DRAFT

ENVIRONMENTAL IMPACT REPORT

ENVIRONMENTAL IMPACT STATEMENT

SOUTH DELTA WATER MANAGEMENT PROGRAM

Phase I of Water Banking Program

EXECUTIVE SUMMARY

June 1990

California Department of Water Resources
United States Bureau of Reclamation

A copy of this report may be obtained FREE from

State of California
DEPARTMENT OF WATER RESOURCES
P.O. Box 942836
Sacramento, CA 94236-0001

C-041721

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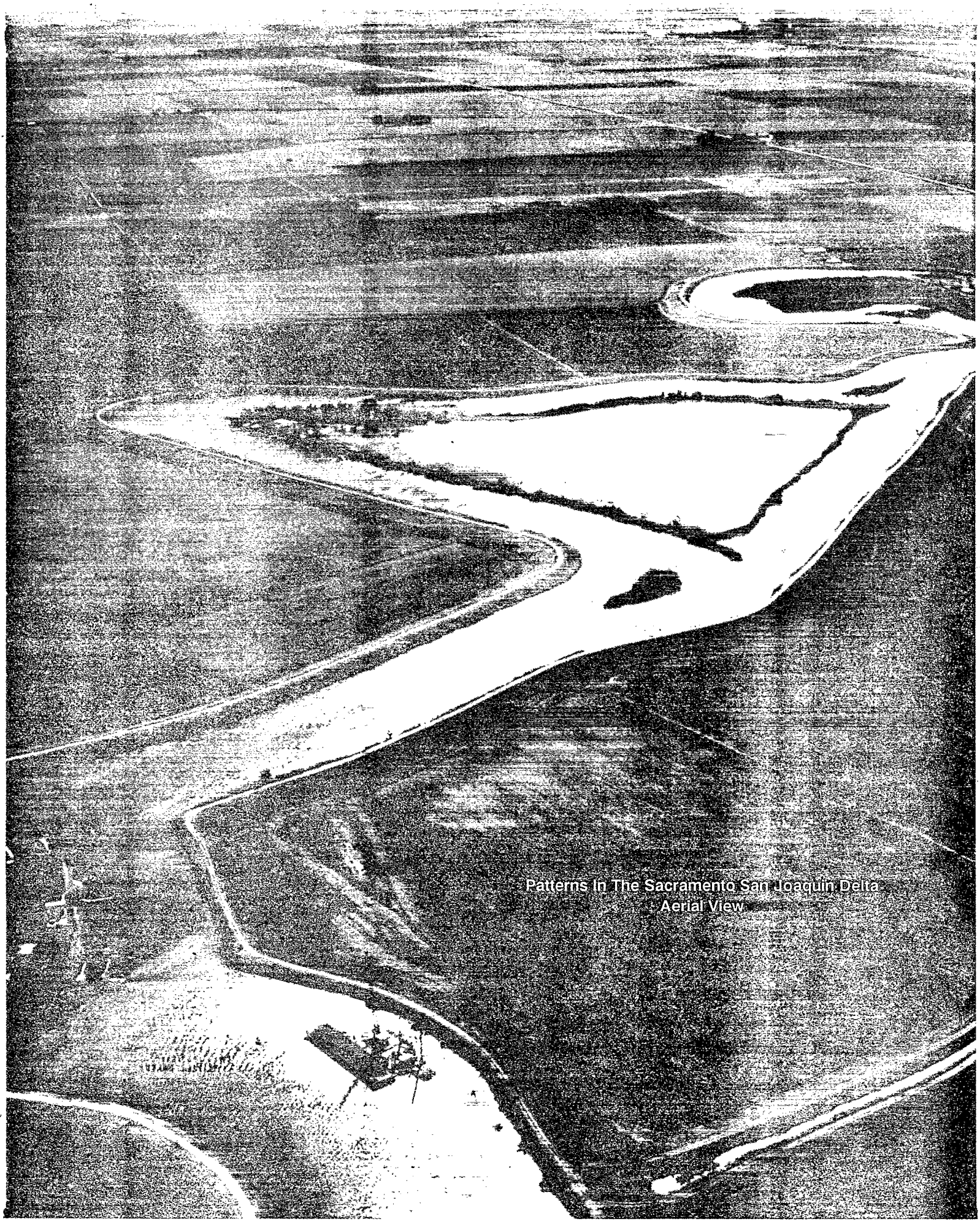

Patterns In The Sacramento San Joaquin Delta
Aerial View

C—041723

C-041723

STATE OF CALIFORNIA—THE RESOURCES AGENCY

GEORGE DEUKMEJIAN, *Governor*

DEPARTMENT OF WATER RESOURCES
1416 NINTH STREET, P.O. BOX 942836
SACRAMENTO, CA 94236-0001
(916) 445-9248

JUL 8 1988

To Interested Parties:

Enclosed for your review is a copy of the Draft South Delta Water Management Program Environmental Impact Report/Environmental Impact Statement Executive Summary. This program is one of three programs underway to address corrective actions for the Delta, and implement the Department's water banking program. This summary assesses the impacts of constructing and operating facilities proposed by this program. The preferred alternative includes:

- enlarge Clifton Court Forebay to about 5,000 surface acres with new intakes at Old River and Middle River at the west and east ends of North Victoria Canal;
- enlarge some existing south Delta channels to improve conveyance and circulation;
- acquire a U.S. Army Corps of Engineers permit to increase the pumping capability of the Banks Pumping Plant up to 10,300 cubic feet per second for operational flexibility to bank winter flows;
- construct up to four mitigation and enhancement barrier-type facilities in south Delta channels to improve water level and circulation. (Temporary barriers are presently in use at two locations.)

The California Department of Water Resources is releasing this draft to initiate public review and comment pursuant to the California Environmental Quality Act. The Bureau of Reclamation will release the document pursuant to the National Environmental Policy Act after publication of notice in the Federal Register.

The proposed CEQA review and comment period will end November 30, 1990. Please submit any written comments before the end of the review period to:

Fred Bachmann
California Department of Water Resources
P. O. Box 942836
Sacramento, CA 94236-0001

The Department has scheduled two public hearings to receive comments on the Draft EIR/EIS at the following locations:

September 19, 1990 at 1:30 p.m.	September 20, 1990 at 7 p.m.
Resources Building Auditorium 1416 Ninth Street Sacramento, CA 95814	Tracy Inn 30 West 11th Street Tracy, CA 95376

Copies of the full Draft EIR/EIS are available from:

California Department of Water Resources
1416 Ninth Street, Room 338
Sacramento, CA 95814

Copies are also available at local libraries. If you need additional information regarding the Draft EIR/EIS, please contact Fred Bachmann at (916) 324-4751.

Sincerely,

E. F. Huntley

Edward F. Huntley, Chief
Division of Planning

Enclosure

C-041725

FOREWORD

Three related Environmental Impact Reports/Environmental Impact Statements (EIR/EIS's) are scheduled to be released to the public in 1990: The South Delta Water Management Program (SDWMP), the North Delta Water Management Program (NDWMP) and Los Banos Grandes (LBG) Offstream Storage Reservoir. The SDWMP is the first phase of the California Department of Water Resources (DWR) water banking program and is designed to resolve local south Delta water supply problems. Before a final decision is made on this program, draft EIR/EIS's on the other two programs will be available for public review. Concurrent with these programs, DWR, the Department of Fish and Game (DFG), and the U. S. Bureau of Reclamation (Reclamation) will continue to conduct public negotiations with input from environmental interests and water users to determine a future agreement to protect Delta estuary fish. The planning programs are designed to be compatible with, and offer, specific mitigation measures to advance this agreement.

This draft EIR/EIS covers actions to be taken over the next several years under the SDWMP. The program consists of several individual actions, most of them to be undertaken by DWR as a part of the State Water Project. The program features involve the same Delta waterways used by Reclamation's Central Valley Project, and, thus, potentially could influence Reclamation operations and/or facilities. Furthermore, there are specific project objectives—namely, improvement of water levels, quality, and circulation in the south Delta channels and fishery conditions—that correspond with Reclamation's objectives for the south Delta. Therefore, Reclamation has joined in the preparation of this general program document and is currently involved in several of the negotiations described. A report on site specifics of the federal portion of the program will be prepared to obtain Congressional authorization for construction of appropriate project features. As necessary, that authorization report and final EIR/EIS will include additional environmental analysis for any site specific National Environmental Policy Act compliance requirements.

The South and North Delta Water Management programs are responding to the growing consensus that "no action" in the Delta is unacceptable and that improvements are needed to correct existing problems. Current operation adversely affects the water quality of drinking water, impacts fisheries, lowers project reliability, and creates concerns with local water diverters, which led to a lawsuit in 1982. Improvements proposed by these Delta Water Management Programs are designed to reduce or eliminate these problems and assist other ongoing efforts to provide flood control improvements for the Delta. Also, the current system is not able to provide the operational flexibility to meet the "water banking" concept approved by the Legislature in 1984. Many factors support this banking concept as an environmentally workable method to meet California's growing water needs.

Water banking is the concept of moving water into storage facilities south of the Delta during winter high-flow conditions, when fishery impacts are less pronounced, and using this stored water during drier periods to reduce diversions from the Delta. The improved hydraulics, with a federal permit to increase diversions in the Delta, proposed by the SDWMP, would permit diversions of these flows when they are

available. Storage facilities such as the Kern Water Bank (ground water storage) or the proposed LBG would provide the storage capacity for this banking operation.

The EIR/EIS's have been carefully organized into individual reports guided by comprehensive statewide planning to improve the decision-making processes. The use of coordinated individual reports was selected to provide added attention to program evaluations as well as flexibility in scheduling and program implementation. At the same time, the interrelationships between each program and their combined effects are addressed in detail by statewide planning documents, cumulative impact evaluations, comprehensive system operation studies, and Delta estuary mitigation activities. Positive results have been achieved with other Delta programs during the last 10 years using coordinated individual reports and a step-by-step approach.

The interrelationship of these reports has been considered in DWR's latest update of the California Water Plan—Bulletin 160-87, *California Water: Looking to the Future* (November 1987). Also, as part of the engineering and environmental assessment for each program, the cumulative impacts and project operations of combining projects were evaluated. This information will be available to negotiators that are developing an agreement to provide for Delta fishery protection, which, in turn, will become an integral part of the complete Delta program.

David N. Kennedy, Director
Department of Water Resources
State of California

Lawrence F. Hancock, Regional Director
Mid-Pacific Region
U.S. Bureau of Reclamation

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FIGURES

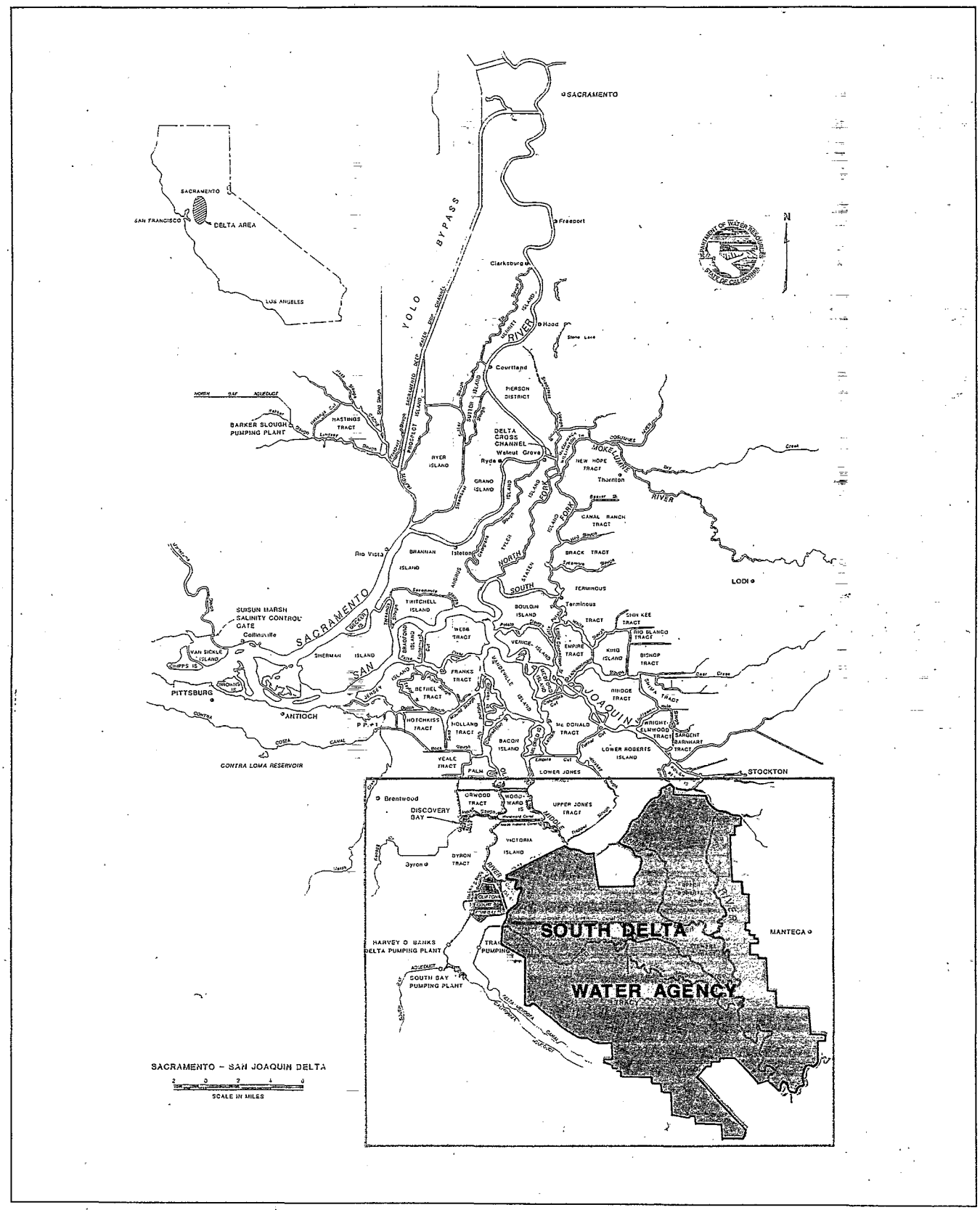

Figure 1. South Delta Water Management Program Study Area

EXECUTIVE SUMMARY

The California Department of Water Resources (DWR) and the U.S. Bureau of Reclamation (Reclamation) propose to implement the South Delta Water Management Program (SDWMP). This program is one of three water management programs being conducted to address issues surrounding the Sacramento–San Joaquin Delta and is the first step in a future water banking program. The South Delta Water Management Study Area is shown in Figure 1. This draft report incorporates comments from an earlier public scoping meeting. Additional comments from the review of this draft will be included in the final environmental document.

The environmental documentation process provides information for the public, government agencies, and decision makers about the potential significant environmental effects of implementing the SDWMP. In addition, this environmental documentation will identify alternatives and possible ways to reduce or prevent environmental impacts. The information will be used to obtain federal regulatory permits that govern projects in the Delta estuary.

An integral part of this process is continuous communication and cooperation with the public, governmental agencies, and environmental groups to improve the decision-making process for both the preferred alternative and adopted mitigation measures. Included in this process are 1) public comments, 2) public scoping meetings, 3) wide distribution of planning reports, 4) organization of special meetings with environmental groups and interested entities, and 5) development of and commitment to implementation and monitoring of a mitigation plan.

This draft EIR/EIS covers actions to be taken over the next several years under the SDWMP. The program consists of several individual actions, most of them to be undertaken by DWR as a part of the State Water Project. The program features involve the same Delta waterways used by Reclamation's Central Valley Project, and, thus, potentially could influence Reclamation operations and/or facilities. Furthermore, there are specific project objectives—namely, improvement of water levels, quality, and circulation in the south Delta channels, and fishery conditions—that correspond with Reclamation's objectives for the south Delta. Therefore, Reclamation has joined in the preparation of this general program document and is currently involved in several of the negotiations described below. A report on site specifics of the federal portion of the program will be prepared to obtain Congressional authorization for construction of appropriate project features. As necessary, that authorization report and final EIR/EIS will include additional environmental analysis for any site specific National Environmental Policy Act compliance requirements.

The Delta is an important resource with a complex and sensitive environment. DWR, Reclamation, and the Department of Fish and Game (DFG) have formed a negotiating group with a broad range of expertise to provide protective measures for the Bay–Delta estuary. DWR and Reclamation are committed to provide staff resources and participation to develop a mutually acceptable agreement. The SDWMP will utilize and contribute to these negotiations to develop mitigation measures. Other important contributions will come from the North Delta Water Management Program (NDWMP), including elimination or reduction of reverse Delta flow patterns caused by the project.

This protection, together with other commitments discussed under "Mitigation Measures," was designed to reduce adverse impacts. To provide further protection for the Delta, DWR and Reclamation will take other steps:

- Negotiate with South Delta Water Agency (SDWA) to protect local agricultural water diversions and provide for interim New Melones releases.
- Integrate mitigation measures that consider improved flow patterns and project operational flexibility into the preferred alternative.
- Fund and initiate a program to promote long-term releases from New Melones Reservoir to protect fish and water quality.
- Continue commitment to water conservation and reclamation programs.
- Develop Delta wetlands.

South Delta Background

The South Delta area generally comprises the lands and channels of the Sacramento–San Joaquin Delta southwest of Stockton. Included in the study area is the SDWA, as defined in the Formation Act, California Statutes of 1973. Important features of the State Water Project (SWP) and Central Valley Project (CVP) are also located in the study area. The area is faced with complex issues, including water rights, water supplies, water quality, and the environment.

The area within SDWA boundaries includes some 150,000 acres, of which 120,000 acres are used for irrigated agriculture. The remainder consists of waterways, berms, channel islands, levees, and lands devoted to homes and industries. About 450,000 acre-feet (AF) of water is diverted from the 75 miles of south Delta channels each year to irrigate the fully developed and highly productive agricultural land.

In July 1982, SDWA filed a lawsuit concerning the effects of SWP and CVP operations on the south Delta. The suit sought a declaration of the rights of the parties, a preliminary injunction, and a permanent injunction requiring that the projects be operated to protect the south Delta.

In past years, SDWA at times reported low water levels in local channels. Accordingly, DWR installed stage recorders, dredged the shallow spots, and modified Clifton Court gate operations to help alleviate the impact of SWP diversions on water levels. During a hot period in July 1985, when farmers claimed they were losing crops due to low water supplies, DWR installed three pumps to provide additional water in Tom Paine Slough.

In addition, DWR and Reclamation have begun interim actions to improve SDWA water conditions with positive results. DWR has modified operations at Clifton Court Forebay (Figure 2), constructed siphons and dredged in Tom Paine Slough, and constructed a weir in Middle River to mitigate the water level problems. Immediately after

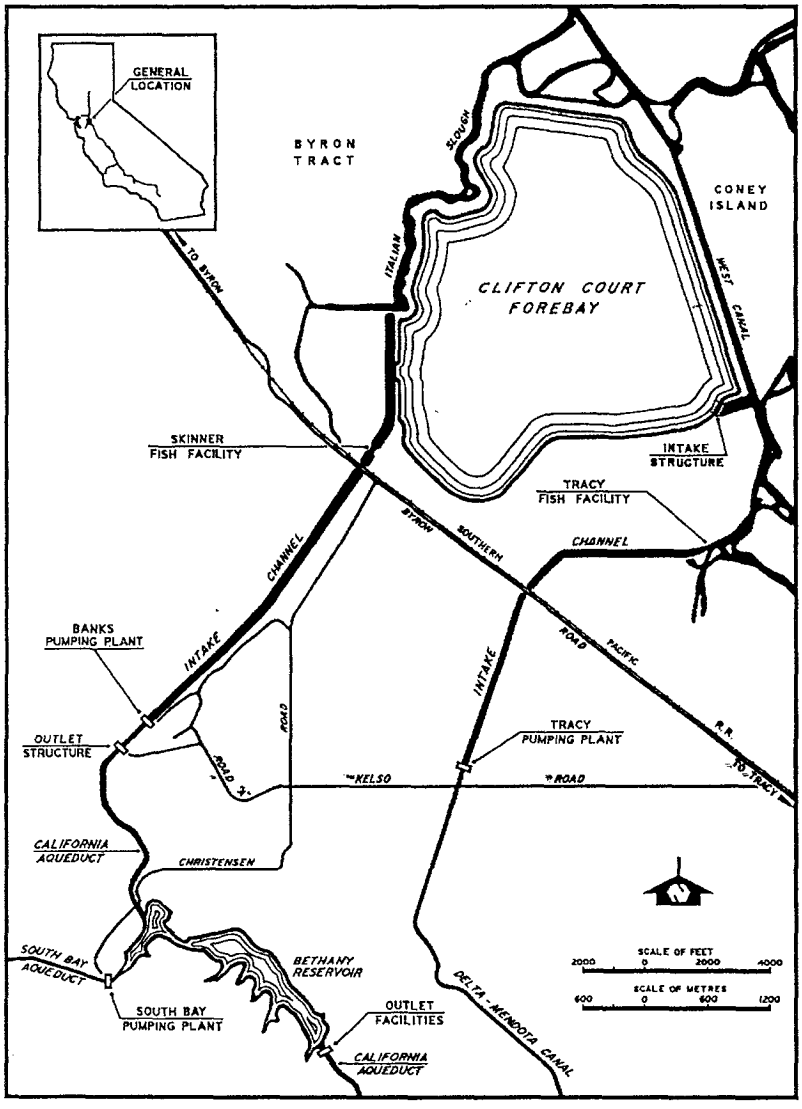

Figure 2. Clifton Court Forebay

Clifton Court Forebay, a key feature of the State Water Project, is located about 10 miles northwest of Tracy. The current surface area of the forebay is 2,180 acres; storage capacity is 31,260 acre-feet. The proposed South Delta Water Management Program would enlarge the forebay to at least 5,000 surface acres.

Together with the Skinner Fish Protective Facility and a connecting intake channel, Harvey O. Banks Delta Pumping Plant diverts water from the south Delta through Clifton Court Forebay for conveyance via the California Aqueduct and South Bay Aqueduct to contracting agencies in the south San Francisco Bay area, the San Joaquin Valley, and Southern California.

The purpose of the forebay is to allow operational flexibility for pumping at the Banks Pumping Plant. This flexibility is a key element of a future water banking program.

the weir became operational, local farmers reported that water levels had improved.

In 1984, the Legislature authorized Los Banos Grandes Reservoir as part of the State Water Resources Development System. The purposes of the project are to develop additional water supplies, improve water quality, and provide additional flexibility for SWP. This additional flexibility could help protect and enhance fish and wildlife.

In DWR Bulletin 160-87, *California Water: Looking to the Future"* (November 1987), DWR evaluated statewide water conditions. In the bulletin, DWR concluded that meeting the water needs of California's rapidly expanding population will involve a variety of water management approaches, including: 1) water conservation, 2) water salvage, 3) conjunctive use of surface and ground water, 4) water transfers, 5) water sharing, 6) waste water reclamation, and 7) water banking. The SDWMP is part of planned water banking to help meet California's future needs.

Program Need

The SDWMP action is in response to:

- an October 1986 framework agreement among DWR, Reclamation, and SDWA that committed all three parties to work together to develop mutually acceptable, long-term solutions to the water supply problems of water users within SDWA;
- 1984 legislation that authorized Los Banos Grandes Offstream Reservoir (LBG) south of the Sacramento-San Joaquin Delta, which would store winter flows; and
- a need to increase the operational flexibility and reliability of the SWP, to meet contractors' requests, which, more than half the time, exceed annual delivery capability, and to improve the quality of water supplies, thereby reducing future difficulties and costs of treating drinking water.

Program Objectives

The objectives of this action are to:

- improve and maintain water levels, circulation patterns, and water quality in the south Delta area for local agricultural diversions;
- improve SWP operational flexibility to help reduce fishery impacts and improve fishery conditions;
- improve SWP and CVP water supply reliability through enhanced capabilities for banking winter supplies and through improved water quality, which will reduce the cost of treating drinking water supplies;
- provide the opportunity to interconnect with Clifton Court Forebay and improve water quality for Contra Costa Canal deliveries to be treated for use as drinking water supplies;
- improve navigation and flood protection; and
- increase recreational opportunities.

Program Alternatives

The narrowing of alternatives utilized a broad range of information that is important to water resources planning. The selection process considered previous studies, activities implemented during droughts, legislative activities, statewide referendums, comprehensive water conservation and reclamation activities, the SDWMP objectives, and project operational flexibility. Previous studies evaluated alternatives on the basis of such factors as economics, energy, water supply, fisheries, wildlife, recreation, water quality technological, legal, and institutional constraints, political issues, and compatibility with other proposals.

In general, previous studies showed that an isolated facility would provide favorable reliability, fishery protection, and improved water quality when compared to other alternatives such as a physical barrier or a through-Delta facility. Recent updates of previous studies showed this same trend. However, the June 1982 voter rejection by State referendum indicated that an isolated Delta facility was unacceptable to the public.

The previous studies also showed that a through-Delta system compatible with the SDWMP would provide significant advantages over existing conditions. Also, extensive programs since 1975 to implement water conservation and reclamation have determined that statewide demands can be reduced by 1.3 MAF by 2010.

Two types of alternatives are evaluated in this report:

- South Delta Water Management alternative facilities.
- Water supply augmentation and demand-reduction alternatives, including such measures as water conservation and desalting.

Under the SDWMP, eight different alternatives and a no-action plan were evaluated. Each alternative evaluated is a combination of various project components, including: 1) mitigation and enhancement barrier-type facilities,

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2) an enlarged Clifton Court Forebay, 3) new intake structures, 4) channel improvements, and 5) related project modifications. The alternatives were formulated to evaluate the various project components and to show the widest range of impacts. Each alternative was evaluated under a wide range of monthly exports. The preferred alternative is to:

- enlarge Clifton Court Forebay to about 5,000 surface acres with new intakes at Old River and Middle River at the west and east ends of North Victoria Canal;
- enlarge some existing south Delta channels to improve conveyance and circulation;
- acquire a U.S. Army Corps of Engineers (Corps) permit to increase the pumping capability of the Banks Pumping Plant up to 10,300 cubic feet per second to allow for operational flexibility. This pumping rate will occur mainly during high-flow months. More than 80 percent of the time, pumping rates will be lower than 8,000 cfs; and
- construct up to four mitigation and enhancement barrier-type facilities in south Delta channels to directly improve water level and circulation. Implementation of these mitigation facilities can start, independent of the forebay expansion, as soon as an agreement is signed with SDWA. Summary Figure 3 shows the preferred alternative.

Water conservation and reclamation alternatives were also evaluated. Impacts associated with reclamation programs are generally insignificant unless construction is involved. Brine disposal and energy consumption are considered as water desalting impacts.

Water conservation and reclamation measures would help reduce the projected water delivery shortfalls. These measures, however, could provide only a part of the additional water needs. In addition, these measures, alone, will neither provide operational flexibility for the SWP nor improve water quality, water levels, and circulation patterns in the south Delta. Therefore, the SDWMP, in conjunction with continued and increased use of water conservation and reclamation measures for year 2000, is needed to meet the multi-objective goals planned for the Delta.

Extraordinary water supply and demand reduction alternatives were compared to the alternative operational plans with the SDWMP. These comparisons also provided the basis for defining the municipal and industrial yield benefits of the SDWMP in the economic evaluation.

These measures are in addition to water conservation and waste water reclamation measures included in statewide future water supply planning. Moreover, extraordinary water conservation alternatives will help offset the 400,000 acre-foot shortage that is expected to occur 10 percent of the time by 2010 with all currently planned expansions of the SWP, including the preferred alternative.

Program Benefits

The SDWMP will provide numerous benefits:

Delta Agricultural Use and Water Level. The SDWMP will improve conditions for agriculture in the south Delta by:

- installing and operating mitigation and enhancement barrier-type facilities to improve water levels and circulation in south Delta channels;
- operating barrier-type facilities in the south Delta to keep San Joaquin River water from directly entering the south Delta;
- improving the existing Clifton Court Forebay so that water can be released during the irrigation season, to enhance water quality in the south Delta channels; and
- making interim releases from New Melones Reservoir to improve water quality in the south Delta.

SWP Reliability. The SDWMP will increase the reliability of SWP deliveries by increasing wet-period diversions of unregulated flows when operated with additional storage capacity south of the Delta.

SWP Water Quality. Under the preferred alternative, water quality at the intake to Clifton Court Forebay will be improved. The preferred alternative's new intake gate location will divert from a source of better quality water. These improvements will reduce chloride, bromide, and total dissolved solids at the SWP intake. This will provide a better source of water to be treated for intended use as drinking water. Water quality can also be enhanced by the ability to take advantage of seasonal and short-term water quality improvements.

Delta Fisheries. Operation of a barrier at the head of Old River will improve flow patterns for San Joaquin River salmon and steelhead migrations. Improved circulation, water quality, and water temperature in the Delta will also have a positive impact on resident fish in south Delta channels. Levee setbacks would create added shoreline habitat.

The preferred alternative also provides the operational flexibility to shift exports away from critical periods for

Operational Flexibility

The enlarged forebay, new intake gates, and 10,300 cfs pumping capacity can improve SWP operational flexibility to manage operations in a manner that will 1) improve project reliability, 2) reduce fishery impacts and 3) improve conditions for local agricultural diverters. With added operational flexibility, the project can bank water supplies south of the Delta during winter and high flow conditions, when the abundance of fish is lower. During periods of low inflow to the estuary, these supplies south of the Delta can be used to reduce the demand on Delta exports and reduce estuary impacts. Another operational advantage includes the ability to control the proportion of annual reserve storage in reservoirs north and south of the Delta. This could increase the frequency of refilling storage from varied runoff patterns.

Added operational flexibility can reduce the cost and difficulty of treating drinking water by improving the quality of delivered supplies. The flexibility to operate an additional intake on Middle River will reduce trihalomethane formation potential, total dissolved solids, and chlorides. Also, the increased ability to take advantage of seasonal and short-term water quality improvements could further improve the quality of delivered supplies. The project's ability to meet the increasingly complex water rights and water quality standards can be improved through greater flexibility to manage Delta salinity on a day-to-day basis during controlled flow conditions. Increased flexibility can reduce costs by allowing for the use of the bulk energy market to buy available short-term electrical power.

In addition to shifting exports away from periods of high fish abundance to periods of low abundance in connection with winter banking, project operational flexibility can reduce fish impacts in other ways. A larger forebay can increase the time in which the Delta cross-channel can be intermittently closed, thus improving conditions for fish migration in the Sacramento River. Fish loss due to predation in the forebay can also be reduced by providing for direct export capability from Italian Slough for short periods of time.

Local agricultural diverters can also benefit from added operational flexibility. A larger forebay with additional intakes can be operated during the irrigation season to release water to south Delta channels, thus improving water levels and circulation. The larger forebay can also reduce the frequency and duration of gate openings, thereby reducing the effects to surrounding diverters.

eggs, larvae, and juvenile striped bass. This can help reduce the direct loss of striped bass caused by SWP pumping. The preferred alternative can also improve western Delta flow patterns and Delta water quality, which will reduce adverse impacts on striped bass. To a limited extent, a larger forebay can also allow for intermittent closure of the Delta cross-channel to improve fish migration in the Sacramento River. During the periods of closure, exports can continue from the additional forebay volume.

New Melones interim releases will also provide instream fishery benefits in the Stanislaus River, San Joaquin River, and south Delta channels. A direct diversion option and measures to remove predation will reduce existing predation losses at the Delta complex.

Energy Requirement. The increased pumping capacity and enlarged forebay will allow SWP operators to lower energy costs by using the bulk energy market to buy available short-term electrical power.

Contra Costa Canal Drinking Water Supplies. An enlarged forebay would provide an opportunity to relocate the Contra Costa Canal intake to the forebay and improve the quality of water to be treated for household use in Contra Costa County.

Flood Control. The SDWMP includes levee improvements, channel dredging, and operation of Clifton Court Forebay to provide flood control benefits.

Navigation. Scenic channels not easily accessible to boating because of siltation can be dredged to improve navigation. Additional gate operational flexibility will reduce project drawdown effects.

Recreation. Proposed channel improvements could provide opportunities for additional recreational development. Dredging would make some scenic stretches of channels accessible. Levee setbacks could create berm islands and additional shoreline for riparian habitat and recreational opportunities. Barrier-type facilities would improve water levels for recreational boating in certain channels that are now shallow and stagnant. Any recreational development will avoid sensitive wildlife areas.

Wildlife. Additional lands will be acquired to enhance diverse species of Delta wildlife. Development of high-quality wetland habitat on these lands can provide significant enhancement opportunities. Alternative designs will also include provisions to acquire and create channel islands to produce additional attractive wildlife areas.

Economic Assessment

The following table shows the estimated economic benefits the SDWMP will provide to various service areas without the additional water-supply benefits of Los Banos Grandes Reservoir and the Kern Water Bank (KWB). Total benefits of the SDWMP are estimated at $35 million per year. This level of benefits supports continuation of an enlarged forebay independent of LBG and KWB.

Region	Annual Benefit ($ million)
M&I	
South Coast	29.3
Central Coast	0.8
San Francisco Bay	2.3
Tulare Lake	0.6
Sacramento River	0.2
Subtotal	**33.2**
Agricultural	
Tulare Lake	1.3
Total	**34.5**

Environmental Assessment

Environmental assessments for the preferred alternative are shown in Table 1, which summarizes the combined impacts of the KWB, LBG, and SDWMP. Without KWB and LBG, the SDWMP will have lower total exports, which can reduce some of the impacts shown in Table 1. It will also provide lower total operational flexibility and will not achieve a level of benefits similar to that of the three projects combined.

Impacts under the preferred alternative were determined for the following:

Energy Impacts. To the extent that water deliveries through SWP facilities will increase due to implementation of the SDWMP, SWP energy requirements will also increase. The estimated average annual increase in energy requirements is about 800 GigaWatt hours (GWH). About 200 GWH of this would be recovered by SWP recovery generation on the aqueduct. Operational flexibility achieved by implementation of the SDWMP will also partially offset SWP energy requirements through use of both off-peak energy and short-term bulk power available in the market.

Construction Impacts. Impacts due to construction of the project components are temporary and consist of:

- increased traffic in the project area;
- increased noise levels;
- disturbed vegetation in the project area;
- possible disrupted local utilities; and
- increased dust and turbidity in the project area.

Impacts on Wildlife and Wildlife Habitat. Under the preferred alternative, Clifton Court Forebay will be enlarged by about 3,000 surface acres. Agricultural land in the project area will be purchased and converted for use in the forebay expansion. Channel enlargement will include design to provide berm habitat by levee setback. Losses of wildlife habitat will be fully mitigated through adoption of a wildife management plan for Sherman Island or for other appropriate locations.

Impact on Salmon and Steelhead. Under the preferred alternative, changes in Sacramento River flow and SWP exports may cause some negative impacts to migrating salmon and steelhead. The barrier on Old River at the confluence of the San Joaquin River will improve San Joaquin River salmon migration.

Direct impacts of the Delta complex on salmon are calculated by a fish loss model. The preferred alternative resulted in slightly greater losses of Chinook salmon compared to the no-action alternative.

Impact on Resident Fish. Direct impacts of the preferred alternative on resident game and non-game fish were evaluated. Two species of resident game fish (black crappie and bluegill), and two non-game fish (threadfin shad and yellowfin goby) were impacted. However, the impacts were found to be insignificant. All of the other resident fish evaluated, including Delta smelt, will benefit from implementation of the SDWMP.

Potential Cumulative Effect

Table 2 shows the potential future cumulative effects of the SDWMP. Not all the water resources activities listed in this table will be implemented in the near future, and some will extend beyond the scope of current statewide water resources planning. Just how all these activities inter-relate is difficult to project. However, certain assumptions can be made to combine actions with mitigation and thus produce favorable effects on the cumulative impacts of the SDWMP. Other assumptions could combine actions without mitigation, thereby producing adverse impacts. Without mitigation, the SDWMP, along with LBG and KWB, could gradually reduce the fishery benefits that will be gained through implementing the SDWMP.

Mitigation Measures

Objectives of the SDWMP include improvement of existing conditions in the south Delta; therefore, mitigation and enhancement features are an integral part of south Delta planning. Other mitigation actions include:

Fish Agreement (Article VII). The existing "Agreement to Offset Direct Fish Losses in Relation to Harvey O. Banks Delta Pumping Plant" provides in Article VII for further negotiations to develop, continue, and improve mitigation measures for the Delta estuary. These negotiations, which have already begun, are between DWR, the Department of Fish and Game (DFG), and Reclamation. Negotiations are conducted publicly, and input from environmental groups and water users is encouraged. The operational flexibility provided by SDWMP will be addressed during the negotiations to formulate provisions that will help reduce fishery impacts.

The negotiations will include provisions for the Bay-Delta estuary along with mitigation measures that can be provided by SDWMP. Development of specific mitigation measures for SDWMP will be guided by the negotiating group. Protective measures for fish will also be designed to include measures for NDWMP and LBG, when implemented.

DWR and Reclamation are committed to the negotiation process and to the formulation of an acceptable mitigation plan for SDWMP.

SDWA Contract to Protect Local Agricultural Supplies. This contract will define specific protection measures, including installation of the mitigation and enhancement barriers shown in Figure 3. Interim releases from New Melones Reservoir are to be included.

Development of Wildlife Areas. Land acquisition and creation of channel islands will be included with this program. DWR is committed to the West Delta Water Management Program (WDWMP) to provide mitigation for the enlargement of Clifton Court Forebay. The WDWMP provides a vast wildlife habitat on Sherman Island as part of a wildlife management plan under consideration by DWR and DFG.

Interagency Programs. The Interagency Health Aspect Monitoring Program for the Sacramento-San Joaquin Estuary is partially funded by DWR. The Interagency Ecological Study Program involves funding by both DWR and Reclamation. Both organizations are committed to support studies conducted by the programs. These studies will provide a sound basis for mitigation measures.

Water Conservation, Water Reclamation, and Water Marketing Actions. These actions will be an integral part of all future water development. Significant reductions in demands have occurred from programs implemented since 1975. Additional programs will be implemented along with the SDWMP.

Mitigation for Energy Impacts. Increased SWP energy requirements will be partially offset by efficient energy consumption through use of off-peak energy.

Mitigation for Construction. Mitigation measures for construction consist of use of roads during off-peak hours, use of flagmen to direct traffic, and replanting of vegetation in the project area. Such mitigation actions can reduce or eliminate the impacts caused by construction.

Archeological and Cultural Resources. The design and specification of the project will include avoidance of known archeological and cultural resource sites. Also, if it is determined during construction that sites meeting the criteria of the National Register would be adversely affected, the State Historic Preservation Officer will be consulted to develop acceptable mitigation procedures.

Mitigation for cumulative impacts generally consists of:

- safeguards by laws, regulations, and water rights standards;
- actions to offset losses in the estuary, such as the Suisun Marsh protection agreement to provide protection for the Marsh;
- contracts between project operators and various interests such as Delta agricultural and industrial users; and
- physical measures such as habitat improvements, grow-out facilities, fish screens, and fish hatcheries.

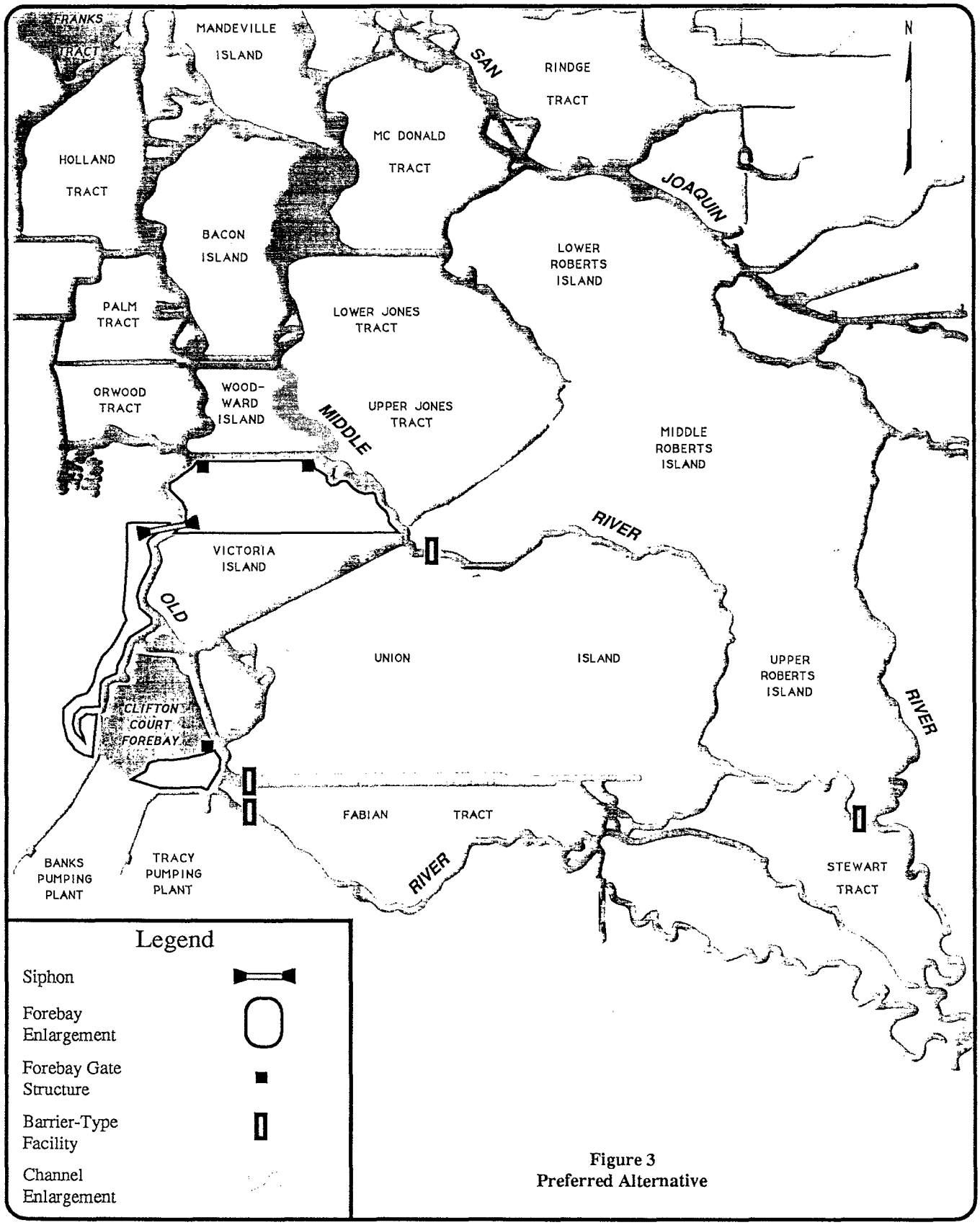

Figure 3
Preferred Alternative

Environmental Commitments

DWR or Reclamation are committed to the following:

- *negotiate with DFG according to Article VII of the existing Banks Pumping Plant Fish Agreement to identify additional protective measures for the Bay-Delta estuary.*
- *negotiate with SDWA to protect local agricultural water diversions, local water quality, and local water levels.*
- *seek Congressional authorization for construction of mitigation and enhancement facilities.*

DWR or Reclamation are committed to further define and implement the following as part of the SDWMP:

- *continue existing—and, if necessary, expand—monitoring programs for sedimentation, scouring, seepage, water quality, and the effectiveness of mitigation plans.*
- *mitigate for wildlife habitat losses by adopting a wildlife management plan on Sherman Island or other locations as appropriate.*
- *maintain existing channel berm habitat, and include design to provide additional berm habitat by levee setback.*
- *mitigate for construction impacts, including using flagmen and off-peak hours for transportation and replanting impacted vegetation.*
- *mitigate for energy impacts, including best use of off-peak energy supplies, and to mitigate for any new power facilities.*
- *perform comprehensive testing of dredged materials if used for enhancement of existing levees or construction of new levees.*
- *continue activities that contribute toward mitigation for cumulative impacts of the project.*
- *obtain necessary federal and State regulatory permits.*
- *make available the option for improved water supplies to the Contra Costa Water District through interconnections.*
- *operate SWP under the preferred alternative to not conflict with any requirements imposed on DWR by the State and federal Endangered Species Acts.*
- *operate the CVP in such a manner that it will not jeopardize the continued existence of any listed species.*
- *reduce predation in Clifton Court Forebay by removing predators and providing intermittent direct diversion from Italian Slough into the fish protective facility.*
- *complete the Class III Cultural Resources Survey for the selected alternatives. If any stites are found to be eligible for the National Register and cannot be avoided, a mitigation plan will be developed.*

DWR or Reclamation are also committed to:

- *provide improved forecasting for Delta water supply conditions for local agriculture.*
- *construct facilities to improve flows in the San Joaquin River to improve survival of young salmon.*
- *provide interim releases from New Melones Reservoir for improvement of both water quality and fisheries.*
- *advance statewide water conservation and reclamation programs that could lessen the demand on Delta water supplies.*
- *participate in a recovery team for winter-run salmon and obtain appropriate agreements or permits..*
- *comply with future Delta standards set by SWRCB as the result of its current hearings.*
- *operate the CVP in compliance with Delta water quality standards set by SWRCB as a result of its current hearings, provided that the required operatiion complies with Congressional directions.*

Table 1
Summary of Environmental Assessment for the Preferred Alternative

Subjects	Physical Impact	Environmental Impact	Protection/Mitigation Measures
Construction	Increase in noise, dust, truck traffic, and turbidity; disturbance of vegetation; minor disruption of services (cables, gas lines, etc.); and some minimal recreational inconveniences are expected. Some channel dredging in the South Delta.	Environmental impacts will be short-term. No significant long-term impact is expected from project construction. Local construction work force will be used for the Project.	CAL-OSHA regulations (noise); Regional Water Quality Control Board permit (turbidity); use of flagman and off-peak hours for transportation; replanting vegetation; Endangered Species Act of 1973; and State and federal dredging permits.
Delta Outflow	Slight decrease in Delta outflow in winter and during high flow conditions.	Shift in exports can have positive effect on fishery. Slight decrease in Delta outflow in winter and high-flow conditions will have minor impact on environment.	D-1485 protective outflow. standards. Existing and new fish protection agreements.
Delta Outflow Pulses	Minor decrease in number of pulses.	Unknown environmental impact.	San Francisco Bay Study funded (partially) by DWR.
Cross-Delta Flow	Minimal changes on Cross-Delta flow.	No impact is expected.	Existing and new fish protection agreements.
Local Municipal and Industrial Use	Possible future water quality improvement to the Contra Costa Canal with potential relocation. Reduced days of availability of offshore supply.	Potential water quality improvement and waters upply for municipal and industrial use in the Delta. Protective water quality standard for M&I will be met for all year types.	D-1485 protective standards. Various industrial water supply contracts.
SWP Water Quality	Reduced total dissolved solids, chlorides, bromides, and THMFP.	SWP water quality will be improved.	D-1485 protective standards. EPA and California Dept. of Health Services drinking water standards. SWP contract objectives.
Agriculture	Improve circulation, increase water levels.	Improve water supply and water quality for South Delta Water Agency agricultural users.	Delta Protection Act. South Delta agreements. Releases from New Melones.
Water Supply Reliability	Increase Banks Pumping Plant exports during winter and high-flow conditions. Increase capacity from 6,400 cfs to 10,300 cfs.	Provide more flexibility for operation of the SWP. Shift in export will have positive effect on environment.	D-1485 protective standards. Letter limiting exports. Existing and new fish agreements. U. S. Army Corps of Engineers Permit.
Sedimentation, Scouring, and Seepage	Increase velocity in Old River.	No scouring or sedimentation is expected.	Channel improvements and forebay intake design will prevent scouring and sedimentation. Existing scour monitoring program will be expanded. Seepage monitoring program will be established.

Table 1 (Continued)
Summary of Environmental Assessment for the Preferred Alternative

Subjects	Physical Impact	Environmental Impact	Protection/Mitigation Measures
Navigation	Increased water levels, channel dredging and physical barriers.	Improved access to scenic channels.	Provision for boat passages and boater designation sites.
Wildlife	Inundation of 3,000 acres for forebay enlargement.	Loss of plant and wildlife habitat.	Implementation of a wildlife management plan. Creation of channel islands and additional shoreline.
Salmon and Steelhead	Construction and operation of barriers will improve San Joaquin River flows. Water quality, dissolved oxygen, and temperature will improve.	Improved flows in San Joaquin and Old River will have positive impact on San Joaquin River spawning. Minor impact on Sacramento River salmon.	D-1485 provides for flow and salinity standards in the Delta. SWP and CVP fish protective facilities. Existing and new fish protection agreements. Predation may decrease by using alternative Italian Slough diversion and expansion of forebay. Interim releases from New Melones.
General Impact on Striped Bass	Provide operational flexibility. Exports can decrease from May through July. Flows in lower San Joaquin River can increase in May, June, and July. Increases in reverse flow August—November.	May and June export reduction and operational modification can improve conditions for striped bass during spawning and for young striped bass. Entrainment of young Sacramento River bass from Project exports would be less.	D-1485 (salinity and minimum flow standard for striped bass.) Existing and new fish protection agreements
Direct Impact on Striped Bass	Can shift export from summer to winter.	Shifting export can benefit striped bass during critical periods. 22% reduction in direct fish losses is expected.	D-1485 protective standards. Predation may decrease in forebay by increasing the volume and using Italian Slough intake periodically.
Resident Fish	Entrainment may decrease in spring and summer. Water quality, dissolved oxygen, and water temperature in south Delta channels can improve.	Minimum net impact on resident fish.	
Fish Food Resources	Can reduce exports in spring and increase exports in winter.	Shift in export can benefit *Neomysis*. More Sacramento River water with low plankton densities will flow to interior Delta.	D-1485 protective standards. Interagency ecological study program. Existing and new fish protection agreements.
Suisun Marsh	Delta outflow will decrease slightly.	No significant impact is expected because of: • little changes in outflow • physical protective facilities and • existing agreement to protect the Marsh.	Suisun Marsh Protection Agreement. Facilities and monitoring program.

Table 1 (Continued)
Summary of Environmental Assessment for the Preferred Alternative

Subjects	Physical Impact	Environmental Impact	Protection/Mitigation Measures
San Francisco Bay	Minor decrease in number of pulses, minor changes in Delta outflow.	Unknown impact.	D-1485 protective standards. Various studies of Bay resources funded partially by DWR.
SWP Service Area	Improve water supply reliability. No expansion of agricultural land is expected.	Primarily replacement supply. Not growth-inducing. Provide better quality of life with fewer water shortages.	Local regulations and mitigation actions. Zoning and planning.
Power Resources	Increase SWP power supply requirements. DWR is not planning to build a new power plant to meet increased load.	Potential increase of fossil fuel consumption.	Water conservation measures. Best use of off-peak power. Mitigation measures for existing plants.
Archeological and Cultural Resources	Some cultural sites are near the project area.	Sites to be avoided.	Design and specification of the project will include avoidance of known archeological and cultural resources sites. Construction consultation if needed.

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Table 2
Potential Future Cumulative Effects of South Delta Water Management Facilities and Potential Related Projects or Actions on Delta

Project or Action	Delta Inflow Changes	Delta Export Changes	Delta Outflow Changes	Delta Water Quality Changes	Potential Fish and Wildlife	Comments
South Delta Water Management Program	No change	Winter increases summer decreases	Winter decreases	Improvement in drinking water quality and agricultural water quality	Downstream San Joaquin River salmon migration improved. Water quality, dissolved oxygen, and temperature conditions for resident fish improved in south Delta channels; reduced entrainment losses. Negative minor impacts on Sacramento River salmon.	Ongoing fishery negotiations concurrently with south Delta water agency negotiations
North Delta Water Management Program	Summer and fall reductions	Drier year increases	Drier year decreases; water right protective outflows will be maintained	Drinking water protections from reduced chlorides, bromides, TDS and THMFP	Net fish migration improved with reduction of reverse flows. Potential reduction of screening losses. Some increase in young salmon in central Delta	Ongoing fishery negotiations concurrently evaluating this program with SDWMP
West Delta water management plan	No change	No change	No change	Protection against salinity intrusion resulting from flooding	Improvement in up to 10,000 acres of diverse wildlife habitat including wetlands	Improve Delta water supply reliability
Coordinated Operation Agreement and Section 10	Potential for increases	Potential for increases	Potential for decreases	Reduced protection without Delta improvements	Increased screening losses	COA requires Delta protection. Mitigation alternatives possible
H. O. Banks Delta Pumping Plant additional units	No change	Slight increase	Slight decrease	Slightly improved due to shifting to winter months	Slight increase in screening losses	Estimated yield increase of 60,000 AF. No further increases without Corps permit.
H.O. Banks Delta Pumping Plant Fish Agreement and Article VII					Significant corrective potential	Article VII negotiations continue

Table 2 (Continued)
Potential Future Cumulative Effects of South Delta Water Management Facilities and Potential Related Projects or Actions on Delta

Project or Action	Delta Inflow Changes	Delta Export Changes	Delta Outflow Changes	Delta Water Quality Changes	Potential Fish and Wildlife	Comments
SB 34 Delta Flood Protection Act	No change	No change	No change	Protection against salinity intrusion from flooding	Act requires the planning for and enhancement of fish and wildlife	Improvement in Delta levees and resulting better reliability of the Delta
Delta wetlands project	No significant change	Potential for some increase	Winter months decreased	Minor winter month changes	Provides operation flexibility	Project planning being conducted by private corporation
Offstream storage south of the Delta	No change	Wetter year increases; minimum change in drier years	Wetter year reductions	Minor changes in winter months	Provides operational flexibility to reduce incremental screening losses	Los Banos and Kern included in Chapter 5 impact analysis
North of Delta additional storage development	Winter and spring reductions; summer and fall increases	Drier year increases	Winter and spring reductions and potential summer and fall increases	Improved drier year protections	Increase in flows and instream benefits/screening losses increased	Current planning on Auburn Dam and Red Bank Project
Central Coastal studies	No change	No change	No change	No change	No change	Slight increase in project deficiencies
Potential Conjunctive use programs upstream of Delta	Drier year increases	Drier year increases	Drier year increases	Improved quality in south Delta in drier years	Increased screening losses improve fishery flows in Stanislaus and San Joaquin rivers in drier years	Active planning for New Melones Reservoir; can provide significant south Delta benefits
Potential water conservation alternatives	No change	Potential reduction	Potential increase	Increased protection	Minimizes screening losses	Additional 200 TAF assumed in place by 2010
Water Transfers north of Delta	Drier year increases	Drier year increase	Drier year increases	Improvement	Screening losses increased	
Water transfers south of Delta	No change	Potential decrease	Potential increase	Improvement	Improvement	Reduced impact on Delta

Table 2 (Continued)
Potential Future Cumulative Effects of South Delta Water Management Facilities and Potential Related Projects or Actions on Delta

Project or Action	Delta Inflow Changes	Delta Export Changes	Delta Outflow Changes	Delta Water Quality Changes	Potential Fish and Wildlife	Comments
Desalination	No change	Potential reduction	Potential increase	Increase protection	Minimizes screening losses	South of the Delta only.
Upstream watershed vegetation management	Winter and spring increases	Drier year increases	Drier year increases	Improved drier year protection	Increase in river flows and instream benefits/screening losses increased	Studies are continuing
Upstream weather modification	Winter and spring increases	Drier year increases	Drier year increases	Improved drier year protection	Increase in river flows and instream benefits/screening losses increased	Pilot program conducted in 1988
Reclamation water contracting programs	Potential for increases	Potential for increases	Potential for decreases	Reduced protection without Delta improvements	Increased screening losses	The environmental effects are similar to those discussed in the COA.
Reduced Colorado River supplies	Potential for increase	Potential for increase	Potential for decrease	Reduces protection without Delta improvements	Increased screening losses	Potential reduction could be 775 TAF
Reduced eastern Sierra supplies	Potential for increase	Potential for increase	Potential for decrease	Reduces protection without Delta improvements	Increased screening losses	Potential reduction 60,000 TAF.
Local upstream increased use	Reduction	No change	Reduction	D-1485	Some reduction in instream benefits	Protected by area of origin and water rights
Upper Sacramento River fisheries and riparian habitat management program	No change	No change	No change	Potential improvement	Improved: temperature, fish rearing, screening, fish ladders, spawning gravels	Federal legislation pending State legislation enacted
Mitigation Banking	No change	No change	No change	No change	Significant improvement in most cases	As now defined, applies to wetlands only
San Joaquin Valley agricultural drainage program	No change	No change	No change	Improved drainage water quality	Will revive and protect wetlands	Drainage management strategies being studied