CALFED
BAY-DELTA
PROGRAM

# Phase I Final Report
# September 1996

CALFED
BAY-DELTA
PROGRAM

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Date: September 16, 1996

To: Washington DC CALFED Agency Representatives

From: Judy Kelly, Deputy Director
CALFED Bay-Delta Program

Subject: Phase I Successfully Completed

We are pleased to report good progress continues to be made on seeking long-term solutions to the issues in the California Bay-Delta System.

Enclosed you will find a copy of the Final Phase I Report which highlights the accomplishments of the past 16 months. We are now actively engaged in developing additional detail on the three proposed alternative solutions outlined in the Report. The detailed alternatives will be analyzed in an EIS/EIR process now underway. We expect to produce a Draft Programmatic EIR/EIS next June and plan to have the final documents out by September 1998.

Program staff will continue to keep you informed on Program progress and we will be in Washington in the next several months to provide you a briefing on the Program. I have also sent copies of the press clips on the Phase I alternative announcement event we held in Sacramento, California on September 3, 1996. If you would like any additional details, please call me at (916) 657-2666.

Enclosures

**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
Department of Commerce
National Marine Fisheries Service

# PHASE I FINAL REPORT

# CALFED BAY-DELTA PROGRAM

**The CALFED Bay-Delta Program is a cooperative effort among state and federal agencies and the general public to ensure a healthy ecosystem, reliable water supplies, good water quality, and stable levees in California's Bay-Delta.**

## CONTENTS



# PERSPECTIVE

The CALFED Bay-Delta Program is a three-phase effort to develop a long-term solution to problems affecting the San Francisco Bay/Sacramento-San Joaquin Delta estuary (the Bay-Delta) in Northern California.

The Program addresses four categories of Bay-Delta problems:

- ecosystem quality
- water quality
- water supply reliability
- system vulnerability

During Phase I, from June 1995 through August 1996, the Program identified these problems, developed a mission statement and several guiding principles, and designed three alternative solutions.

In Phase II, from June 1996 to September 1998, the Program will conduct a broad-based environmental review of the three alternative solutions and will identify the one preferred alternative.

During Phase III, starting in late 1998 or early 1999 and lasting for many years, the preferred alternative will be implemented in stages.

This report summarizes Phase I, describes the three alternative solutions (called Phase II Alternatives), and sets the stage for Phase II.

Each alternative described in this report is a combination of actions (e.g. habitat restoration, new storage, policy changes, etc.) that together address the critical problem areas affecting the Bay-Delta.

None of the alternatives is a project-level proposal. Each focuses on identifying a range of possible actions -- not when, where, and how specific actions should be undertaken.

Each alternative includes

- common programs for
  - water use efficiency
  - ecosystem restoration
  - water quality
  - levee system integrity
- a range of water storage options
- a system for moving ("conveying") water

The common programs, which are virtually the same in all alternatives, include a wide array of actions designed to ensure efficient water use, a healthy ecosystem, better water quality, and stable levees. Several water storage options, from groundwater banking and conjunctive use to offstream surface storage, will be considered for each alternative. The alternatives take different approaches to conveying water through or around the Delta: existing through-Delta conveyance, modified through Delta conveyance, and modified through-Delta conveyance combined with an isolated facility.

The 3 alternatives described in this document will continue to be refined during Phase II through technical evaluation and input from the public, the Bay-Delta Advisory Council (BDAC), and CALFED agencies.

***The Program welcomes questions about the Phase II Alternatives and about the refinement process. Staff may be reached by telephone on weekdays from 8:30am to 5:00pm at (916) 657-2666. Or for information, call the Program's 24-hour hotline at (916) 654-9924 or see the CALFED Bay-Delta Program home page at http://calfed.ca.gov/.***

# PROGRAM OVERVIEW

## THE BAY-DELTA'S SIGNIFICANCE

The Bay-Delta is the largest estuary on the West Coast, a beautiful, lush, and varied ecosystem including a maze of tributaries, sloughs, and islands encompassing 738,000 acres. Lying at the confluence of California's two largest rivers, the Sacramento and the San Joaquin, it is a haven for plants and wildlife, including 70,000 acres of wetlands and supporting 120 fish and wildlife species.

The Bay-Delta is also critical to California's economy, supplying drinking water for two-thirds of Californians and irrigation water for 200 crops, including 45 percent of the nation's produce.

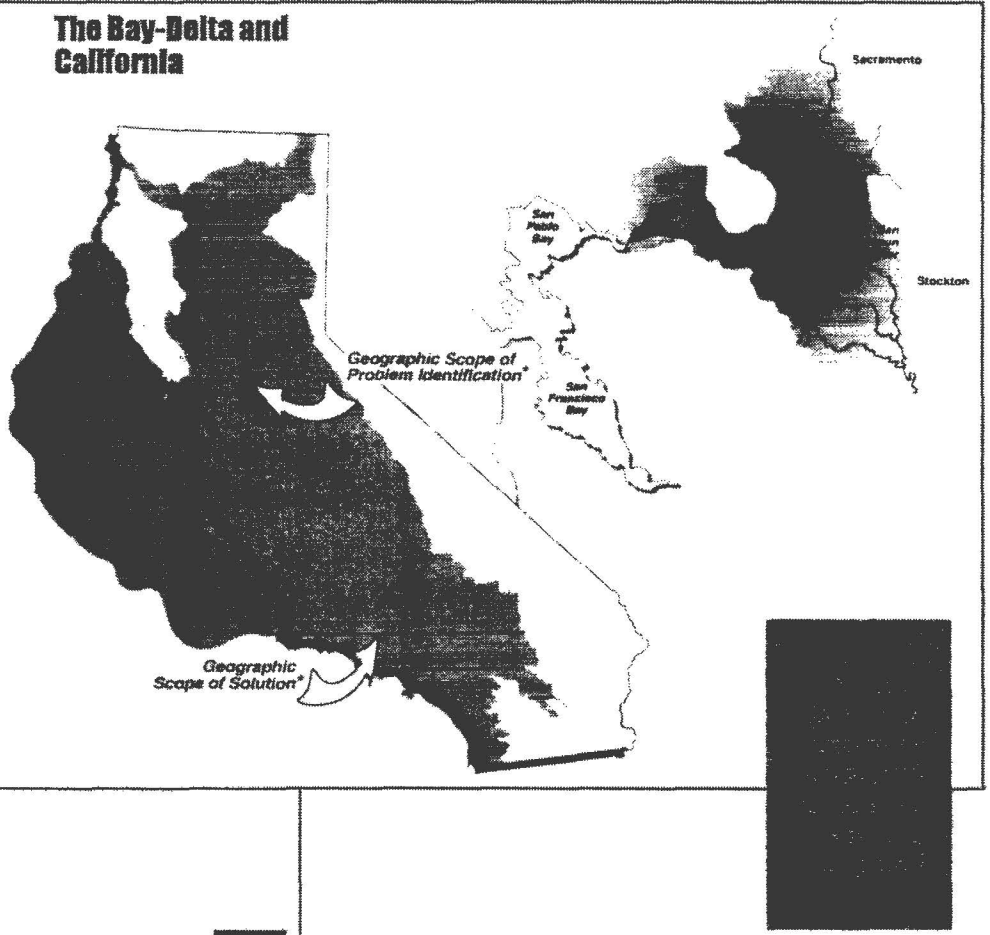
The area has for decades been the focus of competing interests -- economic and ecological, urban and agricultural. And it has suffered from this. Habitats are declining, and several native species are endangered. The system no longer serves as a reliable source of high-quality water, and the levees face an unacceptably high risk of breaching. Though many efforts have been made to address these problems, the issues are complex and interrelated, and many remain unresolved.

## PROGRAM ORGANIZATION

The CALFED Bay-Delta Program is a cooperative effort involving several state and federal agencies with management and regulatory responsibilities in the Bay-Delta. It is also a collaborative effort with Bay-Delta "stakeholders" -- urban and agricultural water users, fishing interests, environmental organizations, businesses, and others -- who contribute to Program design and to the problem-solving/ decision-making process.

Public participation and input have been essential throughout the process to date, and have come principally through the Bay-Delta Advisory Council (BDAC) and public participation in workshops and meetings. The BDAC is chartered under the Federal Advisory Committee Act and includes representatives of stakeholder groups jointly selected by the Governor of California and the U.S. Secretary of the Interior.

**The Bay-Delta and California**



## ORGANIZATIONAL HISTORY AND STRUCTURE OF THE CALFED BAY-DELTA PROGRAM

The CALFED Bay-Delta Program was established in May 1995 and is one element of CALFED, a consortium of state and federal agencies with management and regulatory responsibilities in the Bay-Delta.

At the state level, these agencies are the California Resources Agency, including the Department of Water Resources and the Department of Fish and Game; and the California Environmental Protection Agency, including the State Water Resources Control Board. At the federal level, participating agencies are the U.S. Department of Interior, including the Bureau of Reclamation and the Fish and Wildlife Service; the U.S. Environmental Protection Agency; and the U.S. Department of Commerce, represented by the National Marine Fisheries Service. The U.S. Army Corps of Engineers also participates as a cooperating agency.

CALFED provides policy direction to the Program. It was formed as part of a Framework Agreement signed in June 1994 by California Governor Pete Wilson and by Bruce Babbitt, Secretary of the U.S. Department of the Interior. As part of this Framework Agreement, the state and federal governments pledged to work together to formulate water quality standards to protect the Bay-Delta, coordinate State Water Project (SWP) and Central Valley Project (CVP) operations in the Bay-Delta, and develop a long-term Bay-Delta solution.

In December 1994, the Bay-Delta Accord was signed by state and federal regulatory agencies, with the cooperation of diverse interest groups, to address these issues. This accord drafted integrated water quality standards and created a state/federal coordination group to better integrate the SWP and CVP. The Bay-Delta Program is charged with responsibility for the third issue: development of a long-term Bay-Delta solution.

Impetus to forge this long-term solution came at the state level in California in December 1992 with formation of the Water Policy Council and the Bay Delta Oversight Council, an advisory group to the Water Council. The following year, in September 1993, the Federal Ecosystem Directorate was created at the federal level to coordinate federal resource protection and management decisions for the Bay-Delta.

**CALFED**

**The Resources Agency of CA**
- Dept. of Fish and Game
- Dept. of Water Resources

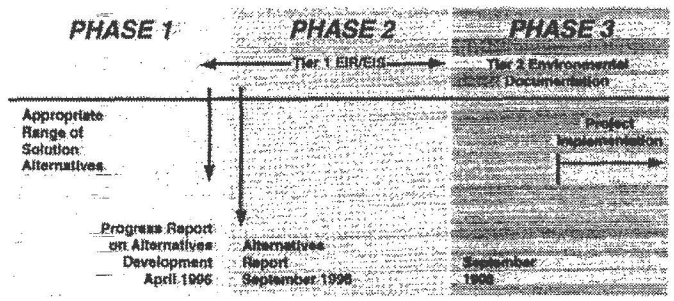
**CA Environmental Protection Agency**
- State Water Resources Control Board

**U.S. Environmental Protection Agency**

**U.S. Dept. of the Interior**
- Fish and Wildlife Service
- Bureau of Reclamation

**U.S. Dept. of Commerce**
- National Marine Fisheries Service

## Three-Phase Program Schedule




## MISSION STATEMENT

***The mission of the CALFED Bay-Delta Program is to develop a long-term comprehensive plan that will restore ecological health and improve water management for beneficial uses of the Bay-Delta system.***

The Program is managed by CALFED staff, with assistance from consulting organizations, and is structured in three phases.

Phase I, lasting from June 1995 to September 1996, is the subject of this report.

Phase II, set to run from summer 1996 to fall 1998, includes three simultaneous processes: (1) a programmatic environmental review to forecast broad environmental impacts of the alternatives, (2) technical analyses necessary to refine and clarify the elements of the alternatives, (3) development of the solution implementation process. Before the end of Phase II, the Program is expected to recommend a preferred solution.

Phase III will include site-specific environmental review of individual elements of the preferred alternative. Implementation of elements of this alternative could begin by early 1999 and will continue in stages over several years.

Other efforts are under way outside the CALFED Bay-Delta Program to address some of the problems and solutions being explored by the Program, particularly in upstream areas. Opportunities to aid or draw from these separate efforts have been and will continue to be addressed.

## PHASE I OBJECTIVES AND ACCOMPLISHMENTS

Phase I has resulted in the Phase II Alternatives, three possible comprehensive solutions to Bay-Delta problems.

The initial focus in Phase I was to define Bay-Delta problems and Program objectives and to identify actions that could resolve these problems and meet these objectives. In addition, strategies were developed to identify, assemble, and refine the alternatives.

To involve the public in accomplishing these goals, the Program convened regular public workshops during Phase I. Workshop 1, held in August 1995, focused on problem identification; workshop 2 in September 1995 focused on defining Program objectives; workshop 3 was held in October 1995 to identify actions to resolve problems and meet objectives; in December 1995 workshop 4 focused on developing solution strategies; workshop 5 was held in February 1996 to assess an initial draft set of 20 alternatives; workshop 6 in April 1996 focused on refining a draft set of 10 alternatives; and workshop 7 was held in June 1996 to present draft versions of the 3 Phase II Alternatives described in this report.

Bay-Delta problems and Program subobjectives defined in this manner are shown on page 6. The primary Program objectives are

- to provide good water quality for all beneficial uses;
- to improve and increase aquatic and terrestrial habitats and improve ecological functions in the Bay-Delta to support sustainable populations of diverse and valuable plant and animal species;
- to reduce the mismatch between Bay-Delta water supplies and current and projected beneficial uses dependent on the Bay-Delta system;

• to reduce the risk to land use and associated economic activities, water supply, infrastructure, and the ecosystem from catastrophic breaching of Delta levees.

In addition to the objectives, the Program in Phase I developed six "solution principles" as criteria for the Bay-Delta solution. While the objectives are technical, the solution principles offer broad policy guidance.

According to the solution principles, a Bay Delta solution must:

***Reduce Conflicts in the System*** Solutions will reduce major conflicts among beneficial uses of water.

***Be Equitable*** Solutions will focus on solving problems in all problem areas. Improvements for some problems will not be made without corresponding improvements for other problems.

***Be Affordable*** Solutions will be implementable and maintainable within the foreseeable resources of the Program and stakeholders.

***Be Durable*** Solutions will have political and economic staying power and will sustain the resources they were designed to protect and enhance.

***Be Implementable*** Solutions will have broad public acceptance and legal feasibility, and will be timely and relatively simple to implement compared with other alternatives.

***Have No Significant Redirected Impacts*** Solutions will not solve problems in the Bay-Delta system by redirecting significant negative impacts, when viewed in their entirety, within the Bay-Delta or to other regions of California.

Another important Phase I task was to establish the geographic scope of the Program. Separate problem and solution scopes were defined.

***Problem Scope*** The Program addresses problems that exist within the legally defined Delta, Suisun Bay (extending to the Carquinez Strait) and Suisun Marsh, or are closely linked to this area. See the map on page 2. Examples could include toxic inflows and outflows, in-migrating fish, and water diversion patterns.

***Solution Scope*** Because the Bay-Delta solution is part of a larger water and biological resource system, a much broader solution scope has been defined, including at least the Central Valley watershed, the Southern California water system service area, and the portions of the Pacific Ocean out to the Farallone Islands. This is necessary because many problems related to the Bay-Delta are caused by factors outside the Bay-Delta or could be addressed with solutions outside the Bay-Delta.

For example, salmon population problems are linked to the Bay-Delta due to high mortality rates during salmon migrations. While one solution would be to reduce mortality during salmon migration through the Bay-Delta, it might be less expensive or ecologically preferable to promote greater salmon production upstream.

An expanded solution scope is also desirable from a planning perspective because more benefits may be generated at lower cost if solutions are not limited to the geographic Bay-Delta.

## ALTERNATIVE IDENTIFICATION

Early in Phase I, the Program identified 50 categories of actions to resolve Bay-Delta problems and achieve Program objectives. These action categories were drawn from

**Phase I was a six-step process of defining Bay-Delta problems, identifying actions that could address those problems, and combining actions into several comprehensive solutions. Public input from a wide array of Californians informed every step of this process and will continue to exert a strong influence as the Program moves into Phase II.**

# BAY-DELTA PROBLEM AREAS & SECONDARY PROGRAM OBJECTIVES

(For primary Program objectives, see pages 4 and 5.)

## ECOSYSTEM QUALITY

| Problems | Objectives |
|---|---|
| * Important aquatic habitats are inadequate to support production and survival of native and other desirable estuarine and anadromous fish in the Bay-Delta system. Examples of fish that have experienced declines related to changes in Delta habitats include delta smelt, longfin smelt, Sacramento splittail, chinook salmon, striped bass, and American shad. | * Improve and increase aquatic habitats so they can support the sustainable production and survival of native and other desirable estuarine and anadromous fish in the estuary. |
| * Important wetland habitats are inadequate to support production and survival of wildlife species in the Bay-Delta system. | * Improve and increase important wetland habitats so they can support the sustainable production and survival of wildlife species. |
| * Populations of some species of plants and animals dependent on the Delta have declined. | * Increase population health and population size of Delta species to levels that assure sustained survival. |

## WATER QUALITY

| Problems | Objectives |
|---|---|
| * Water quality is often inadequate or is perceived as inadequate for drinking water needs. | * Provide good water quality in Delta water exported for drinking water needs. |
| * Delta water quality is often inadequate for agricultural needs. | * Provide good Delta water quality for agricultural use. |
| * Delta water quality is often inadequate for industrial needs. | * Provide good Delta water quality for industrial use. |
| * Delta water quality is often inadequate for recreational needs. | * Provide good Delta water quality for recreational use within the Delta. |
| * Water quality is often adequate for environmental needs for the Bay-Delta system. | * Provide improved Delta water quality for environmental needs. |

## WATER SUPPLY RELIABILITY

| Problems | Objectives |
|---|---|
| * Water supplies of the Bay-Delta system do not meet needs because of conflict among beneficial uses and because of system inadequacies. | * Reduce the conflict between beneficial uses and improve the ability to transport water through the Bay-Delta system. |
| * Bay-Delta system water supplies are uncertain with respect to short- and long-term needs. | * Reduce the uncertainty of Bay-Delta system water supplies to help meet short- and long-term needs. |

## LEVEE SYSTEM INTEGRITY

| Problems | Objectives |
|---|---|
| * Existing agricultural land use, economic activities, and infrastructure in the Delta are at risk from gradual deterioration of Delta conveyance and flood control facilities as well as sudden catastrophic inundation of Delta islands. | * Manage the risk to existing land use, associated economic activities, and infrastructure from gradual deterioration of Delta conveyance and flood control facilities and catastrophic inundation of Delta islands. |
| * Water supply facilities and operations in the Delta are at risk from increased salinity intrusion which can result from sudden catastrophic inundation of Delta islands. | * Manage the risk to water supply facilities and operations in the Delta from catastrophic inundation of Delta islands. |
| * Water quality in the Delta is at risk from increased salinity intrusion which can result from sudden catastrophic inundation of Delta islands. | * Manage the risk to water quality in the Delta from catastrophic inundation of Delta islands. |
| * The existing Delta ecosystem is at risk from gradual deterioration of Delta conveyance and flood control facilities as well as catastrophic inundation of Delta islands. | * Manage the risk to the existing Delta ecosystem from gradual deterioration of Delta conveyance and flood control facilities and catastrophic inundation of Delta islands. |

existing literature and input from CALFED agencies, BDAC, and the general public, and they were used as the building blocks of the solution alternatives. Accordingly, each solution alternative is a combination of action categories reflecting differing approaches to achieving program objectives and addressing solution principles.

Given the large number of these categories, and the range of perspectives on solutions to Bay-Delta problems among stakeholders and CALFED agencies, thousands of potential alternatives could have been identified. A first step for the Program was to devise a methodology that would keep the number of alternatives to a manageable level while still representing the full range of approaches to resolving the problems.

The methodology chosen to accomplish this was to define the critical conflicts that exist between beneficial uses and resources in the Bay-Delta and then to define approaches to resolving these conflicts. The conflicts are between:

***Fisheries and Diversions*** The conflict between fisheries and diversions results primarily from fish mortality attributable to water diversions. This includes direct loss at pumps, reduced survival when young fish are drawn out of river channels into the Delta, and reduced spawning success of adults when migratory cues are altered. The effects of diversions on species of special concern have resulted in regulations that restrict quantities and timing of diversions.

***Habitat and Land Use and Flood Protection*** Habitat for various Bay-Delta aquatic and terrestrial biota has been lost, in part because of land development and construction of flood control facilities. Efforts to restore habitats often require that land used for agricultural production or levees be dedicated to habitat.

***Water Supply Availability and Beneficial Uses*** As water use has increased during the past several decades, competition has increased among instream and out-of-stream water uses. The conflict involves both volumes of water and the timing of instream releases and out-of-stream diversions.

***Water Quality and Land Use*** Water quality can be degraded by land use, and ecosystem water quality needs are not always compatible with urban and agricultural water quality needs.

In assessing these conflicts, alternate approaches .o conflict resolution, and alternative levels of resolution, were defined. Approaches for resolving the fisheries and diversions conflict included (1) a fish productivity approach and (2) a diversion modification approach. Approaches for resolving the habitat and land use/flood protection conflict included (1) an existing land-use pattern approach and (2) a modified land-use pattern approach.

Approaches for resolving the water supply availability and beneficial uses conflict included (1) a demand reduction approach and (2) a supply enhancement approach. Approaches for resolving the water quality and land-use conflict included (1) managing the quality of Delta inflows and (2) managing instream water quality after discharges had occurred.

Within each of these approaches, levels of conflict resolution ranging from less intensive to more intensive were identified.

This process produced 32 approaches to resolving the four conflicts. At this point, four teams were formed —one for each conflict area -- and assigned an equal number of the 32 approaches (i.e., eight apiece), with directions to develop approximately three preliminary solution alternatives for each of the eight approaches.

This procedure identified 100 preliminary solution alternatives which have subsequently served as the foundation for the

refinement process that defined the three alternatives to go into Phase II analysis. In the Program's judgment, these 100 sufficed to bracket the range of possible solutions to the four conflicts.

## ALTERNATIVE REFINEMENT

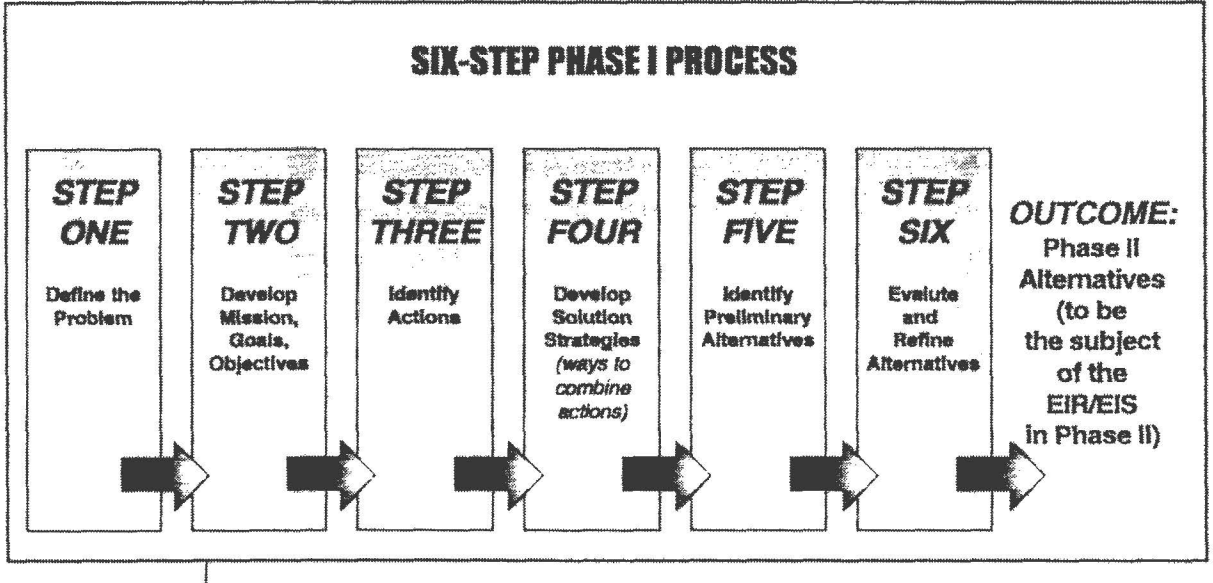
The 100 preliminary alternatives were very broad by design. Moreover, they tended to address the four conflicts in varying degrees -- that is, they were not necessarily balanced in addressing program objectives and solution principles.

In response, the teams were instructed to begin balancing their alternatives, and to refine the initial set to approximately 6 to 10 per area by combining those with similar characteristics. This produced a refined list of approximately 30 alternatives.

Continued consolidation and balancing of the alternatives brought the number to 20. These 20 were presented to stakeholders, BDAC members, and the public at workshop 5. Consolidation and refinement based on input from that workshop produced the 10 alternatives described in the Program's *Phase I Progress Report* of April 1996. During April and May the Program conducted nine public meetings around the state, workshop 6 in Sacramento, and a meeting of the Bay-Delta Advisory Council to discuss the 10 alternatives.

In addition to this public input, the 10 alternatives were assessed for their probable ability to meet Program objectives and satisfy solution principles. Based on public input and expert judgment, the structure of the alternatives was simplified, and portions of the 10 alternatives were combined to create three new, more refined alternatives, the draft Phase II Alternatives.

At workshop 7 and at the May and July BDAC meetings, stakeholders and members of the general public reviewed the draft Phase II Alternatives. Following these public events, minor adjustments were made in the alternatives, and several issues of public concern were recorded for further consideration during Phase II. On July 29, at a public meeting of policy makers from all CALFED agencies, BDAC formally stated its support for carrying the alternative into Phase II, and members of the public had the opportunity to speak



directly to high-ranking agency decision makers and senior staff about any reservations relating to the alternatives. While speakers asked that some important technical and policy issues be addressed during Phase II, there was general agreement that the Phase II Alternatives represent a reasonable range of solutions to Bay-Delta problems.

On the strength of this agreement, the Program concluded its Phase I alternative refinement process and moved into Phase II. During Phase II, the alternatives will continue to be refined as the Program conducts technical analyses, considers additional issues, and takes more public input.

## PHASE I PUBLIC OUTREACH AND PUBLIC INPUT

During Phase I, the Program conducted 14 public meetings in 13 communities from Redding to San Diego, attracting more than 700 attendees. As noted above, the Program also hosted seven technical workshops, in which approximately 1,000 people participated. Additionally, BDAC met every one to two months during Phase I.

Nine of the public meetings were conducted during the formal scoping period, from April 8 through May 20. Scoping is the process of identifying the issues to be addressed in an environmental review document. By law, a scoping period must precede a formal environmental review process, and it must involve extensive public input.

In addition to public gatherings, the Program received more than 200 letters during Phase I from individuals and groups with an interest in the Program's development and in the alternatives. Also, the Program issued several informational documents during Phase I to a mailing list of more than 3,000 interested parties, and Program representatives spoke at meetings and conferences of stakeholder organizations.

All public comment received during Phase I was recorded for consideration. Many comments, including some dealing with technical issues and others addressing the Program's process, could be used immediately to assess and, when appropriate, to adjust the Program and the alternatives. Other comments concerned technical and policy details that the Program will confront in Phase II, and these comments will be carried into Phase II for consideration. Following are some of the public comments that strongly affected the structure of the alternatives during Phase I.

**Urban water suppliers wish to receive the best possible source water.** Agencies that deliver drinking water are concerned about the cost of meeting future drinking water quality standards, as well as the technical challenges of treating degraded source water. This suggests strong pollutant source control measures in every alternative.

**Delta levees will be needed to protect agriculture, infrastructure, and habitat no matter how water is conveyed.** Even if a new conveyance facility is built to protect water quality for some export users, stable levees will be required to protect water quality and many other values in the Delta. This argues for a similar level of Delta levee protection in each alternative.

**The Program needs a single coherent vision of ecosystem restoration.** The restoration of ecosystem functions and the recovery of Bay-Delta species will likely require diverse actions of broad scope. Adaptive management will be vital in guiding efforts to improve ecosystem quality.

**During Phase I, the Program conducted public meetings in Bakersfield, Costa Mesa, Fresno, Long Beach, Los Banos, Oakland, Pasadena, Red Bluff, Redding, Sacramento, San Diego, Stockton, and Walnut Grove.**

**Water use efficiency must be strongly pursued in all the alternatives.** This suggests that water use efficiency measures should be implemented at a high level among all the alternatives.

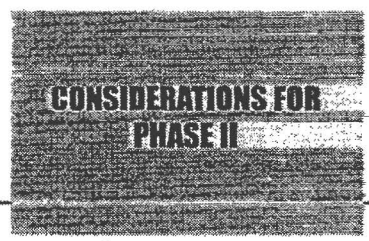
Water use efficiency is not the only component of the alternatives that will help meet water supply objectives; conveyance and storage components will also play an important role. In any alternative, these three components will need to be developed to complement each other. The water use efficiency component must also be flexible in order to accommodate local conditions.

## COST CONSIDERATIONS

At the time this report went to press, capital costs for the three alternatives were estimated to range from $4 billion to $8 billion, an amount to be paid over 20 to 30 or more years.

Some of this cost will be absorbed by existing programs. For example, some early-stage actions in the common programs are already included and funded under existing programs such as the Central Valley Project Improvement Act. Furthermore, under the Program's "affordability" solution principle, the solution alternative ultimately selected must be one that can be implemented and maintained using foreseeable resources. Consequently, if analysis indicates that adequate funds cannot be anticipated to support a particular alternative, that alternative will be changed or discarded.

Because the Program has multiple objectives, the cost of the ultimate solution will support and be spread over many distinct and complex projects. Many of these




**Some of the comments submitted during Phase I by stakeholders and members of the general public, by BDAC, and by staff of the CALFED agencies concern issues that can be most appropriately addressed during Phase II rather than during Phase I. This list summarizes the key public comments from Phase I that the Program will address during Phase II.**

- Include a package of assurances and guarantees.
- Address area of origin issues.
- Include watershed management in the water quality program for each alternative.
- Develop fish screening criteria and priorities.
- Confirm that screens can be sized to handle proposed flows.
- Address entrainment of eggs and larvae in screens.
- Develop more detailed phasing concepts.
- Develop adaptive management as an important tool for each alternative.
- Address water supply issues more explicitly.
- Ensure that the four common programs are implemented concurrently.
- Strengthen public involvement. Give more attention to Southern California, the Bay Area, mountain counties, and business and labor.
- Ensure that technical reports keep pace with policy deliberations.
- Clarify the rationale for selecting the size ranges of storage and conveyance components.
- Clarify the intent and definition of land retirement as a tool.
- Clearly describe the proposed use of transfers, and forecast associated benefits and impacts.
- Clarify the meaning and intent of CALFED terminology.

projects are massive undertakings; even creation of new habitat carries a high price tag, requiring that tons of earth be moved and acres of landscape changed. In addition, just as these projects will be completed successively, the financing can be structured in increments. Even the highest cost estimate seems less daunting when spread over a quarter or a third of a century.

Neither one sector of society nor one revenue source will shoulder responsibility for paying for the ultimate solution alternative. Rather, millions of entities, ranging potentially from government agencies to water users, will share the cost; and the funding strategy will include several revenue streams, possibly including federal grants, private-public partnerships, and general obligation bonds.

## PHASE II ACTIVITIES

During Phase II, the Program will refine the actions that make up the alternatives, develop strategies for implementing the alternatives, and conduct a broad environmental review to identify potential impacts of the alternatives.

***Further alternative refinement*** will entail extensive technical analysis. Examples include the following:

- environmental and engineering studies of issues such as fish entrainment and fish passage;
- preliminary feasibility evaluations of potential sites, addressing issues like existing site geology, general seepage characteristics, and seismic risk;
- clarification of general operating requirements through hydrologic and hydraulic modeling;
- refining the scope of individual actions (e.g. range of storage capacities);
- preliminary cost estimates.

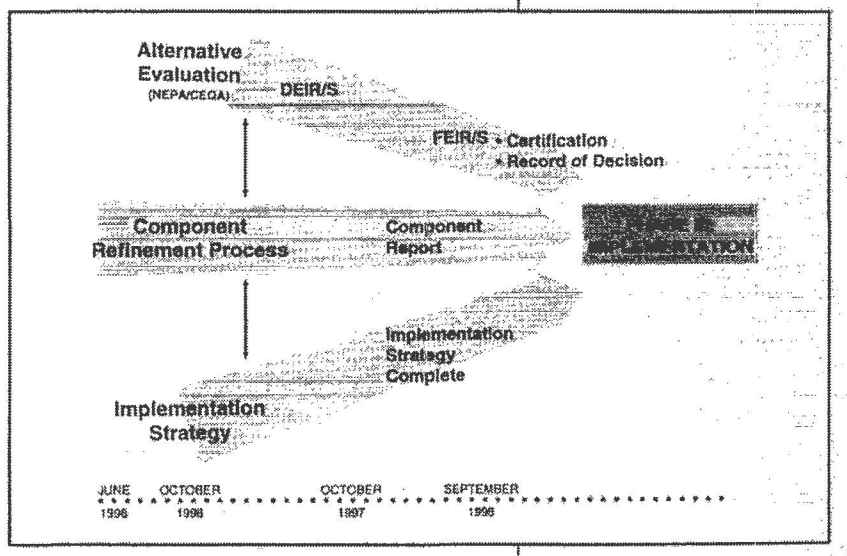
***Implementation strategies*** will address technical, financial, institutional and organizational decisions necessary to start the actions at the beginning of Phase III. These strategies could be based on existing methods or could rely on new approaches. The BDAC has set up work groups to examine policy issues, including implementation strategies, related to water use efficiency, financing, assurances or guarantees and ecosystem restoration.

***A programmatic environmental impact report/statement (EIR/EIS)*** will address the potential environmental implications of each alternative. The primary purpose of this document will be to inform decision makers about the interrelated and cumulative environmental consequences of the alternatives and to identify a preferred alternative for implementation. The environmental review process will conclude with certification of the EIR/EIS and an explanation of why a particular course of action was selected and how each significant impact was addressed in the EIR/EIS.

The EIR/EIS will concentrate on foreseeable impacts, direct, indirect, and cumulative.

**The public will have many opportunities to participate in and comment on the Phase II process.**

## PHASE II PROCESS



# OVERVIEW OF PHASE II ALTERNATIVES

## INTRODUCTION

As described in the previous section, the scoping process and alternative refinement led to a simplified structure for the alternatives. Each alternative includes the four common programs related to **water use efficiency, ecosystem restoration, water quality, and system integrity.** Delta conveyance and water storage provide the primary differences between alternatives.

Each alternative is composed of a different configuration of Delta conveyance, supported by the common programs. Storage, in a variety of sizes and combinations, will be studied to determine the combination of conveyance and storage which meets the Program objectives at the highest and most cost effective level for each alternative.

Scoping, agency review, and solution principle evaluation have resulted in three primary Delta conveyance configurations:

**1. Existing System Conveyance** where little or no modifications are made to the flow capacity of the existing Delta channels.

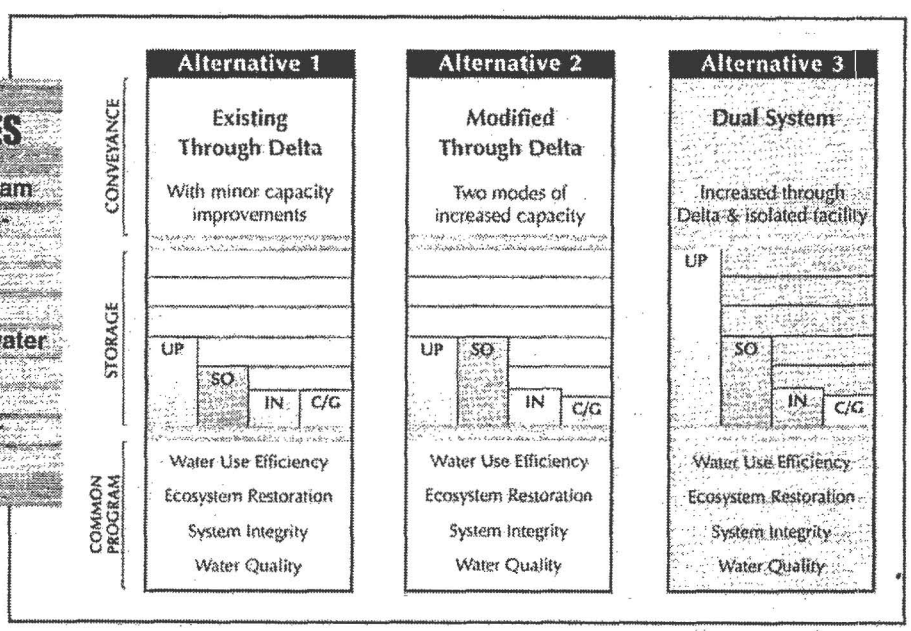
**2. Through Delta Conveyance** where a variety of modifications to Delta channels could be made to increase the conveyance efficiency.

**3. Dual Delta Conveyance** using a combination of improved through Delta conveyance and conveyance isolated from Delta channels.

The evaluations for the Dual Delta Conveyance (Alternative 3) will include extensive study of the isolated conveyance portion to find an optimal range of combined through Delta and isolated conveyance for this alternative. A dual conveyance subcomponent which has sufficient isolated conveyance capacity so as to be a functional equivalent of a fully isolated facility is included. This subcomponent would be subject to further analysis during the environmental review and more informed evaluation against the solution principles to determine whether that concept can satisfy those criteria.

### SUMMARY OF ALTERNATIVES

UP: upstream storage (any offstream storage upstream of the Delta supplied by the Sacramento or San Joaquin Rivers or their tributaries
SO: south of Delta storage (any offstream storage supplied with water exported south from the Delta)
IN: in-Delta storage
C/G: conjunctive use/groundwater banking



## SOME GUIDING ASSUMPTIONS

The Program has developed some fundamental assumptions about the Bay-Delta and the effects that Program actions might have on the system. These assumptions are embodied in the Phase II Alternatives. The assumptions will be studied and tested during Phase II to further the Program's understanding of them, but the success of any comprehensive solution to Bay-Delta problems rests largely on the basic validity of these assumptions.

**The importance of a unit of water in the system is not fixed, but varies according to the flow rate, the time of year, and the water year type.** Thus, it is possible to increase diversion and storage of water during some high flow periods (while preserving peak flows that serve important functions in the system) in order to provide water supply for beneficial uses including ecosystem restoration. Some of this stored water can be used to augment outflow during dry years when there is keen competition for water. At these times water operations have their greatest impact on the ecosystem, and additional water is most needed by Bay-Delta species. In short, water can be diverted during high flow periods with relatively little impact on the system, and can be released at other times to produce great benefit to the system.

**A comprehensive program of ecosystem restoration will improve ecosystem functions and the recovery of Bay-Delta species that are currently threatened, endangered, or of special concern.** In addition to restoration of physical habitat, the alternatives include improved management of flows that will not only reduce the impacts of diversions on the environment during critical periods but will enhance flows during the periods of time which produce the greatest benefits to ecosystem health. The Program assumes that this approach, which combines physical habitat improvements with enhanced flows, will result in fewer constraints on the operation of water supply systems.

If the Program's assumptions are correct, then it is possible to manage water to take advantage of its time value and thereby to restore ecosystem functions and recover species of concern. This will allow the Program to improve water supply reliability and create new opportunities to increase water supplies. If it is possible to take advantage of the time value of water, then new storage can be developed to meet water demands while simultaneously reducing the impact of current water management practices. Successful ecosystem restoration should remove constraints that currently limit the ability to convey water supplies to users, as Delta species recover. Increased reliability and new supply opportunities will occur simultaneously with ecosystem restoration.

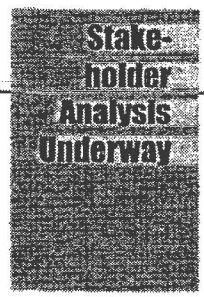
# WATER USE EFFICIENCY COMMON PROGRAM

## INTRODUCTION

Water use efficiency measures serve several purposes. North of the Delta, water use efficiency methods can make water available for other uses and could also provide the opportunity to shift the diversion of water from the system to times when fish will be least affected by the diversions. South of the Delta, in the regions that rely on water exported from the Delta, water use efficiency can make water available for other uses within the export areas, reduce drought shortages for the environment and other beneficial uses, and decrease diversions at times to increase Delta outflow.

The Water Use Efficiency Common Program takes two approaches: reduce the need to take water out of the Delta and reclaim water after use. Urban water users will be encouraged to make greater use of "Best Management Practices (BMPs)," generally-accepted standards for urban conservation, while recycling wastewater. Agricultural users will be encouraged to implement cost-effective actions similar to "Efficient Water Management Practices," jointly developed standards for agricultural conservation.

**The Bay-Delta Advisory Council (BDAC), which represents Bay-Delta stakeholders, has assigned a work group to help identify policy issues relating to water use efficiency and to gather information about possible water use efficiency programs.**




## CONSIDERATIONS

Californians have intense feelings about water use efficiency. While they believe strongly in its importance, they have serious concerns about its implementation. Through a series of public meetings in spring 1996, Californians told the CALFED Bay-Delta Program that ...

- Increased water use efficiency could reduce the opportunities for additional water use cutbacks during drought, so water use efficiency must be accompanied by good drought planning.
- Long-term conservation differs from short-term measures to respond to shortages during dry periods.
- Local jurisdictions should retain the right to develop their own local water use efficiency programs.
- Some areas of California are already near 100 percent efficiency and have little room for improvement.
- Agricultural land conversion, though a possible strategy for reducing agricultural discharges, is not a water use efficiency measure.

With these considerations in mind, the Water Use Efficiency Common Program would encourage local agencies to make appropriate water management decisions that reflect local conditions. During Phase II this common program will be refined and its effect on future demand will be estimated.

## POTENTIAL IMPLEMENTATION MEASURES

### Urban Water Conservation

More urban and industrial water suppliers and users could implement the current "Best Management Practices(BMP's)," generally-accepted standards for urban conservation – possibly even expanding the BMP's to include new practices and accelerated implementation rates.

### Urban Water Reclamation

Urban water suppliers could recycle water to recharge groundwater basins, supplement irrigation supplies, or store water to meet Delta outflow standards. Recycling programs could involve indirect potable or nonpotable reuse, depending on treatment. Reclamation and reuse should focus on facilities that now discharge treated wastewater into salt sinks or other degraded bodies of water.

### Agricultural Water Conservation

More agricultural water suppliers and users could analyze and implement cost-effective measures similar to the "Efficient Water Management Practices," jointed developed standards for conserving agricultural water.

### Agricultural Land Conversion

Temporary and permanent land converstion do not improve water use efficiency and will not be included in the CALFED water use efficiency component. However, the lands that most degrade San Joaquin River water quality could be converted to trusts that focus on drainage management.

# ECOSYSTEM RESTORATION COMMON PROGRAM

## INTRODUCTION

While the Bay-Delta can never be returned to prehistoric conditions, its *ecosystem functions* can be restored. Ecosystem functions are all of the qualities of a natural environment that enable native fish, wildlife, and plants to flourish. The CALFED Bay-Delta Program proposes to restore these functions for the benefit of all the important species that rely on the area's freshwater, brackish tidal marsh, shallow water, riparian woodland, or shaded waterway environments.

Whenever possible, the Ecosystem Restoration Common Program aims to take advantage of natural processes, rather than further disrupting the system to create healthy but artificial conditions. For example, efforts are proposed to establish "meander zones" upstream of the Delta, where tributaries can flow without restriction.

The Ecosystem Restoration Common Program also seeks to restore some of the ecosystem's natural resilience, in part by protecting diversity so that species can adapt to changing conditions. The restoration activities given preference in this component are those that benefit several species and improve other resource areas, including water quality, levee stability, and water supply reliability.

***Between 1969 and 1991, the estimated population of Winter Run Chinook Salmon in the Bay-Delta declined from 117,000 to 191.***

Where competition for Bay-Delta resources makes it impossible to avoid impacts to species, habitats, or ecological functions, compensation would be made by reducing other causes of mortality or improving habitats elsewhere in the Bay-Delta.

## POTENTIAL IMPLEMENTATION MEASURES

### Protect, Enhance, and Where Necessary Restore Habitats

Existing high-quality habitat will be protected and managed before it is lost to further degradation. Where habitats have already been lost, they should be restored to the degree necessary to ensure a healthy, functioning ecosystem. When ecosystem improvements require acquiring privately owned land, it will be sought from willing sellers.

- Improve shallow water tidal habitat. Roughly 8,000 to 12,000 acres of leveed lands, such as on Prospect Island, along Threemile Slough, and in the southeast Delta, could be converted to tidal habitat.

- Restore riparian habitat. Along the Sacramento and San Joaquin Rivers and their tributaries, 4,000 to 5,000 acres could be purchased and transformed into riparian habitat. More riparian habitat will be developed in conjunction with levee stabilization projects.

- Convert diked bay lands to tidal wetlands. This could include conversion of 4,000 to 6,000 acres.

- Improve riverine habitat. Riverine habitat will be improved on the Sacramento River, along Delta channels, and upstream of the Delta. At some locations between Verona and Collinsville on the Sacramento River, levees could be set back, restoring natural river flow for as much as 125 total miles of waterways. Another 20 to 40 river miles of meander belts could be created north of Colusa. River banks and shallow water habitat similarly could be reconstructed along 100 to 150 miles of leveed Sacramento River banks.

- Restore habitats in the San Joaquin River. Habitat values will be restored or enhanced by deepening channels to decrease water temperatures.

- Improve habitats along floodways. For example, 7,000 to 12,000 acres of agricultural land along floodways could be converted to seasonal wetlands.

**Develop and/or Acquire Water for Environmental Use**

Water developed or purchased from willing sellers will be used to increase instream flows, increase outflow from the Delta into the Bay, or for other measures that will benefit the environment.

**Manage Habitats**

Habitats can be more effectively protected and nurtured by changing some agricultural practices, improving coordination among government agencies, and making it easier to secure permits for habitat restoration.

**Reverse Subsidence**

Land use in the Delta has caused many islands to subside so that their "elevations" are as much as 18 feet below sea level. On some islands this process will be reversed by restoring wetlands that generate new peat soil or by other means. The extent of this restoration will be determined in Phase II.

**Control Exotic Species**

Numerous species have been imported to the Bay-Delta from other habitats, such as fish that enter the system when ships dump their ballast water. These species can endanger native Delta species. Efforts will be made to prevent introducing any more exotic species.

**Stakeholder Analysis Underway**

*The Bay-Delta Advisory Council (BDAC), which represents Bay-Delta stakeholders, has assigned an work group to help identify policy issues relating to ecosystem restoration and to gather information about possible ecosystem restoration programs.*

**Install More and Better Fish Screens**

Fish screens are installed to keep fish from straying from their natural habitat or migration route into a diversion. Numerous unscreened diversions on Delta tributary streams will be screened and better fish screens should be considered at existing screened diversions.

**Protect and Manage Fish Populations**

The alternatives will incorporate real-time monitoring of the location and health of fish populations. Such a program could enable water system operations to be modified to benefit fish.

# WATER QUALITY COMMON PROGRAM

## INTRODUCTION

The Water Quality Common Program focuses on limiting release of pollutants into the Bay-Delta system and its tributaries, an effort that will benefit all water users. Specifically, the Program will encourage voluntary compliance with Best Management Practices and other measures to manage discharges of salinity, selenium, pesticide residues, and heavy metals from urban stormwater runoff, agricultural drainage, and other sources. Sources and pollutants of concern will be prioritized and more immediate attention given to those assigned higher priorities.

While the Water Quality Common Program will be essentially the same in every alternative, slight adjustments might be needed to complement an alternative's particular storage and conveyance components and the circumstances of a particular geographic area. For example, an alternative using a dual Delta conveyance system might require a different focus for in-Delta water quality than would an alternative using only through-Delta conveyance.

## CONSIDERATIONS

Through public meetings and comment letters, Californians have told the CALFED Bay-Delta Program that...

- Water users prefer access to high quality source water, rather than reliance on treatment.
- Dilution of pollutants as the dominant strategy will not satisfy the public. Instead, the Program should focus on reducing pollution at the source.
- The alternatives should reduce salt and chemical recirculation and decrease drainage discharge to the San Joaquin Valley.
- Delta water quality should not be degraded by any action or alternative.
- Water quality is now degraded as water moves through the Delta, making it harder for urban water agencies to recycle water.

## POTENTIAL IMPLEMENTATION MEASURES

- Coordinate the enforcement of efficient water quality management practices.
- Improve the management of urban stormwater runoff, in part by shifting the timing of the release of 20 to 30 percent of current runoff volume.
- Clean up and limit runoff from high priority mines like Walker Mine.
- Evaluate the feasibility of allowing urban water purveyors to fund clean-up at high priority mines instead of making costly improvements to wastewater treatment plants.
- Provide incentives for urban water agencies to upgrade their filtration systems. Over time, phase out treatment processes that yield high disinfection byproduct precursors.
- Develop and coordinate programs to manage agricultural drainage by reducing leachate concentrations and volumes, restricting spray programs near waterways, reducing runoff volumes, and limiting pollutant concentrations in runoff. Also shift agricultural discharges from periods of low Delta inflow to periods of higher inflow.
- Institute a Drainage Management Program under which farmers would receive economic incentives to fallow agricultural lands producing harmful runoff.
- Develop watershed protection programs to improve the quality of water flowing from the watershed, and investigate the benefits to the ecosystem and the possibility of increasing water yield.
- Probably as a pilot program, construct wetlands to treat 10,000 to 15,000 acre-feet of upstream wastewater effluent and Delta agricultural drainage.

## SOME POTENTIAL CONCERNS AND CONSIDERATIONS

Despite its projected success in reducing pollution, the Water Quality Common Program has some limitations and many issues that require further study. As proposed, the program would not reduce the total mass of salts recycled to the San Joaquin River through the Valley's irrigation system. Moreover, many of the proposed measures might be very costly, including treatment systems for agricultural drainage and management of urban stormwater runoff. Further, significant analysis remains to be done to determine the degree of water quality improvement that can be achieved through watershed management. Also to be studied is the question of whether wetland treatment systems would expose wildlife to toxins.

All of these issues will be addressed during Phase II.

# LEVEE SYSTEM INTEGRITY COMMON PROGRAM

## INTRODUCTION

A long-term Levee Protection Plan will address levee maintenance, levee stabilization improvements, subsidence reduction, emergency management, beneficial reuse of dredged materials, and establishment of habitat corridors for mitigation of any negative impacts.

To carry out this plan, Delta islands will be prioritized, a strategic plan devised, and stable funding sources identified. Levee subsidence control work will proceed in stages over time, and information on the effectiveness of early stages will be used to help guide the later stages.

Among the criteria used to prioritize islands will be protection of public infrastructure (e.g. pipelines and railroads); protection of private infrastructure (e.g. marinas); maintenance of water quality for all users; and preservation of cultural, recreational, and natural resources.

As a subsidence control measure or as mitigation for the disruption caused by construction work along levees, land adjacent to the levees could be set aside for natural habitat corridors.

## CONSIDERATIONS

Through public input in Phase I, Californians shared with the CALFED Bay-Delta Program their concerns about levee stability, including the following:

- Levees should be improved to provide a high standard of stability.
- Reliable, long-term funding is needed for regular levee maintenance.
- A single regional authority should coordinate stabilization and maintenance of Delta levees and emergency management.
- North Delta flood protection measures are badly needed.

In addition to these public concerns, the Program has identified several system integrity issues that require further analysis. For example, providing better subsidence control and flood protection could disrupt natural habitats and other land uses. Finally, it might prove prohibitively expensive to bring the entire Delta up to a common high level of flood protection.

***Whether or not they own property or enjoy recreation in the Delta, participants in CALFED's public events have expressed strong support for strengthening Delta levees as part of a comprehensive Bay-Delta solution. Moreover, they support a high standard for levee stability and want more analysis of how peat soils respond to earthquake.***

## POTENTIAL IMPLEMENTATION MEASURES

### Levee Maintenance Plan

Funds could be earmarked from a reliable, long-term source to improve levee maintenance. A uniform high standard should be set for levee stability. In conjunction with levee maintenance work, channels could be dredged, not only to help move water more efficiently, but also to increase capacity to reduce flood impacts.

### Stabilization of Levees on the Highest Priority Western Delta Islands

Because western Delta islands are the first line of defense against saltwater intrusion, early efforts to protect those islands could make both fish populations and water quality significantly more secure.

### High Priority Buffer Zones

To protect islands with deep peat soils, Delta landowners could be offered incentives to set aside strips of land as buffers along the levees on those islands. In addition to helping slow subsidence, the conversion of land from agricultural or other use to buffer zones could reduce the need for in-Delta irrigation water and decrease discharges into the Delta. More aggressive long-term subsidence reversal programs would be included for some islands.

### Restoration of Highest Priority Habitats

When buffer zones are created or levee banks shored up, new natural habitats can be integrated.

### Emergency Levee Management Plan

It may be possible to improve the coordination among agencies for responding to Delta floods. In particular, plans could be developed to ensure that adequate materials and equipment will be immediately available should disaster strike. A stable, long-term funding source would be needed for emergency management.

# RANGE OF STORAGE OPTIONS

**Each alternative includes storage options, though specific sites and capacities of new storage are not specified. During Phase II, many storage options will be analyzed for each alternative.**

## INTRODUCTION

New storage facilities could store water for the environment, agriculture, drinking water, or a combination of these uses. New storage would increase flexibility in operating the Bay-Delta system, allowing operators to respond to changing conditions and needs throughout the year. New storage would help in better responding to the effects of droughts.

As noted previously, the storage component will be different in each alternative. Moreover, the location and volume of storage remains to be defined and optimized for each alternative. Expanding existing storage or constructing new storage will be evaluated for each alternative.

Storage could include conjunctive use and groundwater banking or offstream surface storage. Surface storage could be upstream of the Delta (supplied by the Sacramento or San Joaquin Rivers or their tributaries), south of the Delta (supplied with water exported from the Delta), or in the Delta. To determine the workable range of storage for a given alternative, many sizes, locations, and operational policies will be examined. Technical studies will occur during Phase II.

## CONSIDERATIONS

Through public input in Phase I, Californians have expressed broad support for new water storage capabilities. However, they have asked the Program to consider the following:

- The alternatives should explicitly address *adequate* water supplies: it is not enough to promise a more *reliable* supply. One way to ensure that water users have more water available is to create new storage.
- Conjunctive use and groundwater banking should take priority over construction of new surface storage. Before recommending new surface storage, the Program should consider expanding existing reservoirs.
- Groundwater overdraft is a serious problem in the San Joaquin Valley, a fact that must be considered in evaluating conjunctive use and groundwater banking opportunities.

## POTENTIAL STORAGE OPTIONS

### Conjunctive Use/Groundwater Banking

Both conjunctive use and groundwater banking involve storing water in underground basins during wet periods. The stored water can then be extracted to supplement or replace surface water supplies during dry periods. For example, farms can use surface and groundwater supplies conjunctively. Also, excess water (carryover storage) in Shasta and Oroville reservoirs could be transferred to groundwater banking or used conjunctively with storage.

### Upstream Surface Storage

Surface storage upstream of the Delta could be located on any of the tributary streams contributing flow to the Delta. This storage could be filled after the peak flood flow during winter and spring of wet years to serve a variety of purposes. The water could be released directly to water users upstream of the Delta or used to reduce existing diversions from the Sacramento River, help fish move through the river, or improve water quality during dry years. Examples of upstream storage options include the construction of the offstream Colusa-Sites Reservoir or enlargement of the existing Lake Berryessa Reservoir.

### In-Delta Surface Storage

One or more Delta islands could be converted to reservoirs to accommodate in-Delta storage. Existing levees could be reconstructed and screened diversion facilities provided. For example, storage dedicated for environmental uses could be located near the export pumps on one or more islands like Bacon, Mandeville, or Victoria. If, on the other hand, in-Delta storage were used to meet municipal drinking water needs, it might be necessary to remove or seal organic soils on reservoir islands to avoid releasing organic carbon into drinking water. A wide riparian and shallow water habitat corridor could be created around Delta island storage to provide greater fish and wildlife benefits.

### South-of-Delta Surface Storage

Storage south of the Delta could be filled during wet periods from the diversions that now supply the Delta Mendota Canal or the California Aqueduct. With water in storage south of the Delta, export pumping could be curtailed at times when needed to meet environmental objectives.

***Conjunctive use—Integrated management of surface water and groundwater supplies to meet overall water supply and resource management objectives.***

***Groundwater banking- Using available storage capacity within groundwater basins to store surface water that is recharged during periods when it is available (e.g. during peak flood flows).***

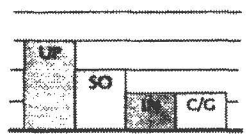
# ALTERNATIVE 1

## OVERVIEW

Similar to the other CALFED Bay-Delta Program alternative solutions, Alternative 1 includes the common programs, a water storage element, and a system for moving, or conveying, water through the Delta. The common programs are essentially the same in all three alternatives. In Alternative 1, water is conveyed using the current system of channels through the Delta (existing conveyance system).

Early in Phase II, technical studies will help determine what provisions for storage would complement this alternative. Staff will study a range of storage capacities and locations. Additional upstream surface storage (on any tributary stream contributing flow to the Delta) could be located north, east, or south of the Delta. Probable ranges to be studied in Alternative 1 are conjunctive use/groundwater banking (0-500 thousand acre-feet (TAF)), upstream surface storage (0-1.5 million acre-feet (MAF)), in-Delta storage (0-600 TAF), and south-of-Delta surface storage (0-1.0 MAF). Given the continued conveyance constraints through the Delta with this alternative, new south-of-Delta storage may not be cost-effective because of the difficulty in making full use of the additional storage capacity. These and other issues will be studied further in Phase II.

### ALTERNATIVE 1 SUMMARY

| CONVEYANCE | STORAGE | COMMON PROGRAM |
|---|---|---|
| Existing Through Delta Channels<br><br>Conveyance ranges from existing up to full capacity | UP - Upstream (offstream)<br>SO - South (offstream)<br>IN - In-Delta<br>C/G - Conjunctive use/ ground water banking<br><br>  <br><br>Maximum levels MAF | Water Use Efficiency<br><br>Ecosystem Restoration<br><br>System Integrity<br><br>Water Quality<br><br>(With adjustments as necessary) |

## OPERATIONS

This alternative would slightly adjust the way Delta diversions are operated. Under a subalternative of Alternative 1, the permitted capacity of south Delta pumps could be incrementally increased up to their physical capacity (15,000 cfs) at times of the year when fish are less vulnerable to the effects of these diversions. Improvements to the existing fish screens on the pumps will also help reduce fish losses at some diversions. By creating more operational flexibility, Alternative 1 would both reduce the impacts of pumping upon fish and improve water supply reliability.

When fish are least vulnerable to the effects of diversions, roughly during late fall and early winter, the pumps would operate at high capacity. Then pumping could be kept to a minimum during the higher priority periods for ecosystem health (approximately March through June). Real-time monitoring of fish populations, though early in its development stage and requiring additional validation and calibration, could be expanded to help guide the pumping operations.

New conjunctive use programs to optimize surface water and groundwater use and surface storage would provide more opportunities to store water during high pumping periods. At the higher pumping

levels, Alternative 1 might require minor south Delta channel improvements to reduce channel velocities under certain flow conditions.

## SOME POTENTIAL BENEFITS

- Preserves the common Delta pool (common source of fresh water for all users, with all users sharing the benefits and responsibilities for the in-Delta system).
- Compared to other alternatives, causes less disturbance to habitats in and near Delta channels.
- Can improve operational flexibility for the benefit of exports and ecosystem health.

## SOME POTENTIAL CONCERNS

- Fish entrainment continues at the pumps, and fish are still drawn into areas (though at a reduced rate) where they are subject to delay and predation.
- Little, if any, improvement in water quality as a result of improved conveyance efficiency.
- Dredging to support increased pumping could disrupt aquatic habitats.

## ISSUES FOR FURTHER STUDY

Early in Phase II, several issues surrounding Alternative 1 will be analyzed further, including the feasibility of exchanging water to augment San Joaquin River flows and the use of a forum for Delta operations to make flow management, water transfer, and export decisions.

## ADJUSTMENTS TO THE COMMON PROGRAMS

The common programs are essentially the same in each of the three alternatives. For each alternative, slight adjustments in the common program will be made to complement the alternative's storage and conveyance components. For example, in Alternative 1, new habitats will be created at a distance from the pumps and the main conveyance channels to reduce fish losses.

**The components of Alternative 1 are complementary so that the whole is greater than the sum of the parts.**

# ALTERNATIVE 2

## OVERVIEW

Similar to the other CALFED Bay-Delta Program alternatives, Alternative 2 combines the common programs, a water storage element, and a system for moving, or conveying, water through the Delta. The common programs are essentially the same in all three alternatives. In Alternative 2, water conveyance through the Delta is substantially improved through significant changes to the existing system of channels (modified through-Delta conveyance system).

The level of conveyance improvements in this alternative could vary from dredging and widening of selected channels to major reconfiguration of Delta channels and flow patterns. Early in Phase II staff will study a wide variety of possible through-Delta conveyance improvements.

In addition to making water flow more efficiently through the Delta, channel improvements could provide opportunities for new fish and wildlife habitats. For example, where levees are set back to increase water conveyance capacity, both shaded riverine and shallow water habitats could be created.

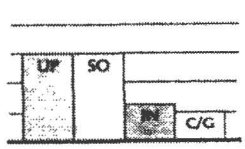
A new diversion, with or without fish screens, could be added on the Sacramento River at a location between Georgiana Slough and Hood. A new diversion could help increase flow capacity and decrease channel velocities. Adding a new Sacramento River diversion would require re-evaluation of existing standards for allowable export ratios and salinity to protect the Bay-Delta ecosystem.

In Phase II, technical studies will help determine what type and volume of storage would best complement this alternative. For each increment of conveyance improvement, staff will study several storage sizes and locations. Additional upstream surface storage could be located north, east, or south of the Delta. Sample ranges of storage to be studied in Alternative 2 are conjunctive use/groundwater banking (0-500 thousand acre-feet (TAF)), upstream surface storage (0-1.5 million acre-feet (MAF)), in-Delta storage (0-600 TAF), and south-of-Delta surface storage (0-1.5 MAF).

## OPERATIONS

Under Alternative 2, the permitted capacity of south Delta pumps could be increased up to their physical capacity (15,000 cfs). During periods when fish are less vulnerable to the effects of diversions, roughly during late fall and early winter, the pumps could operate at high capacity so that when fish are more vulnerable, approximately during March through June, pumping could be minimized. Real-time monitoring of fish populations, though early in its development stage and requiring additional validation and calibration, could be expanded to help guide the pumping operations. Alternative 2 also includes enlarging channel capacities in the north and south Delta to make water movement across the Delta more efficient.

## ALTERNATIVE 2 SUMMARY

| CONVEYANCE | STORAGE | COMMON PROGRAM |
|---|---|---|
| Modified Through-Delta<br><br>Ranges from dredging existing channels to major channel and island reconfiguration<br><br>Screened and unscreened diversions | UP - Upstream (offstream)<br>SO - South (offstream)<br>IN - In-Delta<br>C/G - Conjunctive use/ ground water banking<br><br>  <br><br>Maximum levels MAF | Water Use Efficiency<br><br>Ecosystem Restoration<br><br>System Integrity<br><br>Water Quality<br><br>(With adjustments as necessary) |

Storage in Alternative 2 would greatly enhance operational flexibility. During periods of heavy pumping, water could be stored south of the Delta for release during periods when pumping is curtailed to protect fish. Similarly, during average and wetter years, some flood flow (flow above the requirements for ecosystem protection) could be stored upstream of the Delta and released later to meet downstream needs. Part of this flood flow could also be stored south of the Delta to offset reductions in spring and summer pumping.

During dry and critical years, conjunctive use of surface water and groundwater and groundwater banking programs could help offset Delta exports, thereby increasing spring outflow.

## SOME POTENTIAL BENEFITS

- Preserves the common Delta pool (common source of fresh water for all users, with all users sharing the benefits and responsibilities for the in-Delta system).
- Improves fish habitat and may reduce fish losses at diversion.
- Can improve export water quality, especially at certain times of the year. Can also improve in-Delta water quality.
- Improves operational flexibility in meeting export needs and environmental goals.

***As in Alternative 1, the components of Alternative 2 are complementary so that the whole is greater than the sum of the parts.***

## SOME POTENTIAL CONCERNS

- Construction of channel improvements could temporarily disrupt habitats. Setback levees could disrupt both terrestrial habitats and agriculture over the long-term.
- A Sacramento River diversion could expose more migrating fish to screening impacts. The diversion would be in critical habitat for native fish.
- Total Delta outflow might decrease, though outflow would increase during the periods most important to fish.

## ADJUSTMENTS TO THE COMMON PROGRAMS

For each alternative, slight adjustments will be made to complement the alternative's storage and conveyance components. For example, in Alternative 2 continued through-Delta conveyance might only moderately improve export water quality. As a result, special attention might be given to actions that address export water quality. Similarly, the water use efficiency program could emphasize water transfers more so than in Alternative 1, since the improved through-Delta conveyance of Alternative 2 would facilitate transfers.

# ALTERNATIVE 3

## OVERVIEW

Similar to the other CALFED Bay-Delta Program alternatives, Alternative 3 includes the common program, a storage element, and a system for moving, or conveying, water. The common programs are essentially the same in all alternatives. Alternative 3 will also include storage (at a level to be determined in Phase II), along with both improved through-Delta conveyance and a conveyance facility isolated from existing channels (a man-made channel, isolated from natural channels, to convey part or all of the water intended for export.)

Alternative 3 encompasses a wider range of subalternatives than Alternatives 1 or 2. The new isolated conveyance facility could range in capacity from 5,000 to 15,000 cubic feet per second (cfs) or higher. At the lower capacity levels, a buried pipeline could be used. The Program staff will also evaluate a fully isolated conveyance facility with sufficient capacity to meet the full physical capacity of the south Delta pumps (15,000 CFS). An isolated facility could supply most Delta export needs during spring when fish are most vulnerable to through-Delta conveyance. The isolated conveyance facility could also supply water via spur lines to south Sacramento County, San Joaquin County, and the Bay Area.

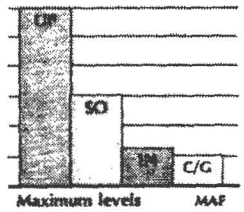
The isolated facility could be supplied through a diversion on the Sacramento River at a location between Hood and Freeport. The diversion would be equipped with state-of-the-art fish screens. However, staff also intends to study different versions of earlier Program proposals to connect an isolated facility with upstream storage facilities, possibly via the Sacramento Ship Canal and an extension of existing canals in the Sacramento Valley, or to carry the isolated facility through the Delta in the form of a chain of lakes.

The through-Delta conveyance in Alternative 3 could vary from use of the existing channels to channel enlargements by dredging and setback levees or significant restructuring of Delta channels and flow patterns. An option to screen the Sacramento River diversion will be studied to supplement the improvements to existing fish screens at the Delta pumps, which will be studied for all options.

In Phase II, technical studies will help determine storage provisions to complement this alternative. For each combination of through-Delta and isolated conveyance, staff will study several possible storage capacities and locations. Additional upstream storage could be located north, east, or south of the Delta.

Probable ranges of storage to be studied in Alternative 3 are conjunctive use/groundwater banking (0-500 thousand acre-feet (TAF)), upstream surface storage (0-3 million acre-feet (MAF)), in-Delta surface storage (0-600 TAF), and south-of-Delta surface storage (0-1.5 MAF). Upstream storage could be filled using the excess capacity of the Tehama Colusa Canal and the Glenn Colusa Canal, and the storage could conjunctively serve the irrigation districts now served by these canals. The Tehama Colusa Canal could also be extended to serve Yolo County and the North Bay Aqueduct, eliminating that diversion.

## ALTERNATIVE 3 SUMMARY

| CONVEYANCE | STORAGE | COMMON PROGRAM |
|---|---|---|
| Dual System<br>Existing Delta channels with modifications<br>Isolated facility from 5,000 to 15,000 cfs | UP - Upstream (offstream)<br>SO - South (offstream)<br>IN - In-Delta<br>C/G - Conjunctive use/ground water banking<br>  | Water Use Efficiency<br>Ecosystem Restoration<br>System Integrity<br>Water Quality<br>(With adjustments as necessary) |

## OPERATIONS

The dual Delta conveyance would increase operational flexibility to divert water while protecting fish from the effects of diversions. With two distinct diversion points, one on the Sacramento River and another in the south Delta, different diversions could be used at different times, depending upon the location of vulnerable fish species. Normally, some water would continue to be conveyed through the Delta to maintain circulation in the central and south Delta. Meanwhile, the permitted capacity of south Delta pumps could be increased to their full physical capacity during periods when fish are less vulnerable to the effects of these diversions. Real-time biological monitoring could be used to help identify these periods. Diverting water from the Sacramento River into the Delta and the isolated facility would require re-evaluation of standards for allowable export ratios and salinity standards to protect the Bay-Delta ecosystem.

## SOME POTENTIAL BENEFITS

- Increases supply opportunities, transfers, and wet year diversions while preserving, at some level, the common Delta pool (common source of fresh water for all users, with all users sharing the benefits and responsibilities for the in-Delta system).
- Reduces fish entrainment.

## SOME POTENTIAL CONCERNS

- Could decrease central and south Delta water quality if not managed carefully.
- Construction of an isolated conveyance facility could disrupt wetland and terrestrial habitats and other land uses.
- A Sacramento River diversion could expose more migrating salmon to screening impacts. The diversion would be in critical habitat for native fish.

## ADJUSTMENTS TO THE COMMON PROGRAMS

For each alternative, slight adjustments will be made to complement the alternative's storage and conveyance components. For example, in Alternative 3 partially isolating conveyance to south-of-Delta users could degrade south Delta water quality at certain times of the year. This would require ameliorative measures, such as development of water to increase San Joaquin River flows or development of in-Delta storage. On the other hand, the water use efficiency program could emphasize water transfers, since the more flexible and efficient conveyance of Alternative 3 would help facilitate such transfers.

**As in Alternatives 1 and 2, the components of Alternative 3 are complementary so that the whole is greater than the sum of the parts.**

# GLOSSARY

***AF*** Abbreviation for acre feet; the volume of water that would cover one acre to a depth of one foot, or 325,851 gallons of water. On average, could supply 1-2 households with water for a year.

***Alternative*** A collection of actions or action categories assembled to provide a comprehensive solution to problems in the Bay-Delta system.

***Action*** A structure, operating criteria, program, regulation, policy, or restoration activity that is intended to address a problem or resolve a conflict in the Bay-Delta system.

***Action Category*** A set of similar actions. For example, all new or expanded off-stream storage might be placed into a single action category.

***Anadromous Fish*** Fish that spend a part of their life cycle in the sea and return to freshwater streams to spawn.

***Best Management Practices (BMP)*** An urban water conservation measure that the California Urban Water Conservation Council agrees to implement among member agencies.

***Central Valley Project (CVP)*** Federally operated water management and conveyance system that provides water to agricultural, urban, and industrial users in California.

***CFS*** An abbreviation for cubic feet per second.

***Conveyance*** A pipeline, canal, natural channel or other similar facility that transports water from one location to another.

***Central Valley Project Improvement Act (CVPIA)*** This federal legislation, signed into law on October 30, 1992, mandates major changes in the management of the federal Central Valley Project. The CVPIA puts fish and wildlife on an equal footing with agricultural, municipal, industrial, and hydropower users.

***Common Delta Pool*** The common pool concept suggests that the Delta provides a common resource, including fresh water supply for all Delta water users, and all those whose actions have an impact on the Delta environment share in the obligation to restore, maintain, and protect Delta resources, including water supplies, water quality, and natural habitat.

***Conjunctive Use*** Integrated management of surface water and groundwater supplies to meet overall water supply and resource management objectives.

***Delta Islands*** Islands in the Sacramento-San Joaquin Delta protected by levees. Delta Islands provide space for numerous functions including agriculture, communities, and important infrastructure such as power plants, transmission lines, pipelines, and roadways.

***Diversions*** The action of taking water out of a river system or changing the flow of water in a system for use in another location.

***Ecosystem*** A recognizable, relatively homogeneous unit that includes organisms, their environment, and all the interactions among them.

***Endangered Species Act (ESA)*** Federal legislation that provides protection for species that are in danger of extinction.

***Exotic Species*** Also called introduced species; refers to plants and animals that originate elsewhere and migrate or are brought into a new area, where they may dominate the local species or in some way negatively impact the environment for native species.

***Export*** Water diversion from the Delta used for purposes outside the Delta.

***Fish Screens*** Physical structures placed at water diversion facilities to keep fish from getting pulled into the facility and dying there.

***Groundwater Banking*** Using available storage capacity within groundwater basins to store surface water that is recharged during periods when it is available (e.g. during peak flood flows).

***Isolated Conveyance Facility*** A canal or pipeline that transports water between two different locations while keeping it separate from Delta water.

***MAF*** An abbreviation for million acre feet.

***Meander Belt*** Protecting and preserving land in the vicinity of a river channel in order to allow the river to meander. Meander belts are a way to allow the development of natural habitat around a river.

***Real-Time Monitoring*** Continuous observation in multiple locations of biological conditions on site in order to adjust water management operations to protect fish species and allow optimal operation of the water supply system.

***Riparian*** The strip of land adjacent to a natural water course such as a river or stream. Often supports vegetation that provides the best fish habitat values when growing large enough to overhang the bank.

***Riverine*** Habitat within or alongside a river or channel.

***Setback Levee*** A constructed embankment to prevent flooding that is positioned some distance from the edge of the river or channel. Setback levees allow wildlife habitat to develop between the levee and the river or stream.

***Shallow Water*** Water with little enough depth to allow for sunlight penetration, plant growth, and the development of small organisms that function as fish food. Serves as spawning areas for Delta smelt.

***Solution Principles*** Fundamental principles that guide the development and evaluation of Program alternatives. They provide an overall measure of acceptability of the alternatives.

***State Water Project (SWP)*** A state-operated water management and conveyance system that provides water to agricultural, urban, and industrial users in California.

***TAF*** An abbreviation for thousand acre feet.

***Terrestrial*** Types of species of animal and plant wildlife that live on or grow from the land.

***Water Conservation*** Practices that encourage consumers to reduce the use of water. The extent to which these practices actually create a savings in water depends on the total or basin-wide use of water.

***Water Reclamation*** Practices that capture, treat and reuse water. The waste water is treated to meet health and safety standards depending on its intended use.

***Water Transfers*** Voluntary water transactions conducted under state law and in keeping with federal regulations. The agency most involved is the State Water Resources Control Board (SWRCB).

***Watershed*** An area that drains ultimately to a particular channel or river, usually bounded peripherally by a natural divide of some kind such as a hill, ridge, or mountain.

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PROGRAM

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