Chapter 2. Alternative Descriptions

This chapter describes the alternatives considered in this Final Programmatic EIS/EIR. The four Program alternatives represent approaches to meeting the CALFED Bay-Delta Program objectives.

2. Alternative Descriptions

This section describes the alternatives considered in this document. The CALFED Bay-Delta Program (Program) alternatives are discussed first, beginning with a brief summary of the alternatives that focuses on their differences, followed by an overview of each of the Program alternative elements. The No Action Alternative is then described. Next, the Environmentally Preferred Alternative is described. Finally, the other alternatives that were considered but not carried forward are noted, along with the rationale for eliminating them from further consideration.

The Preferred Program Alternative identified in this chapter consists of a set of broadly described programmatic actions that set the long-term, overall direction of the Program. However, detail at a greater level of specificity than is available in the programmatic description of the Preferred Program Alternative is important in understanding how this large, complex program may be implemented, funded, and governed in the future. Accordingly, the CALFED agencies have described their proposed actions for the first years following the ROD/CERT of the Programmatic EIS/EIR, as well as set out a long-term implementation strategy.

CALFED will annually review the status of implementation of all actions, the progress toward achievement of all goals and objectives, and compliance with Program schedules and financing agreements pertaining to the CALFED Program. In all Program areas, funds for implementation of the Program will continue to be available only if implementation of all actions, progress toward achievement of all goals and objectives, and compliance with schedules and financing agreements are occurring in a balanced manner. In the event that either the Governor or the Secretary of the Interior determines that the Program has not substantially adhered to this balanced implementation, then the Governor and the Secretary will develop and approve a revised program schedule and budget to achieve balanced implementation.

2.1 PROGRAM ALTERNATIVES

2.1.1 SUMMARY

The four Program alternatives represent differing approaches to conveying water through the Delta. Each of the alternatives includes the Ecosystem Restoration, Water Quality, Levee System Integrity, Water Use Efficiency, Water Transfer, Watershed, Storage, and Conveyance elements. Four general categories of critical problems facing the Bay-Delta are defined—ecosystem quality, water quality, water supply

reliability, and levee system vulnerability. To practicably achieve the Program purpose of restoring ecological health and improving water management for beneficial uses of the Bay-Delta system, the CALFED alternatives will concurrently address problems within these four critical resource categories. Accordingly, a solution to problems in one resource category cannot be pursued without addressing problems in the other resource categories. Each Program alternative includes an assessment with additional storage up to 6 million acre-feet (MAF) and without additional storage.

Alternative 1 relies primarily on the current configuration of the Delta channels. One significant variation includes selected channel improvements in the south Delta, together with streamflow and stage barriers (or their equivalent) at selected locations. (See Figure 2-1.)

Alternative 2 adds improvements to north Delta channels that accompany the south Delta improvements contemplated in Alternative 1. The features include a 10,000-cubic foot per second (cfs) diversion facility on the Sacramento River near Hood. (See Figure 2-2.)

Alternative 3 adds a canal connecting the Sacramento River in the north Delta to the SWP and CVP export facilities in the south Delta, in addition to the north and south Delta facilities contemplated in Alternatives 1 and 2. (See Figure 2-3.)

Program Alternatives

Alternative 1 relies primarily on the current configuration of the Delta channels.

Alternative 2 adds improvements to north Delta channels that accompany the south Delta improvements contemplated in Alternative 1.

Alternative 3 adds a canal connecting the Sacramento River in the north Delta to the SWP and CVP export facilities in the south Delta.

The **Preferred Program Alternative** includes a screened facility on the Sacramento River and other north Delta improvements, if these features are determined necessary to meet drinking water quality goals and can be operated without adversely affecting fish populations.

The Preferred Program Alternative incorporates elements similar to some of the elements in Alternatives 1 and 2. While it includes a new diversion facility on the Sacramento River and channel to the Mokelumne River, the size of this facility would be considerably smaller than Alternative 2. If after additional analysis this diversion facility and channel are not constructed, the Preferred Program Alternative would be most similar to Alternative 1. (See Figure 2-4.)

2.1.2 Overview of the Eight Program Elements

The descriptions of the alternatives are programmatic, defining broad approaches to meet Program purposes. The alternatives are not intended to define the site-specific actions that ultimately will be implemented in Phase III of the Program. A more complete description of the programmatic actions that may be implemented can be found in the Phase II Report and Implementation Plan.

Figure 2-1

General Features of Alternative 1 with a Focus on Delta Facilities

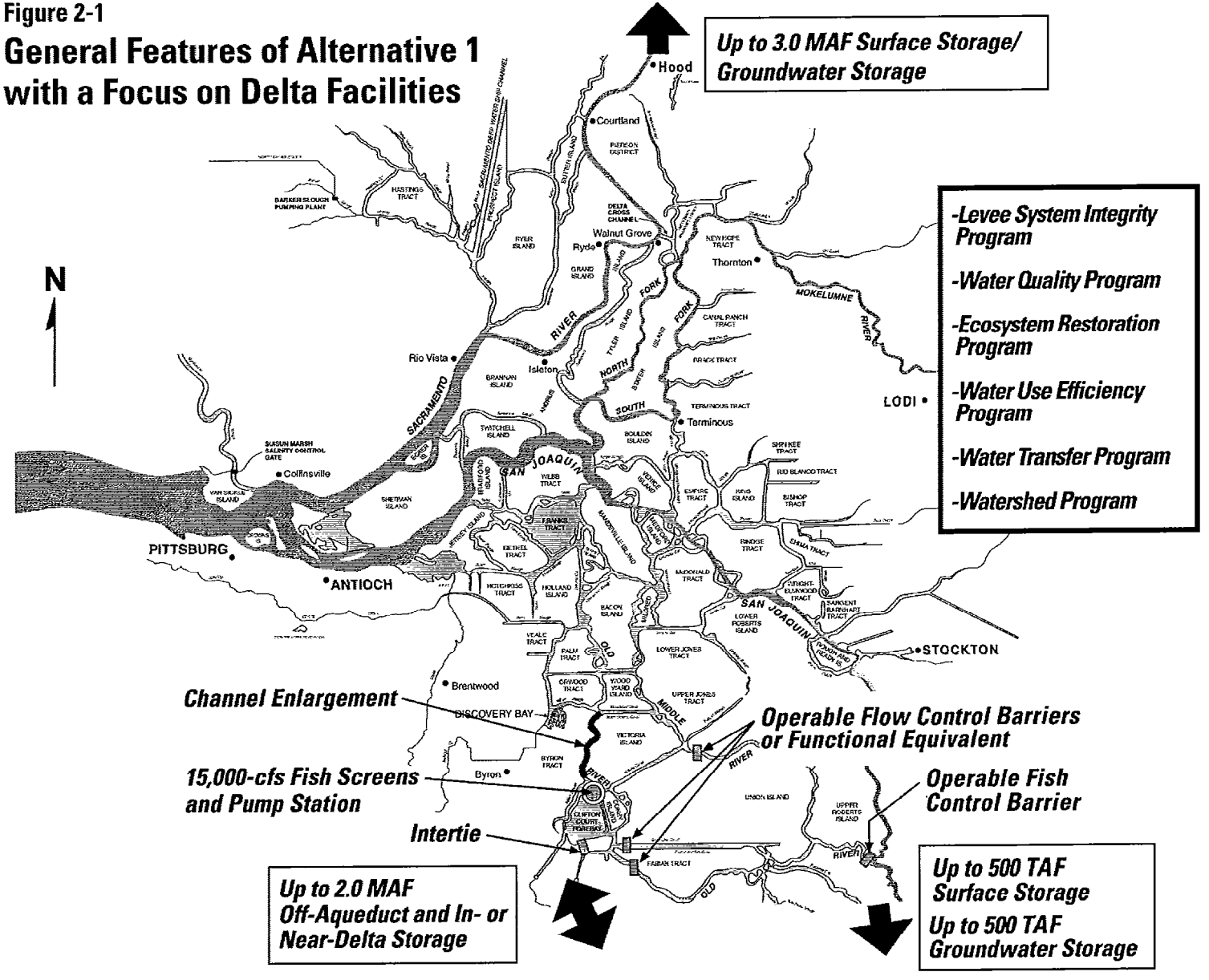


Figure 2-2

General Features of Alternative 2 with a Focus on Delta Facilities

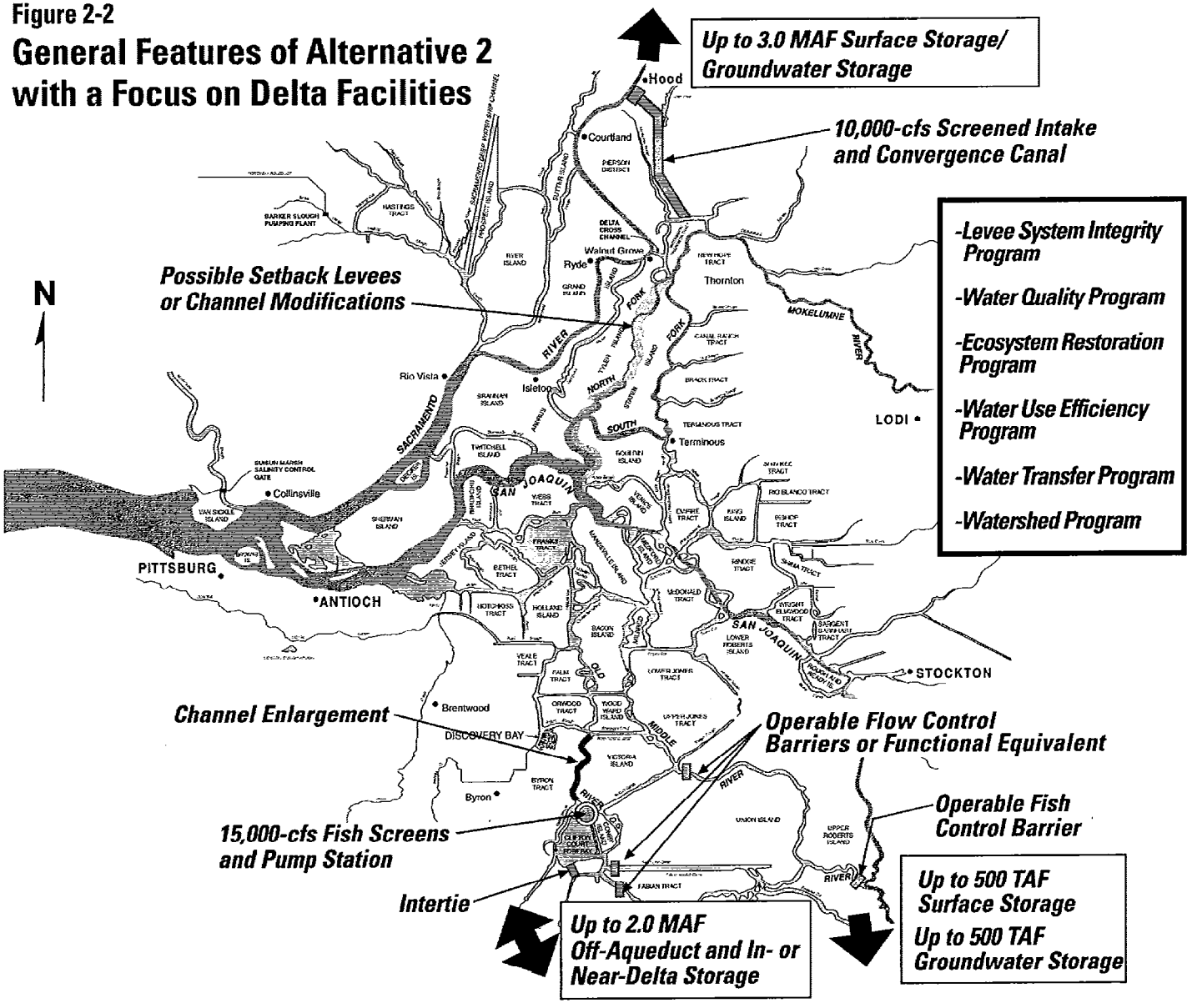


Figure 2-3

General Features of Alternative 3 with a Focus on Delta Facilities

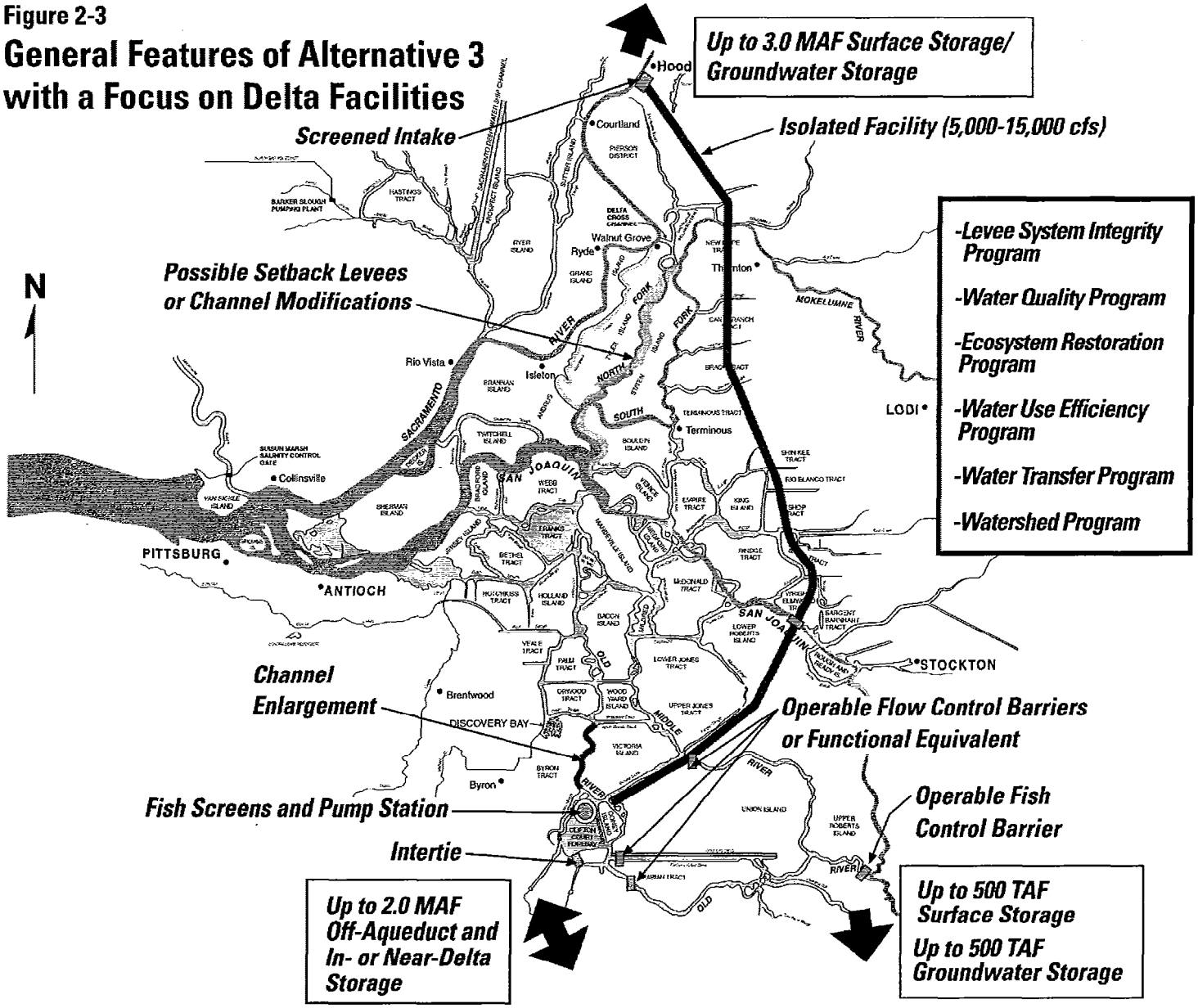
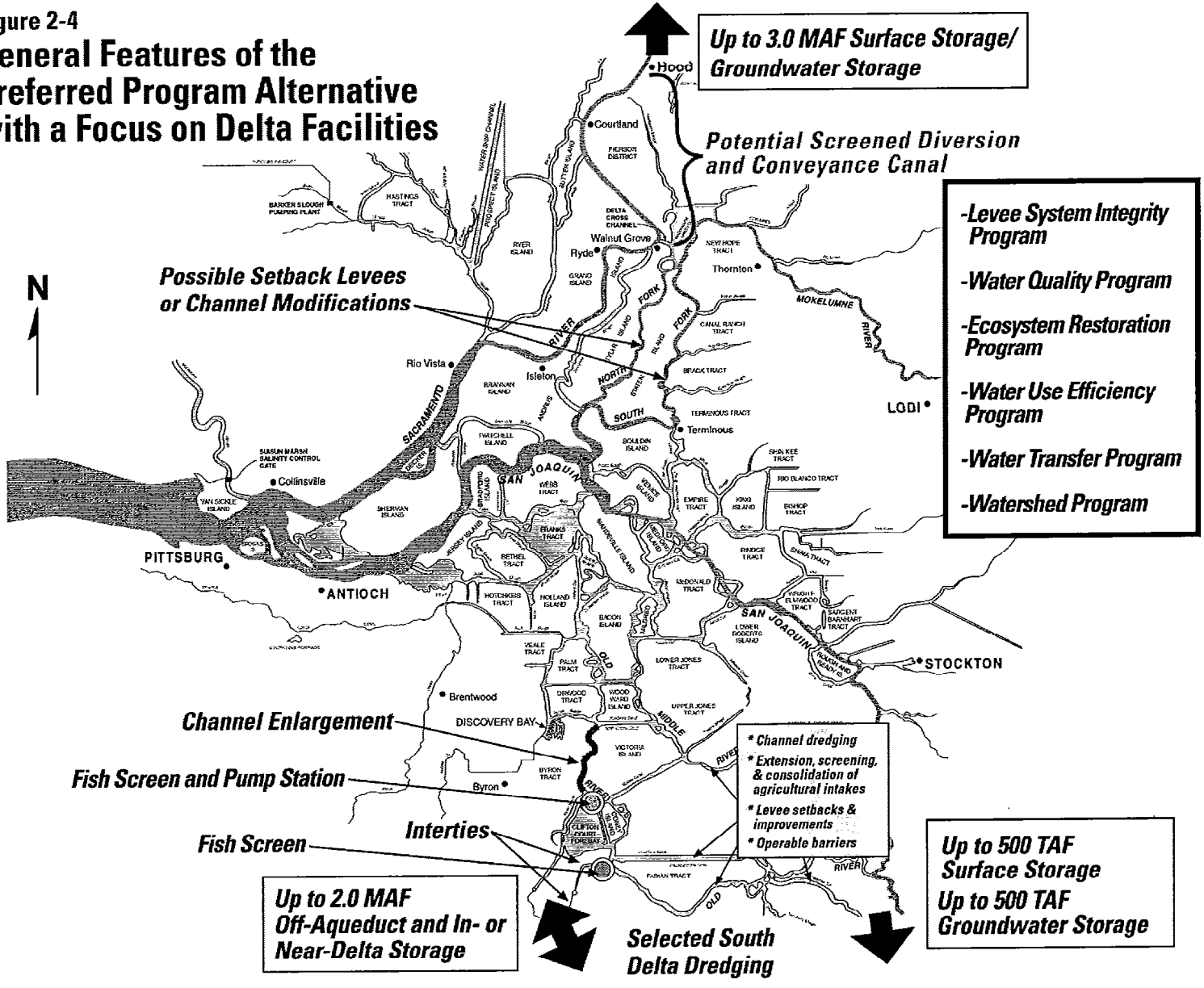


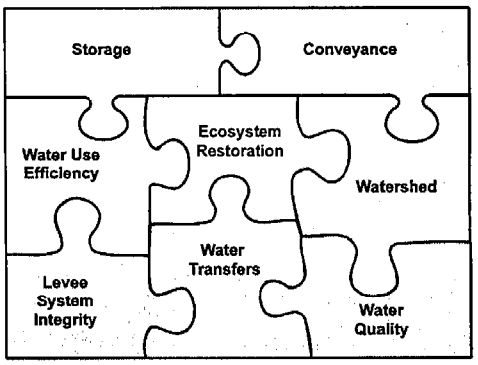
Figure 2-4

General Features of the Preferred Program Alternative with a Focus on Delta Facilities



Ecosystem Restoration Program

The goal of the Ecosystem Restoration Program is to improve and increase aquatic and terrestrial habitats and improve ecological functions in the Bay-Delta system to support sustainable populations of diverse and valuable plant and animal species. In addition, the Ecosystem Restoration Program, along with the water management strategy, is designed to achieve or contribute to the recovery of listed species found in the Bay-Delta and thus achieve goals in the Multi-Species Conservation Strategy (MSCS). Improvements in ecosystem health will reduce the conflict between environmental water use and other beneficial uses, and allow more flexibility in water management decisions.



The Ecosystem Restoration Program identifies programmatic actions designed to restore, rehabilitate, or maintain important ecological processes, habitats, and species within 14 ecological management zones. Implementation of these programmatic actions will be guided by six goals presented in the Ecosystem Restoration Program's Strategic Plan for Ecosystem Restoration (Strategic Plan). Nearly 100 restoration objectives have been developed that are directly linked to one of the six goals. Each objective further defines the restoration approach for each ecological process, habitat, species, or ecosystem stressor. One to several restoration targets have been developed for each objective to set more specific or quantified restoration levels.

Long-term implementation of the Ecosystem Restoration Program will be guided by the adaptive management approach described in the Strategic Plan. This approach to restoration will require review by an Ecosystem Restoration Science Review Panel and will rely on information developed in the Comprehensive Monitoring, Assessment, and Research Program (CMARP).

Representative Ecosystem Restoration Program actions include:

- Protecting, restoring, and managing diverse habitat types representative of the Bay-Delta and its watershed.
- Acquiring water from sources throughout the Bay-Delta's watershed to provide flows and habitat conditions for fishery protection and recovery.
- Restoring critical in-stream and channel-forming flows in Bay-Delta tributaries.
- Improving Delta outflow during key periods.
- Reconnecting Bay-Delta tributaries with their floodplains through construction of setback levees, the acquisition of flood easements, and the construction and management of flood bypasses for both habitat restoration and flood protection.
- Developing assessment, prevention, and control programs for invasive species.

- Restoring aspects of the sediment regime by relocating in-stream and floodplain gravel mining, and by artificially introducing gravels to compensate for sediment trapped by dams.

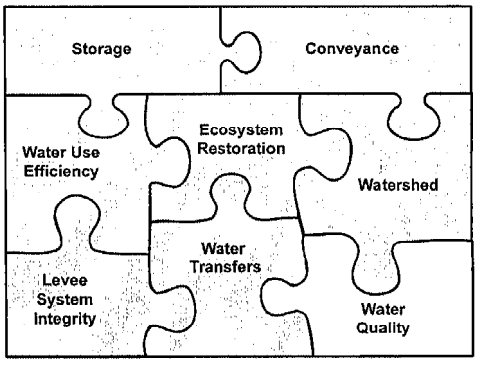
- Modifying or eliminating fish passage barriers, including removing dams, constructing fish ladders, and constructing fish screens that use the best available technology.

- Targeting research to provide information that is needed to define problems sufficiently and to design and prioritize restoration actions.

For more information, see the Ecosystem Restoration Program Plan and the Phase II Report.

Water Quality Program

The Program is committed to achieving continuous improvement in the quality of the waters of the Bay-Delta system—with the goals of minimizing ecological, drinking water, and other water quality problems and of maintaining this quality once achieved. Improvements in water quality will result in improved ecosystem health, with indirect improvements in water supply reliability. Improvements in water quality also increase the utility of water, making it suitable for more uses.



The Water Quality Program includes the following actions:

- **Drinking water parameters.** Reducing the loads and impacts of bromide, total organic carbon (TOC), pathogens, nutrients, salinity, and turbidity through a combination of measures—including source reduction, alternative sources of water, treatment, storage, and, if necessary, conveyance improvements such as a screened diversion facility (up to 4,000 cfs) on the Sacramento River. The Conveyance section of this chapter discusses this potential improvement.

- **Pesticides.** Reducing the impacts of pesticides through (1) development and implementation of best management practices (BMPs) for both urban and agricultural uses; and (2) support of pesticide studies for regulatory agencies, while providing education about and assistance with implementation of control strategies for the regulated pesticide users.

- **Organochlorine pesticides.** Reducing the load of organochlorine pesticides in the system by reducing runoff and erosion from agricultural lands through BMPs.

- **Trace metals.** Reducing the impacts of trace metals, such as copper, cadmium, and zinc, in upper watershed areas near abandoned mine sites. Reducing the impacts of copper through urban stormwater programs and agricultural BMPs.

- **Mercury.** Reducing mercury levels in rivers and the estuary by source control at inactive and abandoned mine sites.

- **Selenium.** Reducing selenium impacts through reduction of loads at their sources, and appropriate land fallowing and land retirement programs.

- **Salinity.** Reducing salt sources in urban and industrial wastewater to protect drinking and agricultural water supplies; facilitating development of successful water recycling, source water blending, and groundwater storage programs. Salinity in the Delta would be controlled by limiting salt loadings from its tributaries through managing sea-water intrusion by such means as: (1) using storage capability to maintain Delta outflow and to adjust the timing of outflow, (2) managing exports, and (3) making modifications to the Delta and Bay.

- **Turbidity and sedimentation.** Reducing the turbidity and sedimentation that adversely affect several areas in the Bay-Delta and its tributaries.

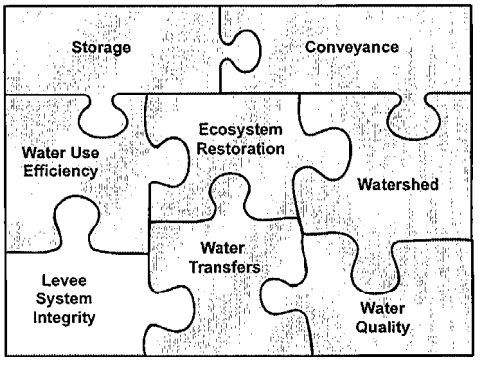
- **Low dissolved oxygen.** Reducing the impairment of rivers and the estuary from substances that exert excessive demand on dissolved oxygen.

- **Toxicity of unknown origin.** Through research and monitoring, identifying parameters of concern in the water and sediment, and implementing actions to reduce their impacts on aquatic resources.

For more information, see the Water Quality Program Plan and the Phase II Report.

Levee System Integrity Program

The Levee System Integrity Program focuses on improving levee stability to benefit all users of Delta water and land. Actions described in this program element protect water supply reliability by maintaining levee and channel integrity. Levee actions will be designed to provide simultaneous improvement in habitat quality, which would indirectly improve water supply reliability. Levee actions also would protect water quality, particularly during low-flow conditions when a catastrophic levee breach would draw salty water into the Delta.



The Levee System Integrity Program consists of five main components plus the Suisun Marsh levee rehabilitation work:

- **Delta Levee Base Level Protection Plan.** Improving and maintaining Delta levee system stability to meet the Corps' Public Law (PL) 84-99 standard.

- **Delta Levee Special Improvement Projects.** Enhancing flood protection for key islands that provide statewide benefits to the ecosystem, water supply, water quality, economy, and infrastructure.

- **Delta Levee Subsidence Control Plan.** Implementing current BMPs to correct subsidence adjacent to levees and coordinating research to quantify the effects and extent of inner-island subsidence.

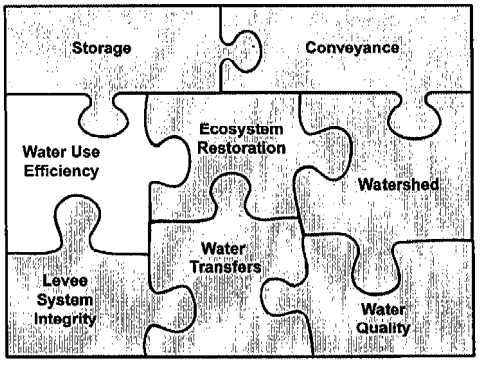
- **Delta Levee Emergency Management and Response Plan.** Implementing actions that will build on existing state, federal, and local agency emergency management programs.

- **Delta Levee Risk Assessment.** Performing a risk assessment to quantify the major risks to Delta resources from floods, seepage, subsidence, and earthquakes; evaluating the consequences; and developing recommendations to manage the risk.

- **Suisun Marsh levees.** Rehabilitating Suisun Marsh levees.

For more information, see the Levee System Integrity Program Plan and the Phase II Report.

Water Use Efficiency Program



The Water Use Efficiency Program includes actions to assure efficient use of existing and any new water supplies developed by the Program. Efficiency actions can alter the pattern of water diversions and reduce the magnitude of diversions, providing ecosystem benefits. Efficiency actions also can result in reduced discharge of effluent or drainage, improving water quality.

The Water Use Efficiency Program will build on the work of the existing Agricultural Water Management Council and California Urban Water Conservation Council process, supporting and supplementing those processes through planning and technical assistance, and through targeted financial incentives (both loans and grants). The Water Use Efficiency Program has identified potential recovery of currently irrecoverable water losses of over 1.4 MAF annually by 2020 as a result of Program actions. Before execution of the ROD/CERT, the Program will identify measurable goals and objectives for its urban and agricultural water conservation programs, water reclamation programs, and managed wetlands programs.

Actions related to water conservation include:

- Implementing agricultural and urban conservation incentives programs to provide grant funding for water management projects that will provide multiple benefits and are cost effective at the statewide level, including improved water quality and reduced ecosystem impacts.

- Identifying, in region-specific strategic plans for agricultural areas, measurable objectives to ensure that water management is improved.

- Expanding state and federal programs to provide increased levels of planning and technical assistance to local water suppliers.

- Working with the Agricultural Water Management Council (AWMC) to identify appropriate agricultural water conservation measures, set appropriate levels of effort, and certify or endorse water suppliers that are implementing locally cost-effective feasible measures.

- Working with the California Urban Water Conservation Council (CUWCC) to establish an urban water conservation certification process and set appropriate levels of effort in order to ensure that water suppliers are implementing cost-effective, feasible measures.

- Helping urban water suppliers to comply with the Urban Water Management Planning Act.

- Identifying and implementing practices to improve water management for wildlife areas.

- Gathering better information on water use, identifying opportunities to improve water use efficiency, and measuring the effectiveness of conservation practices.

- Conducting directed studies and research to improve understanding of conservation actions.

Actions related to water recycling include:

- Helping local and regional agencies to comply with the water recycling provisions in the Urban Water Management Planning Act.

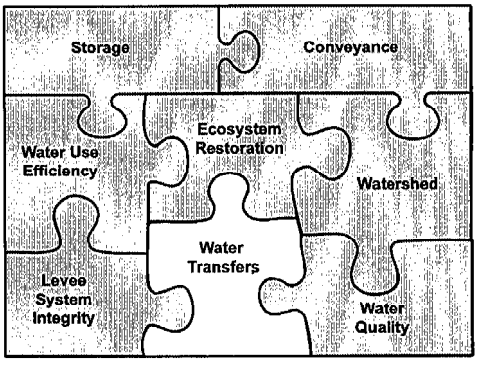
- Expanding state and federal recycling programs to provide increased levels of planning, technical, and financial assistance (both loans and grants) and to develop new ways of providing assistance in the most effective manner.

- Providing regional planning assistance that can increase opportunities for the use of recycled water.

For more information, see the Water Use Efficiency Program Plan and the Phase II Report.

Water Transfer Program

The Water Transfer Program proposes a frame-work of actions, policies, and processes that, collectively, will facilitate water transfers and the further development of a statewide water transfer market. The framework also includes mechanisms to provide protection from third-party impacts. A transfers market can improve water availability for all users, including the environment. Transfers also can help to match water demand with water sources of the appropriate quality, thus increasing the utility of water supplies.



The Water Transfer Program includes the following actions and recommendations:

- Establishing a California Water Transfer Information Clearinghouse to provide a public informational role. The clearinghouse would (1) ensure that information regarding proposed transfers is publicly disclosed, and (2) perform ongoing research and data collection functions to improve the understanding of water transfers and their potential beneficial and adverse effects.

- Requiring water transfer proposals submitted to DWR, Reclamation, or the SWRCB to include analysis of potential groundwater, socioeconomic, or cumulative impacts as warranted by individual transfers.

- Streamlining the water transfer approval process currently used by DWR, Reclamation, and the SWRCB. This action includes clarifying and disclosing current approval procedures and underlying policies, as well as improving the communication between transfer proponents, reviewing agencies, and other potentially affected parties.

- Refining quantification guidelines used by agencies when they review proposed water transfers for approval. This action includes resolving issues between stakeholders and approving agencies regarding the application of current agency-based quantification criteria.

- Improving the accessibility of state and federal conveyance and storage facilities for the transport of approved water transfers.

- Clearly defining carriage water requirements and resolve conflicts over reservoir refill criteria so that transfer proponents are informed of the implications of these requirements.

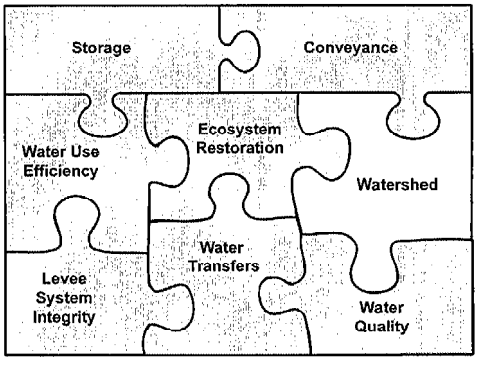
- Identifying appropriate assistance for groundwater protection programs through interaction with CALFED agencies, stakeholders, the State Legislature, and local agencies. This action is intended to assist local agencies in the development and implementation of groundwater management programs that will protect groundwater basins in water transfer source areas.

- Establishing accounting, tracking, and monitoring methods to aid in-stream flow transfers under California Water Code Section 1707.

For more information, see the Water Transfer Program Plan and the Phase II Report.

Watershed Program

The Watershed Program provides financial and technical assistance to local watershed programs that benefit the Bay-Delta system. Watershed actions can improve reliability by shifting the timing of flows, increasing base flows, and reducing peak flows. These actions also help to maintain levee integrity during high-flow periods. Other watershed actions will improve water quality by reducing the discharge of parameters of concern.



The Watershed Program includes the following elements:

- Supporting local watershed activities. Implementing watershed restoration, maintenance, and conservation activities that support the goals and objectives of the Program, including improved river functions.

- Facilitating coordination and assistance. Facilitating and improving coordination and assistance between government agencies, other organizations, and local watershed groups.

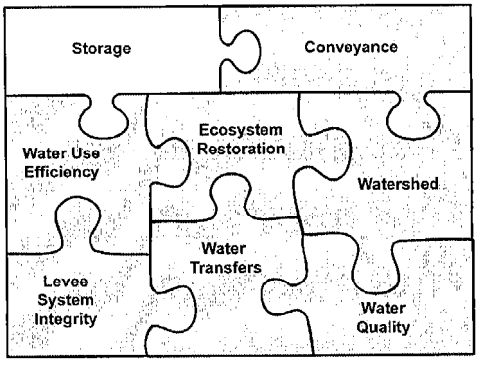
- Developing watershed monitoring and assessment protocols. Facilitating monitoring efforts that are consistent with Program protocols and support watershed activities that ensure that adaptive management processes can be applied.

- Supporting education and outreach. Supporting resource conservation education at the local watershed level, and providing organizational and administrative support to watershed programs.

- Defining watershed processes and relationships. Identifying the watershed functions and processes that are relevant to Program goals and objectives, and providing examples of watershed activities that could improve these functions and processes.

More detailed information is provided in the Watershed Program Plan and the Phase II Report.

Storage



Groundwater and surface water storage can be used to improve water supply reliability, provide water for the environment at times when it is needed most, provide flows timed to maintain water quality, and protect levees through coordinated operation with existing flood control reservoirs.

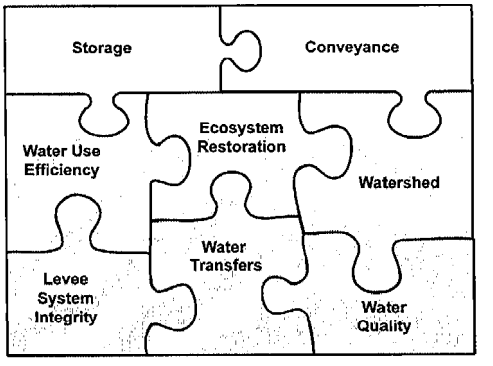
Decisions to construct groundwater or surface water storage will be predicated on compliance with all environmental review and permitting requirements, and maintaining balanced implementation of all Program elements. CALFED will undertake an annual review (see the third paragraph on page 2-1 of this document for more information about this review) to assess progress toward balanced implementation of the Program.

Subject to these conditions, new groundwater and surface water storage will be developed and constructed, together with aggressive implementation of water conservation, recycling, an improved water transfer market, and habitat restoration, as appropriate to meet CALFED Program goals. During Stage 1, through the Water Management Strategy (including the Integrated Storage Investigation) CALFED will continue to evaluate surface water and groundwater storage; identify acceptable site-specific projects; and initiate permitting, NEPA and CEQA documentation, and construction—if all conditions are satisfied.

The total volume of new or expanded surface water and groundwater storage evaluated by CALFED ranges up to 6 MAF. This document discusses the consequences of operating and constructing representative surface and groundwater storage reservoirs and related facilities in the Sacramento River Region, San Joaquin River Region, and Delta Region. Operating assumptions for reservoirs in the Sacramento River and San Joaquin River Regions are discussed in Attachment A. The impacts associated with potential operation of reservoirs in these regions were quantitatively assessed through modeling. In-Delta storage operations are not included in the modeling described in Attachment A due to the limitations of system operation modeling. The impacts associated with operation of in-Delta storage

reservoirs were assessed qualitatively for this Programmatic EIS/EIR and will be analyzed in more detail in subsequent, site-specific environmental documents. Possible related structures that are associated with reservoirs in general include inlets, outlets, siphons, roads, and conveyance and recreational facilities. Possible related structures that are associated with in-Delta storage include inlets from and outlets to Delta channels, siphons between storage islands, conveyance facilities located between storage islands and the state/federal pumps in the south Delta, and recreational facilities. Those surface and groundwater storage projects that appear most feasible are noted in the Phase II Report.

Conveyance



The Preferred Program Alternative employs a through-Delta approach to conveyance. Modifications in conveyance would result in improved water supply reliability, protection of and improvement in Delta water quality, improvements in ecosystem health, and reduced risk of supply disruption due to catastrophic breaching of Delta levees.

The four alternate conveyance approaches are described below.

Conveyance Features of Program Alternatives

Alternative 1 - Existing System Conveyance. Delta channels would be maintained essentially in their existing configuration. Several improvements would be made in the south Delta.

Alternative 2 - Modified Through-Delta Conveyance. Improvements to north Delta channels would accompany the south Delta improvements contemplated under Alternative 1.

Alternative 3 - Dual-Delta Conveyance. The dual-Delta conveyance alternative is formed around a combination of modified Delta channels and a canal or pipeline, connecting the Sacramento River in the north Delta to the SWP and CVP export facilities in the south Delta.

Preferred Program Alternative - Through-Delta Conveyance. The Preferred Program Alternative incorporates elements similar to some of the elements in Alternatives 1 and 2. While it includes a diversion facility on the Sacramento River and channel to the Mokelumne River, the size of this facility would be considerably smaller than Alternative 2. If, after additional analysis, this new facility is not constructed, the Preferred Program Alternative would be most similar to Alternative 1.

Alternative 1 - Existing System Conveyance. Delta channels would be maintained essentially in their existing configuration. Several improvements would be made in the south Delta.

South Delta Improvements. Under Alternative 1, south Delta improvements include:

- Old River would be enlarged in the reach north of Clifton Court Forebay (CCFB) to reduce channel velocities and associated scouring. Both dredging and levee setbacks are being considered to increase conveyance capacity.

- A new 15,000-cfs screened intake with low-lift pumps would be constructed at the head of CCFB.

- A new intertie facility would be constructed to connect the SWP and the CVP facilities.
- An operable fish control barrier would be constructed at the head of Old River.
- Operable flow control barriers would be constructed on Middle River, Grant Line Canal, and Old River or functional equivalents.

Operating Assumptions. Water management criteria play an important role in defining the Program alternatives. The flow, storage, and diversion of water must be simulated to identify differences among the alternatives that result from varying water management criteria. Many assumptions related to project operations and regulatory requirements needed to be made in order to complete the necessary water simulation modeling. The water management criteria for the Program alternatives include ranges of water demands and regulatory requirements. The range of water demands represents uncertainty in the future need for Bay-Delta water supplies due to uncertainty in projections of population, land use, implementation of water use efficiency measures, and the effects of water marketing. The range of regulatory requirements also represents uncertainty related to implementation of the state and federal ESAs and future SWRCB decisions. Due to their length, the operating assumptions for all Program alternatives are included in Attachment A.

Alternative 2 - Modified Through-Delta Conveyance. Significant improvements to north Delta channels would accompany the south Delta improvements contemplated under Alternative 1.

South Delta Improvements. Under Alternative 2, south Delta improvements include:

- As under Alternative 1, Old River would be enlarged in the reach north of CCFB. Also as under Alternative 1, both levee setbacks and dredging are being considered to increase conveyance capacity.
- As under Alternative 1, a new 15,000-cfs capacity screened intake with pumps would be constructed at the head of CCFB.
- As under Alternative 1, a new intertie facility would be constructed to connect the SWP and the CVP facilities.
- As under Alternative 1, operable flow control barriers or their equivalent would be constructed on Middle River, Grant Line Canal, and Old River.

North Delta Improvements. Under Alternative 2, north Delta improvements include:

- A new 10,000-cfs diversion facility from the Sacramento River near Hood to the Mokelumne River. The diversion would include a screened intake and pumping facilities.
- A fish ladder or equivalent would be constructed to convey fish upstream, past the pumps and screens that are associated with the diversion structure, to the Sacramento River.
- The Lower Mokelumne River channel would be widened to improve water conveyance and flood control from Interstate 5 (I-5) to the San Joaquin River.

Operating Assumptions. See Attachment A.

Alternative 3 - Dual-Delta Conveyance. The dual-Delta conveyance alternative includes a combination of modified Delta channels and a new canal or pipeline, connecting the Sacramento River in the north Delta to the SWP and CVP export facilities in the south Delta.

South Delta Improvements. Under Alternative 3, south Delta improvements include:

- A new appropriately sized screened intake with pumps at the head of CCFB.
- As under Alternative 1, Old River would be enlarged in the reach north of CCFB. Also as under Alternative 1, both levee setbacks and dredging are being considered to increase conveyance capacity.
- As under Alternative 1, operable flow control barriers or their equivalent would be constructed on Middle River, Grant Line Canal, and Old River.
- As under Alternative 1, a new intertie facility would be constructed to connect the SWP and the CVP facilities.
- As under Alternative 1, an operable fish control barrier would be constructed at the head of Old River.

North Delta Improvements. Under Alternative 3, these improvements generally run from the north to the south Delta and include:

- An open-channel isolated facility ranging in size from 5,000- (±2000) to 15,000-cfs capacity would be constructed. The intake to the isolated facility would be located near Hood and may include dual points of intake. The intake(s) would be screened. The isolated facility would be placed along the eastern side of the Delta and connected to CCFB.
- Connections would be constructed between south Delta islands, the Contra Costa and Tracy Pumping Plants, and portions of San Joaquin County and the new canal.
- As under Alternative 2, the Mokelumne River channel would be widened to improve water conveyance and flood control from I-5 to the San Joaquin River.

Operating Assumptions. See Attachment A.

Preferred Program Alternative - Through-Delta Conveyance. The Preferred Program Alternative incorporates elements similar to some of the elements in Alternatives 1 and 2. While it includes a diversion facility on the Sacramento River and channel to the Mokelumne River, the size of this facility would be considerably smaller than Alternative 2. If after additional analysis this new facility is not constructed, the Preferred Program Alternative would be most similar to Alternative 1.

South Delta Improvements. Under the Preferred Program Alternative, south Delta improvements include:

- Constructing a new screened intake at CCFB with protective screening criteria.
- Constructing either a new screened diversion at Tracy with protective screening criteria and/or expanding the new diversion at CCFB to meet the Tracy Pumping Plant export capacity.
- Implementing the Joint Point of Diversion (JPD) for the SWP and CVP, and constructing interties.
- Constructing an operable barrier at the head of Old River to improve conditions for salmon migrating up and down the San Joaquin River.
- Implementing actions to ensure the availability of water of adequate quantity and quality to agricultural diverters within the south Delta, and to contribute to restoring ecological health of aquatic resources in the lower San Joaquin River and south Delta. Actions may include channel dredging, extending and screening agricultural intakes, consolidating agricultural intakes, constructing operable barriers, and levee setbacks and levee improvements (such as reinforcing levees or controlling seepage). Actions will be staged, with appropriate monitoring and testing to guide the implementation process.
- Changing the SWP operating rules to allow export pumping up to the current physical capacity of the SWP export facilities.

North Delta Improvements. Under the Preferred Program Alternative, north Delta improvements include:

- Studying and evaluating a screened diversion facility on the Sacramento River with a range of diversion capacities up to 4,000 cfs as a measure to improve drinking water quality in the event that the Water Quality Program measures do not result in continuous improvements toward CALFED drinking water goals.

  The diversion facility on the Sacramento River likely would include a fish screen, pumps, and a channel between the Sacramento and Mokelumne Rivers. The diversion facility on the Sacramento River is to be considered only after three separate assessments are satisfactorily completed: first, a thorough assessment of Delta Cross Channel (DCC) operation strategies and confirmation of continued concern over water quality impacts from DCC operations; second, a thorough evaluation of the technical viability of a diversion facility; and third, satisfactory resolution of the fisheries concerns about a diversion facility. The assessments of the DCC and the diversion facility on the Sacramento River will be completed simultaneously. The result of all three of these evaluations will be shared with the Delta Drinking Water Council or its successor and the expert panel evaluating fish impacts of Delta conveyance. If these evaluations demonstrate that a diversion facility on the Sacramento River is necessary to address drinking water quality concerns and can be constructed without adversely affecting fish populations, the facility will be constructed as a part of the Preferred Program Alternative.

- Constructing new setback levees or dredging and/or improving existing levees along the channels of the lower Mokelumne River system from I-5 downstream to the San Joaquin River.

Operating Assumptions. See Attachment A.

The Preferred Program Alternative includes a process for determining the conditions under which any future additional conveyance facilities or water management actions would be taken. The process would include:

- An evaluation of how water suppliers can best provide a level of public health protection equivalent to Delta source water quality of 50 parts per billion (ppb) bromide and 3 parts per million (ppm) TOC.

- An evaluation based on two independent expert panels' reports—one on the Program's progress toward these measurable water quality goals, and the second on CALFED's progress toward ecosystem restoration objectives, with particular emphasis on fisheries recovery.

2.2 NO ACTION ALTERNATIVE

The No Action Alternative is a description of the anticipated physical, project operation, and regulatory features that would be in place in 2020 if the Program is not approved. The No Action Alternative was used as a basis for comparison of the Program alternatives. The purpose of this comparison is to highlight the changes to the environment that would take place as a result of implementing the various alternatives. The Program also is comparing the alternatives to existing conditions, referred to as the "affected environment" in this document.

Working with agencies, stakeholders, and interested public, the Program developed and applied criteria in the selection of physical features that would be included in the No Action Alternative. These criteria and the projects selected are presented in Attachment A. Generally, the physical features selected were under construction or recently constructed or approved as of June 1995 when scoping for this document began.

Water management criteria also play an important role in defining the No Action Alternative. The flow, storage, and diversion of water must be simulated to identify differences among alternatives. Many assumptions related to project operations and regulatory requirements needed to be made in order to complete the necessary water simulation modeling. The water management criteria for the No Action Alternative include ranges of water demands and regulatory requirements. The range of water demands represents uncertainty regarding future conditions that will affect demands for Bay-Delta water supplies; these conditions include rates and amounts of future population growth, land use change, implementation of water use efficiency measures, and effects of water marketing. The range of regulatory requirements also represents uncertainty related to implementation of state and federal Endangered Species Acts (ESAs) and future SWRCB decisions. For example, changes in future operations could require reinitiating ESA consultations with the National Marine Fisheries Service and USFWS. These consultations could result in new biological opinions and changes in regulatory requirements. While specific assumptions were made to complete the water simulation modeling, the Program's intention is to depict a general range of reasonably anticipated regulatory requirements. These assumptions should not be interpreted as specific predictions of future regulatory actions. The "bookend" assumptions used to bracket the water demand and regulatory requirement ranges are detailed in Attachment A.

Ranges also were used to describe possible flow changes in the Trinity and American Rivers due to the Trinity River Flow Analysis Study and implementation of the East Bay Municipal Utility District's (EBMUD's) CVP contract. These activities could result in changes in the availability of water to meet Program objectives. The assumed ranges were included in the No Action Alternative assumptions only to help decision makers better understand the potential consequences of these actions to the Program. No decisions have been made about the proposed Trinity River flows or American River diversions. The bookend assumptions used to bracket the potential outcome of these processes also are described in Attachment A.

Attachment A also lists the non-project and non-modeling assumptions, issues, or policies that are part of the No Action Alternative. In addition, Attachment A includes a comments and issues section that addresses a number of items that were considered throughout the development of the No Action Alternative.

2.3 ENVIRONMENTALLY PREFERABLE ALTERNATIVE

The problems and potential solutions facing the Bay-Delta involve a complex set of interrelated biological, chemical, and physical systems. This complexity, coupled with the broad scope and number of actions needed to implement the Program, the 30-year or more implementation period, the need to test hypotheses, and resource limitations make it necessary to implement the Program in stages. Consequently, the Preferred Program Alternative provides for implementation of the Program in a staged manner and establishes mechanisms to obtain the necessary additional information to guide the next stage of decision making.

The Preferred Program Alternative consists of a through-Delta conveyance approach, coupled with ecosystem restoration, water quality improvements, levee system improvements, increased water use efficiency, improved water transfer opportunities, watershed restoration, and additional surface waters and groundwater storage. The Preferred Program Alternative meets the Program's multiple purposes, reduces adverse environmental effects, and provides a system of research and monitoring to determine whether modifications or additional actions are needed. It provides multiple benefits, including:

- Modifying the timing and magnitude of flow to restore ecological processes and to improve conditions for fish, wildlife, and plants in the Bay-Delta system.
- Improving and increasing aquatic and terrestrial habitats.
- Modifying and eliminating fish passage barriers.
- Constructing fish screens that use the best available technology.
- Reducing the loads and impacts of bromide, total organic carbon, pathogens, nutrients, salinity, and turbidity.
- Reducing the impacts of pesticides.

- Reducing the impacts of trace metals, mercury, and selenium.
- Improving and maintaining the stability of the Delta and Suisun Marsh levee system.
- Enhancing flood protection for key Delta islands.
- Expanding and implementing agricultural and urban conservation incentive programs.
- Implementing better water management for managed wetlands.
- Facilitating water transfers while protecting from third parties from potentially significant adverse impacts.
- Supporting local watershed restoration, maintenance, and conservation activities.
- Developing appropriate groundwater and surface storage in conjunction with specified water conservation, recycling, and water transfer programs to provide water for the environment at times when it is needed most, and to improve water supply reliability.
- Modifying existing Delta conveyance systems for improved water supply reliability and water quality, improved ecosystem health, and reduced risk of supply disruption due to catastrophic breaching of Delta levees.

Compared to the No Action Alternative and existing conditions, the Preferred Program Alternative provides significant improvements in terms of both its water quality and ecosystem health effects. Under the No Action Alternative, each of the four areas of critical concern—ecosystem quality, water quality, levee system integrity and water supply reliability—would continue to deteriorate, with resultant potentially significant adverse impacts on fisheries, endangered species, and species of concern and their habitats. In addition, the quality of both in-Delta and export water likely would decline under the No Action Alternative. This decline in water quality could result in potentially significant adverse impacts on fisheries, irrigated agriculture, ecosystem health, and drinking water quality. With the continued decline of the ecosystem, interruptions of water deliveries also likely would occur because of constraints on export pumping to protect threatened and endangered species. Finally, under the No Action Alternative, the Delta levees would continue to be vulnerable to failure because of limited maintenance in some locations and the lack of a comprehensive plan for effective emergency response.

There is concern whether a through-Delta conveyance approach can meet future water quality objectives and not adversely affect the recovery of threatened and endangered fish species. Although some scientific and engineering evidence suggests that a dual-Delta conveyance configuration may improve export water quality and achieve fish recovery more effectively, other evidence indicates that such a conveyance configuration can cause in-Delta water quality problems. In addition, during scoping and public meetings, some stakeholders and agencies voiced concern that moving water around the Delta instead of through it may:

- Cause difficulty in ensuring the appropriate operation of such a facility.
- Create impacts from construction.

- Increase the amount of land needed for the facility.

- Provide an engineered solution when non-structural modifications and reoperation of existing facilities may provide similar benefits.

Although the CALFED agencies did not rule out the possibility of constructing an isolated conveyance facility in the future, they were mindful that, even if approved immediately following the ROD/CERT, such a facility could not be studied, approved, funded, and constructed within the first stage (7 years) of implementation.

In light of the technical and feasibility issues discussed above, the CALFED agencies propose to begin with through-Delta modifications. As part of the Preferred Program Alternative, the Program also would:

- Continue to investigate storage opportunities in the context of the broader Water Management Strategy.

- Evaluate and implement storage projects, predicated on complying with all environmental review and permitting requirements. These efforts will be coordinated under CALFED's Integrated Storage Investigation.

- Implement the first stage of the Ecosystem Restoration, Water Quality, Water Use Efficiency, Water Transfers, Watershed, and Levee System Integrity Program Plans.

- Monitor the results of these actions to determine whether an isolated conveyance facility as part of a dual-Delta conveyance configuration is necessary to meet the Program objectives.

If the Program purposes cannot be fully achieved with the actions proposed in the Preferred Program Alternative, additional actions—including an isolated conveyance facility—may need to be added in the future. Until additional information is available to determine whether water quality objectives and fish recovery goals can be met and which, if any, additional actions will be necessary to achieve the Program goals and objectives, the Preferred Program Alternative is the best alternative to achieve overall project purposes and provide significant beneficial improvements over the conditions anticipated under the No Action Alternative, while establishing a process for obtaining this additional information. Moreover, the way the alternatives are structured, going forward with the Preferred Program Alternative does not preclude the Program's ability to undertake additional conveyance actions in the future, subject to appropriate environmental review.

As described above, the Preferred Program Alternative adopts a set of programmatic actions designed to achieve the objectives for each of the resource areas while evaluating the effectiveness of those actions, and assessing whether modifications may be needed to meet Program goals and objectives. The Preferred Program Alternative accordingly constitutes the "Environmentally Preferable Alternative" as that term is used in the National Environmental Policy Act (NEPA) and the "Environmentally Superior Alternative" as that term is used in CEQA. A comparison of impacts among alternatives can be found in summary form in Chapter 3 and more specifically in Chapters 5, 6, and 7.

2.4 ALTERNATIVES NOT CARRIED FORWARD FOR FURTHER EVALUATION

The three basic alternative approaches developed in Phase I of the Program were carried into Phase II. Seventeen alternative configurations of the three basic alternative approaches were developed to further explore potential refinements for storage and conveyance in Phase II. Of the 17 configurations, 5 were eliminated from further evaluation, and 12 were evaluated in the March 1998 Draft Programmatic EIS/EIR. Based on public and agency comments on the March 1998 EIS/EIR and additional technical analysis, the Program was able to further refine and narrow the number of alternative solutions to the four evaluated in this document.

The following explains the rationale for the elimination of alternative configurations from further evaluation prior to and after the release of the March 1998 Draft Programmatic EIS/EIR.

Elimination of Alternative Configurations prior to the March 1998 Draft Programmatic EIS/EIR. Five of the alternative configurations were eliminated based on the results of a narrowing process. The narrowing process primarily focused on technical deficiencies and the conveyance options used in each alternative. Additionally, if alternatives provided the same conveyance function with similar impacts, the less expensive alternatives were retained. Alternatives with lower costs but higher adverse impacts were eliminated. The evaluation used the following process and recommendations from technical work groups, operational modeling results, engineering prefeasibility studies, preliminary information from impact analysis, preliminary cost estimates, and other information:

- Identify and eliminate technical problems not evident when the alternatives were formulated that severely limit an alternative's chances for success.
- Identify alternatives with engineering or technical problems that must be resolved for the alternatives to proceed.
- Modify each alternative, if possible, to remove the technical problems.
- If modifications to the alternative cannot solve the problem, consider the alternative not practicable and eliminate it.
- Reduce the number of alternatives that achieve the same conveyance function with similar impacts.
- Identify alternatives that meet Program objectives to approximately the same degree and achieve the same conveyance function.
- Use engineering or technical and cost evaluations to compare the conveyance features of the alternatives. Consider adverse impacts of each alternative. If one alternative has significantly higher costs for conveyance and/or greater adverse impacts while achieving similar functions, it is not practicable and will be eliminated from further consideration.

Using the above criteria, five alternative configurations (2C, 3C, 3D, 3F, and 3G) were eliminated from further analysis.

Configuration 2C. The Multiple Intakes Conveyance Option in Configuration 2C would use three isolated conveyance channels to convey water to CCFB from two diversion locations on the San Joaquin River and one location on Old River near Franks Tract.

Configuration 2C was eliminated because the alternative would need to be modified to remove technical problems and, even after modification, hydraulically controlling the three water diversion "arms" would have been difficult. In addition, fish screens were needed to prevent fish entrainment at the pumps. Fish screens are costly because they require elaborate flow structures for the intake facilities. Configuration 2C is very expensive, with a total construction cost of $2.281 billion (in 1998 dollars) and a monitoring cost of $2.4 million (in 1998 dollars). Configuration 3I includes the same multiple Delta intake option, as well as options that address possible impacts on anadromous fish that are associated with Configuration 2C. Configuration 3I allows for more operational flexibility.

Configuration 3C. Configuration 3C uses a buried pipeline isolated facility to convey 5,000 cfs from a diversion on the Sacramento River at Hood along the east Delta to CCFB. No new storage is included in this alternative.

Configuration 3C was eliminated because Configuration 3A provides the same conveyance function at less cost. The alternatives are identical, except Configuration 3C proposed a pipeline isolated facility while Configuration 3A proposes an open channel. Configuration 3A would cost $857 million (in 1998 dollars), while Configuration 3C would cost $2.067 billion (in 1998 dollars). The environmental consequences of the pipeline are very similar to those of a channel; therefore, elimination of the pipeline did not result in the loss of an environmentally preferred alternative from the study.

Configuration 3D. As in Configuration 3C, Configuration 3D uses a buried pipeline isolated facility to convey 5,000 cfs from a diversion on the Sacramento River at Hood along the east Delta to CCFB. Configuration 3D differs from Configuration 3C in that it includes new storage.

Configuration 3D was eliminated because Configuration 3B provides the same conveyance function at less cost. The alternatives are identical, except Configuration 3D proposed a pipeline isolated facility while Configuration 3B proposes an open channel. Configuration 3B would cost $857 million (in 1998 dollars), while Configuration 3D would cost $2.067 billion (in 1998 dollars).

Configuration 3F. Configuration 3F, or "Chain-of-Lakes," uses a connected chain of up to eight lakes, created by flooding Delta islands, that would convey water via siphons beneath Delta channels to CCFB.

Configuration 3F was eliminated because of issues related to environmental damage, logistics, and cost. A major drawback of this configuration is the Delta land use conversion it entails. Approximately 37,000 acres of land would be required to create the chain of lakes. Conversion of this land is an environmental concern because some of the land (primarily on the water side of levees) currently provides aquatic habitat. The land currently has valuable agricultural uses, has habitat value for terrestrial wildlife species, and some of this land is intended for habitat restoration under the Ecosystem Restoration Program. In addition to the land use conversion concerns, this configuration creates a logistical concern related to achievement of water quality objectives—the storage of water on Delta peat soils may create TOC problems for urban water users. Finally, this alternative is estimated to cost approximately $2.4 billion (in 1998 dollars) compared to a cost of $1.7 billion (in 1998 dollars) for Configuration 3E,

which provides similar water storage and conveyance functions with fewer associated adverse environmental impacts.

Configuration 3G. Configuration 3G, the Western Delta Isolated Conveyance Facility, uses the Deep Water Ship Channel, and a west Delta conveyance pipeline, tunnel, and channel to convey 5,000 cfs from the intake on the Sacramento River near Sacramento to CCFB.

Configuration 3G was eliminated because its cost is estimated at $2.3 billion (in 1998 dollars), substantially more than the estimated $0.9 billion (in 1998 dollars) for Configuration 3B, which provides very similar water conveyance benefits and results in very similar environmental impacts.

Elimination of Alternative Configurations after the March 1998 Draft Programmatic EIS/EIR. The March 1998 Draft Programmatic EIS/EIR evaluated the impacts of the remaining 12 alternative configurations. The Program considered public comments on the March 1998 Draft Programmatic EIS/EIR and completed additional technical analysis to eliminate some of the configurations and consolidate others.

Configuration 1A. Configuration 1A used six Program elements (Ecosystem Restoration, Water Quality, Levee System Integrity, Water Use Efficiency, Water Transfer, and Watershed Programs) without new storage and conveyance facilities. The Program has determined that a broad range of water management options, including storage, must be evaluated and implemented to achieve the Program's goals. Each alternative now includes a range of storage from 0 to up to 6.0 MAF. An alternative configuration without storage like Configuration 1A is represented in the analysis for zero storage in each of the four alternatives evaluated in this document. In addition, the Program has determined that the goals cannot be met without some south Delta conveyance improvements, which were not part of Configuration 1A.

Configuration 1B. Configuration 1B is similar to Configuration 1A, except for the addition of select south Delta conveyance improvements. Configuration 1B does not include storage. As discussed for Configuration 1A, the zero storage component is represented in the analysis for each of the four selected alternatives.

Configuration 2A. Configuration 2A includes north and south Delta channel modifications that are designed to improve water conveyance but does not include storage. Like Configurations 1A and 1B, this configuration is represented in the zero storage analysis for each of the four selected alternatives.

Configuration 2D. Configuration 2D includes modifications in the north and south Delta that are designed to improve water conveyance, to integrate habitat restoration with the conveyance improvements, and to provide new aqueduct storage south and downstream of the Delta. The alternative provides for more efficient water conveyance from the Sacramento River through the South Fork Mokelumne River and Old River near CCFB. The Program has determined that environmental concerns require separating the main water conveyance path from major new habitat. Locating major habitat away from the main water conveyance path would provide less chance of fish being carried to the south Delta export pumps. The habitat and its potential impacts in this configuration is still represented in the analysis of the Ecosystem Restoration Program element in each of the four selected alternatives. Separating the conveyance and the major new habitat also is preferable for water quality because it keeps the organic carbon that originates in the wildlife habitat out of the main water conveyance path.

Configuration 2E. Configuration 2E includes modifications in the north and south Delta that are designed to improve water conveyance, to provide significant habitat restoration, and to provide additional surface water and groundwater storage. The conveyance and habitat portions are similar to those in Configuration 2D, except for the addition of conveyance and habitat on Tyler Island and the elimination of the 10,000-cfs intake near Hood. Configuration 2E was eliminated for the same reasons that Configuration 2D was eliminated.

Configuration 3A. Configuration 3A includes north and south Delta channel modifications that are designed to improve water conveyance and a small (5,000-cfs) open-channel isolated facility. The configuration does not include new storage. Like the other no-storage configurations, the zero storage in this configuration is represented in the analysis of the four selected alternatives. Additionally, Configuration 3A is represented in the analysis for Alternative 3 in this document. Alternative 3 is examining a range of volumes (5,000 cfs, 10,000 cfs, and 15,000 cfs) for the isolated facility.

Configuration 3B. Configuration 3B includes north and south Delta channel modifications that are designed for water conveyance, a small (5,000-cfs) isolated facility constructed as an open channel, and surface water and groundwater storage. Configuration 3B is represented in the analysis for Alternative 3 in this document. Alternative 3 is examining a range of volumes(5,000 cfs, 10,000 cfs, and 15,000 cfs) for the isolated facility.

Configuration 3H. Configuration 3H includes modifications in the north and south Delta that are designed for water conveyance and significant habitat restoration, a small (5,000-cfs) isolated facility constructed as an open channel, and surface water and groundwater storage. The conveyance and habitat portions are the similar to those in Configuration 2D. Configuration 3H was eliminated for the same reasons that Configurations 2D and 3B were eliminated.

Configuration 3I. Configuration 3I includes three new diversion locations in the south Delta for Tracy and Banks Pumping Plants, a 15,000-cfs isolated facility, and surface water and groundwater storage. The new south Delta diversions were envisioned for use separately or in combination to provide increased operational flexibility. However, Configuration 3I was eliminated for several environmental and cost reasons. For example, the middle diversion on the San Joaquin River:

- Exposes the Eastside tributary and San Joaquin salmon to a new screen.
- Could adversely affect Delta smelt and striped bass.
- Would present problems in salvaging fish because of its location in a tidal zone.
- Could exacerbate water quality problems in the south Delta.

The western diversion is in an area that is critical for Delta smelt and is also in the tidal zone, requiring salvage of fish. The southern diversion on the San Joaquin River likely could be used for only short periods of time due to lack of San Joaquin River flows. The original concept involved no screen on each of these three diversions at their upstream ends but screens at common facilities for the Banks and Tracy Pumping Plants. Because of concern about predation that could occur in the slow-flowing channels, fish screens at the upstream ends were included in the alternative. Cost estimates are approximately $2 billion in 1998 dollars higher for Configuration 3I than for Alternative 3, which is evaluated in this document. Because of concerns about potentially damaging conditions to the aquatic environment and the substantially higher cost, Configuration 3I was eliminated from further consideration.