Confluence (River Miles 168 to 118) Portions of this section of the river have not had any river flows since the construction of the Sand Slough Control Structure and have a maximum capacity of approximately 150 cfs. Flows in the SJR are diverted at Sand Slough to the Mariposa and Eastside bypasses. Water returns to the main channel from Mariposa and Eastside bypasses on the east and Mud and Salt Sloughs on the west. The river flows through San Luis National Wildlife Refuge in the lower part of this reach where water is diverted and returned for refuge operations. Discharges from the Newman Wasteway are returned to this reach of the SJR.

Mud Slough North (Confluence with San Joaquin River at River Mile 121.1) Mud Slough (north), one of the two major west-side tributaries of the SJR, is currently the major carrier of agricultural drainage to the SJR. Drainage originates from the GDA, travels via San Luis Drain, and is

discharged directly into Mud Slough. Flow in Mud Slough (north) upstream of the discharge point consists of wetland releases from northern and southern Grassland Water District and additionally from Volta Wildlife Management Area, as well as operational spills from the DMC and Central California ID's Main Canal and flood flows from Los Banos Creek (Grassland Bypass Project Oversight Committee 1999). Mud Slough (north) downstream of the discharge point is often dominated by water originating from GDA via the San Luis Drain.

Grassland Drainage Area The GDA is located on SJR's western side roughly between Los Banos to the north and Mendota to the south. The GDA consists of CVP contractors Charleston Drainage District, Pacheco Water District, Panoche Drainage District, a portion of Central California ID known as Camp 13 drainage area, Firebaugh Canal Water District, Broadview Water District (acquired by Westlands Water District following retirement from irrigation), and Widren Water District. The GDA is approximately 97,400 acres. Discharges from the GDA consist of saline subsurface agricultural drainage and storm flows that are conveyed by San Luis Drain into Mud Slough.

Salt Slough (Confluence with San Joaquin River at River Mile 129.7) Salt Slough, the other major west-side tributary of the SJR, is located on the easterly side of Kesterson National Wildlife Refuge. Since 1996, water in this channel comes only from wetland discharges, runoff from non-GDA farmland, and occasional flood flows.

Merced River Confluence to Tuolumne River Confluence (River Miles 118 to 86) In this reach small riparian areas on both the SJR's east and west banks divert water for agriculture. Return flows go back to the SJR between Newman and Maze.

Tuolumne River Confluence to Stanislaus River Confluence (River Miles 86 to 80) In this reach small riparian areas on both the SJR's east and west banks divert water for agriculture. Return flows go back to the SJR between Maze and Vernalis.

Stanislaus River Confluence to Old River (River Miles 80 to 54) In this reach are additional diversions for agricultural riparian areas on both of the SJR's banks. Return flows go back to the river as it flows into the southern Delta.

Delta-Mendota Canal

The DMC extends from Jones Pumping Plant in the Delta 117 miles to Mendota Pool. In the context of this document, the "lower" DMC refers to the section of the canal that extends from O'Neill Forebay to Mendota Pool.

Lower DMC This section of the DMC conveys water for Mendota Pool diversions (described above under the "Mendota Pool" subheading) and for

diversions prior to the Mendota Pool, including the Exchange Contractors, and CVP agricultural and refuge users.

CVP Exchange Contractors The Exchange Contractors are provided a substitute supply of 840,000 AF, and of this amount, 140,000 AF is diverted directly from the DMC prior to reaching Mendota Pool, subject to reduction in Shasta critical years. The majority of the return flows go to the SJR through Mud and Salt Sloughs and all return flows return upstream of Newman.

CVP Agricultural Contractors Total CVP agricultural contracts amount to 124,820 AF in the Lower DMC delivery area. CVP South-of-Delta agricultural allocations can be reduced up to 100 percent under certain hydrologic conditions.

CVP Wildlife Management Areas Wildlife management area contract demands in the Lower DMC service area total 182,698 AF annually. Deliveries are subject to a maximum reduction of 25 percent in Shasta critical years. In all other year-types, wildlife refuges are entitled to their full contract amounts. Most refuge return flows enter the SJR through Mud and Salt Sloughs.

Upper DMC As defined within the context of this document, "Upper" DMC refers to the section of the DMC that extends from Tracy Pumping Plant to O'Neill Forebay. Diversions along the Upper DMC are made to CVP contractors and a water right holder. There are a total of 261,310 AF of agricultural contracts, a 10,000 AF M&I contract for the City of Tracy, and a 6,000 AF water right for Patterson Water District. The CVP contracts are subject to reductions based on CVP allocation procedures. A portion of the return flows from areas receiving water from the Upper DMC reenters the SJR at Newman, the Tuolumne River confluence, and/or Vernalis.

Eastside Tributaries

Tributaries of the SJR add significant volumes of water to the river as it heads north to the Delta. The major tributaries of the Merced, Tuolumne, and Stanislaus Rivers are described in the following section. Additional small tributaries, mostly located upstream of the confluence with the Merced River, include the Fresno and Chowchilla Rivers and numerous smaller creeks. Some small creeks also empty into the SJR from the west side from just upstream of the Merced River confluence to the confluence of the Tuolumne River.

Merced River Agricultural development in the Merced River watershed began in the 1850s, and significant development changes have occurred in the area since that time. The enlarged New Exchequer Dam forming Lake McClure was completed in 1967 and regulates releases to the lower Merced River. New Exchequer Dam is owned and operated by Merced ID for power production, irrigation, and flood control.

Lake McClure is operated to protect the Merced River and adjacent lands from flood damage, generate hydroelectric power, provide water supply for irrigation and downstream uses, and provide instream flow for the Merced River. The maximum storage is 1,024,600 AF, dead storage is 3,000 AF, and the minimum pool from which the district can draw water supply is 115,000 AF.

Tuolumne River Flows in the lower portion of the Tuolumne River are controlled primarily by the operation of New Don Pedro Dam, which was constructed in 1971 jointly by Turlock and Modesto IDs with participation by the City and County of San Francisco. The districts divert water to Modesto Main Canal and Turlock Main Canal a short distance downstream from New Don Pedro Dam at La Grange Dam.

New Don Pedro Reservoir is located due east of Modesto, California, on the Tuolumne River. The reservoir is 26 miles long and stores 2,030,000 AF of water at full capacity. Reservoir purposes include agricultural irrigation, hydroelectric power generation, fish and wildlife enhancement, recreation, and flood control.

Stanislaus River Agricultural water supply development in the Stanislaus River watershed began in the 1850s. Currently, the flow in the lower Stanislaus River is primarily controlled by New Melones Reservoir. Other water storage facilities in the Stanislaus River watershed include the Tri-Dam Project, a hydroelectric generation project that consists of Donnells and Beardsley Dams located upstream of New Melones Reservoir on the middle fork of the Stanislaus River, and Tulloch Dam and power plant approximately 6 miles downstream of New Melones Dam on the main stem of the Stanislaus River. Releases from Donnells and Beardsley Dams affect inflows to New Melones Reservoir. Under contractual agreements between Reclamation and Oakdale and South San Joaquin IDs, Tulloch Reservoir provides afterbay storage to re-regulate power releases from New Melones Power Plant.

The main water diversion point on the Stanislaus is Goodwin Dam, located approximately 1.9 miles downstream of Tulloch Dam. Goodwin Dam, which was constructed by Oakdale and South San Joaquin IDs in 1912, creates a re-regulating reservoir for releases from Tulloch power plant and provides for diversions to canals north and south of the Stanislaus River for delivery to Oakdale and South San Joaquin IDs. Water impounded behind Goodwin Dam may be pumped into the Goodwin Tunnel for deliveries to Central San Joaquin Water Control District and Stockton East Water District.

New Melones Reservoir was completed by the Corps in 1978 and was approved for filling in 1983 with a storage capacity of about 2,400,000 AF. The reservoir is located approximately 60 miles upstream from the confluence of the Stanislaus River and SJR and is operated by Reclamation as part of the CVP. It is operated primarily for purposes of water supply, flood control, power generation, fishery enhancement, water quality improvement, and recreation.

Reclamation operates New Melones Reservoir in accordance with the IPO for deliveries to water rights settlement holders, to CVP contractors, and to meet fish and water quality objectives. Additional details on the operational requirements of the IPO are contained in the following section on regulations and agreements.

Sacramento-San Joaquin River Delta

Major CVP facilities in the Delta include Delta Cross Channel, Contra Costa Canal, Jones Pumping Plant, and the DMC. Delta Cross Channel is a diversion channel between the Sacramento River and Snodgrass Slough near Walnut Grove. Delta Cross Channel is used to draw freshwater supplies from the Sacramento River to the interior of the Delta and the export facilities to improve water quality and lower salinity. Contra Costa Canal delivers water diverted from the lower SJR near Oakley to Contra Costa County and communities in the East Bay.

Delta Pumping Facilities

Water from the Delta would need to be pumped into conveyance facilities to allow release for recirculation at upstream locations on the SJR. Two potential Delta pumping facilities could be used for this purpose.

Jones Pumping Plant Formerly known as Tracy Pumping Plan, Jones Pumping Plant is a Federally owned facility used to move water from the Delta for transfer into the DMC. Reclamation awarded the first contract related to construction of the Jones Pumping Plant and appurtenant facilities on June 23, 1947. Reclamation completed the plant in 1951. It consists of an inlet channel, pumping plant, and discharge pipes (Figure 3-1). Water in the Delta is lifted 197 feet into the DMC. Each of the six pumps at Tracy is powered by a 25,000-horsepower motor and is capable of pumping between 800 and 950 cfs, depending on the combination of units running at the time. Power is supplied by CVP power plants to operate the pumps. The water is pumped through three 15-foot-diameter discharge pipes and carried about one mile up to the DMC. The intake canal includes Tracy Fish Screen, which was built to intercept downstream migrant fish so they may be returned to the main channel to resume their journey to the ocean.

Constructed in the 1950-53 timeframe, the Jones Pumping Plant has a State water rights permit based on a “grandfathered” diversion permit issued by the Corps authorizing a maximum instantaneous pumping rate of 4,600 cfs all months of the year. In contrast, while the design conveyance capacity of the DMC begins at 4,600 cfs at the Jones Pumping Plant discharge, it decreases to 4,200 cfs before reaching the inlet channel to O’Neill Forebay. In addition, three areas along the upper DMC have experienced subsidence such that the long-term average practical capacity is about 4,150 cfs. Operationally, during peak (summer) demand periods, deliveries along the upper DMC typically average about 350-400 cfs such that Jones Pumping Plant can pump at or close to its permitted 4,600 cfs capacity. However, from early September through

early spring upper DMC deliveries are minimal such that Jones Pumping Plant pumping is limited to about 4,150 cfs, the conveyance capacity of the DMC at O'Neill Forebay.

Figure 3-1. Jones Pumping Plant

The DMC transports water from the Jones Pumping Plant 117 miles along the west side of the San Joaquin Valley to Mendota Pool west of Fresno. The DMC also supplies water to O'Neill Forebay where it is pumped into storage in the CVP portion of the SLR. A more detailed description of the DMC is provided in the preceding section.

Banks Pumping Plant The SWP also has significant infrastructure in the Delta including the Banks Pumping Plant and the California Aqueduct. The Banks Pumping Plant is located west of the Jones Pumping Plant on a second canal off of Clifton Court Forebay. Banks Pumping Plant lifts water into the California Aqueduct for delivery to SWP contractors in the Central Valley and Southern California. Water is diverted directly from the California Aqueduct as well as delivered to O'Neill Forebay for storage in the state's portion of the SLR.

The Banks Pumping Plant is located 2.5 miles southwest of Clifton Court Forebay and 11.5 miles northeast of Livermore, California. Banks Pumping Plant is the first pumping plant for the California Aqueduct and the South Bay Aqueduct. Banks Pumping Plant has a much larger capacity than Jones Pumping Plant with a physical capacity of 10,670 cfs at the design head from 11 units. However, the 1981 "Four Pumps Agreement" issued by the Corps constrains the capacity to 6,680 cfs from March 16 through December 14. Outside of this period, pumping is limited to 6,680 cfs plus one-third of the total flow at Vernalis when flow exceeds 1,000 cfs.

Banks Pumping Plant is currently the subject of a legal challenge in its right to operate due to concerns over permitting of fish takes under the California ESA.

Storage Components

Use of existing south of Delta storage facilities is an optional component that may be incorporated into one or more of the alternatives. Significant storage is not needed for real-time operational alternatives. However, use of storage will increase flexibility in the ability to use Delta pumps to obtain recirculation water from the Delta. Construction of new storage facilities is not considered for the DMC Recirculation Project. Existing south of Delta storage facilities that may be used in the project are discussed below.

O'Neill Dam and Forebay These joint Federal/State facilities are located on San Luis Creek, 2.5 miles downstream from B.F. Sisk Dam. O'Neill Dam, completed in 1967, is a zoned earthfill structure with a height of 87 feet and a crest length of 14,300 feet. Containing 2.8 million cubic yards of material, the dam was completed in 1967. The forebay holds 56,400 AF, the top 20,000 AF of which act as re-regulator storage necessary to permit off-peak pumping and on-peak generation by the main San Luis Pumping-Generating Plant.

O'Neill Forebay Inlet Channel extends 2,200 feet from the DMC to deliver water to O'Neill Forebay. Six pumping units of the O'Neill Pumping-Generating Plant lift water 45 to 53 feet into the forebay. The forebay is used as a hydraulic junction point for Federal and State waters. Recreation facilities are included at the forebay for picnicking, camping, swimming, boating, water skiing, and fishing.

B. F. Sisk Dam and San Luis Reservoir These joint Federal/State facilities are located on San Luis Creek near Los Banos, California. Completed in 1967, B F. Sisk Dam is a zoned earthfill structure 382 feet high with a crest length of 18,600 feet; it contains 77,656,000 cubic yards of material.

The SLR has a capacity of 2,041,000 AF and is used to store water pumped from the Delta. Releases are made through the San Luis Pumping-Generating Plant, using its power generating capacity. The lake filled for the first time on May 31, 1969. The reservoir offers facilities for fishing, boating, water skiing, and camping. The SLR serves as the major storage reservoir for the CVP and SWP.

The California Aqueduct (a State feature) flows directly into O'Neill Forebay. The pumping-generating units lift the water from O'Neill Forebay and discharge it into the SLR. When not pumping, these units generate electric power by reversing flow through the turbines. Water for irrigation and urban uses is released into the San Luis Canal and flows by gravity to Dos Amigos Pumping Plant where it is lifted more than 100 feet to permit gravity flow to the terminus of the joint-use facilities at Kettleman City. The State canal system continues to the southern San Joaquin Valley and southern coastal areas. Two detention reservoirs, Los Banos and Little Panoche, control cross drainage along the San Luis Canal. The reservoirs also provide recreation and flood control benefits.

The CVP portion of the SLR is 972,000 AF and the SWP portion is 1,067,000 AF. The SLR is used to store water pumped from the Delta primarily during wet conditions in the winter months for delivery during the late summer and fall months. Water is released from the SLR back into the California Aqueduct and the lower DMC as well as diverted directly from the reservoir on the west side for delivery to Santa Clara County and other areas of the central coast.

Conveyance Pathways

Water could be moved from the DMC to the SJR through the Westley Wasteway, Newman Wasteway, Mendota Pool, or CVP Refuges. Westley Wasteway's outlet would release water back into the SJR just upstream of the confluence of the Tuolumne River. Newman Wasteway would release water into the SJR just upstream of the confluence of the Merced River. Mendota Pool and refuges would release water upstream of Sand and Mud Sloughs.

Newman Wasteway (DMC Milepost 54.38) Newman Wasteway is a CVP facility designed to convey emergency releases from the DMC. Newman Wasteway flows from west to east with its headgate on the DMC, just upstream of Check 10 at Milepost 54.38. Newman Wasteway is 8.2 miles long with the upper 1.5 miles concrete lined and the remainder unlined. The capacity of the wasteway channel is 4,300 cfs, but the existing average flow is only 50 to 75 cfs from agricultural drainage. Occasional pulse flows are sent down the wasteway to clear accumulated sediment away from the headgates. The terminus of the wasteway is at the SJR, 1.24 miles upstream of the Merced River confluence (see Figure 3-2).

Figure 3-2. Newman Wasteway at DMC (a) and at San Joaquin River Terminus (b)

Westley Wasteway (DMC Milepost 34.32) Westley Wasteway is a CVP facility designed to convey emergency releases from the DMC. Westley Wasteway flows from west to east with its headgate on the DMC at Milepost 34.32. Westley Wasteway is 3.8 miles long with the upper 2.3 miles concrete-lined, an unlined section between Milepost 2.30, and another lined section below Milepost 2.98 to Milepost 3.82. Below Milepost 3.82 the channel

is unlined and has been diverted via a bypass structure to supply drainage water to private wetlands located to the southeast of the previous channel (see Figure 3-3).

Figure 3-3. Westley Wasteway at DMC (a) and at Bypass to Private Refuge (b)

The capacity of the wasteway channel is 4,300 cfs, but the existing average flow is only 50 to 75 cfs from agricultural drainage. Occasional pulse flow is sent down the wasteway to clear accumulated sediment away from the headgates. The SJR is not currently directly connected to the wasteway outlet as originally constructed. As shown in Figure 3-4 outflow from the end of the wasteway flows through a recently constructed bypass channel that discharges into a private wetland which then drains to the SJR. Additional analysis will be required to determine the feasibility of using Westley Wasteway to convey DMC water to the SJR.

Mendota Pool Physical description of Mendota Pool is provided under Physical Environment above. Prior to new restoration flows expected to result from the SJRRP, recirculation through Mendota Pool would not be practical due to the dry reaches below Sack Dam.

CVP Wildlife Management Areas (Refuges) Physical descriptions of the CVP Wildlife Management Areas (Refuges) are provided under Physical Environment above. Recirculation through the Refuges would likely have limited if any value due to water quality degradation as water passes through the refuges and mixes with return flows in Mud and Salt Sloughs.

Sacramento River

The Sacramento Valley encompasses approximately six million acres of developed agriculture and urban areas and undeveloped native areas. The Sacramento River system includes the Sacramento River and its major tributaries including the Feather, Yuba, Bear, and American Rivers and their tributaries. The CVP also imports Trinity River water through facilities on the Trinity River and Clear Creek Tunnel. Most major streams and rivers in the

Sacramento Valley are regulated by reservoirs of various sizes to provide flood control, water supply, hydropower, and other benefits.

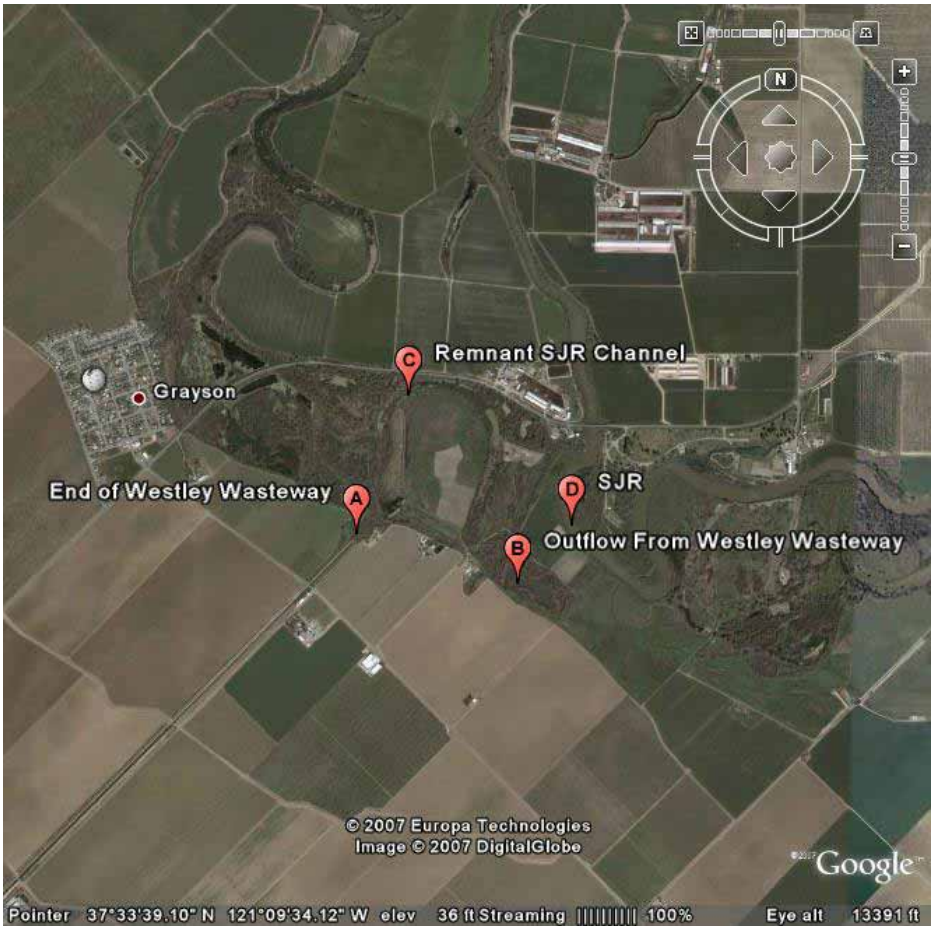

Figure 3-4. Westley Wasteway Outlet Relative to the San Joaquin River

Major reservoirs in the Sacramento Valley include the CVP's Shasta (4,552,000 AF) and Folsom (975,000 AF) Reservoirs, and the SWP's Oroville Reservoir (3,558,000 AF) on the Feather River. For the purpose of evaluating the effects of DMC recirculation the most significant affects will likely be in the CVP reservoirs and system, with smaller affects that may ripple through the remainder of the upstream system due to changes in the Delta.

Water System Operations Regulations and Agreements

The previously described system of natural rivers and human-made storage and conveyance facilities is governed by a myriad of Federal, State, and local regulations and agreements. These regulations and agreements constrain how the system can be operated. Regulations and agreements cover operations for flood control, water supply, water quality, and environmental objectives. The following sections describe the major regulations and agreements that govern

and effect SJR hydrology and operations. A more limited description of Delta and upstream water requirements is included at the end of the section.

San Joaquin River Below Friant Dam

As discussed above, other than flood control releases, the releases from Friant Dam to the SJR is normally limited to that amount necessary to maintain diversions by riparian and contractor users below Friant Dam to a location near Gravelly Ford. Water diverted to the fish hatchery below Friant Dam and returned to the river partially serves that purpose. Review of historical operation records (Reclamation monthly reservoir operation reports) provided guidance in estimating the minimum downstream release in Table 3-1. From an analysis of the historical record (1990–1994) for periods when no flood control releases were made, an annual release of 116,700 AF was estimated to be the current minimum release necessary to meet downstream diversions (including seepage). Pursuant to pending implementation of the SJRRP, releases other than for flood control will be governed by the Settlement.

Merced River

Due to a water rights agreement known as the Cowell Agreement, Merced ID must make available below Crocker-Huffman Diversion Dam an amount of water that can then be diverted from the Merced River at a number of private ditches between Crocker-Huffman Diversion Dam and Shaffer Bridge. Two additional riparian diversions not covered under the Cowell Agreement exist off of the Merced Falls pool. The Merced River also has flow requirements as set forth by the Federal Energy Regulatory Commission (FERC) and the Davis-Grunsky contract between the State of California and Merced ID.

To satisfy the flow requirements and the Cowell Agreement, the district operates to a target flow below Crocker-Huffman Diversion Dam equal to the Cowell Agreement entitlement plus the FERC/Davis-Grunsky flow requirements. The flow below Crocker-Huffman Diversion Dam must equal the greater of the Davis-Grunsky and FERC flows, plus the Cowell Agreement entitlement.

Tuolumne River

Minimum flows for the Tuolumne River are required by the FERC license for the New Don Pedro Project. As listed in Table 3-2, the FERC license identifies 10-year type classifications for the Tuolumne River, of which only seven have distinctly different minimum flow schedules.

Stanislaus River

The Stanislaus River is governed by several different regulations and agreements. New Melones Reservoir is operated in an attempt to balance numerous different objectives including fishery flow requirements, water supply, SJR water quality, and inflow to the Delta. The following paragraphs provide additional detail on the various regulations and agreements.

Table 3-2. Tuolumne River FERC Flow Requirement Classification

Year Type Classification[1]	San Joaquin Basin 60-20-20 Index (1,000 af)
Critical and Below	<1500
Median Critical	1500
Intermediate Critical/Dry	2000
Median Dry	2200
Intermediate Dry/Below Normal	2400
Median Below Normal	2700
Intermediate Below Normal/Above Normal	3100
Median Above Normal	3100
Intermediate Above Normal/Wet	3100
Median Wet/Maximum	3100

Note:
[1] For each year type classification, a basic schedule of flows is identified for the breakpoint for the year type. For example, if the San Joaquin Basin Index is 1,550,000 AF the year is classified as Median Critical and its basic schedule is a volume of 103,000 AF. The FERC license requires an interpolation of schedules within year type classifications.
Key:
af = acre feet FERC = Federal Energy Regulatory Commission

New Melones Interim Plan of Operations The New Melones IPO provides water for four purposes: fishery, water quality, Bay-Delta flow, and water supply. In this discussion, fishery refers to flow requirements of the 1987 Reclamation–DFG Agreement and prescriptive use of CVPIA 3406(b)(2); water quality refers to SWRCB's D-1641 salinity objectives at Vernalis; Bay-Delta flow refers to D-1641 flow requirements at Vernalis (not including pulse flows during the April 15–May 16 period, VAMP); and water supply refers to CVP contractors, Stockton East Water District, and Central San Joaquin Water Control District.

Allocations to various purposes are generally based on the value of the end-of-February New Melones storage, plus the March–September forecast of inflow to the reservoir. Water is provided to Oakdale and South San Joaquin IDs in accordance with their settlement with Reclamation (water year basis). Required releases to the Stanislaus River below Goodwin Dam are based on the following: (1) releases up to the amount of the fishery pattern are debited from the annual fishery allocation; (2) releases up to the amount of the D-1641 Bay-Delta flow requirement, excluding the amount of fishery release, are debited from the annual Bay-Delta flow allocation; and (3) releases up to the amount of the Vernalis water quality requirement, excluding the amount of fishery and Bay-Delta flow allocations, are debited from the annual Vernalis water quality allocation.

Oakdale and South San Joaquin IDs receive a full supply of 600,000 AF unless the water inflow to New Melones is less than 600,000 AF. In these dry conditions the districts' supply is reduced as a function of the actual inflow.

1987 Reclamation–DFG Agreement, and Service Discretionary Use of CVPIA 3406(b)(2) Depending on the fishery allocation (0–467,000 AF/year) under the New Melones IPO, the fishery release volume at Goodwin Dam is managed under the base and pulse flow schedules. Fishery releases are based on the 1987 Reclamation–DFG agreement and the Service discretionary use of the CVPIA 3406(b)(2) account to support release goals established by the Anadromous Fish Restoration Program.

D-1422 Additional releases are made to the Stanislaus River below Goodwin Dam, if necessary, to meet D-1422 dissolved oxygen content objective. D-1422 requires that water be released from New Melones to maintain the dissolved oxygen concentration in the Stanislaus River at a value of at least 7 mg/L as measured near Ripon. Releases from Goodwin Dam to the Stanislaus River (except for flood control) do not exceed 1,500 cfs.

D-1641 – Vernalis Water Quality and Flow The salinity objective near Vernalis was originally defined in D-1422, D-1641 provisions revised this requirement. D-1641 requires salinity near Vernalis to be less than 0.7 EC for April–August and less than 1.0 EC September–March based on a 30-day running average. Releases are made from New Melones, as required, up to the allocation provided by the New Melones IPO, to meet this criterion.
D-1641 also requires the flow at Vernalis to be maintained during the February through June period. The flow requirement is based on the required location of "X2" and the San Joaquin Basin Index according to Table 3-3. VAMP's objectives become the flow objective during the period April 15 through May 16. Releases are made from New Melones, as required, but are limited by the Bay-Delta allocation determined by the New Melones IPO.

Table 3-3. Delta Vernalis Flow Objectives (avg monthly cfs)

San Joaquin Basin Index	X2 Required West of Chipps	X2 Required East of Chipps
Wet	3420	2130
Above Normal	3420	2130
Below Normal	2280	1420
Dry	2280	1420
Critical	1140	710

Key:
cfs = cubic feet per second avg = average

San Joaquin River Agreement

The SJRA provides for the acquisition of water by Interior from certain SJRGA members for use as a pulse flow at Vernalis during April and May, and the acquisition of other water for use during other times of the year. The water is needed to support the VAMP during the pulse flow period and to assist the Interior in meeting the Anadromous Fish Restoration Plan, Bay-Delta flow objectives, and the Service Biological Opinion for Delta Smelt. As part of the VAMP, the CVP and SWP exports during the VAMP test period (April/May) will be managed to specified levels.

Four components of water are provided by certain SJRGA members: Merced, Turlock, Modesto, Oakdale, South San Joaquin IDs, and the Exchange Contractors.

- Up to 110,000 AF per year towards meeting the VAMP flow target. Water provided under this component is divided among the SJRGA members. This water is to only be used during the VAMP 31-day test flow period.

- Additional water from Merced ID (12,500 AF) during October of all years. This flow is provided above the "existing flow" in the Merced River during October.

- Additional water from Oakdale ID (15,000 AF) every year to be available to Reclamation. In addition to this water, any of the (up to) 11,000 AF of Oakdale ID VAMP water not provided towards meeting the VAMP flow target is also available to Reclamation.

- Additional water from willing SJRGA members above the 110,000 AF to achieve full "double-step" flow targets.

The VAMP flow target is determined by a series of procedures and conditions based on the flow at Vernalis, which would occur in the absence of the SJRA ("existing flow"), and the San Joaquin Valley Water Year Hydrologic Classification. The SJRA provides a VAMP flow target that will be incrementally larger than the existing flow at Vernalis consistent with Table 3-4.

The SJRA assigns a numeric adjunct (60-20-20 Indicator) to the San Joaquin Valley Water Year Hydrologic Classification: a wet year is assigned the numeric value of 5, an above normal year is assigned the numeric value of 4, a below normal year is assigned the numeric value of 3, a dry year is assigned the numeric value of 2, and a critical year is assigned the numeric value of 1. In any year when the sum of the current year's 60-20-20 indicator and previous year's 60-20-20 indicator is 7 or greater, the 31-day flow target will be the flow target one level higher than that established by Table 3-4 (e.g., if the existing flow is

3,500 cfs, then the flow target will be 5,700 cfs). This condition is referred to as a "double-step."

Table 3-4. VAMP Flow Targets (cfs)

Existing Flow at Vernalis	VAMP Test Flow Target
0 - 1,999	2,000[1]
2,000 - 3,199	3,200
3,200 - 4,449	4,450
4,450 - 5,699	5,700
5,700 - 7,000	7,000

Note:
[1] For the purpose of determining water to be provided by the SJRGA's members only. The VAMP Test Flow Target is 3,200 cfs.
Key:
cfs = cubic feet per second
VAMP = Vernalis Adaptive Management Plan

The SJRA also provides for relaxation of this obligation during sequential dry-year periods. During years when the sum of the current year's 60-20-20 Indicator and the previous 2 years' 60-20-20 Indicator is 4 or less (a sequence of dry and critical years), the SJRGA members will not be required to provide water above the existing flow.

The agreement assumes that the Stanislaus River is operated in accordance with the New Melones IPO and that releases under the plan are included in the "existing" flow at Vernalis.

The SJRGA has executed a "Division Agreement," which specifies the amount and order of the individual contributions of water by its members. The division of flow to provide up to 110,000 AF of water for VAMP is shown in Table 3-5.

An additional 12,500 AF of water above "existing" flow in the Merced River is provided by Merced ID in October of all years. Also, an additional 15,000 AF of water and up to 11,000 AF of any unused Oakdale ID VAMP water is made available to Reclamation by Oakdale ID. The additional 15,000 AF of water from Oakdale ID is released in October above any flow that is already occurring under the IPO. Oakdale ID VAMP water not used during the VAMP period is released to the Stanislaus River evenly distributed among November and December.

Table 3-5. Division of VAMP Pulse Flow Water (AF)

Entity (in order of providing flow)	First 50,000	Next 23,000	Next 17,000	Next 20,000	Totals
Merced ID	25,000	11,500	8,500	10,000	55,000
Oakdale ID/South San Joaquin ID	10,000	4,600	3,400	4,000	22,000
Exchange Contractors	5,000	2,300	1,700	2,000	11,000
Modesto ID/Turlock ID	10,000	4,600	3,400	4,000	22,000

Key:
AF = acre-feet ID = Irrigation District

Water Operation System Model Existing Conditions Assumptions

The water operations modeling will be done in the current version of the California Simulation Model (CalSim II). CalSim II is a hydrologic planning model of California's waterscape with an emphasis on the CVP and SWP systems. CalSim II was developed jointly by the DWR and Reclamation. CalSim II is a simulation by optimization model that utilizes a linear programming/mixed integer linear programming solver to determine the optimal set of decisions based on a set of weights and constraints.

The current version of CalSim II has been expanded and refined through the Common Assumptions process for the CALFED surface storage investigations. Appendix A includes the common assumptions used as input to CalSim II. The Common Assumptions process has made significant improvements to the CalSim II model to provide a common representation of both the existing and future level conditions for use in all the surface storage investigations.

The Common Assumptions version of CalSim II covers both the Sacramento River and SJR valley floor drainage areas, the upper Trinity River, the San Joaquin Valley, and Southern California agricultural and urban areas served by the CVP and SWP.

CalSim II can be run to one or more different "steps" or levels of regulations (i.e., D-1641, CVPIA (b)(2), etc.). This study will include the operation of the system up to and including CVPIA Section 3406(b)(2).

Model Assumptions Appendix A provides a summary of the assumptions used for the Existing, Future No-Action, and Supplemental Future Conditions for CalSim II. The appendix shows Version 8D of the Common Assumptions model package. Version 8D is an interim update to support the joint agency review process for Common Assumptions. These assumptions have been developed by the Common Assumptions Common Modeling Team and are completely described in the accompanying CalSim II documentation. SJR restoration flows are not currently incorporated in CalSim II, but post processing analysis will evaluate the effects of SJR Restoration flows on lower SJR flows and water quality. When these assumptions are updated they will be incorporated into the CalSim II modeling as appropriate.

Water Quality

Existing water quality in the DMC, SLR, Lower SJR, Delta, and tributaries will be described based on historical monitoring data collected since Water Year 2000. Although extensive previous monitoring data exist, conditions in the SJR and Delta have changed significantly since the implementation of salt and selenium management strategies by the Grassland Area Farmers under the terms of the Use Agreement for the San Luis Drain and Waste Discharge Requirement for the Grassland Area Farmers. As a result, existing conditions in the SJR have improved and data from years prior to 2000 do not correctly reflect the existing conditions.

To allow expansion of existing conditions to different water year types for the purpose of comparison of existing and Future No-Action Conditions with future conditions from project alternatives, EC at compliance stations on the SJR and southern interior Delta for different water year types will be predicted using the 2005 CalSim II Model for the SJR. The modeling output will be compared to recent monitoring data to verify the model accuracy.

Output of the CalSim II model will be used as boundary conditions (input) for the Delta-specific water quality, level, and velocity models, and water fingerprinting models. The primary modeling tool used for the analysis of baseline and project effects in the Delta will be the Delta Simulation Model 2 (DSM2). The Delta is represented by interconnected open-water areas and one-dimensional channel segments. The model can include tidal dynamics as well as exports from each of the different segments. It is the standard modeling tool for regional studies in the Delta. It has a long history of use for study of water management and operations, movement and dispersion of pollutants and salinity, water-surface elevations within the Delta, and effects of changes in hydrologic conditions.

CalSim II model results (monthly or split month) will be used as DSM2 input for flow rates of major flows into the Delta, exports and diversions from the Delta, and water quality (salinity) of SJR inflows. Historical water quality data will be used for other inflows.

DSM2 results will be presented as maps, tables, or time series plots for specific location depicting salinity, channel water direction and velocity, water-surface elevations, and source water fingerprinting (fraction of water from major sources).

Concentrations of other water quality parameters of concern in the SJR (boron, selenium, dissolved organic carbon, bromide) will be estimated from existing data and water fingerprinting results using existing information on water quality concentrations for source waters (e.g., SJR, Sacramento River, SJR Eastside tributaries, SJR Westside tributaries) using a mass balance approach.

Biological Resources

The existing biological resources for the Study area will be determined based primarily on existing historical references and surveys supplemented by limited field confirmation. Recent environmental documents will also be reviewed for new data not yet available in the peer-reviewed literature.

Existing conditions with respect to threatened and endangered species will be based on known occurrence; a review of the California Natural Diversity Data Base; a review of existing environmental documents; and consultation with the NMFS, the Service, DFG, and staff from Reclamation and DWR. Limited field surveys may be used to confirm information from documents or to fill data gaps.

Data representing baseline fisheries information in the project area will be compiled from the Bay-Delta Assessment Team data sources for the suite of species under evaluation: all races of Chinook salmon, Central Valley steelhead, Delta smelt, splittail, green and white sturgeon, striped bass, and American shad. These data sources as well as reports in the peer reviewed and grey literature will be used to determine which of these species and their life stages are present in what locations and time of the year.

This information will be summarized to determine which species and their life stages will be evaluated for the effects of recirculation. Data are also available for salvage records at the Banks and Jones Fish Salvage Facilities at Banks and Jones Pumping Plants, respectively. This information will be useful in evaluating the change to risk of entrainment and salvage at the facilities from hydrodynamic changes in the Delta due to recirculation.

Existing coded-wire-tag recovery data will be compiled from the DFG, Service, and other sources, summarized, and analyzed to establish baseline straying rates. A thorough review of pertinent literature as well as frequent personal communications with agency personnel will be used to agree upon baseline conditions and establish where detailed databases do not exist.
Such sources will be used to determine the fish species present in the project areas as well as the seasonal occurrence, physical habitat requirements, and water quality tolerances of each of these species. A literature review of current scientific understanding of the imprinting mechanisms will also be conducted. The literature review will summarize known information on how imprinting occurs and how fish use this imprinted olfactory image as a tool to retrace their migration pathway.

The approach to develop a fisheries baseline and analysis method includes using a Fishery Technical Work Group comprised of individuals representing the DFG and DWR, the Service' Offices of Anadromous Fishery Restoration Program and Protected Species, and NMFS along with the consultant team.

Socioeconomic Resources

Social and economic resources include population, employment and the economy, local government, and utilities and public services. These existing resources in the Study area will be based upon population and demographic data provided by the U.S. Bureau of Census; economy and industry information from the California Commerce and Economic Development Program; and employment data from the U.S. Bureau of Labor and Statistics. In addition, county profiles and local government services will be developed and summarized based on data obtained from the California Department of Finance and county/city government websites.

Land Use

Existing land use in the SJR watershed and the Study vicinity will be based on land use surveys conducted by DWR as part of the California Water Plan Updates and land use plans for counties and cities within the Study area. The Study area includes all or parts of Contra Costa, Fresno, Kings, Merced, Stanislaus, San Joaquin, and Santa Clara Counties; the metropolitan areas within those counties; the five major IDs served by the SJR tributaries; the Stanislaus River CVP contractor districts; and the 32 member agencies of the Authority.

Land use in the area primarily consists of highly productive agricultural land and urban areas, such as Stockton, Tracy, Modesto, Merced, and Los Banos. According to the 2005 California Water Plan Update, San Joaquin Valley is recognized as one of the most important agricultural regions in California and includes over 2 million acres of irrigated cropland.

Restoration of the SJR and providing essential habitat for fish and wildlife is also important within the Study area. Lands set aside for habitat restoration include the San Joaquin River National Wildlife Refuge, west of Modesto. The San Joaquin River Management Plan identifies other lands set aside for the purpose of restoration and habitat.

Cultural Resources

Where potential exists for ground disturbance or for effects to built environment features 50 years or older, the following process will be conducted to determine existing conditions for compliance with CEQA and NEPA/National Historic Preservation Act:

- **Define Area of Potential Effects (APE) –** APE map(s) (horizontal and vertical disturbance) will be prepared for the affected areas. The APE for architectural and archaeological resources will be congruent.

- **Conduct Records Search –** A Class I records search will be completed at the appropriate records center of the California Historical Resource Information System. The records search will encompass the entire project footprint and a one-half (½) mile buffer, including construction

laydown and staging areas, as well as access roads. The record search will be augmented by a review of historic maps and possible contact with local historical societies.

- **Native American Consultation –** The Native American Heritage Commission will be contacted for review of its Sacred Lands File and a list of individuals and/or groups it believes should be contacted. Letters to contact those interested individuals and/or groups will be sent requesting any specific information or concerns they might have regarding the project area. One follow-up phone call will be made to each recipient.

- **Field Survey: Archaeology –** An intensive pedestrian survey of the project APE will be conducted by a qualified archaeologist. All identified archaeological resources will be subject to field recordation on California Department of Parks and Recreation 523 forms.

- **Field Survey: Architectural History –** Any built environment resource in the project area will be examined and assessed by a qualified architectural historian. It is assumed that no significant built environment resources will be affected by the project undertaking.

Future Without-Project Conditions

This section of the document describes the approach for describing future without project conditions. As required under NEPA, future conditions with the project must be compared to future conditions without the project to assess changes. The planning period for the future condition evaluation may be dependant on the particular resource area. Some resources may have several future condition years (e.g., 2010, 2020, 2030) as required to conduct the analysis, while other resources may only require one future condition year (e.g., 2030).

Physical Environment and Water System Operations

Changes to the physical environment and water system operation assumed for the Future No-Action Condition are described in the table in Appendix A. Several key assumptions relevant to this project are presented in that table. They include the following:

- 2030 level of development for water demand

- Continuation of VAMP

- Implementation of the San Joaquin River Salinity Management Plan

- Changes to CVP-SWP coordinated operations
- Conveyance of Level 2 refuge water supplies at Banks Pumping Plant

Water Quality

Future water quality conditions will tier off the future water supply conditions. Future conditions for the Lower SJR will include phase-in for the selenium TMDL limits and salt limits included in the Use Agreement for the Grasslands Bypass Project, which expires in 2009. The agreement could be extended; however, it is likely load and concentration limits for selenium in Mud Slough would not be feasible to meet without selenium treatment of drainage water and the discharges to Mud Slough will cease. As a result, discharges from the Grassland Bypass Project (which includes significant proportions of salt, selenium, and boron) are assumed to have been removed after 2009.

Biological Resources

Future biological conditions will be evaluated based on trends in land use and water supply in the project area. Based on current growth in the San Joaquin population and continued conversion of open space and farmland for municipal development, the extent and diversity of biological resources outside defined refuges and reserves continues to shrink. Various agencies have projected development rates in San Joaquin Valley and are preparing plans for future growth that can be used to make predictions about future conditions for biological resources. Example organizations include the Great Valley Center, the San Joaquin Multi-Species Habitat Conservation Plan, and the planning departments of San Joaquin, Merced, Fresno, and other affected counties.

Socioeconomic Resources

The socioeconomic resources in the area are expected to change, driven by population increases in the Study area. Population projections conducted by the California Department of Finance will be used to determine expected population increases. Anticipated increases in population growth in San Joaquin and Santa Clara valleys will result in increased demands on water resources systems for additional and reliable water supplies, energy supplies, water-oriented facilities, recreational facilities, and flood damage reduction facilities.

Land Use

Future land uses will largely depend on population increase and the availability and reliability of high quality water supply. According to the California Department of Finance, population growth in the Study area will range between 18 and 32 percent over the next 10 years. Population growth and the resulting urbanization will generate increasing land use challenges. As populations increase, lands currently used for agriculture will likely be converted for urban uses.

Ecosystems restoration programs will also likely seek agricultural lands for conversion to riparian habitat and refuge areas to provide increased habitat for

fish and wildlife along the SJR and its tributaries. In addition, water quality in the region has been greatly impacted by historic land uses in the region, so WQOs and requirements may have a significant impact on how land use practices are altered in the future.

Cultural Resources

Future cultural resources conditions will be the same as the current conditions, based on anticipated compliance with NEPA/CEQA requirements for preservation of resources. If any other projects in the affected area are anticipated to affect existing resources based on existing previously prepared environmental documentation, they will be noted and incorporated into the Future No-Action Condition.

Chapter 4
Problems, Needs, and Opportunities

Significant elements of any water resources investigation are identifying the scope and magnitude of problems to be addressed and discovering opportunities for improvement for all affected resources. The identification of problems, needs, and opportunities provides a foundation for formulating alternative plans to solve the problems and needs and realize opportunities.

This chapter and the previous chapter present the status and relevance of existing resource conditions associated with the DMC Recirculation Project. This section also provides potential references to be consulted throughout the Study to further develop the problems, needs, and opportunities. It should be noted that DMC Recirculation is one tool that may be used to help solve the problems and aid in achieving the objectives described below. Other tools include new and ongoing programs and projects described in Chapter 2.

Flow Objectives

To protect beneficial uses in the lower SJR and south Delta, the SWRCB has established flow requirements for the Delta that the CVP and SWP must meet as a condition of operating the Jones and Banks Pumping Plants, respectively. These flow requirements are established in the 1995 Bay/Delta Plan and D-1641, issued on December 29, 1999, and revised on March 15, 2000. The 1995 Bay/Delta Plan includes a prescribed spring pulse flow at Vernalis (the point at which the SJR enters the Delta) scheduled to coincide with fish migration in the SJR tributaries and the Delta. SJR flow objectives were developed to provide attraction and transport flows and suitable habitat for various life stages of aquatic organisms, including Delta smelt and Chinook salmon.

Flow requirements established for fish and wildlife beneficial uses in the 1995 Basin Plan are provided in Table 4-1.

Reclamation constructed, and has historically operated, New Melones Dam and Reservoir to assist in meeting its obligations related to the flow requirements at Vernalis, as a condition of operating the Jones Pumping Plant. The 1993 listing of the Delta smelt as a threatened species and proposed listing as an endangered species could potentially change the release requirements from New Melones to support Delta Smelt.

Table 4-1. Minimum Monthly Average Flow Requirements for SJR at Airport Way Bridge, Vernalis (Interagency Station C-10)

Water Year Type	Time Period	Flow (cfs)
Wet, Above Normal	February 1 – April 14 and May 16 – June	2,130 or 3,420
Dry, Below Normal		1,420 or 2,280
Critical		710 or 1,140
Wet	April 15 – May 15	7,330 or 8,620
Above Normal		5,730 or 7,020
Below Normal		4,620 or 5,480
Dry		4,020 or 4,880
Critical		3,110 or 3,540
All	October	1,000[1]

Source: SWRCB 1995

Note:

[1] Includes up to an additional 28,000 AF pulse/attraction flow during all water year types. The amount of water is limited to the amount necessary to provide a monthly average flow of 2,000 cfs. The additional 28,000 AF is not required in a critical year following a critical year.

Key:

AF = acre feet cfs = cubic feet per second SJR = San Joaquin River

During the evidentiary and public input portions of the SWRCB process leading to adoption of both the 1995 Bay/Delta Plan and D-1641, interested parties suggested that DMC recirculation was an alternative method for meeting flow obligations that could be more efficient and provide potential water supply benefits to water users on the Stanislaus River. Alternative methods are needed to reliably meet flow objectives at Vernalis and in south Delta Channels.

References to develop flow objectives and establish current flow problems in the SJR and Delta include:

- *Water Quality Control Plan for the San Francisco Bay/Sacramento-San Joaquin Delta Estuary* (SWRCB 1995)
- D-1641 revised (SWRCB 2000)
- VAMP
- *Summary Recommendations of the San Joaquin River Water Quality Management Group for Meeting the Water Quality Objectives for Salinity Measured at Vernalis and Dissolved Oxygen in the Stockton Deep Water Ship Channel* (SJRWQMG 2005)
- Final Programmatic EIS/EIR (CALFED 2000)
- Programmatic ROD (CALFED 2005)

Water Quality Objectives

The Delta provides drinking water to two-thirds of the State's population and water for other beneficial uses, such as other urban uses, agricultural production, and environmental purposes. To protect beneficial uses WQOs have been developed for salinity caused by saltwater intrusion and agricultural drainage and dissolved oxygen. These WQOs set forth in the 1995 Bay/Delta Plan include objectives established to protect M&I, agricultural, and fish and wildlife beneficial uses.

Ideally, these objectives should be met while minimizing impacts to fish and wildlife resources. Alternate methods to meet water quality requirements at Vernalis and in the Interior South Delta Channels are essential, as the SWRCB and the EPA have listed the lower SJR as an impaired water body.

Water quality in the lower SJR and the south Delta has been the subject of several historical, current, and pending regulatory actions and studies. Low flows and discharges from agricultural areas, wildlife refuges, and M&I treatment plants all contribute to water quality problems. Areas of particular concern include the portion of the SJR downstream from its confluence with the Stanislaus River, in the vicinity of Stockton and Vernalis.

The water quality in the south Delta, downstream from Vernalis, also is influenced by diversions of water by the SWP and CVP, diversions by local users, tidal action, return flows and urban runoff wastewater discharges, and channel capacity. The lower SJR has been listed as an impaired water body by the SWRCB and EPA because of its high concentrations of salts, boron, and selenium, as well as unknown toxicity, and low concentrations of dissolved oxygen in the DWSC (EPA 2006a).

Delta water quality standards for operation of CVP and SWP facilities were established by the SWRCB in the 1995 Bay/Delta Plan and D-1641. Salinity objectives published in D-1641 are shown in Table 4-2. The 1995 Basin Plan for the southern Delta (SJR at Airport Way Bridge, Vernalis) expressed the salinity objective as a maximum 30-day running average of mean daily EC for the protection of agricultural beneficial uses. Additional salinity objectives are established for fish and wildlife beneficial uses in the SJR within the Delta.

Table 4-2. WQOs for Salinity from D-1641[1]

Location	Time Period	Water Year Type	EC (mmhos/cm)
EC objective for agricultural beneficial uses SJR at Airport Way Bridge, Vernalis	April – August	All	0.7
	September – March	All	1.0
EC objective for agricultural beneficial uses, interior southern Delta Stations SJR at Brant Bridge, Old River near Middle River, Old River at Tracy Road Bridge	April – August	All	0.7[1]
	September – March	All	1.0

Note:
[1] D-1641 Footnote 5 of Table 2 indicated the interim objective of 1.0 expired April 1, 2005, due to the lack of construction of permanent barriers or equivalent measures. The DWR and Reclamation have petitioned to change the date of the effective date due to delays beyond their control to December 31, 2008 (or installation of permanent barriers) (SWRCB 2005). The EC objective is currently undergoing review through a SWRCB process.
Key:
EC = electrical conductivity
D-1641 = State Water Resources Control Board Decision 1641
DWR = California Department of Water Resources
mmhos/cm = millimhos per centimeter
Reclamation = Bureau of Reclamation
SJR = San Joaquin River
SWRCB = State Water Resources Control Board
WQOs = water quality objectives

The Salinity and Boron TMDL (SJR at Vernalis) Basin Plan Amendment (CVRWQCB 2004) was approved by the SWRCB in November 2005, and received final approval from EPA on February 8, 2007. Under the recommended implementation program, allowable discharges are to be based on the assimilative capacity (or flow rate). In addition to managing discharges of salinity and boron, the TMDL also allows dischargers to increase the assimilative capacity by providing clean freshwater flows.

Modeling conducted as part of previous investigations by Reclamation indicated that under some recirculation alternatives such as the VAMP flow compliance, salinity might increase in some locations (such as Vernalis) and decrease in other locations (such as below the Newman Wasteway) as a result of substitution of Merced River released for DMC releases (Reclamation 2003).

The Dissolved Oxygen TMDL Basin Plan Amendment (CVRWQCB 2005a) was approved by the CVRWQCB in February 2005 and by the SWRCB in November 2005, but has not received final approval from EPA. This TMDL identifies three primary factors that affect dissolved oxygen concentrations in the DWSC, including channel geometry, loads of oxygen demanding substances and reduced flows.

References to develop WQOs and establish current water quality issues in the SJR and Delta include:

- *Water Quality Control Plan for the San Francisco Bay/Sacramento-San Joaquin Delta Estuary* (SWRCB 1995)
- D-1641, revised (SWRCB 2000)

- VAMP
- *Selenium TMDL Basin Plan Amendment* (CVRWQCB 2001)
- *Salinity and Boron TMDL (San Joaquin River at Vernalis) Basin Plan Amendment* (CVRWQCB 2004)
- *Dissolved Oxygen TMDL Basin Plan Amendment* (CVRWQCB 2005a)
- *Diazinon and Chlorpyrifos TMDL Basin Plan Amendment* (CVRWQCB 2005b)
- *303d List of Impaired Water Bodies* (Lower SJR as impaired water body) (EPA 2006b)
- *Summary Recommendations of the San Joaquin River Water Quality Management Group for Meeting the Water Quality Objectives for Salinity Measured at Vernalis and Dissolved Oxygen in the Stockton Deep Water Ship Channel* (SJRWQMG 2005)
- *Water Quality Program Plan* (CALFED 2000b)

Other Opportunities

To the extent possible, the DMC Recirculation Project will pursue opportunities to improve other concerns such as water supply reliability, groundwater overdraft, anadromous fish survival, and south Delta water levels in developing alternatives that address SJR and Delta flow and WQOs.

Water Supply Reliability

The recirculation of water to improve water quality and flows also may have the potential to improve water supply reliability for CVP contractors in the Delta export areas and the Stanislaus River. To the extent that recirculation would contribute to consistently meeting the Vernalis flow and salinity standards without reducing contract water service supplies in any year, the reliability of CVP Delta export water service supplies could be enhanced in the long term.

Similarly, to the extent that meeting Vernalis flow and salinity standards through recirculation could reduce releases from New Melones for those purposes, the reliability of contract water service for CVP contractors along the Stanislaus River with water supplies derived from New Melones storage could increase in the long term.

References to establish current water supply reliability needs in the SJR and Delta include:

- *California Water Plan Update,* Bulletin 160-98 (DWR 1998)
- *California Water Plan Update,* Bulletin 160-05 (DWR 2006)

Groundwater Overdraft

The SJR hydrologic region covers approximately 9.7 million acres. The region depends heavily on groundwater for agricultural and urban use, especially during drought periods, and portions of the Merced County area and eastern San Joaquin County are entirely dependent on groundwater. Groundwater use within the region accounts for about 30 percent of the average annual supply for agricultural and urban use. Overdraft conditions in the western portion of the basin contribute to the deterioration of groundwater quality by promoting the recharge of streamflow from marine sediments in the Coast Range with high total dissolved solids levels.

IDs and cities pump groundwater from the Merced, Modesto, and Eastern San Joaquin County groundwater basins to help meet demand during drought conditions. All three of these basins are in a state of overdraft. In Bulletin 60-93, DWR reported that the overdraft in the Merced Groundwater Basin is occurring at a rate of 28,000 AF per year, based on the 1990 Level of Demand.

Overdraft conditions can contribute to subsidence, groundwater quality degradation, and declines in agricultural productivity. Under some conditions, subsidence can lead to the irreversible loss of storage capacity in an aquifer. Subsidence from hydrocompaction has occurred in two particular areas: lands west of Mendota (USGS 82-370), and most of the area north of Tracy.

Recirculation may reduce the existing groundwater overdraft to the extent that it increases water supply availability from New Melones and other reservoirs for uses other than meeting the flow and quality objectives in the SJR and southern Delta established in the 1995 Bay/Delta Plan and D-1641.

References to establish current groundwater needs and basins with overdraft concerns in the SJR and Delta include:

- *California Water Plan Update,* Bulletin 160-98 (DWR 1998)
- *California Water Plan Update,* Bulletin 160-05 (DWR 2006)
- *California's Groundwater,* Bulletin 118 (DWR 2003)
- Final Programmatic EIS/EIR (CALFED 2000)
- *Groundwater in the Central Valley, California – A Summary Report* (Bertoldi et al. 1991)

Anadromous Fish Survivability

Improved flow in the SJR might benefit the survivability of juvenile and adult anadromous fish. In D-1641, the SWRCB requires an evaluation of the potential imprinting impacts on out-migrant juvenile fall run Chinook salmon and steelhead in the San Joaquin Basin that could result from the DMC Recirculation Project. Under certain scenarios, recirculation could be used to improve dissolved oxygen levels in the Stockton area, potentially aiding the upstream migration of adult salmonids. This evaluation should clarify whether improving the flow in the river through recirculation poses a greater benefit or liability to anadromous fish.

References to addressing anadromous fish survivability needs in the SJR and Delta include:

- *Water Quality Control Plan for the San Francisco Bay/Sacramento-San Joaquin Delta Estuary* (SWRCB 1995)
- D-1641 revised (SWRCB 2000)
- *Summary Recommendations of the San Joaquin River Water Quality Management Group for Meeting the Water Quality Objectives for Salinity Measured at Vernalis and Dissolved Oxygen in the Stockton Deep Water Ship Channel* (SJRWQMG 2005)
- Final Programmatic EIS/EIR (CALFED 2000)
- Programmatic ROD (CALFED 2005)
- Ecosystem Restoration Program Plan (CALFED 2002)

South Delta Water Levels

During periods when low SJR flows combine with high export rates and low tides, south Delta water levels can become so low as to constrain diversions for irrigation. The problem of south Delta low water levels is multifaceted; it may be addressed, in full or in part, by the SDIP and DMC recirculation during late summer periods. The DMC Recirculation Project could improve the likelihood of the SDIP being successful in addressing low water levels.

The SDIP involves installing permanent operable barriers at key locations within the Delta and carefully focused channel dredging, among other actions. This evaluation should determine whether, and to what extent, DMC recirculation would enhance the ability of SDIP to maintain desired water levels in the south Delta during critical irrigation periods.

References to establish current south Delta water levels and problems associated with low water levels include:

- *Water Quality Control Plan for the San Francisco Bay/Sacramento-San Joaquin Delta Estuary* (SWRCB 1995)
- D-1641 revised (SWRCB 2000)
- *California Water Plan Update*, Bulletin 160-98 (DWR 1998)
- *California Water Plan Update*, Bulletin 160-05 (DWR 2006)
- *South Delta Improvements Program EIS/EIR* (Reclamation and DWR 2005)

Summary

The primary problems and needs for the DMC Recirculation Project are responding to flow and water quality requirements. Other opportunities may include improvements in water supply reliability, prevention of further groundwater overdraft, improvements in anadromous fish survivability, and supplements to south Delta water levels. Table 4-3 describes the problems, needs, and opportunities for the DMC Recirculation Project.

Table 4-3. Problems, Needs, and Opportunities

Problems, Needs, and Opportunities	
Problems and Needs	
Flow Objectives	Provide flow for meeting fishery flow objectives at Vernalis and in south Delta channels. Provide operational flexibility to improve the reliability of meeting the flow requirements at the Vernalis gauging station.
Water Quality Objectives	The lower SJR has been listed as an impaired water body by the SWRCB and EPA because of its high concentrations of salts, boron, and selenium, as well as toxicity, and low concentrations of dissolved oxygen in the DWSC (EPA 2006a). As of 04-01-05, D-1641 requires DWR and Reclamation either to meet an EC objective of 0.7 mmhos/cm from April through August or to have completed construction of permanent operable barriers (or equivalent measures) in the southern Delta and an operations plan to protect southern Delta agriculture. Implementation of the SDIP has been delayed and salinity objectives of 0.7 mmhos/cm for agricultural water use in the interior southern Delta locations are often not achieved.
Other Opportunities	
Water Supply Reliability	Improve water supply reliability for Stanislaus River users and CVP export contractors. The recirculation of water to improve water quality and flows may have the potential to improve water supply reliability for CVP contractors in the Delta export areas and the Stanislaus River.
Groundwater Overdraft	Reduce groundwater overdraft. MID and OID pump groundwater from the Merced, Modesto, and Eastern San Joaquin County groundwater basins to help meet demand during drought conditions and some basins are in a state of overdraft. Westside water users rely on deep groundwater pumping and saline surface supplies to supplement inadequate contract deliveries.
Anadromous Fish Survivability	Augment flow to improve anadromous fish survivability. D-1641 requires an evaluation of potential imprinting impacts on juvenile fall run Chinook salmon and steelhead in the San Joaquin Basin that may result from recirculation. Determine if improving the flow in the SJR through recirculation poses a greater benefit or liability relative to anadromous fish.
South Delta Water Levels	Improve south Delta water levels. Low SJR flows combined with high export rates and low tides can cause south Delta water levels to become so low as to constrain diversions for irrigation.

Notes:
[1] The SWRCB is currently reviewing the southern Delta salinity objectives for agriculture. Any changes in the objective will impact the need for, or implementation of, the DMC Recirculation Project.

Key:
CVP = Central Valley Project
D-1641 = State Water Resources Control Board Decision 1641
Delta = Sacramento-San Joaquin River Delta
DWR = California Department of Water Resources
DWSC = Stockton Deep Water Ship Channel
EC = electrical conductivity
EPA = U.S. Environmental Protection Agency
MID = Merced Irrigation District
mmhos/cm = micromhos per centimeter
OID = Oakdale Irrigation District
Reclamation = Bureau of Reclamation
SDIP = South Delta Improvements Project
SJR = San Joaquin River
SWRCB = State Water Resources Control Board

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Chapter 5
Plan Formulation Approach

All elements of the Study are being prepared to conform to P&Gs (Water Resources Council 1983). This chapter presents the plan formulation process and the identified planning criteria, objectives, constraints, and principles used to guide the Study.

This IAIR is one in a series of documents to be developed for the Study. The next document is the PFR, followed by the EIS/EIR and Feasibility Report. The PFR will present the results of the initial alternatives evaluation and further refine the alternatives. The Feasibility Report will evaluate and compare the final alternatives and identify a recommended plan. After the receipt of public comments on the Draft EIS/EIR, the Feasibility Report and final EIS/EIR will be prepared, followed by the ROD and NOD. All of these documents detail the plan formulation process for the Study.

Plan Formulation Process

The plan formulation process for Federal water resources investigations and projects is defined in the P&Gs. The P&Gs include a six-step, structured approach to problem solving that provides a rational framework for sound decision making. The six steps are defined below:

- Step 1: Identifying existing and projected future resource conditions without implementation of a project
- Step 2: Defining water resources problems and needs to be addressed
- Step 3: Developing planning objectives, constraints, and criteria
- Step 4: Identifying resource management measures and formulating potential alternative plans to meet planning objectives
- Step 5: Comparing and evaluating alternative plans
- Step 6: Selecting a plan for recommended implementation

Note that the plan formulation process is iterative and its steps can be revisited during any step of the planning process. This IAIR does not represent all steps of the planning process; for example, the Federal formulation criteria and accounts will be utilized in subsequent planning stages and documents.

As shown on Figure 5-1, the emphasis in the planning phases changes as the Study process progresses. Initially, emphasis is placed on defining problems, needs, and opportunities, and compiling and forecasting conditions in the Study area to support the development of DMC Recirculation Project objectives. The emphasis of the Study then shifts to defining management measures and combining them to formulate and evaluate alternative plans, which are used later to prepare the EIS/EIR and Feasibility Report.

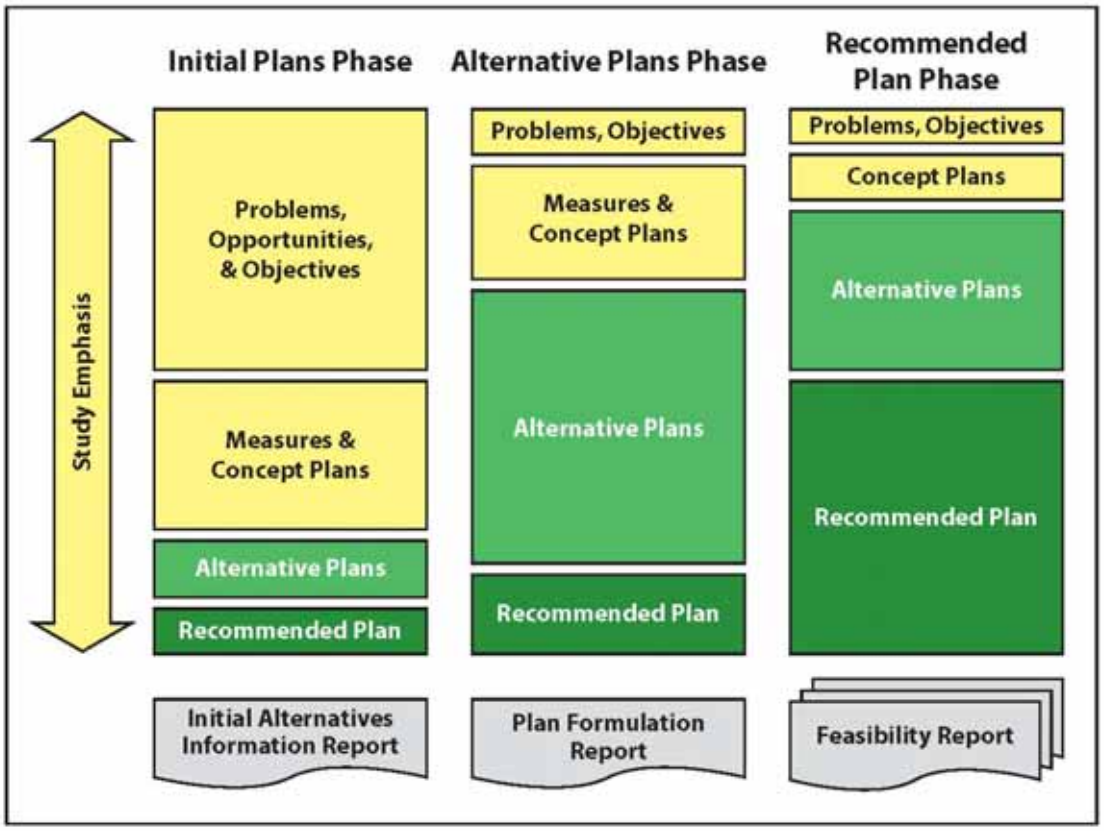

Figure 5-1. Federal Planning Process

Planning Objectives

On the basis of the previously identified and defined problems and needs in the Study area and with guidance from legislative and regulatory directives, several objectives were developed. These objectives are to be used to help guide the formulation of alternatives to address the problems and needs. The Study alternatives will be specifically formulated to address the following objectives:

- Objective A – Provide supplemental flow in the lower SJR for meeting fishery flow objectives through the use of excess capacity in export pumping and conveyance facilities.

- Objective B – Provide lower salinity water to the SJR for meeting water quality objectives at Vernalis through the use of excess capacity in export pumping and conveyance facilities.

- Objective C – Provide greater flexibility in meeting the existing water quality standards and objectives for which the CVP has responsibility so as to reduce the demand on water from New Melones Reservoir used for that purpose and to assist the Secretary in meeting any obligation to CVP contractors from the New Melones Project.

- Objective D – Use recirculation to improve dissolved oxygen in the SJR

- Objective E – Provide lower salinity water to the SJR for meeting water quality objectives at Interior South Delta Stations through the use of excess capacity in export pumping and conveyance facilities.

Planning Constraints and Guiding Principles

Planning constraints and guiding principles for the Study are described in the following subsections.

Constraints

Planning constraints guide the Study's direction. These constraints include Congressional legislation (i.e., study authorizations) and existing water resources projects and programs. Planning constraints, such as biological, cultural, and socioeconomic resources; hydrology; and topography, can also be specific to proposed project locations. Specific planning constraints include the following:

- Study Authorizations: The Study is authorized by the CALFED Bay-Delta Authorization Act of 2004 (Public Law 108-361), which provides a directive for Reclamation to develop and initiate implementation of a program to meet all existing water quality standards and objectives for which the CVP has responsibility. As described under Study Authorization in Chapter 1, the Study is part of PTMS.

- Laws, Regulations, and Policies: Laws, regulations, and policies that must be considered include, but are not limited to, water rights decisions, operational plans and rules for Federal and State water supply facilities, NEPA, Fish and Wildlife Coordination Act, Clean Air Act, Clean Water Act, National Historic Preservation Act, Federal and State ESAs, CEQA, and CVPIA. Reclamation must also satisfy the SWRCB's requirements to evaluate the potential impacts of recirculating water from the DMC, including, but not limited to,

changes in water composition, imprinting and fish entrainment, and impact on water deliveries.

- CALFED ROD: The CALFED ROD is a general framework for addressing the CALFED Bay-Delta Program and it includes program goals, objectives, and projects intended primarily to benefit the Bay-Delta system, its tributaries, and areas that receive water supplies exported from the Delta. Formulation and evaluation of initial project alternatives, including a No-Action Alternative, will comply with the CALFED ROD (CALFED 2000c) and will not conflict with CALFED objectives, solution principles, or policies.

Guiding Principles

Guiding principles used during the Study's plan formulation can help establish the preferred alternative for addressing the planning objectives. Guiding principles include the planning principles and guidelines identified in the P&Gs, other Federal planning regulations, and State and local policies. Guiding principles include the following:

- Alternatives are to be consistent with the identified planning constraints.
- A direct and significant geographical, operational, and physical dependency must exist between major components of alternatives.
- Alternatives should address, at a minimum, each of the identified primary planning objectives.
- Alternatives should either avoid potential adverse impacts on environmental resources or include features to mitigate unavoidable impacts through enhanced designs, construction methods, and/or facilities operations.
- Alternatives should avoid unmitigated adverse impacts to hydrologic and/or hydraulic systems, such as water supply pumping and conveyance facilities, flood control works, or other significant water resource uses in the Study area.
- Alternatives should avoid potential adverse impacts on present or historical cultural resources or include features to mitigate unavoidable impacts.
- Alternatives are to be formulated and evaluated based on a 50-year analysis period.

- First costs for alternatives are to reflect current prices and price levels, and annual costs are to include the current Federal discount rate and an allowance for interest during construction.

- Alternatives should have a high certainty for achieving the intended benefits and not depend significantly on long-term actions for success.

- Alternatives are to reflect the purposes, operations, and limitations of existing and without-project future projects and programs.

Criteria for Formulating and Evaluating Alternatives

Each alternative plan must be formulated with consideration of the following four criteria:

- Completeness: Completeness is the extent to which the alternative plans provide and account for all necessary investments or other actions to ensure the realization of the planning objectives, including actions by other Federal and non-Federal entities. The completeness of an alternative will be determined by the extent to which all components of an alternative have been identified; an alternative's contribution to the planning objectives (and the reliability of that contribution); the ability of an alternative to be implemented without relying significantly on other actions to occur; and the engineering and operations and maintenance requirements of an alternative. Completeness will also be judged by the mitigation of potential adverse impacts of a particular alternative.

- Efficiency: Efficiency is the extent to which an alternative plan is the most cost-effective means of achieving the planning objectives, without adversely impacting the environment. The costs and benefits associated with each initial alternative will be the basis for plan comparison under the efficiency criterion. Benefits will come from flow and water quality improvements in the lower SJR and a reduced reliance on New Melones Reservoir for those improvements, anadromous fish survival, and greater system operational flexibility. The environmental consequences of any initial alternative will also be evaluated for the efficiency criterion in a variety of resource areas, such as biological and socioeconomic impacts.

- Effectiveness: Effectiveness is the extent to which the alternative plans contribute to achieving the planning objectives. Initial alternatives will be evaluated on their ability to provide flow in the SJR to meet water quality (specifically salinity and dissolved oxygen) and flow objectives, improve operational flexibility for meeting flow requirements at Vernalis, and reduce reliance on New Melones.

- Acceptability: Acceptability is the extent to which the alternative plans meet the requirements of applicable laws, regulations, and public policies. This criterion also assesses the degree of acceptance by Federal, State, and local entities and the public. Criteria will likely include compliance with D-1641 and D-1422 water quality, flow, and other requirements, benefits to flow regime and water quality, and benefits or impacts to water supply and water supply reliability and wildlife, habitat, and fisheries.

In addition, the following four accounts are established to facilitate the evaluation and display of the effects of alternative plans:

- National Economic Development (NED) – The NED account displays changes in the economic value of national output of goods and services. The NED account is required.

- Environmental Quality – The environmental quality account displays nonmonetary effects on significant natural and cultural resources.

- Regional Economic Development – The regional economic development account registers changes in the distribution of regional economic activity. Evaluations of regional effects are to be carried out using nationally consistent projections of income, employment, output, and population.

- Other Social Effects – The other social effects account registers effects from perspectives that are relevant to the planning process but are not reflected in the other three accounts.

Other information that is required by law, or that will have a material bearing on the Federal decision-making process, should be included in the other accounts or in some other appropriate format used to organize information on effects. The accounts are applied to screen initial alternatives later in the planning process.

Chapter 6
Resource Management Measures

Following the development of the DMC Recirculation Project objectives, constraints, and criteria, the next major steps are to identify and evaluate potential resource management measures and to formulate initial alternatives. This chapter defines and introduces resource management measures that can address this Study's objectives.

Resource management measures were identified that appeared most viable to meeting the DCM Recirculation Program objectives by performing an initial, qualitative screening of a broad range of measures. Following the initial screening, additional considerations specific to retained measures are identified, and these retained measures are further screened to ascertain a suite of measures appropriate for consideration in the development of potential initial alternatives.

Definition of Resource Management Measures

A resource management measure is a feature or activity, structural or non-structural, which addresses a specific objective. Potential resource management measures were identified as part of previous studies, programs, and projects to address problems, needs, and opportunities in the Study area. These measures were developed and reviewed during Study team meetings, field inspections, and with input from stakeholders for their ability to address the objectives. This chapter generally describes the measures considered, and presents summary information related to their potential to address the objectives and reasons for either retaining or eliminating measures from further development.

The resource management measures were evaluated for their ability to address the DMC Recirculation Project's objectives. The ranking of measures was qualitative; the decision making regarding how well a measure accomplished a specific objective was collectively determined by the study team. The following sections describe the wide range of measures considered, justification for eliminating or retaining measures, and further information on how retained measures might be incorporated into initial alternatives.

Measures considered for the DMC Recirculation Project are focused on methods to deliver water from the Delta to the SJR upstream of Vernalis consistent with the concept of Recirculation. Measures considered include delta pumping facilities, conveyance facilities, and storage facilities.

Resource Management Measures Screening

Resource management measures were screened by their ability to address at least one objective without adverse impact on other objectives. Measures were analyzed for the degree to which they fulfill a specific objective and were rated on a scale from low to high. The objectives are listed below:

- Objective A – Provide supplemental flow in the lower SJR for meeting fishery flow objectives through the use of excess capacity in export pumping and conveyance facilities.
- Objective B – Provide lower salinity water to the SJR for meeting water quality objectives at Vernalis through the use of excess capacity in export pumping and conveyance facilities.
- Objective C – Provide greater flexibility in meeting the existing water quality standards and objectives for which the CVP has responsibility so as to reduce the demand on water from New Melones Reservoir used for that purpose and to assist the Secretary in meeting any obligation to CVP contractors from the New Melones Project.
- Objective D – Use recirculation to improve dissolved oxygen in the SJR.
- Objective E – Provide lower salinity water to the SJR for meeting water quality objectives at Interior South Delta Stations through the use of excess capacity in export pumping and conveyance facilities.

Measures were retained based on how well it accomplished a specific objective based on previous experience with CVP and SJR systems operations and professional judgment. Due to the very specific objectives defined in the authorizing legislation and State actions, the number of measures available for consideration was limited.

Although the DMC Recirculation Project is a part of PTMS, the Study does not include consideration of measures not related to DMC recirculation that can contribute to meeting the standards. For example, purchase of water from other sources was not considered as a measure under this Study.

Measures were retained for further consideration based on their ability to achieve or contribute to achieving the objectives. Table 6-1 provides a summary of the screening evaluation by resource measures.

Resource management measures that were considered but eliminated are not precluded from reconsideration in future Study activities. Future events may create conditions that require the reconsideration of particular measures eliminated under this IAIR.

Table 6-1. Summary of Resource Measure Screening Evaluation

Measure	Status	Comment	Objectives
Delta Pumping			
Jones Pumping Plant	Retained	Excess capacity, used for pilot project.	A, B, C, D, E
Banks Pumping Plant	Retained	Use requires no impact to SWP water deliveries.	A, B, C, D, E
Conveyance			
DMC	Retained	Excess capacity, used for pilot project.	A, B, C, D, E
California Aqueduct	Retained	Used to replace recirculated CVP water in SLR.	A, B, C, D, E
Newman Wasteway	Retained	Used for pilot project.	A, B, C, D, E
Westley Wasteway	Retained	Requires outlet conveyance analysis.	A, B, C, D, E
Mendota Pool	Eliminated	Would require sustained flow below Sack Dam for efficient delivery to Vernalis.	
Friant Reservoir	Eliminated	Requires reliance on implementation of SJRRP. Potential changes in recirculation requirements to be included as sensitivity analysis.	
Firebaugh and Volta Wasteways	Eliminated	Potential adverse water quality effects from saline shallow groundwater.	
Natural Creeks	Eliminated	Requires new outlet structures and potential adverse effects from benthic sediment scour.	
Refuge Pathway	Eliminated	Potential adverse effects on SJR water quality (salinity, organic carbon), refuge operation conflicts.	
Storage			
SLR	Retained	Use for temporary storage of recirculation water.	A, B, C
New Melones Operational Releases			
Release recirculation water before New Melones releases	Retained	Assist in bounding operational choices	A, B, C
Release recirculation water after New Melones releases	Retained	Assist in bounding operational choices	A, B, C

Key:
CVP = Central Valley Project
DMC = Delta-Mendota Canal
SJR = San Joaquin River
SJRRP = San Joaquin River Restoration Program
SLR = San Luis Reservoir
SWP = State Water Project

Measures to Address Objectives

The following identify resource management measures that address the objectives.

Objectives A, B, C, D, and E

Various potential resources management measures were identified to address the objectives of providing flow and reducing salinity concentrations in the SJR for meeting water quality, agricultural, and fishery flow objectives (Objectives

A and B). All measures rely on the use of export pumping and conveyance facilities.

While the water quality and flow objectives are distinct, the measures to achieve the objectives are common with the major difference being the required amounts of DMC water that would be released and the timing of the release. All measures identified will also support achieving Objectives C, D, and E but are primarily focused on helping to achieve compliance with SJR objectives at Vernalis. These measures include elements of pumping, conveyance, and storage:

Delta Pumping Jones Pumping Plant would be the primary facility to supply water for recirculation. Banks Pumping Plant would be used through Joint Point of Diversion to replace water in SLR that was withheld from storage or release from storage. The following are retained for further analysis:

- Pump additional water at Jones Pumping Plant for recirculation when capacity is available in excess of existing demands for delivery and storage.
- Pump water at Jones Pumping Plant for recirculation during times when lower DMC demands can be met by reducing water placed in SLR storage or releasing water from SLR.
- Pump water at Banks Pumping Plant through the use of Joint Point of Diversion to replace water in SLR that was withheld from storage or released from storage.
- Pump Water at Jones Pumping Plant as needed to meet Vernalis WQ and Flow objectives.

Pumping using Banks Pumping Plant for direct releases to the SJR was considered but eliminated because no wasteway pathway exists from SWP to the SJR.

Conveyance Pathway Conveyance pathways from DMC to the SJR upstream of Vernalis is required to meet Objectives A and B. The following pathways are retained for further analysis.

- Release water for recirculation at Westley Wasteway.
- Release water for recirculation at Newman Wasteway.

As described in Chapter 3, Westley Wasteway is located closer to Vernalis and, therefore, may have the potential for lower water losses due to bank infiltration or consumptive riparian uses. However, existing channel constraints in Westley Wasteway and its path to the SJR will require additional analysis to determine what improvements are needed to support use of Westley Wasteway (see

Figure 3-4). Newman Wasteway has been successfully used in the 2004 pilot recirculation project and is retained for further analysis.

Releases to Mendota Pool were considered but eliminated because of the portions of the SJR downstream of Sack Dam that are currently dry during summer months and year-round in most years. A considerable volume of water would be required to establish a consistent flow due to significant instream losses. In addition, the portion of the river immediately upstream of the confluence with the Merced River is very slow moving and receives discharges from Mud and Salt Sloughs. Increasing flow could increase the resuspension and transport of previously deposited benthic sediment and result in greater transport of groundwater seepage to the downstream portion of the SJR.

Releases from Friant Reservoir were also considered but eliminated because they are outside of the authorized project. It is noted that one goal of the SJRRP is to provide water for fish migration in SJR which could potentially reduce the need for recirculation.

Assuming restoration flow as a means of meeting the project objectives was considered but eliminated as it would rely on implementation and coordination with DMC Restoration Project. However, a sensitivity analysis will be performed to determine whether additional flows released from Friant are likely to improve either flows or water quality at Vernalis.

Other conveyance measures considered but eliminated include: releasing water through Federal refuges, releasing water through other natural waterways adjacent to the DMC, and releasing water through other downstream DMC wasteways.

Releasing water through Federal refuges was eliminated due to the high organic carbon and salinity load in the refuges resulting from waterfowl, habitat, and evaporation that occurs in the refuges. As described in Chapter 3 refuges are currently developing real-time operational release protocols to manage draw down during periods of high river flow when assimilative capacity is high in the SJR.

Other DMC wasteways downstream of Newman (Firebaugh and Volta) were not included for further consideration due to concerns that increased flow in these wasteways might increase transport of selenium and salt, which are known to be elevated in the shallow groundwater in the vicinity of the wasteways and are already a concern in the SJR. Additional concerns with the hydrologic connectivity of these wasteways to the SJR further lowered the desirability of using these wasteways.

Using natural creeks adjacent to the DMC, such as Del Puerto or Orestimba Creeks, were eliminated from further consideration due to the need for new outlet works and potential environmental impacts associated with the sediments

in the creeks. As noted in its letter of December 11, 2006, total suspended solids and turbidity are concerns of the CVRWQCB and would generally preclude paths that would increase these parameters.

Storage Incidental use of stored water in SLR may be required for any release alternative due to the need to ensure water deliveries in the lower DMC are adequate. Additional measures using storage in SLR will be considered to allow noncoincident pumping and release, thereby improving flexibility in using Jones and Banks Pumping Plants.

Objective C

Objective C is to reduce reliance on New Melones and increase water supply to CVP Stanislaus River contractors. The major resource management measure to achieve this objective will be to use New Melones as a supplemental supply to achieve water quality and flow objectives after use of recirculation. That is, water quality releases from New Melones would be used after recirculation if an additional need occurs for water to meet Vernalis objectives. The extent to which New Melones releases are governed by Vernalis flow and water quality needs rather than Stanislaus River in-stream fisheries requirements will influence how well this objective is achieved.

Objectives D and E

Objectives D and E focus on using recirculation to achieve WQOs for dissolved oxygen in the DWSC and achieving water WQOs at the South Delta Interior Stations. As described in Chapter 3, other projects, including SDIP, are focused on implementation of actions designed to achieve these objectives.

Because DMC recirculation is not the primary measure being contemplated to achieve these objectives no additional measures will be developed other than those described above to assist in meeting these objectives. The effect of recirculation releases on assisting to achieve the Stockton dissolved oxygen and South Delta Interior Stations will be assessed through the environmental modeling and assessment process. Key evaluations in the Study would include the following:

- Evaluate necessary flow levels required to positively impact low dissolved oxygen levels in the SJR.
- Evaluate necessary flow and water levels required to positively impact south Delta water quality and levels.
- Evaluate the ability of DMC recirculation to improve water levels in the south Delta.

Chapter 7
Development of Initial Alternatives

This chapter describes initial alternatives that will be further considered and analyzed in the PFR, EIS/EIR, and the Feasibility Report. Components of these alternatives include physical facilities used to deliver water to the SJR and operational aspects (strategies) related to their use. The initial alternatives were formed with the goal of encompassing the range of different facilities and operational priorities that could be used to accomplish the DMC Recirculation Project objectives.

No-Action Alternative

The No-Action Alternative is required for analysis of environmental effects under CEQA and NEPA. Under this alternative, no recirculation would be conducted. For the NEPA analysis, the No-Action Alternative will be used as the baseline to compare with the effects of the different action alternatives. For the CEQA analysis existing conditions at the time the NOP was published (May 2007) are used as the baseline. The No-Action Alternative is described in Chapter 3 of this document.

Operational Strategies

Operational priorities, physical and regulatory constraints, and policy objectives applied to a given alternative will affect the use of physical facilities for recirculation. Several key operational assumptions and strategies considered in the formulation of the alternatives are described below.

New Melones Water Supply

The New Melones water supply priority addresses the goal of reducing the reliance on New Melones for meeting water quality standards and flow objectives in the SJR and Delta. Recirculation could provide an alternative source of CVP water to the SJR to assist in meeting standards and objectives. Recirculation could be used before water from New Melones, after water from New Melones, or based on a flexible priority.

The relative priority that recirculation has with New Melones releases has a direct implication to the water supply at New Melones; less dependency upon New Melones for Delta and SJR objectives results in a greater amount of water supply available for CVP obligations from the Stanislaus River.

A flexible priority between New Melones releases and recirculation will be considered due to the differences in water quality characteristics of the source of water or to avoid or mitigate impacts to water users or the Delta.

Direct Pumping and Release

This operational strategy would provide recirculation at times when water quality standards or flow objectives require supplemental flow in the SJR (real-time pumping and release). The availability of supplemental flow through recirculation would occur only when available, unused, and allowed (regulatory) capacity occurs within the pumping, conveyance, and delivery system. This strategy would provide the least risk to CVP south of Delta water deliveries as pumping and conveyance would be available only when they are not interfering with the current uses and priorities.

This operational strategy could function within any New Melones water supply priority described above. The New Melones water supply priority would affect the frequency and magnitude of required releases from New Melones and, therefore, affect the amount of water supplied to the SJR and Delta from the Stanislaus River.

Pumping, Storage, and Release

An extension of the direct pumping and release strategy is the use of SLR storage as a tool to provide regulation between the need for supplemental flow to the SJR and the availability of pumping and conveyance. A storage recirculation operation could provide releases to the SJR during a period when pumping is constrained or when recirculation releases would result in reductions in the amount of CVP water stored in SLR.

Incremental additional pumping through Jones Pumping Plant or Banks Pumping Plant could occur prior to or after the reduction in stored water. This operation may or may not have a consequence to CVP south of Delta deliveries, depending upon the priority that the additionally pumped water has within the CVP operation.

CVP South of Delta Deliveries versus Recirculation

Use of CVP pumping and conveyance capacity with recirculation as a high priority could adversely affect CVP south of Delta water contract deliveries, and to some extent, other CVP non-Stanislaus River deliveries. As touched upon above, the use of CVP pumping and conveyance could range from available, unused, and allowable capacity to a level that would effectively reallocate exported CVP water to the DMC Recirculation Project.

The extent to which DMC recirculation would be allowed to adversely affect CVP deliveries would be a future policy decision. Additionally, recirculation would likely occur with some measure of conveyance inefficiency. Although physically the recirculation could provide additional flow to the Delta (to the extent that additional flow is released to the SJR above that which would occur

under no action), conveyance losses may occur between the point of canal and stream conveyance and the recapture of the release at the pumping facilities. In other words, not all of the water released for recirculation may be available for recapture.

Other Facility Uses versus Recirculation

Other uses of the pumping, conveyance, and storage facilities include CVPIA actions, EWA commitments, water transfer commitments, and Coordinated Operations Agreement commitments. Rather than assume that each of these uses will be ranked in importance with recirculation, an alternative will be established for the analysis that provides recirculation with a high priority relative to all other uses and uses sensitivity analysis to investigate impacts of these assumptions.

Compliance

During the course of the Study certain configurations of physical features and operational conditions may result in operations that provide full compliance with both the water quality standards and flow objectives. At that point a strategy of compliance will be developed that allocates the limited resources among the compliance requirements and other contractual obligations. The sensitivity of the strategy to alternative benefits and costs will be investigated.

SWP Integration and Facilities

SWP facilities would be used in a subset of alternatives. A major assumption of the Study is that no adverse water supply impact to the SWP is to occur under any alternatives. SWP facilities would be used in the recirculation alternatives to provide additional opportunities for pumping, conveyance, and storage with the above limitation.

Initial Alternatives

Initial alternatives were formulated from the resource management measures described in Chapter 6.

The theoretical combinations of physical facilities, conveyance pathways, and operational strategies could create a nearly endless list of potential alternatives. The performance of initial alternatives can be bracketed, however, by careful selection of a combination of resource management measures to encompass the range of potential impacts and benefits.

This approach to alternative formulation develops a suite of alternatives that have discernibly different characteristics. The suite of initial alternatives will provide results that are sufficiently robust to identify the accomplishment of project objectives: the compliance with water quality standards and flow objectives, and water supply enhancement at New Melones. Information garnered from the hydrologic investigation will feed into an environmental

evaluation of the initial alternatives. Table 7-1 presents the initial alternatives that have been identified for further study. Figure 7-1 graphically illustrates the general construct of the initial alternatives.

Table 7-1. Initial Alternatives

Alt	Delta Pumping Facilities	Delta Recirculation Pumping Priority for Recirculation	Conveyance	Recirculation Release Timing	Priority with Existing New Melones Delta Operation
1A	Jones/Banks	High (no SWP impact)	Newman/Westley	Real-time and stored	After
1B	Jones/Banks	Low (no SWP/CVP south of Delta impact)	Newman/Westley	Real-time	After
2A	Jones	High (no SWP impact)	Newman/Westley	Real-time and stored	After
2B	Jones	Low (no SWP/CVP south of Delta impact)	Newman/Westley	Real-time	After
2C	Jones	Medium (no SWP; some CVP south of Delta impact)	Newman/Westley	Real-time and stored	Before
2D	Jones	High (no SWP impact)	Newman/Westley	Real-time and stored	Before
2E	Jones	Low (no SWP/CVP south of Delta impact)	Newman/Westley	Real-time	Before
3A	Jones/Banks	High (no SWP impact)	Newman/Westley	Real-time and stored	Before
3B	Jones/Banks	Low (no SWP/CVP south of Delta impact)	Newman/Westley	Real-time	Before

Key:
Alt = alternative
CVP = Central valley Project
Jones = C.W. “Bill” Jones Pumping Plan
Banks = Harvey O. Banks Pumping Plant
Delta = Sacramento-San Joaquin River Delta
SWP = State Water Project

Three main alternatives are identified based on the specific overall objective they serve or major facilities they use. These main alternatives are:

- Alternative 1 – Supplement Current Operation - Recirculation flows are added on top of New Melones releases, which typically remain at current levels.
- Alternative 2 – CVP Alone - Only Jones Pumping Plant is used for recirculation flows or to place water in storage.
- Alternative 3 – Enhance New Melones Water Supply - New Melones releases are added as necessary on top of recirculation flows.

Each of these main alternatives contains either two or five operational scenarios. The operational scenarios vary in the priority for use of the facilities to transport water for recirculation in relation to other existing uses and are designed to optimize a particular objective such as achieving water quality standards or minimizing impacts to Westside CVP contractors. Figure 7-1 also provides an overview of operational scenarios, while Figure 7-2 presents an overview of which facilities are used and how the scenarios vary in operational priorities.

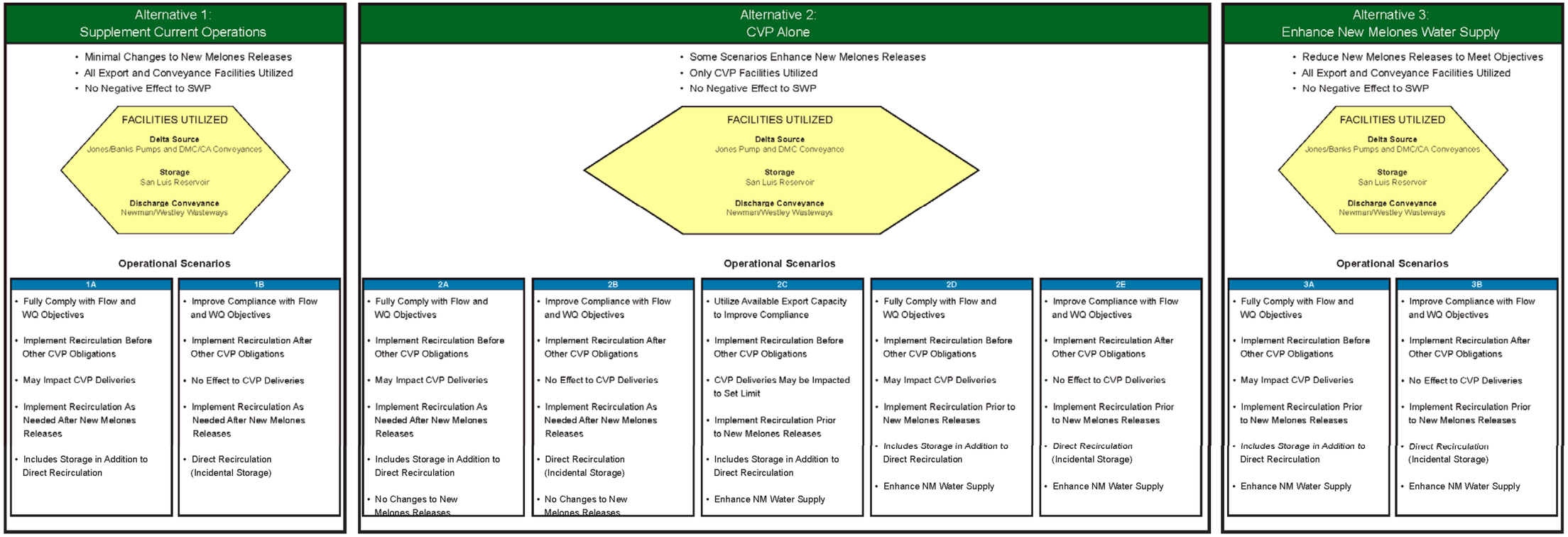

Figure 7-1. Range of Alternatives

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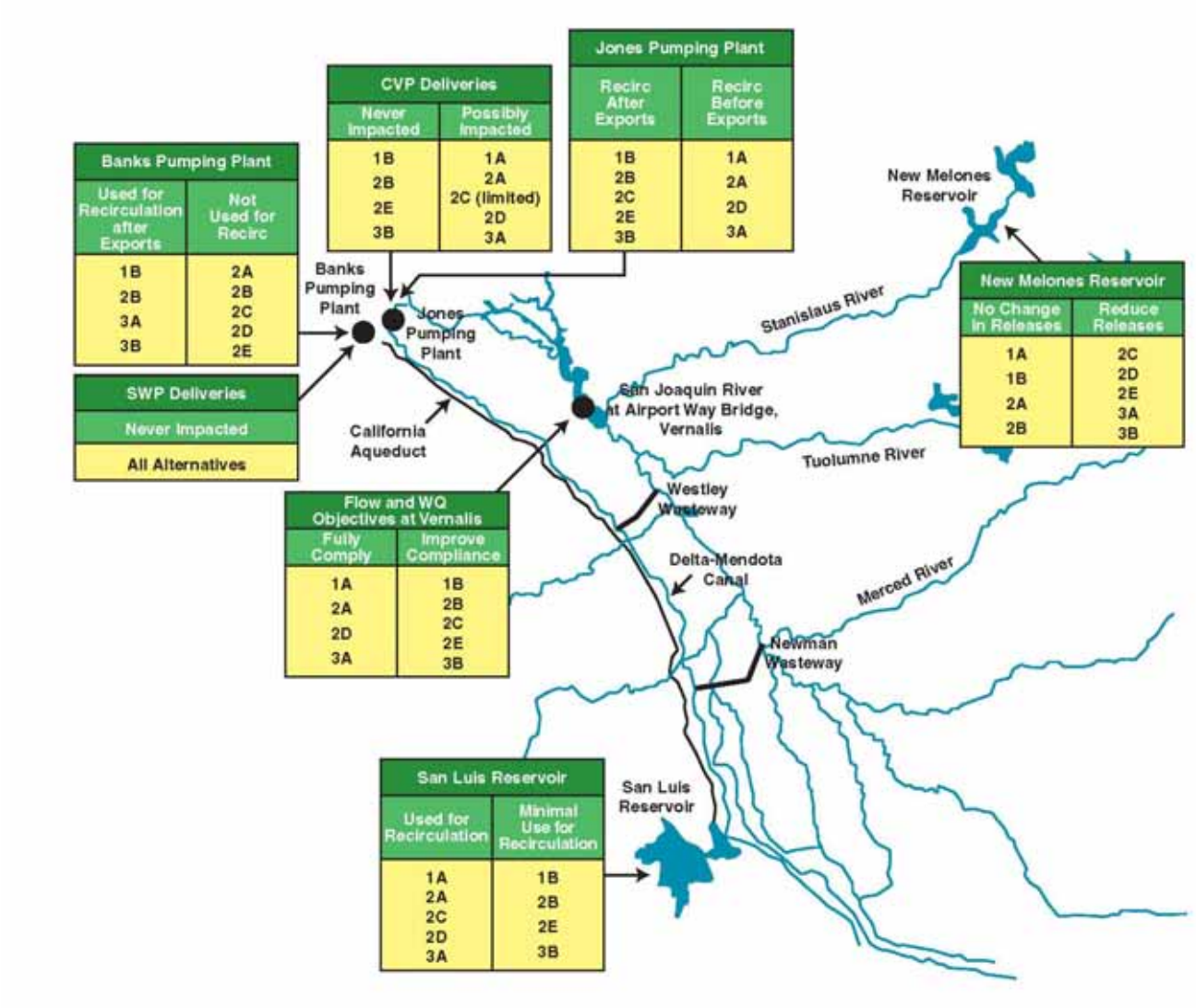

Figure 7-2. Alternative Components

Each initial alternative and operational scenario is described below.

Alternative 1 – Supplement Current Operation

This alternative adds recirculation to the existing operation in the basin. Recirculation would be used as an additional tool to help meet current water quality standards and flow objectives. Under this assumption, the current level of releases from New Melones for water quality and flow compliance would largely remain unchanged. Banks Pumping Plant would be used to replace water in the SLR lost due to recirculation. Variants include different Jones Pumping Plant pumping priorities relative to other CVP obligations. Two operational scenarios to this alternative would be evaluated:

- Alternative 1A – would fully comply with water quality and flow requirements regardless of CVP south of Delta delivery impacts. Both the CVP and SWP pumping, conveyance, and storage facilities would be assumed to be available for the project; however, no water supply impact would occur to the SWP. The order of use of supplemental facilities would be (1) available, unused, and allowable capacity at Jones Pumping Plant, (2) available, unused, and allowable capacity at Banks Pumping Plant, and (3) as-required capacity at Jones Pumping Plant needed to provide compliance.

- Alternative 1B – would utilize recirculation of water that is currently available through CVP and SWP facilities without impact to either the SWP or to CVP south of Delta deliveries. Under this alternative recirculation releases would occur coincidently with pumping (real-time) and only limited "incidental" use of SLR would occur.

Alternative 2 – CVP Alone

This alternative focuses the tools available to serve project goals on CVP facilities (inclusive of existing institutional arrangements such as wheeling transfers and non-CVP water supplies). Recirculation flow would be limited to water that can be pumped at Jones Pumping Plant. Operational scenarios to be evaluated include:

- Alternative 2A – would use recirculation prior to New Melones releases, recirculation to ensure compliance with objectives would have high Delta pumping priority in comparison to CVP exports, and recirculation would include both real-time and stored releases.

- Alternative 2B – would use recirculation prior to New Melones releases, recirculation to ensure compliance with objectives would have low Delta pumping priority in comparison to CVP exports, and recirculation releases would occur coincidently with pumping (real-time) and only limited "incidental" use of SLR would occur.

- Alternative 2C – would use a hybrid assumption for the Delta pumping priority, whereby recirculation would be provided using real-time and stored water releases up to an assumed limit of impact to CVP south of Delta deliveries.

- Alternative 2D – would use recirculation before New Melones releases, recirculation to ensure compliance with objectives would have high Delta pumping priority in comparison to CVP exports, and recirculation would include both real-time and stored releases.

- Alternative 2E – would use recirculation before New Melones releases, recirculation to ensure compliance with objectives would have high Delta pumping priority in comparison to CVP exports, and

recirculation releases would occur coincidently with pumping (real-time) and only limited "incidental" use of SLR would occur.

Alternative 3 – Enhance New Melones Water Supply

This alternative strives to evaluate the dual project objectives of water quality and flow compliance and the enhancement of the New Melones water supply. The discriminating difference between this alternative and Alternative 1 is that the recirculation component occurs prior to a New Melones release for SJR water quality and flow requirements. In this alternative, New Melones supplements recirculation only if necessary. The results of evaluation of this alternative will provide insight into the amount of New Melones water supply that could be enhanced by a lesser reliance on New Melones for compliance to Delta water quality and flow requirements. Similar to Alternative 1, two basic operational scenarios are explored:

- Alternative 3A – would use whatever recirculation measures are necessary to fully comply with water quality and flow requirements (high Delta pumping priority).

- Alternative 3B – would use only the recirculation capacity available that would not impact SWP and CVP south of Delta deliveries (low Delta Pumping priority.

Common Components

Two pathways for recirculation will be considered as components of the alternatives that are being evaluated in the Study. Newman Wasteway is currently capable of providing the widest range of recirculation flows with little or no modification (see Chapter 3), as has been demonstrated by the 2004 pilot study. However, potential environmental impacts exist due to habitat that has developed within portions of the channel and due to the fine sediment in the wasteway.

Westley Wasteway is not currently capable of discharging as much water to the SJR without modifications at the outlet. SJR water quality will be evaluated under the assumption that the discharge can be modified. In addition, the potential costs and environmental impacts of modifying the discharge location will be evaluated.

For the purposes of the water supply modeling and analysis, the project alternatives will all assume the same discharge facility, namely Newman Wasteway, because for CalSim II modeling both wasteways discharge into the same section of the model. From a water supply modeling perspective, the inclusion of only this single option within the alternatives' configurations should provide adequate results for the Study. Additional, more detailed water quality modeling will provide more information on specific benefits to the SJR for alternatives using each pathway. In addition to the water supply and quality

analysis specific sediment quality, biological survey, and physical discharge analyses would be conducted to compare and rank the use of each wasteway.

Chapter 8
Comparison of Initial Alternatives

This chapter presents the method to be used for comparison of initial alternatives.

Criteria and Comparison

All elements of the Study are being prepared to conform to the Federal P&Gs (Water Resources Council 1983). Each initial alternative must be formulated with consideration of the following four criteria identified in the P&Gs: completeness, effectiveness, efficiency, and acceptability.

Completeness

Completeness is the extent to which an alternative provides and accounts for all necessary investments or actions by Reclamation, DWR, or others to ensure the realization of the planning objectives, including actions by other Federal and non-Federal entities. Specific conditions for determining the completeness of an alternative include the following:

- Each alternative contributes to meeting all of the objectives.
- These alternatives do not rely significantly on any other actions.
- The alternatives are considered equally reliable from an engineering standpoint and have similar operations and maintenance requirements.

Effectiveness

Effectiveness is the extent to which the alternatives contribute to achieving the planning objectives. Initial alternatives will be evaluated on their ability to address the DMC Recirculation Project objectives (described in Chapter 5).

Efficiency

Efficiency is the extent to which an alternative is the most cost-effective means of achieving the planning objectives and does not adversely impact the environment. The environmental consequences will be evaluated for the following resource areas:

- Physical Environment – water supply, water quality, noise and vibration, and hazardous materials

- Biological Environment – aquatic and fishery resources, vegetation and habitat, wildlife, special-status species, and wild and scenic rivers
- Cultural Environment
- Socioeconomic Resources – environmental justice
- Land Use – land use, population, public health and safety, recreation and public access, aesthetics, utilities and public services, water supply, and power and energy

In addition, the costs and benefits associated with each initial alternative will be a basis for plan comparison under the efficiency criterion.

Acceptability

Acceptability is the extent to which the alternatives meet the requirements of applicable laws, regulations, and public policies. This criterion also assesses the degree of acceptance by State and local entities and the public. It considers compatibility with existing laws, regulations, and public policies. Specific conditions for determining the acceptability of an alternative include the following:

- Compliance with D-1641 and D-1422 water quality, flow, and other requirements
- Compliance with CEQA, NEPA, Federal ESA, California ESA, CWA, and other applicable laws and regulations
- Benefits to water supply and water supply reliability
- Benefits to wildlife, habitat, and fisheries
- Benefits to flow regime and water quality

Evaluation Metrics

Evaluation of each alternative for the different affected resources will be conducted in the PFR. The effects of the different alternatives for each resource area will be compared using a series of metrics developed specifically for the Study. Table 8-1 provides a list of the evaluation metrics and components.

During the development of the PFR these evaluation metrics will be further developed and categorized into the four overall comparison criteria. Technical studies will be conducted to evaluate how well each alternative performs against the metrics and form the basis of the alternative comparison.

Table 8-1. Evaluation Metrics

Metric	Component	Geographic Area
Achieving Project Goals		
	EC	SJR Vernalis, Interior South Delta
	Flow	SJR Vernalis
	Reliance on New Melones	New Melones
	Dissolved oxygen	SJR @ DWSC
	Water levels in South Delta	South Delta
Water Supply		
	CVP contractors deliveries	Delta export area, Stanislaus delivery area
	SJR tributary effects	Tributaries
	Storage level changes	SLR, Sacramento Basin
Water Quality		
	Dissolved oxygen	SJR, DWSC
	Selenium	SJR
	Electrical conductivity	SJR, X2, other Delta/key locations
	Toxics	SJR
	Bromide	Delta M&I diversions
	Dissolved organic carbon	Delta M&I diversions
Fisheries		
	Change in exports	Delta
	Timing of export	Delta
	Dissolved oxygen	DWSC
	Temperature	SJR
	Turbidity	SJR
	Toxics	SJR
	Channel hydraulics	Delta
	Source water cueing	SJR
	Flooded channel area	SJR
	Instream habitat	Tributaries
	Recreational fishing	SLR
Threatened and Endangered Species		
	Number of protected species potentially adversely affected	Affected area
	Number of protected species potentially beneficially affected	Affected area
	Magnitude of adverse effect	Affected area
	Percentage of habitat area affected	Affected area
Energy		
	Energy use	CVP, SWP
Economics		
	Cost	Affected area
	Benefit	Affected area
Implementability		
	Operational complexity	Affected operation

Key:
CVP = Central Valley Project
EC = electrical conductivity
Delta = Sacramento-San Joaquin River Delta
DWSC = Stockton Deep Water Ship Channel
M&I = municipal and industrial
SJR = San Joaquin River
SLR = San Luis Reservoir
SWP = State Water Project

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Chapter 9
Fish Imprinting and Straying

Recirculation through the DMC would introduce additional water from the Sacramento River into the SJR, potentially creating straying problems for anadromous fish. Fishery agencies have expressed concern that returning adult Chinook salmon and steelhead from the Sacramento River could stray into the SJR. Another possibility is that outmigrating smolts exposed to recirculated water during the spring could imprint on the Sacramento River source water fraction and then stray into the Sacramento River on returning as adults.

These issues are critical to the potential use of recirculation to meet the DMC Recirculation Project objectives. There are four runs of Central Valley Chinook salmon, of which two are listed as threatened or endangered under the Federal ESA and the California ESA. One run of Central Valley steelhead is also listed as threatened under the ESA.

Challenges exist to evaluating the potential for straying. Central Valley fall-run Chinook salmon are produced at five Central Valley hatcheries to support the ocean fishery, and many of these fish are trucked from the hatchery to a release point in the western Delta. Because these fish did not have a chance to imprint on olfactory cues during their outmigration, the ones that escape the ocean fishery and return to spawn in the Central Valley exhibit a relatively high rate of straying. Straying rates in the Central Valley have been related to low-flow conditions, recirculation, outflow and export/import ratios, and trucking of smolts in past studies. Baseline straying rates may be available through recovery of coded-wire-tag adult fish recovered during carcass counts on the SJR tributaries.

Some of the baseline straying rates in Central Valley streams range up to 17 percent. Some of the factors that are important in assessing straying include:

- The time of the year that recirculation would be likely to cause straying
- The run or runs that would be exposed to the recirculation
- How straying would change relative to the existing high straying rates of trucked hatchery fish

Another factor related to the straying issue within the Central Valley is: advantage to the establishment of salmon runs in the restored SJR.

The DMC Recirculation Technical Fishery Working Group will identify methods to evaluate the straying issue. These steps would include a literature review of mechanisms surrounding homing and migration for anadromous salmonids and a more thorough assessment of baseline straying rates in the SJR tributaries and elsewhere in the Central Valley through the review of coded-wire-tag returns from other tributaries. The Long-Term CVP OCAP and Biological Opinion also provide some insights into the straying issues.

Another potential method to evaluate straying would be to assess the effects on straying of comparable examples of intrabasin water transfers within the Central Valley (from the American River to the Cosumnes River and the Yuba River to Deer Creek) or even interbasin transfers from the Eel River to the Russian River or from the Trinity River to the Sacramento River. These empirical examples may provide data or some insights as to the significance of the straying issue relative to water transfers and could provide a corollary to the effects of DMC recirculation.

No field studies are being proposed at this time. Radio-tagged adult salmon have been tracked in the past to assess straying; however, captured adult salmon from the Delta could be from any of the tributaries. The ability to determine if straying occurs requires proper identification of the natal river. No benign way exists to correctly associate a field-captured salmon to its natal river.

Chapter 10
Study Management and Public Involvement

The Study is addressing issues of interest and concern to stakeholders engaged in local and regional water resource planning, as well as Federal and State agencies with regulatory and management responsibilities related to natural resources in the Study area. Successful completion of the Study requires involvement from a variety of agencies, stakeholders, and the public. The Study will provide opportunities for both stakeholder and public involvement and participation. This chapter briefly describes both the management structure and the stakeholder and public outreach strategy.

Study Management

Reclamation has established a study management structure primarily consisting of a Project Management Team (PMT), Collaborative Interagency Team (CIT), Stakeholder and Public Outreach Team, and various technical teams. Reclamation is the Lead Federal agency for NEPA compliance and DWR is the State Lead agency for CEQA compliance. Responsibilities for each team are summarized below.

Project Management Team

The PMT consists of a Project Manager from both Reclamation and DWR; an interdisciplinary team consisting of engineering, environmental resources, reservoir water operations, public involvement, and project support resources; the consultant team; and representatives from participating resource agencies. The PMT directs work performed by the CIT and technical teams, directs public involvement activities, coordinates general public input, and coordinates results of the Study.

Collaborative Interagency Team

The CIT consists of representatives from the PMT and State and Federal agencies with regulatory and management responsibilities, such as the Service, NMFS, the Corps, DFG, SWRCB, and CVRWQCB. In addition, the San Francisco Bay RWQCB and EPA may engage, to some extent, in the Study. The CIT will be coordinated by the Project Managers and will provide support to the PMT.

Technical Teams

The primary technical focus areas for the Study include water quality, water supply and operations, fisheries, terrestrial biology, and benefits analysis. Representatives from the PMT and CIT will form technical teams to address

these technical areas. Additional technical teams will address other environmental compliance issues.

Stakeholder and Public Outreach Team

The stakeholder outreach team includes representatives from Reclamation, DWR, and the consultant team. This team will initiate two distinct outreach efforts. One will provide outreach targeted to the needs of stakeholders; the other will target the general public.

Interagency Coordination

As mentioned earlier, the Study management structure includes the active participation of numerous State and Federal agencies with regulatory responsibilities. In addition to coordinating study efforts with these agencies, coordination will also take place with Cooperating Agencies in the environmental review process.

Cooperating Agencies

The purpose is to solicit input in the development of the Study early and often from agencies who have technical expertise to assist the PMT in the environmental review process. Reclamation is preparing agreements that identify roles and responsibilities for Cooperating Agencies. Representatives from Cooperating Agencies will work with technical teams and technical work groups in the development of the Study. Coordination with Cooperating Agencies will focus on specific environmental issues such as water quality, water supply and operations, fisheries, and terrestrial biology.

Stakeholder and Public Involvement

The purpose of stakeholder and public involvement is to identify and implement activities and opportunities to inform and engage stakeholders and agencies in the development of the Study. Stakeholder and agency involvement is designed to address issues of interest and concern to stakeholders and agency engaged in local and regional water resource planning efforts. Additionally, public involvement activities will inform the broader public and seek their input into the development of the Study.

The interactive components of the public involvement program focus on involving those with a stake in the outcome of the Study. Stakeholders in the Study area bring a high level of experience and local knowledge to the process, and provide a variety of responses that influence the Study process. Outreach components are designed to provide information and material to a broad group of interested parties. The outreach components disseminate information widely, bring additional stakeholders and interested parties into the process; and

enhance coordination with related water resources planning and management groups.

Public Involvement Goals

The public involvement goals are to:

- Identify and inform stakeholders, agencies, elected officials, community leaders, and general public that are likely to be interested in the Study and its potential approaches/solutions.
- Ensure that these audiences understand the mandate for the Study, technical considerations and constraints, and the development of the Study.
- Solicit and incorporate stakeholder and public input into the development of the Study.
- Develop and implement effective communication processes and tools.

Audiences and Participants

Audiences include Reclamation's water contractors, water agencies, environmental interests, and regulatory agencies that have jurisdiction related to aspects of the DMC Recirculation Project. Additional audiences will include elected officials, regional interests, community leaders, recreation, the media, and the broader public in the geographic area. A mailing list of stakeholders and interested persons has been developed for the purposes of distributing Information and meeting notices, as well as ensuring that a broad range of interests are informed of the development of the project. The mailing list will continue to be updated as interest in the Study grows.

Stakeholder Workshops

As previously mentioned, stakeholders bring a high level of experience and local knowledge to the process. Workshops have had, and will continue to have a major role in engaging stakeholders into overall Study process. A series of workshops (see Table 10-1) has been held to date with future workshops to be scheduled at critical milestones in the Study. Workshops have been held to explain the results of efforts done to date, and gain input of future Study efforts.

Table 10-1. Stakeholder Workshops to Date

Date/Location	Purpose
March 10, 2006 Modesto, California	Solicit stakeholder input on issues and concerns prior to preparing POS
November 17, 2006 Modesto, California	Provide study update; engage stakeholders in the development of the Study
December 12, 2006 Modesto, California	Engage stakeholders in the development of alternatives to be considered in the Study
February 9, 2007 Modesto, California	Engage stakeholders in identification of baseline assumptions and evaluation criteria to be considered as part of the IAIR

Key:
POS = Plan of Study IAIR = Initial Alternatives Information Report

Public Scoping

Public scoping meetings were held in April 2007 (see Table 10-2) to solicit public, stakeholder, and agency input on the alternatives, concerns, and issues to be address in the EIS/EIR. A Notice of Intent to prepare an EIS/EIR was published in the Federal Register on March 30, 2007, and a Notice of Preparation was filed with the California State Clearing House on March 28, 2007. The scoping meetings provided an introduction and overview of the DMC Recirculation Project; information on the planning process, alternatives development, and environmental resources; and provided opportunities for input.

Table 10-2. Public Scoping Meetings

Date/Time	Location
Monday, April 16, 2007 10 a.m. – 12 Noon	Federal Building, 2800 Cottage Way, Cafeteria Rooms C-1001 and C-1002, Sacramento, California
Monday, April 16, 2007 6 p.m. – 8 p.m.	Miller and Lux Senior Center Building, 830 6th Street, Los Banos, California
Tuesday, April 17, 2007 6 p.m. – 8 p.m.	Modesto Centre Plaza, 100 I Street, Pistache Room Modesto, California

A scoping report, consistent with Reclamation guidance and in compliance with NEPA and CEQA requirements, will be prepared. It will describe agency and public comments received on the scope of the EIS/EIR, the Study's approach to incorporating these comments into the environmental review process. Written comments received at the scoping meetings or submitted via letter, fax, and email during the comment period will be included in the scoping report.

Briefings

Briefings will be scheduled with elected officials and/or their staff to provide Study updates. The Stakeholder and Public Outreach Team, along with the PMT, will coordinate briefings as needed. Elected officials will also be kept informed of the development of the Study through the distribution of Study materials. Briefings may also be scheduled with other interested groups or organizations.

Information Materials

Information materials to be developed and distributed include:

Briefing Packet

Briefing packets will be developed and distributed to elected officials, media, and interested persons to establish a base of information on the Study. It will include facts sheets, graphics, and information about the public review process, a study schedule, and contact information.

Updates

A series of Study updates will be developed at key milestones, (i.e., release of the IAIR, Plan Formulation Report, EIS/EIR, Feasibility Report, etc.).

Websites

The Study websites contain background and current information, Study documents, public and stakeholder meetings and materials; updates; and serves as a vehicle for providing input. The following are the Study website URL addresses:

www.usbr.gov/mp/dmcrecirc/index.html
http://baydeltaoffice.water.ca.gov/sdb/recirc/index_recirc.cfm

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Chapter 11
Future Actions

Plan Formulation

Plan formulation will continue following release of the IAIR with the preparation of the PFR. The purpose of the PFR is to further refine, compare, and evaluate the initial alternatives. The PFR will include water supply modeling to quantify the timing and amount of recirculation that can be achieved under the different alternatives.

The change in physical characteristics (flow and quality) at various locations in the system will be used as the basis for the environmental analysis for key resources for each alternative. These alternatives will be compared to each other and the No-Action Alternative and existing conditions to assist in both further refinement of selected alternatives and development of cost and benefits.

Schedule

The schedule for major documents is presented below. Additional stakeholder workshops will be held to inform stakeholders of progress and obtain input on at key decision points.

PFR – mid 2008
Draft EIS/EIR – late 2008
Feasibility Report – mid 2009
Final EIS/EIR – mid 2009
ROD and NOD – mid 2009

Figure 11-1 presents a report schedule timeline.

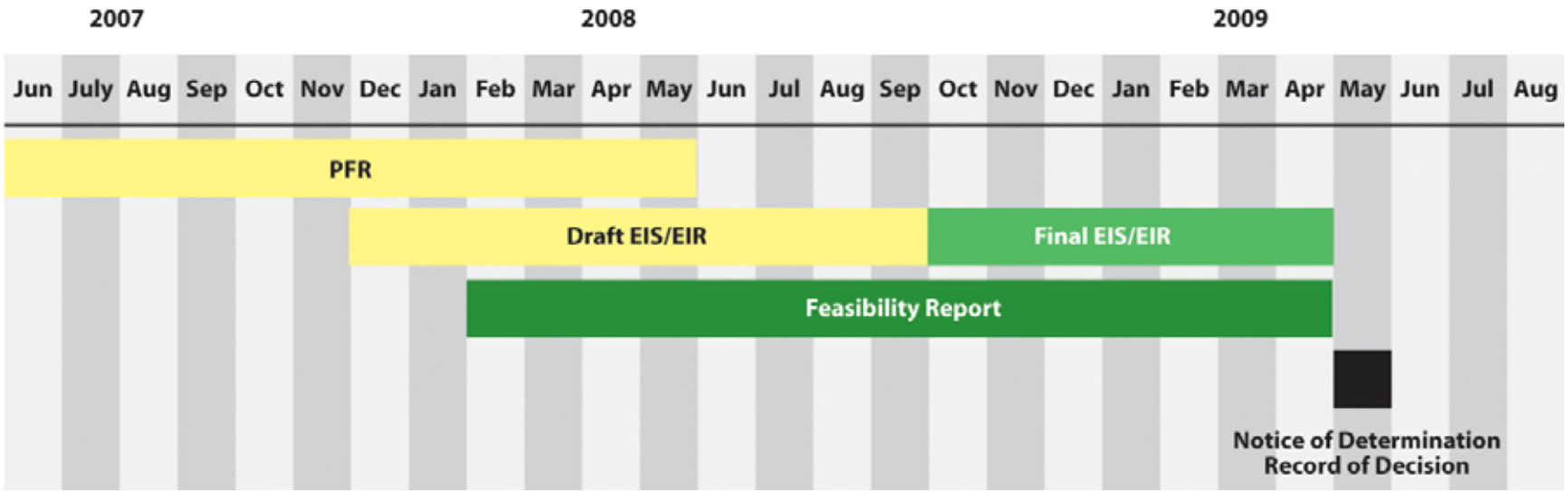

Figure 11-1. Report Schedule Timeline

Chapter 12
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Appendix
CalSIM II Inputs (CACMP-Version 8D)

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CalSim II Inputs (CACMP – Version 8D)

	Existing Condition Assumption	Future No-Action Condition Assumption	Future Condition Assumption – Supplemental No. 1
Planning horizon	2004[1]	2030[1]	Same as existing conditions assumption
Demarcation date	June 1, 2004[1]	Same as existing conditions assumption	Same as existing conditions assumption
Period of simulation	82 years (1922–2003)	Same as existing conditions assumption	Same as existing conditions assumption
HYDROLOGY			
Level of development	2005 level[2]	2030 level[3]	Same as existing conditions assumption
Sacramento Valley (excluding American River)			
CVP	Land-use based, limited by contract amounts[4]	Same as existing conditions assumption	Same as existing conditions assumption
SWP (FRSA)	Land-use based, limited by contract amounts[5]	Same as existing conditions assumption	Same as existing conditions assumption
Nonproject	Land-use based	Same as existing conditions assumption	Same as existing conditions assumption
Federal refuges	Recent historical Level 2 deliveries[6]	Firm Level 2 water needs[6]	Same as existing conditions assumption
American River			
Water rights	2004[7]	Sacramento Area Water Forum[7,8]	Same as existing conditions assumption
CVP	2004[7]	Sacramento Area Water Forum (PCWA modified)[7,8]	Same as existing conditions assumption
PCWA	No CVP contract water supply	35,000 AF CVP contract supply diverted at the new American River PCWA Pump Station	Same as existing conditions assumption
San Joaquin River[9]			
Friant Unit	Limited by contract amounts, based on current allocation policy	Same as existing conditions assumption	Same as existing conditions assumption
Lower Basin	Land-use based, based on district-level operations and constraints	Same as existing conditions assumption	Same as existing conditions assumption
Stanislaus River	Land-use based, based on New Melones Interim Plan of Operations[10]	Same as existing conditions assumption	Same as existing conditions assumption

CalSim II Inputs (CACMP – Version 8D)

	Existing Condition Assumption	Future No-Action Condition Assumption	Future Condition Assumption – Supplemental No. 1
South of Delta (CVP/SWP project facilities)			
CVP	Demand based on contracts amounts[4]	Same as existing conditions assumption	Same as existing conditions assumption
Contra Costa Water District	124,000 AF CVP contract supply and water rights[11]	195,000 AF CVP contract supply and water rights[11]	Same as Future No-Action Condition assumption
SWP	Demand varies based pattern used for 2004 OCAP today studies; Table A transfers that occurred in 2005 and 2006 are not included	Demand based on full Table A amounts[5,12]	Same as Future No-Action Condition assumption
Article 56	Based on 2002–2006 contractor requests	Same as existing conditions assumption	Same as existing conditions assumption
Article 21	MWD demand up to 100,000 AF/month from December to March, total of other demands up to 84,000 AF/month in all months[5,12]	MWD demand unlimited but subject to capacity to convey and deliver; KCWA demand of up to 2,555 cfs; others same as existing	Same as Future No-Action Condition assumption
Federal refuges	Recent historical Level 2 deliveries[6]	Firm Level 2 water needs[6]	Same as Future No-Action Condition assumption
FACILITIES			
System wide	Existing facilities[1]	Same as existing conditions assumption	Same as existing conditions assumption
Sacramento Valley			
Shasta Lake	Existing, 4,552,000 AF capacity	Same as existing conditions assumption	Same as existing conditions assumption
Colusa Basin	Existing conveyance and storage facilities	Same as existing conditions assumption	Same as existing conditions assumption
Upper American River	PCWA American River pump station not included[13]	PCWA American River pump station included	Same as Future No-Action Condition assumption
Lower Sacramento River	Freeport Regional Water Project not included	Freeport Regional Water Project included	Same as Future No-Action Condition assumption

CalSim II Inputs (CACMP – Version 8D)

	Existing Condition Assumption	Future No-Action Condition Assumption	Future Condition Assumption – Supplemental No. 1
Delta Region			
SWP Banks Pumping Plant	6,680 cfs capacity[1]	Same as existing conditions assumption	8,500 cfs capacity[1]
CVP Jones Pumping Plant	4,200 cfs plus diversions upstream of DMC constriction	4,600 cfs capacity in all months (allowed for by the DMC –California Aqueduct Intertie)	Same as Future No-Action Condition assumption
Los Vaqueros Reservoir	Existing storage capacity, 100,000 AF, (Alternative Intake Project not included)	Existing storage capacity, 100,000 AF; Alternate Intake Project included[14]	Same as Future No-Action Condition assumption
San Joaquin River			
Millerton Lake (Friant Dam)	Existing, 520,000 AF capacity	Same as existing conditions assumption	Same as existing conditions assumption
South of Delta (CVP/SWP project facilities)			
South Bay Aqueduct Enlargement	None	430 cfs capacity from junction with California Aqueduct to Alameda County FC&WSD Zone 7 diversion point	Same as Future No-Action Condition assumption
California Aqueduct East Branch Enlargement	None	None	Same as existing conditions assumption
WATER MANAGEMENT ACTIONS (CALFED)			
Water Transfer Supplies (available long term program)			
Phase 8[15]	None	Supplies up to 185,000 AF/year from new groundwater substitution, with 60% going to SWP and 40% to CVP[16]	Same as Future No-Action Condition assumption
Lower Yuba River Accord	Not included	Not included	Same as existing conditions assumption

CalSim II Inputs (CACMP – Version 8D)

	Existing Condition Assumption	Future No-Action Condition Assumption	Future Condition Assumption – Supplemental No. 1
REGULATORY STANDARDS			
Trinity River			
Minimum flow below Lewiston Dam	Trinity EIS Preferred Alternative (369,000–815,000 AF/year)	Same as existing conditions assumption	Same as existing conditions assumption
Trinity Reservoir end-of-September minimum storage	Trinity EIS Preferred Alternative (600,000 AF as able)	Same as existing conditions assumption	Same as existing conditions assumption
Clear Creek			
Minimum flow below Whiskeytown Dam	Downstream water rights, 1963 Reclamation Proposal to the Service and National Park Service, and the Service's discretionary use of CVPIA 3406(b)(2)	Same as existing conditions assumption	Same as existing conditions assumption
Upper Sacramento River			
Shasta Lake end-of-September minimum storage	D-1993 winter run biological opinion (1,900,000 AF)	Same as existing conditions assumption	Same as existing conditions assumption
Minimum flow below Keswick Dam	Flows for D-90-5 and the Service's discretionary use of CVPIA 3406(b)(2)	Same as existing conditions assumption	Same as existing conditions assumption
Feather River			
Minimum flow below Thermalito Diversion Dam	1983 DWR–DFG Agreement (600 cfs)	Same as existing conditions assumption	Same as existing conditions assumption
Minimum flow below Thermalito Afterbay outlet	1983 DWR–DFG Agreement (750-1,700 cfs)	Same as existing conditions assumption	Same as existing conditions assumption
Yuba River			
Minimum flow below Daguerre Point Dam	Interim D-1644 Operations[17]	Same as existing conditions assumption	Same as existing conditions assumption

CalSim II Inputs (CACMP – Version 8D)

	Existing Condition Assumption	Future No-Action Condition Assumption	Future Condition Assumption – Supplemental No. 1
American River			
Minimum flow below Nimbus Dam	D-893[18] (see accompanying Operations Criteria), and the Service's discretionary use of CVPIA 3406(b)(2)	Same as existing conditions assumption	Same as existing conditions assumption
Minimum Flow at H Street Bridge	D-893	Same as existing conditions assumption	Same as existing conditions assumption
Lower Sacramento River			
Minimum flow near Rio Vista	D-1641	Same as existing conditions assumption	Same as existing conditions assumption
Mokelumne River			
Minimum flow below Camanche Dam	FERC 2916-029, 1996 (Joint Settlement Agreement) (100-325 cfs)	Same as existing conditions assumption	Same as existing conditions assumption
Minimum flow below Woodbridge Diversion Dam	FERC 2916-029, 1996 (Joint Settlement Agreement) (25-300 cfs)	Same as existing conditions assumption	Same as existing conditions assumption
Stanislaus River			
Minimum flow below Goodwin Dam	1987 Reclamation–DFG agreement, and Service discretionary use of CVPIA 3406(b)(2)	Same as existing conditions assumption	Same as existing conditions assumption
Minimum dissolved oxygen	D-1422	Same as existing conditions assumption	Same as existing conditions assumption
Merced River			
Minimum flow below Crocker-Huffman Diversion Dam	Davis-Grunsky (180-220 cfs, Nov-Mar), Cowell Agreement, and FERC 2179 (25-100 cfs)	Same as existing conditions assumption	Same as existing conditions assumption
Tuolumne River			
Minimum flow at Lagrange Bridge	FERC 2299-024, 1995 (Settlement Agreement) (94,000–301,000 AF/year)	Same as existing conditions assumption	Same as existing conditions assumption

CalSim II Inputs (CACMP – Version 8D)

	Existing Condition Assumption	Future No-Action Condition Assumption	Future Condition Assumption – Supplemental No. 1
San Joaquin River			
San Joaquin River below Friant Dam/Mendota Pool	None	None	None
Maximum salinity near Vernalis	D-1641	Same as existing conditions assumption	Same as existing conditions assumption
Minimum flow near Vernalis	D-1641, and VAMP per SJRA	Same as existing conditions assumption[19]	Same as existing conditions assumption [19]
Sacramento River–San Joaquin River Delta			
Delta Outflow Index (Flow and Salinity)	D-1641	Same as existing conditions assumption	Same as existing conditions assumption
Delta Cross Channel gate operation	D-1641	Same as existing conditions assumption	Same as existing conditions assumption
Delta exports	D-1641, the Service's discretionary use of CVPIA 3406(b)(2)	Same as existing conditions assumption	Same as existing conditions assumption
OPERATIONS CRITERIA: RIVER-SPECIFIC			
Upper Sacramento River			
Flow objective for navigation (Wilkins Slough)	3,500–5,000 cfs based on CVP water supply condition	Same as existing conditions assumption	Same as existing conditions assumption
American River			
Folsom Dam flood control	Variable 400/670 flood control diagram (without outlet modifications)	Same as existing conditions assumption	Same as existing conditions assumption
Flow below Nimbus Dam	Discretionary operations criteria corresponding to D-893 required minimum flow	Same as existing conditions assumption	Same as existing conditions assumption
Sacramento Area Water Forum Mitigation Water	None	Up to 47,000 AF in dry years	Same as existing conditions assumption

CalSim II Inputs (CACMP – Version 8D)

	Existing Condition Assumption	Future No-Action Condition Assumption	Future Condition Assumption – Supplemental No. 1
Feather River			
Flow at Mouth of Feather River (above Verona)	Maintain DFG/DWR flow target of 2,800 cfs for Apr-Sep dependent on Oroville inflow and FRSA allocation	Same as existing conditions assumption	Same as existing conditions assumption
Stanislaus River			
Flow below Goodwin Dam	1997 New Melones Interim Plan of Operations	Same as existing conditions assumption	Same as existing conditions assumption
San Joaquin River			
Salinity at Vernalis	D-1641	SJR Salinity Management Plan[20]	Same as Future No-Action Condition assumption
OPERATIONS CRITERIA: SYSTEMWIDE			
CVP water allocation			
CVP Settlement and Exchange	100%(75 % in Shasta critical years)	Same as existing conditions assumption	Same as existing conditions assumption
CVP refuges	100% (75 % in Shasta critical years)	Same as existing conditions assumption	Same as existing conditions assumption
CVP agriculture	100-0% based on supply (South-of-Delta allocations are reduced due to D-1641 and 3406(b)(2) allocation-related export restrictions)	Same as existing conditions assumption	Same as existing conditions assumption
CVP M&I	100-50% based on supply (South-of-Delta allocations are reduced due to D-1641 and 3406(b)(2) allocation-related export restrictions)	Same as existing conditions assumption	Same as existing conditions assumption
SWP water allocation			
North of Delta (FRSA)	Contract-specific	Same as existing conditions assumption	Same as existing conditions assumption
South of Delta (including North Bay Aqueduct)	Based on supply; equal prioritization between agriculture and M&I based on Monterey Agreement	Same as existing conditions assumption	Same as existing conditions assumption

CalSim II Inputs (CACMP – Version 8D)

	Existing Condition Assumption	Future No-Action Condition Assumption	Future Condition Assumption – Supplemental No. 1
CVP-SWP coordinated operations			
Sharing of responsibility for in-basin use	1986 COA (2/3 of the North Bay Aqueduct diversions are considered as Delta Export, 1/3 of the North Bay Aqueduct diversion is considered as in-basin use)	1986 COA (FRWP EBMUD and 2/3 of the North Bay Aqueduct diversions are considered as Delta export, 1/3 of the North Bay Aqueduct diversion is considered as in-basin use)	Same as Future No-Action Condition assumption
Sharing of surplus flows	1986 COA	Same as existing conditions assumption	Same as existing conditions assumption
Sharing of restricted export capacity for project-specific priority pumping	Equal sharing of export capacity under D-1641; use of CVPIA 3406(b)(2) restricts only CVP exports	Same as existing conditions assumption	Same as existing conditions assumption
Dedicated CVP conveyance at Banks Pumping Plant	None	SWP to convey 50,000 AF/year of Level 2 refuge water supplies at Banks Pumping Plant (July and August)	SWP to convey 100,000 AF/year of Level 2 refuge water supplies at Banks Pumping Plant (July and August)
North-of-Delta accounting adjustments	None	CVP to provide the SWP a maximum of 375,000 AF/year of water to meet in-basin requirements through adjustments in 1986 COA accounting (released from Shasta)	CVP to provide the SWP a maximum of 75,000 AF/year of water to meet in-basin requirements through adjustments in 1986 COA accounting (released from Shasta)
Sharing of export capacity for lesser priority and wheeling-related pumping	Cross Valley Canal wheeling (maximum of 128,000 AF/year), CALFED ROD defined Joint Point of Diversion	Same as existing conditions assumption	Same as existing conditions assumption
San Luis Low Point	SLR is allowed to operate to a minimum storage of 100,000 AF.	Same as existing conditions assumption	Same as existing conditions assumption
CVPIA 3406(b)(2)			
Policy Decision	Per May 2003 Interior Decision	Same as existing conditions assumption	Same as existing conditions assumption
Allocation	800,000 AF, 700,000 AF in 40-30-30 dry years, and 600,000 AF in 40-30-30 critical years	Same as existing conditions assumption	Same as existing conditions assumption

CalSim II Inputs (CACMP – Version 8D)

	Existing Condition Assumption	Future No-Action Condition Assumption	Future Condition Assumption – Supplemental No. 1
CVPIA 3406(b)(2) (continued)			
Actions	1995 Basin Plan, upstream fish flow objectives (Oct-Jan), VAMP (Apr 15-May 15) CVP export restriction, 3,000 cfs CVP export limit in May and June (D-1485 striped bass cont.), post-VAMP (May 16-31) CVP export restriction, ramping of CVP export (June), upstream releases (Feb-Sep)	Same as existing conditions assumption	Same as existing conditions assumption
Accounting adjustments	Per May 2003 Interior decision, no limit on responsibility for nondiscretionary D-1641 requirements with 500,000 AF target, no reset with the storage metric and no offset with the release and export metrics, 200,000 AF target on costs from Oct-Jan	Same as existing conditions assumption	Same as existing conditions assumption

Notes:

[1] A detailed description of the assumptions selection criteria and policy basis used is included in the policy section of this CACMP report.

[2] The Sacramento Valley hydrology used in the Existing Conditions CalSim II model reflects nominal 2005 land-use assumptions. The nominal 2005 land-use was determined by interpolation between the 1995 and projected 2020 land-use assumptions associated with Bulletin 160-98. The San Joaquin Valley hydrology reflects 2005 land-use assumptions developed by Reclamation to support Reclamation studies.

[3] The Sacramento Valley hydrology used in the Future No-Action CalSim II model reflects 2020 land-use assumptions associated with Bulletin 160-98. The San Joaquin Valley hydrology reflects draft 2030 land-use assumptions developed by Reclamation to support Reclamation studies.

[4] CVP contract amounts have been reviewed and updated according to existing and amended contracts as appropriate. Assumptions regarding CVP agricultural and M&I service contracts and Settlement Contract amounts are documented in Table 4 (North of Delta) and 6 (South of Delta) of Appendix B: CACMP Delivery Specifications.

[5] SWP contract amounts have been reviewed and updated as appropriate. Assumptions regarding SWP agricultural and M&I contract amounts are documented in Table 2 (North of Delta) and Table 3 (South of Delta) of Appendix B: CACMP Delivery Specifications.

[6] Water needs for Federal refuges have been reviewed and updated as appropriate. Assumptions regarding firm Level 2 refuge water needs are documented in Table 4 (North of Delta) and 6 (South of Delta) of Appendix B: CACMP Delivery Specifications. As part of the Water Transfers technical memorandum (Appendix A: Characterization and Quantification), incremental Level 4 refuge water needs have been documented as part of the assumptions of future water transfers.

[7] Assumptions regarding American River water rights and CVP contracts are documented in Table 5 of Appendix B: CACMP Delivery Specifications.

[8] Sacramento Area Water Forum 2025 assumptions are defined in Sacramento Water Forum's EIR. PCWA CVP contract supply is modified to be diverted at the PCWA pump station. Assumptions regarding American River water rights and CVP contracts are documented in Table 4 of Appendix B: PFCMP Delivery Specifications.

[9] The new CalSim II representation of the SJR has been included in this model package (CalSim II San Joaquin River Model, [Reclamation 2005]). Updates to the SJR have been included since the preliminary model release in August 2005. In addition, a dynamic groundwater simulation is currently being developed for SJR valley, but is not yet implemented. Groundwater extraction/recharge and stream-groundwater interaction are static assumptions and may not accurately reflect a response to simulated actions. These limitations should be considered in the analysis of results.

[10] The CACMP CalSim II model representation for the Stanislaus River does not necessarily represent Reclamation's current or future operational policies.

[11] The Existing CVP contract is 140,000 AF. The actual amount diverted is reduced due to supplies from the Los Vaqueros project. The existing Los Vaqueros storage capacity is 100,000 AF. Associated water rights for Delta excess flows are included.

[12] Table A and Article 21 deliveries into the San Francisco Bay Area Region–South and South Coast Region in the CACMP are a result of interaction between CalSim II and LCPSIM. More information regarding LCPSIM is included in the following subsection of this document and the CalSim-LCPSIM Integration technical memorandum (see Appendix C: Analytical Framework).

[13] PCWA American River pumping facility upstream of Folsom Lake is under construction. A Sacramento River diversion for PCWA is not included in the PFCMP. This assumption will be revisited as part of the development of the Feasibility Study Common Models Package.
[14] The Contra Costa Water District Alternate Intake Project is a new intake at Victoria Canal to operate as an alternate intake for Los Vaqueros Reservoir. This assumption is consistent with the future no-project condition defined by the Los Vaqueros Enlargement study team.
[15] Mokelumne River flows reflect EBMUD supplies associated with the Freeport Regional Water Project.
[16] This Phase 8 requirement is assumed to be met through Sacramento Valley Water Management Agreement Implementation.
[17] Interim D-1644 is assumed to be implemented
[18] Sacramento Area Water Forum Lower American River Flow Management Standard is not included in the CACMP. Reclamation has agreed in principle to the Flow Management Standard, but flow specifications are not yet available for modeling purposes.
[19] It is assumed that either VAMP, a functional equivalent, or D-1641 requirements would be in place in 2030.
[20] The CACMP CalSim II model representation for the SJR does not explicitly implement the CALFED Salinity Management Plan

Key:
AF = acre-feet
cfs = cubic feet per second
CACMP = Common Assumptions Common Models Package
COA = Coordinated Operations Agreement
CVP = Central Valley Project
CVPIA = Central Valley Project Improvement Act
D-xxxx = State Water Resources Control Board Water Right Decision
DFG = California Department of Fish and Game
DMC = Delta-Mendota Canal
DWR = California Department of Water Resources
EBMUD = East Bay Municipal Utility District
FC&WSD = Flood Control and Water Supply District
FERC = Federal Energy Regulatory Commission
FRSA = Feather River Service Area
FRWP = Freeport Regional Water Authority
FSCMP = Feasibility Study Common Models Package
KCWA = Kern County Water Authority
LCPSIM = Least Cost Pricing Simulation Model
M&I = municipal and industrial
MWD = Metropolitan Water District of Southern California
OCAP = Operations Criteria and Plan
PCWA = Placer County Water Authority
PFCMP = Plan Formulation Report Common Models Package
ROD = Record of Decision
SJR = San Joaquin River
SJRA = San Joaquin River Agreement
SLR = San Luis Reservoir
SWP = State Water Project
Service = U.S. Fish and Wildlife Service
VAMP = Vernalis Adaptive Management Plan