



## Memorandum

Date: September 30, 1998

To: Agency Liaisons

From: Mark Cowin, Assistant Director  
*mul*  
Program Modeling and Storage and Conveyance Branch

Subject: Early Review Draft of Storage and Conveyance Refinement Process Overview

Attached for your review and comment is the early review draft of the Storage and Conveyance Refinement Process Overview. This report outlines the technical studies related to storage and conveyance facilities conducted in support of the revised draft Programmatic EIS/EIR. Summary responses to public comments related to storage and conveyance facilities are also included. Comments on the draft should be directed to me in Room 1148, Resources Building, by Friday, October 16, 1998.

If you have any questions, please call me at (916) 653-2986 or Dave Samson at (916) 653-9715.

Attachment

---

**CALFED Agencies**

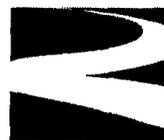
**California** The Resources Agency  
Department of Fish and Game  
Department of Water Resources  
California Environmental Protection Agency  
State Water Resources Control Board

**Federal** Environmental Protection Agency  
Department of the Interior  
Fish and Wildlife Service  
Bureau of Reclamation  
U.S. Army Corps of Engineers

Department of Agriculture  
Natural Resources Conservation Service  
Department of Commerce  
National Marine Fisheries Service

# **Storage and Conveyance Refinement Process Overview**

**Early Review Draft  
September 30, 1998**



**CALFED  
BAY-DELTA  
PROGRAM**

# TABLE OF CONTENTS

	<u>Page Number</u>
<b>Introduction</b>	1
<b>Original Storage and Conveyance Studies</b>	2
Operation and Delta Simulation Modeling	2
Operational Parameters for CALFED Alternatives	2
Spreadsheet Post-Processing Model	3
System Operation Modeling	3
Delta Simulation Modeling	6
Preliminary Cost and Feasibility Studies	8
Facilities Inventory	8
Facility Description and Cost Estimates	9
Technical Studies	10
Groundwater	10
Flood Control Reoperation	10
<b>New or Updated Storage and Conveyance Studies</b>	10
Operation and Delta Simulation Modeling	10
System Operation Modeling	11
Delta Simulation Modeling	13
Revised or Additional Cost and Feasibility Studies	15
Ongoing Storage and Conveyance Screening Process	15
Storage and Conveyance Component Cost Estimates	16
Delta Consumptive Use from an Isolated Facility	16
Isolated Facility with an Incised Canal Configuration	17
Additional Technical Studies	17
Preliminary Flood Study of the North Delta	17
North Delta Flood Control Scenarios	17
Depletion Analyses of Agricultural vs. Wetlands Water Use	18
<b>DEFT Technical Support</b>	18
DEFT Delta Alternative Evaluations	19
DEFT Stage I Implementation Evaluations	20
<b>Economic Evaluation of Water Management Alternatives</b>	21
Scenario Development	21
Impact Analysis	21
Western San Joaquin Valley Economic Modeling	22
Study Activities	22
<b>General Responses to Comments</b>	26

## TABLES

	<u>Page Number</u>
1. <b>Original CALFED Phase II Storage and Conveyance Refinement Process Reports</b>	<b>24</b>
2. <b>Updated or Additional CALFED Phase II Storage and Conveyance Refinement Process Reports</b>	<b>25</b>

# CALFED Phase II Storage and Conveyance Refinement Process Overview

---

## INTRODUCTION

The CALFED Bay-Delta Program has been developing and analyzing a series of comprehensive alternative solutions to Bay-Delta problems over the past several years. In Phase I, completed in September of 1996, CALFED identified the problems confronting the Bay-Delta system, developed a mission statement and guiding principles, and formulated three basic approaches to solving the identified problems. In Phase II, CALFED has refined the preliminary alternatives and is conducting a comprehensive programmatic evaluation and environmental review. In Phase III, the Program will be implemented. Phase III is expected to begin in 2000 and proceed over the next 20 to 30 years and will include any site-specific environmental review and permitting.

Each alternative studied during Phase II includes programs for ecosystem restoration, water quality, levee and channel integrity, water use efficiency, water transfers, and watershed management. In addition, each alternative includes options for storage and Delta conveyance. Through the Storage and Conveyance Refinement Process, CALFED has conducted technical evaluations of the benefits, costs, and impacts of a wide variety of storage facilities and Delta conveyance configurations. This work has been undertaken in a uniquely open public process with the participation of a wide variety of public agencies, stakeholder groups, and interested individuals.

CALFED released a Draft Programmatic Environmental Impact Statement /Environmental Impact Report (DEIS/EIR) in March 1998. Foundational work completed through the Storage and Conveyance Refinement Process was used as technical input to the DEIS/EIR. This work included the following primary activities:

- ♦ Evaluation of general operating parameters through hydrologic and Delta simulation modeling.
- ♦ Evaluation of capacities and dimensions of storage and conveyance components.
- ♦ Development of preliminary cost estimates for the storage and conveyance components and common programs.
- ♦ Preliminary evaluations to determine the feasibility of specific sites for locating the various program components.

Since the March 1998 release of the DEIS/EIR, CALFED has continued work on the Storage and Conveyance Refinement Process with a focus on the following tasks:

- Updating and expanding storage and conveyance studies.
- Providing technical support for the Diversion Effects on Fisheries Team (DEFT) process.

- Initiating an economic Evaluation of Water Management Alternatives.
- Responding to public comments.

CALFED storage and conveyance reports prepared prior to the release of the original DEIS/EIR are described and summarized in Table 1. Additional storage and conveyance activities and reports, conducted after the release of the original DEIS/EIR, are described and summarized in Table 2. A summary of the Diversion Effects on Fisheries Team process, the Economic Evaluation of Water Management Alternatives study, and responses to public comments on the DEIS/EIR related to storage and conveyance issues are also included in this Appendix.

## **ORIGINAL STORAGE AND CONVEYANCE STUDIES**

The initial release of the DEIS/EIR documented the progress of the Storage and Conveyance Refinement process to March 1998. Considerable technical work was included in the Phase II evaluation, providing a framework that consists of operation and Delta modeling studies, preliminary cost and feasibility studies, and technical studies. An outline of the original storage and conveyance studies, as provided in the March 1998 DEIS/EIR, is described below.

### **Operation and Delta Simulation Modeling**

One of the most fundamental objectives of the Storage and Conveyance Refinement Process was to devise fair and reasonable operation rules for an equitable evaluation of the CALFED alternatives. During 1996, CALFED solicited input on proposed operating concepts over a six-month period, which was incorporated in the evaluation. These concepts were defined in a "Storage and Conveyance Alternative Component Refinement Process" document dated September 5, 1996. This document was a catalyst for the Phase II storage and conveyance hydrologic and hydrodynamic modeling activities, which consisted of 1) refining operational parameters for CALFED alternatives, 2) spreadsheet post-processing operation modeling, 3) system operation modeling, and 4) delta simulation modeling.

***Operational Parameters for CALFED Alternatives:*** Any water resource planning evaluation must be initiated by first establishing a set of operational assumptions for diverting, releasing, and allocating water in the system. For a complete evaluation of CALFED alternatives, it was necessary to fully explore the interaction of storage and conveyance components as measured by the full range of CALFED goals. Input from the CALFED agencies and stakeholder community as to the appropriate range of operating concepts was integrated into an operation plan for modeling the alternatives. These initial concepts were defined in a "Storage and Conveyance Alternative Component Refinement Process," document dated September 5, 1996. A compilation of suggestions from stakeholders for system operating parameters along with a description of the alternatives for the Programmatic EIS/EIR were presented at a CALFED Storage and Conveyance Workshop on March 20, 1997. This information is documented in the "Status Reports on Technical Studies for the Storage and Conveyance Refinement Process," dated March 20, 1997. Updates on initial spreadsheet post-processing modeling, system operation modeling, and Delta modeling were also included in the status report.

Based on the initial hydrologic and Delta hydrodynamic studies, more refined operating rules were prepared for the alternatives and described in the "CALFED Bay-Delta Program System Operation Modeling Plan" (Operation Modeling Plan), dated on July 23, 1997. Again, input from the CALFED agencies and stakeholder community was integrated into this plan. The Operation Modeling Plan describes the assumptions for existing conditions, no action and the Program Alternatives and DWRSIM program modifications necessary to evaluate the alternative components. The operation assumptions in the Operation Modeling Plan were presented at a Storage and Conveyance Workshop on June 25, 1997 by CALFED staff.

**Spreadsheet Post-Processing Model:** Initial evaluations of potential new storage components were analyzed using the CALFED Post-Processing Operation Model. This tool was used to conduct preliminary evaluations to help guide the overall storage and conveyance study effort. These evaluations included sensitivity analyses of operational parameters, as well as storage and conveyance facilities. Environmental, agricultural, and urban water supply benefits were depicted in this model. The model provided a suitable method for analyzing the general effects of various storage operational rules and goals, identifying critical external constraints, and providing initial refinement to the ranges of storage and conveyance capacities to be considered in more detailed system operation studies.

The initial sensitivity evaluation of operational parameters and storage capacities using the CALFED Post-Processing Operation Model was presented at a Storage and Conveyance Workshop on March 20, 1997 by CALFED staff, and documented in the "Status Reports on Technical Studies for the Storage and Conveyance Refinement Process". CALFED also completed two reports summarizing the sensitivity of various operational parameters and physical capacities of potential new storage and conveyance facilities using the spreadsheet-based CALFED Post-Processing Model. These reports are:

"Status Report on Technical Studies for the Storage and Conveyance Refinement Process: Evaluation of Upstream Storage and South of Delta Off-Aqueduct Storage Using the CALFED Post-Processing Spreadsheet Operations Model", dated May 9, 1997.

"Status Report on Technical Studies for the Storage and Conveyance Refinement Process: Combined Environmental – Agricultural and Urban Water Supply Evaluation using the CALFED Post-Processing Spreadsheet Operations Model", dated May 12, 1997.

**System Operation Modeling:** Each new facility must fit into California's existing water management system. System modeling tools, such as DWRSIM, can be used to explore the effects of new facilities on water supplies, channel flows, and reservoir elevations. DWRSIM is a water accounting model, which estimates the storage and conveyance of water through the system, in accordance with all the concepts and rules devised to protect the Delta, instream flows, and water supplies.

Efforts to model the various potential CALFED storage and conveyance components using DWRSIM began in the fall of 1996 with model programming modifications and preliminary sensitivity studies. This preliminary work considered combinations of the following storage and conveyance components using the DWRSIM Version 8.41 model: 1) dual Delta conveyance - 5,000 cfs and 15,000 cfs isolated facility, 2) Sacramento River tributary offstream surface storage, and 3) south of Delta off-aqueduct surface storage. Initial results were presented at a Storage and Conveyance Workshop on March 20, 1997 by DWR staff. The "Status Reports on Technical Studies for the Storage and Conveyance Refinement Process," dated March 20, 1997, documents the preliminary system operation modeling conducted with the DWRSIM model.

Additional DWRSIM program modifications and DWRSIM operation studies were required to complete the system operations modeling for the CALFED evaluation of alternatives. CALFED staff prepared a "CALFED Bay-Delta Program Operation Modeling Plan," finalized on July 23, 1997, which characterized the modeling assumptions and program modifications. DWR's Hydrology and Operations Section and a CALFED consultant, Surface Water Resources, Inc (SWRI) conducted these activities. Each new facility component and Environmental Restoration Program Plan (ERPP) flow targets were added to DWRSIM along with operation studies with specific combinations of storage and conveyance facilities to represent the CALFED alternatives.

Two reports titled "Preliminary Results/Evaluation of System Modeling with DWRSIM," dated September 23, 1997, and "A Status Report on System Modeling Using DWRSIM," dated September 24, 1997, were presented by CALFED, DWR, and SWRI at a Storage and Conveyance Workshop on September 24, 1997. These reports describe 1) the development of 2020-level of development hydrology, 2) the development of new DWRSIM model features, and 3) the preliminary results of the system operation studies. This preliminary work represented combinations of the following alternative components using the DWRSIM Version 9.04 model:

- ♦ 5,000 cfs Isolated Facility
- ♦ Environmental Sacramento River tributary offstream surface storage
- ♦ Agricultural/Urban Sacramento River tributary offstream surface storage
- ♦ South of Delta off-aqueduct surface storage
- ♦ Sacramento Valley and San Joaquin Valley groundwater storage

Following the Storage and Conveyance Workshop in September 1997, DWR and SWRI updated and completed the operation studies described in the operation-modeling plan along with additional sensitivity studies. CALFED staff held a meeting with stakeholders on October 30, 1997 to inform the stakeholder community of the preliminary results and to develop additional sensitivity criteria for system operation analysis. This information was provided in a report titled "CALFED Bay-Delta Program Storage and Conveyance Refinement Process: A Status Report on System Modeling Using DWRSIM," dated October 30, 1997. This preliminary work represented combinations of the following alternative components using DWRSIM Version 9.06 model:

- 5,000 cfs and 15,000 cfs Isolated Facility
- Environmental Sacramento River tributary offstream surface storage
- Environmental San Joaquin offstream surface storage
- Agricultural/Urban Sacramento River tributary offstream surface storage
- South of Delta off-aqueduct surface storage
- In-Delta surface storage
- Sacramento Valley and San Joaquin Valley groundwater storage

In an effort to refine the CALFED Program alternatives and to recommend a draft preferred alternative, CALFED organized an Interagency Development Team (IDT) in October 1997. Several new operational criteria were devised by IDT to further refine CALFED Program alternatives and were modeled by DWR and CALFED staff. To predict the water supply consequences of the alternatives, two operational criteria were analyzed representing a range of possible operational rules that might be necessary to protect the Delta ecosystem. System operation studies were completed both with and without storage for each alternative.

The preliminary results of the sensitivity studies were presented to the CALFED Policy Group in a presentation package titled "CALFED Bay-Delta Program Water Supply Opportunities: Evaluation of Refined Alternatives" on November 24, 1997. A presentation package on the initial evaluation of the alternatives prior to the IDT effort was also presented to the CALFED Policy Group. This presentation package was titled "CALFED Bay-Delta Program Water Supply Opportunities: Initial Evaluation of Alternatives."

At a Storage and Conveyance Workshop on January 22, 1998, the sensitivity studies conducted for IDT and the CALFED Policy Group were presented. The system operation studies were summarized in a report titled "CALFED Bay-Delta Program Storage and Conveyance Refinement Process: A Status Report on System Modeling Using DWRSIM," dated January 22, 1998. These studies represented each of the alternatives with and without additional storage and conveyance facilities. Alternative 3 was evaluated for a range of sizes of an isolated facility (I.F.). New CALFED storage included North Delta Surface Storage (NDSS), South Delta Surface Storage (SDSS), or a combination thereof.

A summary of the original core operation studies is listed below:

<u>Study</u>	<u>Description</u>
558	Existing Conditions
516	No Action
518	Alternative 1A & 1B
609	Alternative 1C (Storage)
528	Alternative 2A
532a	Alternative 2B, 2E (Storage)

530	Alternative 2D (2 MAF SDSS only)
578	Alternative 3A (5k I.F.)
579	Alternative 3B (5k I.F. w/Storage)
595	Alternative 3 - 10k I.F.
567	Alternative 3 - 10k I.F. w/ Storage
580	Alternative 3 - 15k I.F.
581	Alternative 3E & 3I (15k I.F. w/ Storage)

**Delta Simulation Modeling:** DWRDSIM and the spreadsheet models can only estimate in the broadest terms the effects on conditions in the Delta. Delta modeling is required to evaluate the effects of various changes in the Delta due to Delta conveyance configurations and new facilities. Utilizing DWRDSM1 and, later, DWRDSM2, computer-simulated Delta modeling studies were conducted to address various hydrodynamic issues associated with the analysis of Delta impacts. Delta modeling results include flows, velocities, circulation patterns, salinity, and water levels in the south Delta. Circulation patterns are presented using average flow directions and mass tracking studies. Salinity is discussed using end of month total dissolved solids and X2 location.

Efforts to model the various potential CALFED Delta conveyance alternatives using DWRDSM1 began in the fall of 1996 with the initial analysis of six different geometric configurations as summarized below:

- ♦ Existing Delta Geometry
- ♦ Interim South Delta Program Geometry
- ♦ North Delta Program Geometry
- ♦ North Delta Program with Hood Diversion Geometry
- ♦ CUWA Alternative C Geometry
- ♦ Chain-of-Lakes Alternative

The alternative configurations were initially described in the "CALFED Bay-Delta Program Draft Delta Conveyance and Storage Component," dated January 30, 1997. This information was presented at a Storage and Conveyance Workshop on March 20, 1997 by DWR staff and summarized in the "Status Reports on Technical Studies for the Storage and Conveyance Refinement Process". This report represents the preliminary Delta simulation modeling conducted with the DWRDSM1 model along with preliminary efforts to recalibrate the DWRDSM1 (Suisun Marsh Version) model, using both new velocity and channel geometry data collected by USGS.

Using DWRDSM1, simulations of six CALFED Delta configuration alternatives were completed and described in a report titled "Status Reports on Technical Studies for Storage and Conveyance Refinement Process: Delta Simulation Model Studies of Alternatives 1A, 1C, 2B, 2D, 2E and 3E," dated August 4, 1997. Additional information is presented in an addendum titled "CALFED Bay-Delta Program Storage and Conveyance Refinement Process: Addendum and

Errata to Delta Simulation Model Studies of Alternatives 1A, 1C, 2B, 2D, 2E, 3E," dated September 24, 1997. A brief description of the Delta alternative configurations follows:

- *Alternative 1A* – Existing Delta geometry with no changes to any Delta channels or structure
- *Alternative 1C* – Delta change consistent with the preferred alternative for the Interim South Delta Program
- *Alternative 2B* – North Delta improvements, a 10,000 cfs screened Hood intake, and south Delta improvements
- *Alternative 2D* – 10,000 cfs screened Hood intake, eastern Mokelumne River floodway, east Delta habitat, and south Delta habitat
- *Alternative 2E* – Tyler Island Habitat, western Mokelumne River floodway, Dead Horse floodway, east Delta habitat, and south Delta habitat.
- *Alternative 3E* – 15,000 cfs isolated facility at Hood and joined at Clifton Court Forebay south of Victoria Canal

The hydraulics and water quality data for CALFED Alternative 3A and 3B were compiled later in a report titled "Status Reports on Technical Studies for Storage and Conveyance Refinement Process: Delta Simulation Model Studies of Alternatives 3A and 3B," dated October 2, 1997. CALFED Alternatives 3A and 3B assumed a 5,000 cfs isolated facility and South Delta flow control structures. Alternative 3B assumed an in-Delta storage component.

Delta conditions for the CALFED alternatives were simulated by DWRDSM1 using a 16-year water period (1975-91) under a common hydrology from DWRSIM operation study 472B. Study 472B assumed a 1995 level of development and a 2020 level of water demands under the SWRCB 1995 Water Quality Control Plan with permit allowing up to 10,300 cfs pumping at Banks Pumping Plant. This 16-year period represents a wide range of Delta inflows and export conditions.

Recalibration of the Delta Simulation Model 1 (Suisun Marsh Version) was completed in September 1997 by DWR. This process was summarized in a final report titled "Status Reports on Technical Studies for Storage and Conveyance Refinement Process: Recalibration of the Delta Simulation Model I (Suisun Marsh Version)," dated September 4, 1997. This report summarized the geometry revision base on the latest Delta and Bay bathymetry data, and the DSM1 hydrodynamics and salinity recalibration based on the later flow and salinity data.

In an effort to refine the CALFED Program alternatives, additional Delta simulations were conducted using DWR's new Delta simulation model, DWRDSM2. The Delta simulation model included river, estuary, and land modeling improvements described below:

- **River** - Simulates riverine systems, and has been extended from Sacramento to Shasta Dam. Also has been tested with high flow/stage simulations for flood modeling.
- **Estuary** - Completely flexible estuary model; stages and flows may be specified at boundary and internal points.
- **Land** - Includes effects from land-based processes, such as consumptive use and agricultural runoff.

DWRDSM2 calculates stage, flow, velocities, and mass transport processes, including salts, multiple non-conservative constituents, temperature, THM formation potential and individual particles. An analysis of Delta Alternatives 1A, 1C, 2B, 3E and 3X was completed by January 1998 using DWRDSM2 and Delta hydrologies from DWRSIM 516, 531, 532, 551, and 567 respectively. The results from this analysis were compiled into a report titled "Status Report on Technical Studies for the Storage and Conveyance Refinement Process: Delta Simulation Model Studies of Alternatives 1A, 1C, 2B, 3E, 3X," dated January 16, 1998. A summary description of the Delta Alternatives' configurations is as follows:

- **Alternative 1A** – Existing Delta geometry with no changes to any Delta channels or structure
- **Alternative 1C** – Delta change consistent with the preferred alternative for the Interim South Delta Program
- **Alternative 2B** – North Delta improvements, a 10,000 cfs screened Hood intake, and south Delta improvements
- **Alternative 3E** – 15,000 cfs isolated facility at Hood and joined at Clifton Court Forebay south of Victoria Canal with Delta agricultural surface water diversion from the isolated facility
- **Alternative 3X** – 10,000 cfs isolated facility at Hood and joined at Clifton Court Forebay south of Victoria Canal

### **Preliminary Cost and Feasibility Studies**

In addition to conducting operation and Delta model simulation for alternative evaluations, several other storage and conveyance activities were conducted by CALFED. CALFED developed an inventory of storage and conveyance facilities along with more detailed facility studies and cost estimates.

**Facilities Inventory:** One of the primary objectives of the Storage and Conveyance Refinement Process has been the development of inventories of storage and conveyance opportunities. In developing the storage and conveyance component inventories, numerous studies and ongoing investigations were reviewed from the last 40 years by federal, State and local agencies to ensure that the most appropriate components were included. In particular, information by the Department of Water Resources (DWR) for the Bulletin 160-98 Program (the California Water Plan Update) and the Los Banos Grandes Program were reviewed.

To aid in the initial selection of individual component, first-level selection was made under the following criteria:

- storage facility must have a minimum new capacity of 100 thousand acre-feet (TAF)
- a conveyance facility must have a minimum new capacity of 500 cubic feet per second (cfs)
- component must not conflict with existing laws, such as projects which would be located on federally designed Wild and Scenic Rivers or within Wilderness Areas
- component has potential to significantly contribute to the Program's objectives

The inventories for surface storage components, groundwater storage components, and conveyance components are described in a report titled "CALFED Bay-Delta Program Storage and Conveyance Component Inventories," dated March 7, 1997. The information was presented at a Storage and Conveyance Workshop on March 20, 1997 by CALFED staff.

**Facility Description and Cost Estimates:** The inventories report lead to a more refined list of components to be studied in further detail. CALFED agency staff with backgrounds in biology, civil engineering, geology, and hydrology identified and eliminated impracticable surface water storage locations. The criteria for eliminating a surface water storage location includes 1) inadequate storage volumes, 2) conflicts with CALFED's restoration programs, 3) excessive cost, and 4) engineering constraints. Site locations with high environmental impacts were "red flagged" as locations with higher mitigation costs. Twenty-three (23) reports were prepared and compiled into a draft report titled "CALFED Storage and Conveyance Components Refinement Process: Facility Descriptions and Cost Estimates," dated October 1997. As the title suggests, this report provided a general description and a component construction cost of each facility. Itemized costs were prepared for individual facility components, which were summed to develop a base construction estimates for each of the 23 reservoir sites, conveyance facilities, and groundwater projects. The storage and conveyance facilities that were evaluated are listed below:

**Surface Storage Facilities**

Lake Berryessa Reservoir  
Cottonwood Creek Complex  
Los Banos Grandes Reservoir  
Los Vaqueros Reservoir Enlargement  
Millerton Lake Enlargement  
Montgomery Reservoir  
Orestimba Reservoir  
Red Bank Project  
San Luis Reservoir Enlargement  
Sites/Colusa Reservoir Project  
Shasta Lake Enlargement

**Surface Storage Conveyance**

Lake Berryessa Intertie  
Chico Landing Intertie  
Mid-Valley Canal  
Tehama-Colusa Canal Enlargement  
Tehama-Colusa Canal Extension

**Sacramento-San Joaquin Delta Facilities**

Chain of Lakes Project  
In-Delta Storage Facilities  
Isolated Delta Conveyance Facilities  
Multiple Intake Option

**Technical Studies**

In addition to core tasks such as operation modeling and preliminary cost and feasibility studies, CALFED has conducted a number of other storage and conveyance related technical studies. During the original Phase II evaluation period, CALFED completed two key technical studies as described below.

**Groundwater:** Groundwater provides about 40 percent of the urban and agricultural water supply in California. Appropriate and effective groundwater management is essential to the success of the CALFED Bay-Delta Program. CALFED conducted an outreach program to help identify and address stakeholder concerns regarding groundwater use and management with special emphasis on conjunctive use projects. A report titled "Status Report on Technical Studies for the Storage and Conveyance Refinement Process: CALFED Groundwater Outreach Program," dated November 12, 1997, described the progress of the outreach program. The report disclosed the scope of the program, definitions of groundwater terms to help facilitate discussion of groundwater issues, draft principles for CALFED conjunctive use projects, a summary of stakeholder concerns, and preliminary mitigation strategies to address those concerns.

**Flood Control Reoperation:** The New Year's Day Flood of 1997 was one of the largest on record in the 90-year northern California water history in terms of intensity of rainfall, volume of floodwater, and aerial extent, impacting areas from the Oregon border to the southern end of the Sierra. New flood records were set on many of the major Central Valley rivers heightening concern over the vulnerability of the California water system to flooding. Immediately following the 1997 flood, CALFED began examining the possibility of transferring flood control storage from Shasta Lake and Lake Oroville to potentially new offstream storage. A report titled "Status Report on Technical Studies for the Storage and Conveyance Refinement Process: CVP/SWP Flood Control Reoperation," describes the evaluation using a CVP/SWP spreadsheet model.

**NEW OR UPDATED STORAGE AND CONVEYANCE STUDIES**

Since the March 1998 release of the DEIS/EIR, CALFED has continued the Storage and Conveyance Refinement Process. Work completed since March 1998 includes new and updated simulation modeling, revised cost and feasibility studies, and additional technical studies.

**Operation and Delta Simulation Modeling**

In order to maintain consistency in the CALFED program, the Storage and Conveyance Refinement Process has included an on-going effort to update and expand the modeling studies on which much of the technical analysis is based. Since the release of the DEIS/EIR, a particular focus has been on updating and expanding operational and Delta modeling studies.

**System Operation Modeling:** Several operation modeling studies have been updated since the initial release of the Draft EIS/EIR. New operation studies have been conducted for the Diversion Effects on Fisheries Team (DEFT) and previous operating studies are being updated to incorporate refined assumptions to maintain consistency in the CALFED program and to support the EIS/EIR evaluation process.

At a Storage and Conveyance Workshop on April 24, 1998, the studies conducted for the original Phase II Interim Report and DEIS/EIR were presented. The system operation studies were summarized in a report titled "CALFED Bay-Delta Program Storage and Conveyance Refinement Process: A Status Report on System Modeling Using DWRSIM," dated April 24, 1998.

Following the release of the DEIS/EIR, CALFED formulated the Diversion Effects on Fisheries Team (DEFT) to evaluate the potential for the CALFED alternatives to provide for recovery of fisheries in the Bay-Delta system. DEFT was also charged with providing suggestions for improving the fisheries benefits of the current CALFED alternatives. The NoName Group, a subcommittee of the CALFED Operation Group, was tasked with further evaluating the water supply and water quality measures to be implemented in Stage I of the CALFED program. To support the DEFT and NoName processes, several operation studies were conducted. These studies provide the initial evaluations for CALFED Stage I implementation of water supply and fishery protection measures. A summary description of the operation studies conducted for the DEFT and NoName processes is shown below:

<u>Study</u>	<u>Description</u>
689 (DEFT1)	1995 LOD + WQCP + Delta (b)(2) + [Apr/May VAMP Upstream & Export + .25 E/I ratio from Feb-Jun. + .55 E/I for Nov., .45 E/I from Dec.-Jan. + .75 E/I from Aug.-Sep + 1962 LOD X2 for Chipps] + [ISDP + JPOD + DMC-CA Intertie + Madera Ranch GW]
690 (DEFT2)	1995 LOD + WQCP + Delta (b)(2) + .55 E/I for Nov., .45 E/I from Dec.-Jan.
691 (DEFT3)	1995 LOD + WQCP + Delta (b)(2) + .25 E/I ratio from Feb-Jun.
692 (DEFT4)	1995 LOD + WQCP + Delta (b)(2) + Apr/May VAMP Export only

<u>Study</u>	<u>Description</u>
560B (Study1)	Accord + Upstream AFRP Flows
662 (Study2)	Accord + Upstream AFRP Flows + New Facilities [ISDP + JPOD + DMC-CA]
549new (Study3)	Accord + Upstream AFRP Flows + Delta (b)(2)
663 (Study4)	Accord + Upstream AFRP Flows + Delta (b)(2) + New Facilities
665 (Study4A)	Accord + Upstream AFRP Flows + Delta (b)(2) + New Facilities w/GW [ISDP + JPOD +DMC-CA <i>intertie + Madera Ranch</i> ]
669 (Study4B)	Accord + Upstream AFRP Flows + Delta (b)(2) + New Facilities w/Shasta [ISDP + JPOD +DMC-CA <i>intertie + Shasta Enlargement</i> ]
661 (Study5)	Accord + Upstream AFRP Flows + Delta (b)(2) + DEFT Action [ <i>Apr/May VAMP Upstream &amp; Export + .25 E/I ratio from Feb-Jun. + .55 E/I for Nov., .45 E/I from Dec.-Jan. + .75 E/I from Aug.-Sep + 1962 LOD X2 for Chipps</i> ]
664 (Study6)	Accord + Upstream AFRP Flows + Delta (b)(2) + DEFT Action + New Facilities
672 (Study7)	Accord + Upstream AFRP Flows + Trinity
673 (Study8)	Accord + Upstream AFRP Flows + Trinity + New Facilities
649 (DW)	Accord + Upstream AFRP Flows + Delta Wetlands

In addition to conducting operation studies for the DEFT and NoName groups, CALFED has undertaken an on-going effort to update and expand the system operation modeling studies in order to maintain consistency in the CALFED program. As the CALFED process continues to develop, many operational assumptions have been refined, requiring changes to the system operation modeling studies. For example, changes were required in the assumptions for CVPLA Delta (b)(2) actions, Stanislaus River operations, and VAMP actions on the San Joaquin River. In addition, model enhancements were necessary to incorporate the ERPP flow targets with these

changes in assumptions. The new operation studies will be used to refine the evaluations conducted for the EIS/EIR and Phase II reports.

**Delta Simulation Modeling:** Several Delta modeling studies have also been updated since the initial release of the DEIS/EIR. In addition, new Delta modeling studies have been conducted for the evaluation of the CALFED alternatives as requested by stakeholders. Mass tracking, water quality, and levee failure studies are still being developed by CALFED in support of the EIS/EIR and Common Programs.

A Delta modeling study was also conducted for Alternative 1EX assuming 1995 level of development and existing Delta geometry. No changes were made to any Delta channels and no temporary structures in the south Delta or fish control structures at the head of Old River were installed. The hydrology used for evaluating this study came from DWRSIM study 558. Modeling results were provided in terms of Delta flows, Delta electrical conductivity, monthly average X2 locations, and water levels in the south Delta. These results were summarized in a report titled "Appendix: Alternative 1EX Delta Modeling Assumptions and Results," dated April 24, 1998.

Re-evaluation of Delta modeling studies for CALFED Alternatives 1C, 2B, and 3X was completed in June 1998. The geometry, general modeling assumptions and Delta facility operations for this study were identical to the January report; however, the hydrology information for the alternatives came from DWRSIM study 532a for Alternatives 1C and 2B and study 636 for Alternative 3X. Alternative 2B had additional operational modifications to Hood diversions, which were constrained by a minimum Rio Vista flow of 3,000 cfs in July through September and limited to 5,000 cfs in May. Unlike the January study, Alternative 3X in this study did not include the "In Delta Storage" component. Flows, electrical conductivity, X2 locations, and water level elevations in selected locations in the Delta were summarized in the draft report titled "Status Report on Technical Studies for the Storage and Conveyance Refinement Process: Delta Simulation Model Studies of Alternatives 1C, 2B, and 3X," dated June 1, 1998.

One important element of the Storage and Conveyance Refinement Process is to solicit and explore suggestions made by interested agencies and stakeholders. CALFED has provided technical support to stakeholders by modifying operational assumptions in the Delta model to evaluate the resulting Delta impacts.

A re-evaluation of Alternative 2B with South Fork Mokelumne Improvements was conducted upon the request of South Delta Irrigation District. Hydrology used for this alternative came from DWRSIM study 532a. The geometry and the Delta facility operation for this study were identical to the June 1, 1998 study of Alternative 2B. The 10,000 cfs screened Hood intake on the Sacramento River would still discharge to Snodgrass Slough; however, South Fork rather than North Fork Mokelumne River improvements would be implemented to accommodate the

increased cross-Delta flow. Western New Hope Track, Bouldin Track, and Empire Track along the South Fork of the Mokelumne River would be set back at 2000 ft. The results of this study were summarized in the draft report titled, "Status Report on Technical Studies for the Storage and Conveyance Refinement Process: Delta Simulation Model Studies of Alternatives 2B, 2B\_AH1, and 2B\_AH2 (North and South Fork Mokelumne Improvements)," dated July 1, 1998.

A re-evaluation of Alternative 3 with a 7,500 cfs Isolated Facility was also conducted at the request of Ag/Urban. Hydrology used for this alternative was provided by Surface Water Resources Inc. (SWRI), which reflects a 7,500 cfs isolated facility under different Hood diversion assumptions using a CALFED 2020 hydrology and demand pattern. The geometry and the Delta facility operation for this study is identical to the June 1, 1998 study of Alternative 3X; however, no intertie is assumed in connecting the Clifton Court Forebay to Tracy Pumping Plant. The results of this study were summarized in the draft report titled, "Status Report on Technical Studies for the Storage and Conveyance Refinement Process: Delta Simulation Model Studies of Alternative AUD1X2M (Dual Facility)," dated September 9, 1998.

To support DEFT and NoName processes, several Delta simulation studies were conducted. These studies provide the initial evaluations for CALFED Stage I implementation of fishery protection measures. Two scenarios were conducted for the DEFT, which assumed the existing Delta geometry with the following structural and operational changes:

#### *Scenario 1*

- Permanent flow control structures are installed in Old River, Middle River and Grant Line Canal.
- Permanent fish control structure is installed at the head of Old River.
- Tracy Pumping is *NOT* connected to Clifton Court Forebay through an intertie.
- A new Forebay intake structure with a 10,300 cfs capacity (full Banks capacity) installed in the Northeast section
- Delta-cross channel closed in October through June in all water year types.

#### *Scenario 2*

- Includes the same operational and structural elements in Scenario 1, but adds a 2,000 cfs Hood diversion demonstration/testing facility. The 2,000 cfs facility would have an alignment as defined for Alternative 2B. The North Fork of the Mokelumne would not be expanded and McCormack-Williamson Tract will not be flooded.

The results of these DEFT studies have not yet been documented. CALFED is also still conducting Delta simulation studies relating to mass tracking, detail water quality modeling, and studies on salinity gradients due to levee failures. These studies are intended to provide additional support to other CALFED Program areas, such as the Water Quality Program and Levee Program.

A mass tracking study is being conducted to evaluate and compare the movement of particles in the Delta under several CALFED Alternatives. The Particle Mass Tracking (PMT) model is a valuable tool that can be used to give an indication of the residence time of fish egg or larvae as affected by circulation in the Delta. For this study, the "mass" is introduced at discrete locations in the Delta such as Vernalis, Terminous, Freeport, Rio Vista, San Andreas Landing, and Prisoners Point to determine its fate under CALFED Alternatives 1C, 2B, and 3X along with the Existing Conditions and No Action Alternatives. The mass is tracked over a period of time (30 days and 60 days) after injection for the water period 1976-1991.

In support of the Water Quality Program, Delta simulations will be conducted using a superposition approach to evaluate specific water quality constituents, such as bromides and selenium, for Existing Conditions, No Action, and Alternatives 1C, 2B and 3X. The salinity concentrations at various locations in the Delta will be determined by the following salinity sources: 1) Sacramento River, 2) San Joaquin River, 3) Delta agricultural and soil, and 4) sea/brackish.

In support of the Levee Program, Delta simulations will be conducted to determine salinity impacts associated with specific levee failures, such as Sherman Island. The analysis will be conducted for non steady-state and steady-state conditions under different hydrologic conditions and system operations. The specific study scenarios are still being devised for the purposes of the Levee Program and the DEIS/EIR. Information regarding levee failure locations and the size of breaches are currently being prepared by CALFED.

#### **Revised or Additional Cost and Feasibility Studies**

Since the March release of the DEIS/EIR draft document, CALFED has continued refining information regarding the set of storage and conveyance facilities under consideration. This includes conducting more detailed cost and feasibility studies. The cost and feasibility studies were conducted in an effort to provide a higher level of detail for comparison of the storage and conveyance alternatives currently under consideration.

***Ongoing Storage and Conveyance Screening Process:*** Beginning in June 1997, a panel of environmental specialists and engineers were gathered to review the series of "Facility Description and Cost Estimate" reports. Comments were incorporated into the reports to reflect more current and expansive environmental and engineering considerations associated with each facility. As a result of further evaluation, a revised list of storage facilities was developed and additional reports were generated for any new facilities. The current list of potential storage facilities includes:

- Colusa Reservoir Complex
- Glenn Reservoir
- Lake Berryessa Enlargement
- Red Bank Project
- Shasta Lake Enlargement
- Sites Reservoir
- Thomes-Newville Reservoir
- Folsom Reservoir Enlargement
- Garden Bar Reservoir
- Waldo Reservoir
- Chain of Lakes Facility
- In-Delta Storage
- Garzas Reservoir
- Los Banos Grandes
- Los Vaqueros Enlargement
- Orestimba Reservoir
- Panoche Reservoir
- San Luis Reservoir
- Cooperstown Reservoir
- Millerton Lake Enlargement
- Montgomery Reservoir

***Storage and Conveyance Component Cost Estimates:*** Detailed cost and economic analyses were completed in April 1998 by CALFED staff. Itemized costs were prepared for individual facility components, which were summed to develop base construction estimates for each of the 22 reservoir sites, conveyance facilities, and groundwater projects. The base construction estimates were used as the basis for developing capital costs, which includes additional contingency, engineering, and regulatory costs. A forgone investment value was used to adjust for the assumed 5-year construction period for reservoir storage. Similarly, a 2-year construction period was assumed for groundwater storage and major reservoir conveyance facilities. Annual costs were also developed assuming a 50-year capital recovery period at a 6 percent discount rate.

CALFED alternative costs were generated using the total capital and annual costs of representative storage facilities, Delta conveyance, and the CALFED Common Programs. The Common Programs include water quality and watershed management, ecosystem restoration, water use efficiency and transfers, and levee system integrity. Without indicating specific facility locations, representative storage costs were developed as a function of the following storage volumes:

- Up to 3.0 MAF of Sacramento Valley surface storage
- Up to 250 TAF of Sacramento Valley groundwater storage
- Up to 240 TAF of San Joaquin Valley surface storage
- Up to 500 TAF of San Joaquin Valley groundwater storage
- Up to 2.0 MAF of off-Aqueduct storage South of the Delta

Cost estimates were documented in a draft report titled "Storage and Conveyance Component Cost Estimates," dated April 29, 1998. A brief overview of this evaluation was presented on July 21, 1998 at a Storage and Conveyance Workshop by CALFED staff.

***Delta Consumptive Use from an Isolated Facility:*** As part an evaluation of the Isolated Facility, an evaluation of Delta consumptive use was conducted as a cooperative effort between CALFED and the Department of Water Resources. The purpose of this study was to investigate

the potential for improving water quality for the in-Delta applications by serving both agricultural and urban users from the proposed isolated facility. This study describes the conceptual infrastructure and preliminary costs of the local water distribution system. Study details and conclusions are presented in a draft report titled "Preliminary Investigations for Supplying Delta Consumptive Use from an Isolated Facility," dated October 1998.

***Isolated Facility with an Incised Canal Configuration:*** The objective of this study was to refine and improve the facility configuration, address structural integrity concerns, and optimize operational considerations of the proposed isolated facility. The study resulted in identification of the infrastructure required to convey water from the Sacramento River (near Hood) to the Clifton Court Forebay. Study results also include the primary benefits of the incised section over the previously proposed raised canal. Study details and conclusions are documented in the draft report titled "Isolated Facility – Hydraulic Analysis of Incised Canal Configuration," dated October 1998.

#### **Additional Technical Studies**

Several additional technical studies have also been completed since March 1998 as a part of the continued Storage and Conveyance Refinement process. CALFED has completed a feasibility investigation of two preliminary North Delta flood control studies and a preliminary study comparing depletions of agricultural versus wetland habitat land uses.

***Preliminary Flood Study of the North Delta:*** The study area considered in this analysis consisted of a 2,000 square mile watershed region in the North Delta including the drainage basins of Morrison Creek, Consumnes River, Dry Creek, and Mokelumne River. Hydrographs of the Consumnes and Mokelumne Rivers were obtained from the U.S. Army Corps of Engineers and used as input in the DWOPER flood model. Specific CALFED actions were modeled including constructing 2,000-foot setback levees along New Hope Tract, creating additional flood storage at Canal Ranch and Brack Tracts, and increasing flood storage and conveyance by breaching McCormack-Williamson Tract. The flood impacts associated with these actions were analyzed by comparing resulting stages, velocities, and levee breaches to a base case scenario of existing conditions. A presentation of this evaluation was made at the Storage and Conveyance Workshop on April 24, 1998 while still in draft form. This evaluation was later finalized in a report titled "CALFED Bay-Delta Program Technical Services Branch Conveyance Facilities Unit: Preliminary Flood Study North Delta," dated June 1998.

***North Delta Flood Control Scenarios:*** A flood study of the North Delta was conducted for CALFED by Ensign and Buckley Consulting as a follow-up to the preliminary North Delta Flood Study. Six flood control scenarios were analyzed using two different storm events: a Delta Specific storm and a Morrison Specific storm. The DWOPER flood model was used to analyze each scenario and increases in stage, levee failures, and flow velocities were used as indicators for flood impacts. Each scenario is described as follows:

- *Scenario 1:* 500-foot sections of levee at the upstream and downstream ends of the McCormack-Williamson Tract would be removed to allow additional flood storage and eliminate uncontrolled surge of flood waters out of the tract due to levee failures.
- *Scenario 2:* In addition to creating breaches in the McCormack-Williamson Tract, 500-foot setback levees would be added on a portion of the South Mokelumne River and Canal Ranch Tract would be utilized as a flood storage area.
- *Scenario 3:* Scenario 3 would include the same features as Scenario 2, except Brack Tract is also added as a flood storage area.
- *Scenario 4:* Breaches in the upstream and downstream ends of McCormack-Williamson Tract would be created and utilizing dredging in the North and South Forks of the Mokelumne River to convey the increased flows downstream.
- *Scenario 5:* Scenario 5 includes the same components as Scenario 3 (McCormack-Williamson floodway, 500-foot levee setbacks on the south Mokelumne river, and canal Ranch and Brack Tract flood storage) and adds dredging on the North Mokelumne.
- *Scenario 6:* Creates a 500-foot breach in the levee at the downstream end of the McCormack-Williamson Tract, while keeping the remainder of the tract's levees intact. Breaching the downstream levee would allow tidal marsh habitat to be created within the tract, and leaving the upstream levee intact would promote continued use of the floodplain storage in the Franklin Pond area rather than allowing flows to pass unchecked through the tract.

A presentation of this evaluation was made at a Storage and Conveyance Workshop on July 21, 1998, while still in draft form. Results were later compiled into a report titled "North Delta Flood Control Scenarios," finalized on August 25, 1998.

***Depletion Analyses of Agricultural vs. Wetlands Water Use:*** The objective of this study was to compare the relative magnitude of potential impacts to water use due converting existing agricultural land to wetland habitat. While preliminary results indicated that wetlands showed an increase in depletions over typical existing agricultural crops, further analysis is required. Although refinement of this evaluation is currently in progress and results have not yet been finalized, general assumptions and preliminary results are outlined in a draft report titled "Agricultural and Wetlands Water Use: A Preliminary Comparison of Depletions."

## **DEFT TECHNICAL SUPPORT**

One of the fundamental problems facing CALFED is the conflict between maintaining water supply reliability and restoring the health of the Delta ecosystem to protect sensitive species. Current operations have impacted many fish species in the Delta. Fish are entrained or impinged at the pumps of the CVP and SWP, and though there are current restrictions on pumping

activities during periods when sensitive species are present in the Delta, additional protective tools must be developed. One critical development in Phase II of the CALFED Program has been the formation of the Diversion Effects on Fisheries Team (DEFT) to address this issue. DEFT has been charged with the difficult tasks of developing a set of operational and structural tools to provide increased protection and promote recovery of several sensitive fish species in the Delta. CALFED has provided technical support to DEFT by post-processing modeling results from DEFT operation and Delta simulation studies (as previously described) to provide impact comparisons to the current set of base CALFED studies.

**DEFT Delta Alternative Evaluations**

As a precursor to the DEFT analysis, several CALFED operation and Delta simulation studies were conducted and summarized in the April 21, 1998 draft report titled, "Status Report on Technical Studies for the Storage and Conveyance Refinement Process: Preliminary Results of System/Delta Modeling using DWRSIM and DSM2." This report included a series of technical appendices with graphic comparisons of the CALFED Alternatives with and without storage, providing average monthly flows and probability of exceedence graphs at various locations and hydrologic periods. The DEFT Species Teams analyzed flow results from each study to get an indication of potential benefits and impacts to fisheries. The following DSM and DWRSIM studies were used in the initial DEFT evaluation:

<u>DSM Study</u>	<u>Description</u>
1EX	Existing Conditions
1A	No Action
1C	Alternative 1C (with Storage)
2B	Alternative 1B (with Storage)
3X	Alternative 3X (10,000 I.F. with Storage)
<u>DWRSIM Study</u>	<u>Description</u>
558	Existing Conditions
516	No Action
518	Alternative 1A & 1B (without Storage)
609	Alternative 1C (with Storage)
528	Alternative 2A (without Storage)
532a	Alternative 2B, 2E (with Storage)
595	Alternative 3 - 10k I.F. (without Storage)
567	Alternative 3 - 10k I.F. (with Storage)

Another series of DWRSIM and DWM-2 modeling studies were also used to provide background for the DEFT evaluation. These studies were summarized into seven technical appendices and compiled into a May 19, 1998 draft report titled, "Status Report on Technical Studies for the Storage and Conveyance Refinement Process: DWRSIM and DSM2 Modeling Studies of CALFED Alternatives and ERPP Water Acquisitions." This report focused on evaluating the effects of allocating an "environmental flow" for purposes designated in the Ecosystem Restoration Program Plan (ERPP). Studies, which included an ERPP flow, were compared to various baseline

studies without the ERPP flow targets. The same DSM2 studies were used and the DWRSIM studies included:

<u>DWRSIM Study</u>	<u>Description</u>
558	Existing Conditions
516	No Action
517	Alternative 1 without ERPP
518	Alternative 1 with Surrogate Demand and ERPP
531	Alternative 1C with Storage
532	Alternative 2B with Storage
567	Alternative 3X with 10k I.F. and Storage
551	Alternative 3E with 15k I.F. without Storage

### **DEFT Stage I Implementation Evaluations**

Following the evaluation of alternatives, DEFT focused on the CALFED Stage I implementation of a through-Delta conveyance alternative. Specific reoperation scenarios with some additional facilities were assumed to provide varying degrees of additional protection for fisheries. The initial range of possible actions developed by DEFT and NoName is listed below:

- DEFT list of actions which include:
  - ✓ April – May VAMP
  - ✓ E/I Restrictions (.25 Feb-Jun, .55 Oct, .45 Nov, .45 Dec)
  - ✓ E/I Relaxations (.75 Aug, .75 Sep)
  - ✓ X2 Standard (1962 LOD)
  
- NoName list of supply actions which include:
  - ✓ ISDP (Relaxed COE pumping restrictions at Banks PP)
  - ✓ Unlimited Joint Point of Diversion
  - ✓ 400 cfs Aqueduct Intertie
  - ✓ 350 TAF Madera Ranch Groundwater Bank

CALFED conducted several DEFT operation and hydrodynamic studies, which included various combinations of the actions outlined above. Results of these studies were summarized by CALFED and compared with other CALFED alternatives. The report is titled "Status Report on the Technical Studies for the Storage and Conveyance Refinement Process: Summary Analysis of Delta Operations and Hydrodynamic Studies for CALFED/DEFT Alternatives."

While preliminary results from DEFT operation studies often indicated an impact to water supply when compared to the other CALFED Alternatives, the potential benefits to fisheries due to DEFT actions were the focus of this evaluation. The findings and recommendations developed through the DEFT process will be compiled and documented in a final report by September 1998.

## **ECONOMIC EVALUATION of WATER MANAGEMENT ALTERNATIVES**

Several agencies and stakeholder groups have suggested that CALFED conduct a more thorough economic analysis of water management options to identify the most cost-effective means of achieving the Program's water supply reliability goals. Completing an economic evaluation of water management alternatives on a statewide basis is a challenging objective because of the many complex issues and constraints that are involved, including: institutional constraints, Delta conveyance constraints, surface water – ground water interactions, third party impacts, and environmental impacts. In addition, considerable time and effort is required to develop a comprehensive analytical approach for evaluating the hydrologic and economic impacts associated with various combinations of water supply and demand management options.

### **CALFED Economic Evaluation of Water Management Alternatives**

To conduct an economic evaluation of water management alternatives, CALFED has developed an approach under the review of stakeholder representatives. The study consists of two major phases: 1) scenario development and 2) impact analysis.

**Scenario Development:** The scenario development methodology consists of creating water supply options by linking conveyance options with demand locations. Water supply options include supply increase and demand reduction opportunities. Increases in water supply resulting from implementing a conveyance option also will be estimated. Cost and quantity characterize water supply options, while cost and capacity characterize conveyance options. Water supply demands are characterized by amount and location and are a function of the cost of available supply. Both long-term average and drought period demand patterns will be developed.

Stakeholders have been asked to provide input on policy assumptions and preferences to guide scenario development. Examples of possible policy assumptions and preferences include limitations on land fallowing or facility development, allocation of costs, quantities of water supply from conservation, and costs of mitigation. Various policy assumptions and preferences will be grouped into sets that represent stakeholder views. This information is being gathered through a series of stakeholder meetings and a review of stakeholder correspondence and reports. During the next several months, these policy assumptions will be refined as a result of additional discussions with stakeholders.

The next phase of the study, scheduled to proceed through June 1999, will involve linking the water supply options, conveyance options, demand locations, and policy assumptions and preferences. A range of scenarios will be formulated, designed to represent the most cost-effective combinations of supply, demand management, and conveyance options. The result will be three to five water management scenarios, which reflect, to the extent possible, the full range of stakeholder viewpoints.

**Impact Analysis:** To evaluate the relative hydrologic, environmental, and socio-economic consequences of various water management scenarios and to help judge their practicability, an impact analysis tool is being developed. The first step in developing this tool is to formulate the necessary assumptions and methods to construct a modeling framework. This framework will integrate socio-economic, environmental, water quality, power production, and hydrologic

models to capture the critical interdependencies and constraints, which characterize water management in California.

A key effort in this task is to develop a method to link the Department of Water Resources' project operations model (DWRSIM) with the Central Valley Ground and Surface Water Model (CVGSM). This linkage will allow more realistic DWRSIM runs by capturing the consequences of changes in CVP and SWP deliveries on groundwater, and the effects of changes in agricultural water use on upstream depletions.

Another key element in this analysis is the development of a method for linking the DWR Urban Water Service Reliability Benefit Model (LCPSIM) to the joint USBR and DWR Central Valley Production and Transfer Model (CVPTM). This linkage would allow realistic modeling of the interactions between agricultural production, agricultural water use by source, and water marketing within the agricultural sector and between the agricultural and the urban sectors. This will facilitate the estimation of economic impacts and groundwater impacts due to water marketing and changes in agricultural water use in the Central Valley.

The direct economic impacts, which are estimated with the LCPSIM/CVPTM analysis tool, will feed into the IMPLAN (Impact Analysis for Planning) model. First developed by the US Forest Service, IMPLAN is now maintained and sold by MIG, Inc. This model was designed to translate direct economic impacts on Central Valley agriculture into impacts on regional employment and income, and estimate third-party impacts to local communities.

Output from the hydrologic models must be analyzed to identify potential changes in streamflows and groundwater levels due to specific water management options. An evaluation of adverse or beneficial environmental effects associated with to habitat value or threatened and endangered species survival must be conducted. The integration of power production and urban water quality models into the comprehensive modeling framework will also facilitate the analysis of other important impacts.

Development of the impact evaluation tool is scheduled to proceed through June 1999. Once the tool is available, an additional six months will be required to complete the evaluation of three to five water management scenarios.

### **Western San Joaquin Valley Economic Modeling**

CALFED is also supporting the economic modeling efforts of Dr. David Sunding of U.C. Berkeley. This evaluation addresses the agricultural impacts of varying water supplies through supply cuts, technology adoption, land retirement and expanded trading opportunities within the westside service area of the San Joaquin Valley.

**Study Activities:** A significant amount of data needed for the westside study has already been collected. This core information is being expanded along with other technical efforts to construct the westside economic model as described below:

1. A GIS database containing information in the following characteristic for all irrigated parcels south of the Delta:
  - land allocation among crops
  - soil quality
  - microclimate
  - groundwater conditions (depth and quality)
  - water district membership
  - distribution of surface water deliveries
2. A statistic analysis of land allocation the measures the impact of surface water reliability on crop choice. This analysis control for environmental and institutional factors through the use of discrete dependent variable techniques.
3. A conceptual economic model describing how growers respond to changes in surface water delivery distributions. This model highlights the impact of changes in water supply distributions on durable investments, including planting permanent crops and installing low-volume irrigation technologies.
4. A empirical model of the west side of the San Joaquin Valley measuring the economic value of improvements in water supply reliability. This analysis is built on the first three components of the project. The analysis incorporates output market impacts of changes in crop allocations and other investments.
5. Organize and host meetings of a technical economic advisory board. This group is composed of CALFED stakeholder representatives. The purpose of the board is to review technical aspects of economic analysis performed by CALFED staff and contractors, including work performed at UC. Berkeley.

An interim report is anticipated by late fall 1998, which will describe the database and the statistical analysis of crop choice. The report will also include preliminary results from the economic model. The analytical procedures developed could improve in the more comprehensive water management evaluation, which integrates statewide system operations, groundwater modeling, and various urban and agricultural economic models.

Table 1 – Original CALFED Phase II Storage and Conveyance Refinement Process Reports

Number	Reports/Documents	Date	Hydrologic and Delta Simulation Modeling				Preliminary Cost and Feasibility Studies	Technical Studies
			Operation Parameters and Plan for Alternatives	Spreadsheet Post-Processing Modeling	System Operation Modeling	Delta Simulation Modeling		
1	"Storage and Conveyance Alternative Component Refinement Process"	9/5/96	X					
2	"CALFED Bay-Delta Program Storage and Conveyance Component Inventories"	3/7/97					X	
3	"Status Report on Technical Studies for the Storage and Conveyance Refinement Process: Completion of suggestions for System Operating Parameters, CALFED Bay-Delta Program Modeling Section and Alternatives for Programmatic EIR/EIS Evaluation Sections"	3/20/97	X	X	X	X		
4	"Status Report on Technical Studies for the Storage and Conveyance Refinement Process: Evaluation of Upstream Storage and South of Delta Off-Aqueduct Storage Using the CALFED Post-Processing Spreadsheet Operations Model"	5/9/97		X				
5	"Status Report on Technical Studies for the Storage and Conveyance Refinement Process: Combined Environmental - Agricultural and Urban Water Supply Evaluation using the CALFED Post-Processing Spreadsheet Operations Model"	6/12/97		X				
6	"Status Report on Technical Studies for the Storage and Conveyance Refinement Process: CVP/SWP Flood Control Reoperation"	April, 97						X
7	"CALFED Bay-Delta Program System Operation Modeling Plan"	8/21/97	X					
8	"CALFED Bay-Delta Program Storage and Conveyance Refinement Process: Delta Simulation Model Studies of Alternatives 1A, 1C, 2B, 2D, 2E, 3E"	8/4/97				X		
9	"CALFED Bay-Delta Program Storage and Conveyance Refinement Process: Recalibration of the Delta Simulation Model I (Suisun Marsh Version)"	9/4/97				X		
10	"CALFED Bay-Delta Program Storage and Conveyance Refinement Process: Preliminary Results/Evaluation of System Modeling with DWRSIM"	9/23/97			X			
11	"CALFED Bay-Delta Program Storage and Conveyance Refinement Process: A Status Report on System Modeling Using DWRSIM"	9/24/97			X			
12	"CALFED Bay-Delta Program Storage and Conveyance Refinement Process: Addendum and Errata to Delta Simulation Model Studies of Alternatives 1A, 1C, 2B, 2D, 2E, 3E"	9/24/97				X		
13	"CALFED Storage and Conveyance Components Refinement Process: Facility Description and Cost Estimates"	Oct. 97					X	
14	"CALFED Bay-Delta Program Storage and Conveyance Refinement Process: Delta Simulation Model Studies of Alternatives 3A and 3B"	10/2/97				X		
15	"CALFED Bay-Delta Program Storage and Conveyance Refinement Process: A Status Report on System Modeling Using DWRSIM"	10/30/97			X			
16	"Status Report on Technical Studies for the Storage and Conveyance Refinement Process: CALFED Groundwater Outreach Program"	11/12/97						X
17	"CALFED Bay-Delta Program Storage and Conveyance Refinement Process: Delta Simulation Model Studies of Alternatives 1A, 1C, 2B, 3E, 3X"	1/16/98				X		
18	"CALFED Bay-Delta Program Storage and Conveyance Refinement Process: A Status Report on System Modeling Using DWRSIM"	1/22/98			X			

**Table 2 – Updated or Additional CALFED Phase II Storage and Conveyance Refinement Process Reports**

Number	Reports/Documents	Date	Hydrologic and Delta Simulation Modeling				Preliminary Cost and Feasibility Studies	Technical Studies
			Operation Parameters and Plan for Alternatives	Spreadsheet Post-Processing Modeling	System Operation Modeling	Delta Simulation Modeling		
1	"Status Report on Technical Studies for the Storage and Conveyance Refinement Process: Preliminary results of System/Delta Modeling using DWRSIM and DSM2"	4/21/98			X	X		
2	"Status Report on Technical Studies for the Storage and Conveyance Refinement Process: A Status Report on System Modeling using DWRSIM"	4/24/98			X			
3	"Status Report on Technical Studies for the Storage and Conveyance Refinement Process: Alternative 1EX - Delta Modeling Assumptions and Results"	4/24/98				X		
4	"Status Report on Technical Studies for the Storage and Conveyance Refinement Process: Storage and Conveyance Component Cost Estimates"	4/29/98					X	
5	"Status Report on Technical Studies for the Storage and Conveyance Refinement Process: DWRSIM and DSM2 Modeling Studies of CALFED Alternatives and ERPP Water Acquisitions"	5/19/98			X	X		
6	"Status Report on Technical Studies for the Storage and Conveyance Refinement Process: Delta Simulation Model Studies of Alternatives 1C, 2B, and 3X"	6/1/98				X		
7	"Preliminary Flood Study - North Delta"	6/1/98						X
8	"Status Report on Technical Studies for the Storage and Conveyance Refinement Process: Preliminary Investigation for Supplying Delta Consumptive Use from an Isolated Facility"	6/1/98						X
9	"Status Report on Technical Studies for the Storage and Conveyance Refinement Process: Delta Simulation Model Studies of Alternatives 2B, 2B_AH1, and 2B_AH2 (North and South Fork Mokelumne Improvements)"	7/1/98				X		
10	"Draft North Delta Flood Control Scenarios"	7/15/98						X
11	"Summary of Delta Simulation Model Studies to Date"	8/1/98				X		
12	"Status Report on Technical Studies for the Storage and Conveyance Refinement Process: Agricultural and Wetlands Water Use: A Preliminary Comparison of Depletions"	8/18/98						X
13	"Status Report on Technical Studies for the Storage and Conveyance Refinement Process: Delta Simulation Model studies of Alternative AUDIX2M (Dual Facility)"	9/9/98				X		
14	"Status Report on Technical Studies for the Storage and Conveyance Refinement Process: Summary Analysis of Delta Operations and Hydrodynamic Studies for CALFED/DEFT Alternatives"	9/10/98			X	X		
15	"Status Report on Technical Studies for the Storage and Conveyance Refinement Process: Isolated Facility - Hydraulic Analysis of Incised Canal Configuration"	10/26/98					X	

## **GENERAL RESPONSES TO COMMENTS**

Approximately 1,000 public, stakeholder, and agency comments on the March 1998 draft of CALFED's Programmatic EIS/EIR were directed toward storage and conveyance issues. The majority of comments pertained to new and existing infrastructure, benefits and impacts, system operations and modeling, implementation, cost/economic issues, supply and demand issues, and water management concerns. In an effort to thoroughly respond to these comments and concerns, CALFED staff has recorded and reviewed every comment. In light of the resource requirement to address each comment individually and the schedule commitment for the December 1998 release of the revised draft PEIS/EIR, it was determined that categorical responses to the primary issues would be documented. Under this format, CALFED staff developed general responses to the issues paraphrased from individual comments.

The majority of the comments fall into one of the following categories. Accordingly, a response to each of these issues is presented in the following sections.

- Groundwater Storage and Conjunctive Use
- Surface Storage
- Isolated Facility
- Operating Assumptions and Modeling
- Supply and Demand – DWR Bulletin 160
- Water Management
- Desalination
- Cost/Economic/Financing
- Beyond CALFED Mandate
- Clarifications
- Power Production and Energy

ISSUE	RESPONSE
<b>GROUNDWATER STORAGE AND CONJUNCTIVE USE</b>	
<p><b>Local Control</b> – Groundwater storage and conjunctive use programs need to be implemented and operated under local jurisdictions with particular regard to area of origin rights.</p> <p><b>Impact Evaluation</b> – Groundwater storage and conjunctive use programs may cause significant impacts such as subsidence, lower water table, permanent aquifer damage, third party impacts, or a reduction in water quality.</p>	<p>The role of the CALFED Bay-Delta Program in groundwater management and conjunctive use programs is to provide outreach to local communities and water users and identify concerns, facilitate pilot projects and monitoring, and assist with implementation and impact mitigation for projects with appropriate local controls and support. Implementation of all aspects of the Program will comply with existing state and federal laws. Among these laws, Section 1220 of the California Water Code mandates that export of groundwater must comply with local groundwater management plans that have been approved by a county Board of Supervisors. In accordance with this statute, any groundwater management or conjunctive use program implemented by CALFED will be consistent with local groundwater management plans.</p> <p>CALFED recognizes the potential impacts and benefits of groundwater management programs. When properly implemented, groundwater management programs can contribute significantly to the CALFED long-term solution. However, any specific groundwater project proposal must be thoroughly evaluated before it is implemented. This project-specific planning must involve local participation and include detailed evaluation of potential impacts, mitigation, costs, operating criteria, and assurances under which the project will operate.</p>
<p><b>Role of Groundwater Management/Nonstructural</b> – CALFED should fully implement all available groundwater management, conservation, reoperation, and conjunctive use alternatives prior to (or in-lieu of) implementation of additional surface storage or conveyance facilities. Conversely, CALFED is over-reliant on water use efficiency and transfers.</p>	<p>Groundwater management, conservation, reoperation, and conjunctive use programs have the potential to supplement water supply reliability, operational flexibility, and subsequent environmental benefits associated with new surface storage and conveyance facilities. The potential does not exist for these measures to completely replace the benefits of additional surface storage and conveyance facilities. For example, surface storage can provide new opportunities for flood control, power generation and regulation, recreation, improved water supply reliability for environmental flows and water users, and improved flexibility for overall water management. Delta conveyance improvements hold higher potential for improving the quality of Delta water supplies and reducing entrainment effects on fisheries.</p> <p>While groundwater storage generally has fewer terrestrial and aquatic impacts and is less costly than surface storage, it remains limited in flexibility due to slower rates of storage and withdrawal compared to surface storage. None-the-less, CALFED believes more efficient use must be made of existing water supplies system-wide and the potential benefits of water conservation, recycling, and groundwater conjunctive use will be optimized and utilized to the extent feasible under CALFED's long-term solution. CALFED's strategy is to provide a mix of all available water management options and to include new surface storage when predefined conditions and linkages for implementation are satisfied. These predefined conditions include (among others): achieving a high level of water use efficiency throughout the solution area, demonstrating progress on the water transfer framework, and demonstrating progress on groundwater and conjunctive use where consistent with local water management goals and subject to local restrictions.</p>

**ISSUE**

**RESPONSE**

**GROUNDWATER STORAGE AND CONJUNCTIVE USE (continued)**

Study and Implementation Strategy – CALFED should pursue and consider groundwater management and conjunctive use with one or more of the following approaches: (1) provide local communities with grants to study and implement programs, (2) immediate implementation, (3) pilot and monitoring programs, or (4) prepare cost comparison to other supply reliability alternatives.

CALFED is employing a methodical, three-staged approach to groundwater management and conjunctive use programs. First, CALFED is conducting outreach to local communities to learn more about specific local concerns and interests. This effort has resulted in a set of draft principles for implementation of conjunctive use projects. Second, CALFED will support pilot projects, monitoring, and modeling programs to evaluate specific projects that are based on local control and have substantial local support. Finally, CALFED will support implementation of conjunctive use or groundwater banking with appropriate local controls, monitoring, and mitigation for any significant adverse impacts.

ISSUE	RESPONSE
<b>SURFACE STORAGE</b>	
<p><b>Site Recommendations and Feasibility Indicators</b> – CALFED should build additional surface storage in a specific watershed (suggestions covered locations throughout the State) while considering several feasibility indicators.</p> <ul style="list-style-type: none"> <li>• <b>Recommendation to Build Auburn Dam</b> – CALFED should build Auburn Dam to improve water supply, increase flood protection, produce energy, and because of its high benefits-to-cost ratio.</li> </ul>	<p>A wide variety of potential reservoir sites are currently being evaluated statewide. The most viable locations will be identified based on the economic, engineering, environmental, cultural, and operational characteristics, in compliance with applicable State and federal law.</p> <p>The Auburn Dam project is included in the March 7, 1997, CALFED Draft Component Inventory Report. Therefore, it has been considered in the analysis of potential reservoir alternatives. However, according to investigations performed by the US Fish and Wildlife Service, the site contains ecological and environmental resources that are unmitigable with present technology.</p>
<p><b>Implementation</b> – CALFED should implement additional surface storage facilities within one on the following timeframes: (1) prior to any of the Common Programs, (2) in conjunction with Common Programs, (3) subsequent to Common Programs, (4) immediately, or (5) subsequent to further impact and engineering analyses.</p>	<p>CALFED has developed a staged implementation strategy that utilizes adaptive management. The first seven-year stage of implementation (Stage 1) will consist of actions which initiate progress towards meeting CALFED goals to simultaneously solve problems in the four identified problem areas of Ecosystem Quality, Water Supply Reliability, Water Quality, and Levee System Integrity. During Stage 1, improvements to water supply reliability will be made through actions such as improvements to through-Delta conveyance and implementation of groundwater storage programs. Feasibility studies and environmental documentation for new or expanded surface storage will also proceed during Stage 1. New or expanded surface storage will be constructed provided each of the following is achieved: (a) a high level of water use efficiency is achieved throughout the solution area; (b) demonstrated progress on the water transfer framework; (c) demonstrated progress on groundwater and conjunctive use where consistent with local water management goals and subject to local restrictions; (d) demonstrated commitment to finance by beneficiaries; (e) completion of 404(b)(1) Clean Water Act compliance; and (f) site-specific environmental documentation, determination of consistency or compliance with state and federal regulations, and necessary permits, authorizations, or waivers are completed.</p>

ISSUE	RESPONSE
<b>SURFACE STORAGE (continued)</b>	
<p><b>Impact Evaluation</b> – Construction and operation of additional storage facilities will not only result in a variety of adverse environmental impacts, but this strategy also violates CALFED’s own standards that prohibit a redirection of impacts.</p> <ul style="list-style-type: none"> <li>• <b>Opposition to Raise Shasta Dam</b> – CALFED should not consider raising Shasta Dam due to the extensive environmental impacts in the McCloud and Pit Rivers, because it would violate the California Wild and Scenic Rivers Act, and because the California Public Resources Code prohibits State participation in enlarging Shasta.</li> </ul>	<p>Few Program actions could be implemented under the most strict interpretation of CALFED’s solution principle of “no redirected impacts.” Construction of any storage or conveyance facility, levee improvements, and even habitat restoration activities all result in some level of redirected impacts to specific locations. CALFED’s intention is to consider the implications of any Program action to all resources. If the site-specific impacts of any given action are mitigable without net harm to any resource in whole, CALFED considers that action as implementable under the solution principles.</p> <p>CALFED acknowledges that adverse impacts would be realized due to construction and operation of surface storage facilities – as with any project of similar magnitude. However, CALFED is rigorously adhering to state and federal environmental regulations (including CEQA and NEPA) designed to minimize and/or provide environmental mitigation at least equivalent to the impacts. Projects that result in significant unmitigable redirected impacts will not be implemented under the CALFED Program.</p> <p>Current federal and state environmental laws require the consideration of all possible alternatives before choosing a specific reservoir site. Therefore, the enlargement of Lake Shasta is an alternative that must be included in the analysis and selection of potential reservoir sites. The US Bureau of Reclamation, in coordination with CALFED staff, is performing preliminary studies of various levels of enlargement to determine the feasibility of the project. Further engineering, economical and environmental investigations will determine if the project is viable.</p>

ISSUE	RESPONSE
<b>SURFACE STORAGE (continued)</b>	
<p><b>Supply Reliability and Environmental Benefits</b> – Surface storage should be avoided because it is unnecessary and the cost exceeds the benefits.</p>	<p>Considering the magnitude of conflicts over available water in California and the differing local conditions, CALFED is proposing that a mix of all available water management options is the best approach for ensuring water supply reliability in the future. While aggressive implementation of water conservation, recycling, and groundwater conjunctive use is critically important for effective water management and for helping to reduce the growth in demand for water, new surface storage has the potential to provide additional multiple benefits. Surface storage can provide new opportunities for flood control, power generation and regulation, recreation, improved water supply reliability for environmental flows and water users, and improved operating flexibility for overall water management.</p> <p>The combination of better management using all available options provides more flexibility for operations and improves overall water supply reliability for all users. However, due to regulatory requirements, the major financial commitments, and the potential environmental impacts, new surface storage requires special consideration. CALFED believes more efficient use must be made of existing water supplies system-wide prior to building new surface storage. In addition, there must be enhanced opportunities for water transfers prior to building new surface storage. Therefore, CALFED's strategy is to provide a mix of all available water management options and to include surface storage as soon as predefined conditions and linkages for implementation are satisfied. Those predefined conditions will include demonstration that implementation of surface storage is economically justified. In addition, CALFED's financial strategy principle of beneficiary pays implies that specific beneficiaries of surface storage projects will pay the associated costs. Those investors will demand a demonstration that potential benefits exceed costs of any proposed project.</p>
<p><b>Refinement - Site Specific</b>– EIS/R should identify the specific locations, impacts, and operating criteria for the proposed surface storage.</p>	<p>The CALFED Phase II investigations (programmatic in nature) focused principally upon general locations of storage sites (north of Delta, in-Delta, and/or south of Delta). Similarly, a range of storage volumes was also developed for each general location. Hence, the “representative” reservoirs and accompanying costs for each location are presented in the Draft Programmatic EIS/R. In order to develop the representative reservoirs, program staff conducted pre-feasibility studies on several specific potential storage sites. Program staff is also coordinating with DWR Northern District staff on pre-feasibility studies of off-stream storage options as directed under Proposition 204. Storage options will be screened on the basis of economic, engineering, environmental, cultural, and operational characteristics in compliance with state and federal laws, thereby reducing the list of potential storage sites. Program staff will then be able to provide more detailed, site-specific, information regarding storage options.</p> <p>Development of more detailed investigations will occur during Phase III of the CALFED Process. At that time, operating criteria and site-specific impacts will be developed and evaluated. These findings will be included in project-specific feasibility studies and environmental documentation.</p>

ISSUE	RESPONSE
<b>ISOLATED FACILITY</b>	
<p><b>Impact Evaluation</b> – Construction and operation of an isolated facility would have various adverse impacts that need to be quantified, considered, and compared to other conveyance alternatives.</p>	<p>The isolated facility would provide many water supply reliability, water quality, and environmental benefits. Conversely, as with any project of this magnitude, there would be adverse impacts as well. Should a need to implement the isolated facility be identified as outlined in the contingency Delta conveyance component of CALFED's Implementation Strategy, project level environmental documentation would thoroughly identify, evaluate, and address all potential benefits and impacts prior to commitment to any such facility.</p>
<p><b>Common Pool</b> - Common Pool concept must be maintained to ensure shared interest in Delta improvement maintenance</p>	<p>Many individuals and agencies that use water from the Bay-Delta system divert their water supplies directly from the Delta itself, including in-Delta agriculture users, Bay Area communities, and the state and federal water projects. The common pool concept includes a common interest in restoring, maintaining, and improving the Delta with respect to water supply, water quality, and the ecosystem. Under each CALFED alternative, all diverters would continue to take some or all of their water from the Delta channels – thus maintaining the common Delta pool. Specifically, under alternatives 1 or 2, all Delta diverters would continue to be fully reliant upon Delta channels for water supplies. Under alternative 3, a dual conveyance system would allow some water users to take part of their supplies from the Sacramento River upstream of the Delta. It is important to realize however, that under all CALFED alternatives, Delta water users would continue to depend on the common pool for part of their supplies.</p>
<p><b>Assuring Appropriate Operations of Conveyance Facilities</b> – Concern remains that construction and operation of an isolated facility will dramatically increase water exported from the estuary, will reduce the incentive to protect the integrity of the Delta, and will ignore the need to maintain specified water quality standards throughout the Delta.</p>	<p>The list of potential “tools” available for addressing these and other concerns about assuring the implementation of the Program is long and varied, ranging from fairly simple contractual agreements to more complex long term financial agreements and multipurpose legislation. Given the complexity of the assurances issues and the need to coordinate both the state and federal authorities applicable to the Bay-Delta problem, CALFED is assuming that any significant assurances proposals will require state and federal authorizing legislation.</p> <p>The assurances effort will continue in public BDAC Assurances Workgroup meetings, briefings to BDAC and other discussions with agencies and stakeholders.</p>

ISSUE	RESPONSE
<b>ISOLATED FACILITY (continued)</b>	
<p><b>IF/PC Contrast</b> – The isolated facility is simply another attempt to develop the peripheral canal that was already voted down in 1982. Furthermore, implementation of the isolated facility will result in additional export capacity (and therefore – export volumes) as demonstrated by CALFED’s ultimate plan to operate Banks pumping Plant at full capacity.</p>	<p>Several features (physical, operational, and programmatic) differentiate the isolated facility from the previously proposed peripheral canal that sparked a divisive confrontation in a 1982 state bond initiative. First, the scopes of the two projects are different with respect to diversion and conveyance capacities. Second, the peripheral canal was to be operated primarily to increase the State’s developed water supply. Lastly, the peripheral canal was designed to be a stand-alone project.</p> <p>The capacity of the peripheral canal is contrasted with that of the isolated facility with respect to the export capacity as well as potential diversion impacts to fisheries and water quality. Specifically, the diversion capacity of the isolated facility (between 5,000 and 15,000 cfs) is less than the peripheral canal (23,000 cfs). Although the peripheral canal was designed to provide in-Delta releases, the conveyance capacity into Clifton Court Forebay was to be 18,300 cfs. It should be noted that the combined physical capacity of the State Water Project (10,300 cfs) and the Central Valley Project (4,600) is 14,900 cfs. Thus, the 15,000 cfs isolated facility portrayed in the CALFED alternative evaluations represents the maximum combined capacity that the state and federal projects can export.</p> <p>The peripheral canal included a feature to discharge Sacramento River water from the canal into various Delta channels as a means of improving in-Delta water quality. Since anadromous fish species rely upon chemical tracers in water to navigate to their native spawning areas, there was concern that such discharges would cause anadromous fish to stray from the Sacramento River into the Delta, thereby reducing their reproductive success. The Program is not considering releasing Sacramento River water from the proposed isolated conveyance facility into Delta channels.</p> <p>Full CVP and SWP export capacity would provide additional operational flexibility. The ability to export water at full physical capacity during periods of high Delta inflow and low impacts to fisheries will allow water users to rely on stored water while exports are reduced during periods of low Delta inflow and high diversion impacts on fisheries. This type of operation could improve water supply reliability while improving conditions for Delta fisheries. The existing export capacity of the CVP and SWP facilities would not be increased as a result of constructing the isolated facility. However, the isolated facility could provide the means for improved export water quality and reduced entrainment of fish in the south Delta. The “dual-conveyance” alternative would also provide additional operational flexibility to allow exports from the diversion location that resulted in the lowest impacts to migrating fish populations. Lastly, the isolated facility would not be a stand-alone, single-purpose water supply project. Rather, it would be part of a comprehensive program solution intended to meet all CALFED objectives.</p>

ISSUE	RESPONSE
-------	----------

<b>ISOLATED FACILITY (continued)</b>	
<p><b>Fish Screens</b> – It will be impossible to effectively screen the proposed isolated facility diversion at the Sacramento River.</p>	<p>CALFED and various stakeholder agencies are currently addressing fish screen development of this magnitude. It is believed that a 5,000 cfs to 15,000 cfs screened diversion and fish handling facility can be effectively operated. In fact, a benefit to fisheries is expected due to the “consolidation” of some of the existing unscreened diversions into one screened diversion. In all likelihood, CALFED (in conjunction with other stakeholders) would initially recommend the construction of a test facility prior to a full scale implementation. Such a facility would be subject to extensive research and input from both the environmental and engineering communities prior to any proposed expansion.</p>
<p><b>Implementation and Further Study</b> – The isolated facility is the only effective means of improving water quality and supply reliability with respect to through Delta flows. Therefore, CALFED should construct the isolated facility immediately.</p>	<p>At this time, CALFED has not ruled out the potential need for an isolated facility to achieve our mission. Conversely, CALFED cannot conclude, based on current information, that the facility is necessary for fulfilling that mission. Although the isolated facility would produce many water quality and environmental benefits through increased operational flexibility, there has been considerable public objection to its implementation. Those opposed to the facility point out that its construction would cause local impacts, its implementation would be expensive, and adequate assurances that the facility would be properly operated and the Delta “common pool” would be preserved cannot be guaranteed. The draft Stage 1 Implementation Strategy relies on the existing Delta configuration with minor modifications. The strategy is to do everything practical to make a though Delta configuration work before the contingent inclusion of the isolated facility would be considered.</p> <p>If this alternative is not successful, due to public health concerns over water quality or unmitigable impacts to fisheries, consideration of an isolated facility will resume. In the mean time, CALFED will proceed with preliminary planning and evaluations for the isolated facility. If the isolated facility is ultimately determined necessary, this strategy would not have significantly delayed implementation since years of additional studies would be required before implementation would be possible (regardless of when a decision is made).</p>

ISSUE	RESPONSE
<b>OPERATING ASSUMPTIONS AND MODELING</b>	
<p><b>Purpose/Objective of Modeling</b> – CALFED modeling lacks credibility for the following reasons: (1) the operation assumptions are biased toward a specific stakeholder (environmental or water development interests), (2) the validity of the conclusions derived from the model is questionable.</p>	<p>The primary objective of CALFED's modeling studies is to provide information to assist in the evaluation of new facilities and operating concepts. Modeling results are not intended to provide a definitive single "answer". Instead a model should be construed as an analytical tool that approximates the interrelationship of physical and institutional parameters under various scenarios. Assumptions for operating new storage and conveyance facilities considered in the Program alternatives were designed to aid in the evaluation of the alternatives. Where questions regarding specific assumptions arise, sensitivity evaluations may be conducted to test other assumptions. Some of these sensitivity evaluations are documented in this PEIS/EIR.</p> <p>CALFED maintains that the level of detail included in its modeling studies and evaluations of alternatives is consistent with the programmatic decisions being made during Phase II of the Program. The modeling tools and assumptions used by CALFED are under constant refinement. As CALFED completes Phase II of the Program and moves into implementation during Phase III, more detailed and refined evaluations of storage and conveyance facilities will be conducted. Information obtained through these evaluations will be included in project-specific environmental documentation.</p>
<p><b>X2</b> – CALFED should better define the significance of X2 as well as the sensitivity of X2 with respect to Delta water operations.</p>	<p>Salinity criteria which, in part, determine Delta outflow requirements under the current Bay-Delta standards are referred to as the "X2" standards. The X2 requirement sets the position of the salinity gradient in the estuary so that a salt concentration of two parts per thousand is positioned where it may be more beneficial to aquatic life. The position of the salinity gradient is believed to be related to food abundance, birth/mortality rates, and habitat impacts. X2 has been linked to the abundance of Longfin Smelt and Pacific Herring. It has also been linked to the survival index of Striped Bass.</p> <p>CALFED has conducted evaluations to determine both the potential effects on X2 location associated with implementation of the Program alternatives under existing Bay-Delta standards and the water supply impact of potential changes in X2 requirements under each Program alternative. These evaluations were documented in the March 1998 Phase II Interim Report. This revised draft PEIS/EIR includes a refined evaluation of the potential effects on X2 location associated with implementation of the Program alternatives.</p>

ISSUE	RESPONSE
<b>SUPPLY &amp; DEMAND - BULLETIN 160-98</b>	
<p><b>Water Supply and Demand Forecasting</b> – CALFED needs to reconsider the demand and supply estimates depicted in Bulletin 160-98. The Bulletin does not adequately account for supply, demand, and conservation potential.</p>	<p>The California Department of Water Resources updates the “California Water Plan, Bulletin 160” every five years. The Plan provides a statewide assessment of present and projections of future water supplies and demands. Another major focus of the draft Bulletin is to quantify the extent to which water supply actions being planned by California water agencies could reduce future shortages. The Bulletin estimates actions appearing to have a reasonable chance of being implemented by 2020, including water conservation, water recycling, desalting, new storage facilities, and new conveyance facilities. The draft Bulletin assumes a significant amount of urban water conservation in its base 2020-level water demand forecast. Most notably, the Bulletin assumes that urban best management practices pursuant to the existing urban memorandum of understanding will be fully implemented statewide by 2020. Statewide, this assumption results in 1.5 MAF of applied water reduction.</p> <p>The 1995 and 2020 levels of demand estimates used in CALFED modeling are based on Bulletin 160-98 land use projections in the Sacramento Valley and 73-year (1922-1994) historic inflow data from the Sacramento River watershed. Inflow from the San Joaquin Valley watershed is based on analysis conducted by the Bureau of Reclamation on CVP demands. The 1995 level of demand for CVP Delta exports is assumed at 3.6 MAF/year, including wildlife refuges, and for the 2020 level of demand the CVP Delta exports is assumed at 3.8 MAF/year. For the SWP, CALFED uses a variable 1995 level of demand pattern ranging between 3.5 MAF/year in drier years down to 2.6 MAF/year in wetter years and a 2020 level of demand pattern varied between 3.5 MAF/year and a contractual maximum of 4.1 MAF/year. The demands for most SWP contractors vary in response to local wetness indexes and Metropolitan provided estimated SWP demands consistent with their Integrated Resources Plan (IRP).</p> <p>Under the various CALFED Alternatives, modeling results indicate the long-term average CVP deliveries range from 2.4 to 2.6 MAF, and dry year average deliveries from 1.7 to 2.0 MAF. Similarly, modeling results indicate the long-term average SWP deliveries range from 3.3 to 3.9 MAF, and dry year average deliveries from 2.1 to 2.8 MAF. In summary, the model predicts delivery shortages for both CVP and SWP contractors for most years except very wet periods. While there are curtailments in CVP/SWP exports in most years, the Bulletin 160-98 applied water and net consumptive use projections used in the upstream hydrology to determine the effects of upstream water demands are fully met by the modeling.</p>

ISSUE	RESPONSE
<b>WATER MANAGEMENT</b>	
<p><b>Rights and Reallocations</b> – Area of origin rights, reallocation of existing supplies, and existing water rights must be considered by CALFED.</p> <p><b>Reoperation of Existing Facilities</b> – Reoperation of existing infrastructure should be considered to supplement (or in-lieu of) structural solutions.</p>	<p>Existing water rights, including area of origin rights, have been acknowledged and considered by CALFED in evaluations for this PEIS/EIR. While, some reallocation of existing supplies resulting from market responses could result from implementation of proposed CALFED actions, CALFED is not considering any direct reallocation of water supplies or water rights between water users.</p> <p>Reoperation can take advantage of the flexibility in California's existing water resources infrastructure. However, given the extent of the conflict between water needs for the Bay-Delta ecosystem and the needs for reliable water supplies from the Bay-Delta system, it is not expected that reoperation of existing facilities alone can provide a comprehensive, durable solution. None-the-less, more detailed evaluation of specific reoperation proposals will occur throughout implementation of the CALFED Program and it is expected that many will be adopted.</p>
<b>DESALINATION</b>	
<p><b>Consider/Implement Desalination</b> – CALFED should implement desalination as a solution to the state's water supply reliability problems.</p>	<p>All forms of water management, including desalination, must be considered by public agencies in planning for water supply reliability. Although desalination has the potential to augment water supplies in many coastal areas, it is not currently a practicable or affordable method of replacing Bay-Delta water supplies. Future improvements to desalination technology may result in the need for reconsideration. However, current planning activities such as those represented by this PEIS/EIR cannot responsibly assume these advancements in technology will be realized.</p>

ISSUE	RESPONSE
<b>COSTS/ECONOMICS/FINANCING</b>	
<p><b>Benefits-Based Financing</b> – CALFED should not provide subsidies (directly or indirectly) to either agricultural or urban water users. Instead a “user pays” financing approach should be pursued.</p>	<p>A "benefits-based approach" is one of several principles that the CALFED finance package is being based upon. This financing strategy would prevent public monies from subsidizing individual water use for any new storage or conveyance facilities constructed. Public money will only be expected to fund a particular project to the extent that the project creates public benefits.</p>
<p><b>Capital Annual Cost Development</b> – CALFED has overlooked some cost items that must be considered.</p>	<p>CALFED maintains that all significant cost considerations have been accounted for commensurate with this programmatic level of evaluation. Although some assumptions may be disputed, the relative feasibility of each facility (with respect to cost) will not be affected. More detailed cost estimates will be completed during project level feasibility studies and environmental documentation.</p> <p><b>CALFED Total Capital Cost estimates include the following:</b></p> <ul style="list-style-type: none"> <li><input type="checkbox"/> Base Construction Estimates for all mobilization, labor, materials, relocation/removal of existing infrastructure, land acquisition, and right-of-way required for construction and operation of facilities.</li> <li><input type="checkbox"/> 20% for contingencies</li> <li><input type="checkbox"/> 35% for planning, engineering, construction administration, and legal costs</li> <li><input type="checkbox"/> 20% for regulatory, mitigation, and documentation related to environmental and cultural resources</li> <li><input type="checkbox"/> Forgone Investment Value during construction is also considered – This is the loss of investment opportunity due to allocation of monies prior to returns. A discount rate of 6% is assumed.</li> </ul> <p><b>CALFED Total Capital Cost estimates include the following:</b></p> <ul style="list-style-type: none"> <li><input type="checkbox"/> Capital Recovery – A discount rate of 6% is assumed over a period of 50 years.</li> <li><input type="checkbox"/> 1.5% of the Total Capital Cost to account for operation and maintenance costs</li> <li><input type="checkbox"/> 0.5% of the Total Capital Cost to account for energy costs</li> </ul>
<b>BEYOND CALFED MANDATE</b>	
<p><b>Beyond CALFED Mandate</b> – CALFED needs to improve water supply, water quality, supply reliability, and the ecosystem in a variety of locations outside of the proposed solution area.</p>	<p>CALFED is not charged with solving the entire state's water problems; rather, our mandate is to address issues (including water supply) as they relate to the Bay-Delta system and its tributary watersheds. We have evaluated a range of potential solutions addressing water supply reliability for the Bay-Delta, which is an important part of the state's water supply system. These potential solutions may indirectly benefit other aspects of California's water supply, but we will not evaluate options with the specific goal of satisfying water needs for the entire state</p>

ISSUE	RESPONSE
<b>CLARIFICATIONS</b>	
<p><b>Corrections, Errors, and Omissions</b> – CALFED needs to expand, revise, remove, or replace information stated in the PEIS/R due to errors, omissions, inconsistencies, or typos.</p>	<p>CALFED recognizes the numerous comments received requesting clarification or correction of information presented in the initial draft PEIS/EIR documents. To the extent possible, these will be addressed, verified, corrected, and included in the revised December 1998 draft. Remaining errata will be resolved prior to the release of the Final PEIS/EIR.</p>
<b>POWER PRODUCTION AND ENERGY</b>	
<p><b>Impact Evaluation</b> – CVP operational changes could result in curtailment of power generation and a loss of entitlement to preference power customers. The impact analyses are based on DWRSIM model results that use too broad a timestep---30 days--for power generation, and are not specific enough to disclose the effects to individual generation plants. The two scenarios, all impacts allocated either to (1) the CVP or (2) the SWP, are not realistic.</p>	<p>Worst-case effects of CALFED actions on power production are disclosed in the Draft PEIS/EIR, as described in the analyses which allocate all impacts to either the CVP or to the SWP. Either scenario is acknowledged to be extreme, but is useful in setting bounds of possible impacts. Actual impacts are expected to fall somewhere between the extremes. Depending on the alternative implemented, the changes in project operations could result in either an increase or decrease in capacity and up to a net 1600 GWh reduction in annual energy production. Reductions in energy generation could result in increased power rates as replacement power is purchased on the open market as well as possible reductions in future entitlements to CVP preference power customers. The amounts of such changes are described in the Draft PEIS/EIR, and will likely be refined to a narrower range for the Final PEIS/EIR when modeling results of the preferred alternative become available. Based on the amount of power available under new water operations scenarios, future changes in entitlements of CVP power to preference customers would be determined by the Western Area Power Administration in an allocation process independent of the CALFED Program.</p>
<p><b>Effects of CALFED Program Actions on SWP System Energy Rate</b> – Assumptions used in Section 8.5.2.3 to adjust the SWP system energy rate for use as a consistent benchmark are not clear.</p>	<p>The effects of the Bay-Delta Program No-Action Alternative assumptions for SWP system energy will be clarified in the revised Draft PEIS/EIR as to whether the rate will increase or decrease and whether off-aqueduct power costs will be included.</p>

ISSUE	RESPONSE
<p><b>POWER PRODUCTION AND ENERGY (continued)</b></p> <p>Cost increases for Water Users – Increases in power costs or shifts in environmental costs from power uses to water users could increase agricultural and urban water rates. Mitigation for power impacts is not defined as to likelihood or effectiveness, and is not presently subject to adequate assurances.</p>	<p>The possibility of water rate increases from increased power costs or from environmental costs shifted from power customers to water users is acknowledged. Power rates are constrained by a competitive market and alternative power sources are available at market rates. Because of the availability of alternative sources, power will not sell above market rates, regardless of what costs are assigned to it. It is likely that beneficiaries will be liable for added new costs, depending how Program costs are ultimately apportioned. The BDAC Finance Committee is currently working on this issue. The reallocation of the components that comprise power cost is listed as a mitigation measure for the impact of power cost increases and reduced power generation. The refinement of Program costs and cost allocations continues, as does the assessment of means to adequately mitigate for impacts to power production and rates. Challenging assurance issues for both power customers and water users will have to be resolved.</p>

Printed by  
Department of Water Resources  
Reprographics

D - 0 1 1 4 8 5

D-011485