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Delta Water Facilities

Program for:
**Delta Protection and Water Transfer
Water Conservation
Water Recycling
Surface and Ground Water Storage**

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ON THE COVER:

California's Delta resembles a giant farm, interlaced with many miles of inland waterways which abound with incomparable fishing and recreational activity and commercial navigation. These waters form the nucleus of the water transport systems of the State Water Project and the Federal Central Valley Project.

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**Department of
Water Resources**

Bulletin 76

Delta Water Facilities

Program for:

**Delta Protection and Water Transfer
Water Conservation
Water Recycling
Surface and Ground Water Storage**

July 1978

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Secretary for Resources

**the Resources
Agency**

Edmund G. Brown Jr.
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**State of
California**

Ronald B. Robie
Director

**Department of
Water Resources**

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FOREWORD

Compromise and cooperation are the twin keys needed to unlock the long-standing and emotion-charged Delta water controversy.

The Sacramento and San Joaquin Rivers, which drain almost 40 percent of California, join at the Sacramento-San Joaquin Delta—a major fish and wildlife resource; a freshwater source for agriculture, industry, and people; a place of incomparable recreation and scenic value; and the nucleus of the water transport system of the State Water Project (SWP) and federal Central Valley Project (CVP)—in short, a valuable California resource that must be protected. In the simplest terms, protecting the Delta means allowing enough fresh water to flow through the Delta estuary during the dry months to maintain the balance of fresh and salt water. It also means improving the water transfer systems such that project operation does not harm the Delta or its resources.

Almost 18 years ago (December 1960), the Department of Water Resources (DWR) released its preliminary edition of Bulletin 76, "Delta Water Facilities", which compared alternative solutions to Delta problems and identified minimum facilities for successful operation of the SWP. Much opposition developed from the numerous diverse and often conflicting Delta interests, particularly from boating and fishery interests. With the belief that an acceptable solution rested with joint planning, the Department of Water Resources initiated the Interagency Delta Committee (IDC) in 1961.

In 1965, the IDC recommended a Peripheral Canal concept as the joint Delta water conveyance facility for the SWP and CVP and for improved water management in the Delta. Assured that the Delta would be guaranteed protection by legislation and/or contract before construction, the Peripheral Canal received widespread support. In 1966, DWR adopted the Peripheral Canal as the Delta facility of the SWP. In 1969, the U.S. Department of the Interior recommended that the Peripheral Canal be a joint-use facility of the CVP and SWP with costs shared equally. In 1970, the Resources Agency, acting on behalf of the State, endorsed the joint-use facility and urged early congressional authorization *on the condition that Delta water requirements would have priority over export*. In 1974, DWR released a draft environmental impact report on the Peripheral Canal. Again controversy erupted because specific guarantees for Delta protection lagged behind plans for implementing project facilities.

The question is not should the Delta be protected, but rather how should the Delta be protected. State laws, on which SWP and CVP water right permits are based, require that all reasonable water needs for the Delta must be met before water becomes available for export to other areas. Fear that Delta needs will not be met is at the heart of the controversy. Some Delta interests believe that other areas of the State have the political leverage to require the export of water which they feel is needed for their own use. These fears have been magnified by the Bureau of Reclamation's historic position that the CVP is not obligated to protect the Delta, if doing so would conflict with other CVP purposes authorized by Congress.

When I became Director in March 1975, one of my primary goals was to break the Delta "log-jam", which was stalemating completion of the SWP, and begin again in earnest State Water Project future supply planning, which had virtually ended five years before. We began a two-year review of the Delta, the Peripheral Canal and its alternatives, and the future water needs and operation for the SWP and CVP.

In contrast with the 1960 preliminary edition of Bulletin 76, which emphasized Delta facilities, our comprehensive program incorporates several other elements that I think are essential for the successful resolution of the Delta controversy and for future water management in California. These include: (1) serious water conservation efforts; (2) the use of water recycling and reclaimed waste water to stretch existing water supplies; (3) conjunctive use of the California Aqueduct and presently dewatered ground water storage capacity south of the Delta to bank water during wet years for withdrawal during dry years; (4) the development of new water storage reservoirs using the off-stream concept which avoids damming free-flowing rivers; (5) construction of the Peripheral Canal and related facilities in the Delta and Suisun Marsh; and,

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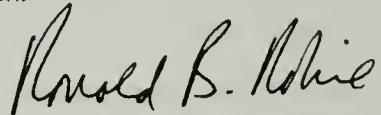
most importantly, (6) the necessary environmental and Delta guarantees which have been lacking in past efforts.

Guarantees center on agreements or federal legislation that will require the Bureau of Reclamation to comply with the same Delta protection conditions required of the State. It now appears that the historic reluctance of the Bureau of Reclamation to recognize an obligation to protect the Delta has changed. As a result of recent meetings between Secretary of the Interior Andrus and Governor Brown, and of a Special Task Force Report on the federal San Luis Unit, the Federal Government has now indicated a willingness to do its share in protecting the Delta, but has made it clear that its funding resources for water projects are limited, and that California is in competition with other states which also have serious water problems. Agreements for sharing the responsibility for operating the CVP and SWP to meet identical Delta water quality standards and protect the fishery of the Delta-Bay estuary should be more easily achieved as a result of the recent Supreme Court decision (*California v. U.S.*, U.S.L.W. 4997, July 3, 1978). This landmark decision vindicated the State's long-held position that the Bureau must comply with conditions in State water-rights permits that are not in conflict with congressional directives authorizing federal projects.

State Senate Bill 346, which embodies the Department's program, is currently before the Legislature. Although the bill has not yet received legislative approval, we have received support from a broad spectrum of interests, including the Association of California Water Agencies, Sierra Club, Planning and Conservation League, Metropolitan Water District of Southern California, the East Bay Municipal Utility District, Contra Costa County Water District, California Labor Federation, San Francisco Bay Conservation and Development Commission, and most State Water Project contractors, to name but a few.

This bulletin summarizes the Department of Water Resources' comprehensive plan for protecting the Sacramento-San Joaquin Delta and meeting the water export needs of the SWP and the CVP through the year 2000. I am confident that this program can resolve the long-standing controversy and meet the reasonable water needs both within and outside the Delta.

Pursuant to Water Code Section 10004, this bulletin is being submitted to the California Legislature and shall become a part of the California Water Plan.



RONALD B. ROBIE
Director
July 1978

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Contributions and assistance were provided by many individuals in other units of the Department of Water Resources.

Information and assistance by the Department of Fish and Game and the Delta Environmental Advisory Committee are gratefully acknowledged.

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The California Water Commission serves as a policy advisory body to the Director of Water Resources on all California water resources matters. The nine-member citizen Commission provides a water resources forum for the people of the State, acts as liaison between the legislative and executive branches of State Government, and coordinates federal, State, and local water resources efforts.

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Figure 1. Major Central Valley Project and State Water Project facilities.

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CHAPTER I. OVERVIEW

Through the Sacramento-San Joaquin Delta passes the lifeblood of the State—water for crops, people, fish, wildlife, and factories. These water needs are competitive, and finding ways to meet them is a monumental task that must be undertaken now.

The Sacramento and San Joaquin Rivers join at the Delta to provide water not only for Delta cities, farms, industries, and recreationists, but also for export to nearly 90 public agencies that have long-term contracts with the State Water Project (SWP) and the federal Central Valley Project (CVP). These agencies serve more than one-quarter of the land area and two-thirds of the population of the State. Delta waterways also provide a rich repository of aquatic life, including more than a dozen species of game fish. These waterways are a major resource for fishing, hunting, boating, and scenic enjoyment. To protect this area and at the same time meet increasing water export needs, a number of water management problems must be solved.

Under California law, Delta water requirements for reasonable uses must be met before any water is exported by the State. The Department of Water Resources (DWR) is also obligated to make all reasonable efforts to deliver water to meet the reasonable needs in SWP service areas up to the contract limits.

The purpose of this bulletin is to review a number of approaches for meeting Delta needs and water exports, and to set forth a specific course of action through the year 2000. The program is designed to protect the Sacramento-San Joaquin Delta and to insure water supplies in reasonable amounts for Californians who depend on water exported from the Delta. Implementation of each component of the plan will require documentation required by the California Environmental Quality Act (CEQA) and to the extent of federal participation, the National Environmental Policy Act (NEPA).

Brief Summary of Delta Planning

Planning to develop and protect the Delta began in the 19th century. Reclamation of Delta marshlands began in the 1850's. By 1930, nearly the entire Delta had been reclaimed into intensively farmed islands. During the 1870's and early 1880's, three popular sport fishes—striped bass, white catfish, and American shad—were transported from the East Coast of the United States and planted in the Delta. Protection of these species is still of prime concern.

Ocean salinity intrusion into the Delta was first noted in 1841 and was recognized by the early settlers as a potential problem to water supplies. A salt water barrier to combat this problem was first proposed in the 1860's. Since that time, there have

been numerous studies of means for controlling salinity intrusion and otherwise improving the management of the water resources of the Delta for the benefit of all Californians.

Physical barriers to separate salt and fresh water were predominant in early studies. In 1931, it was concluded that it was not economically justified to construct a barrier.¹ That same year it was also concluded that the Delta could be protected from salinity intrusion and be assured of an ample and dependable water supply if mountain storage reservoirs were used to provide water for controlling the rate of Delta outflow. It was further concluded that facilities and/or channel improvements would be needed in the north Delta to facilitate water conveyance across the Delta for use in the San Joaquin Basin as part of the original State Water Plan. These conclusions eventually led to the construction (as part of the federal CVP) of Shasta Reservoir on the upper Sacramento River and the 1.6-kilometre (1-mile) Delta Cross Channel near Walnut Grove to provide better quality water at the intakes to the Contra Costa Canal at Rock Slough and the Delta-Mendota Canal near Tracy (Figure 1).

During the 1940's and 1950's salt water barriers at numerous sites on the Bay and Delta system were again studied in detail. In 1955 it was concluded that barriers in the San Francisco Bay system would not be functionally feasible due to uncertainty of the quality of water in the barrier pool, and that further barrier consideration should be limited to, or upstream from, the Chipps Island site at the outlet of the Delta.²

In 1960, California voters approved the Burns-Porter Act to assist in the financing of the SWP. This Act includes Delta facilities "... for water conservation, water supply in the Delta, transfer of water across the Delta, flood and salinity control, and related functions". In that same year, the Department proposed the Delta Water Project (later referred to as the Waterway Control Concept) to serve as the Delta facilities of the SWP (Bulletin 76, "Delta Water Facilities", Preliminary Edition, December 1960). However, Department plans for such facilities met with stiff opposition from Delta water users, boaters, fish and wildlife agencies, and other Delta interests. This led to the formation of the Interagency Delta Committee (DWR, USBR, and U.S. Corps of Engineers (USCE)) in the fall of 1961.

In 1965, the Interagency Delta Committee (IDC) recommended the Peripheral Canal. This facility was considered best for conveying water for the SWP and CVP and improving water management in the

¹ California Division of Water Resources, Report on the State Water Plan, Bulletin No 28, "Economic Aspects of a Saltwater Barrier", 1931

² Board of Consultants and Division of Water Resources for the Water Project Authority "Barriers in the San Francisco Bay System", March 1955

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Delta. This plan received widespread but conditional support. In 1966, DWR adopted the Peripheral Canal as the Delta Facility of the SWP. In 1969, the U.S. Department of the Interior adopted the USBR's Peripheral Canal Feasibility Report, which recommended that the project be a joint-use facility of the CVP and SWP with costs shared equally. In 1970, the Resources Agency, acting on behalf of the State, endorsed the joint-use facility and urged early congressional authorization on the condition Delta water requirements would have priority over export. In 1974, DWR released a draft Environmental Impact Report (EIR) on the Peripheral Canal.

Need for Reevaluation

During the 10 years since the Peripheral Canal was first recommended, conditions changed dramatically—controversy flared over the Peripheral Canal draft EIR; inflation continued at a high rate; population growth slowed, reducing the rate of increase in water demands; and the people became more aware of the environmental requirements for Delta protection. Consequently, in April 1975, DWR Director Robie announced a reappraisal of the management of project water supplies, the Peripheral Canal, and all the surrounding issues.

Goal

The basic goal of this reappraisal was to find the best way to protect the Delta environment while pumping water from the Delta for the SWP and CVP.

Questions Addressed

Some basic questions relating to management of Delta and SWP water supplies addressed were:

- What are the reasonable needs of the Delta?
- What are the reasonable export needs?
- What savings in water and energy can be achieved by conservation efforts?
- To what extent can project and contractor water needs be met by reclaimed waste water?
- To what extent can demand on the Delta be reduced during dry periods by conjunctive management of surface and ground water resources available to the project?
- Can additional conservation storage and project yield be achieved through the use of underground storage space available to the project?
- Will more dams on Northern California streams be needed to meet project needs?
- Are Delta facilities needed?
- If so, what combination of facilities?
- And, if so, when are they needed?

Key Issues

The Delta is the key link in water operations for the CVP and SWP. Most of the water supplied by these

projects originates north of the Delta; and a major portion of this supply is put to use in the South San Francisco Bay area, the San Joaquin Valley, and Southern California, after being transported across the Delta. Thus, almost any controversy confronting water development and water management in California also becomes an issue in a study of Delta alternatives. The controversies surrounding a decision in the Delta can be divided into issues concerning Delta interests and other statewide interests.

The Sacramento-San Joaquin Delta is a unique feature of the California landscape. Its 299 000 hectares (738,000 acres) are interlaced with 1 100 kilometres (700 miles) of meandering waterways.

Protection of the Delta environment is considered essential to the general welfare of California and to the acceptance of any program to transfer water supplies across the Delta for export.

The Department of Fish and Game (DFG) reports that CVP and SWP diversions from the Delta, which are occurring without an adequate Delta water transfer facility, are having an adverse impact on existing channels and Delta fisheries. In large part, this condition is due to pumping water directly from the southern Delta channel system.

The State Delta Protection Act (1959) and decisions of the State Water Resources Control Board (SWRCB) spell out the need to preserve and provide good water quality throughout Delta channels to protect the area's reasonable beneficial uses and environmental balances. DWR is obligated to provide water from the SWP to comply with these requirements. Yet, the Federal Government has historically refused to dedicate a portion of the CVP water supply to furnish a share of the water needed to protect the Delta. However, this whole matter is now under review by the Department of the Interior. Early in 1978 the Department of the Interior released a Special Task Force Report on the San Luis Unit of the CVP in response to Public Law 94-46. In regard to the Delta, the report recommended, in part:

- "1. The Department of the Interior should promptly commit itself, as a matter of policy, to exercise such authority as it may have, and to seek from Congress affirmation of, and such additional authority as may be required, to meet water quality standards and provide fish and wildlife mitigation and enhancement flows in the Sacramento-San Joaquin Estuary from the CVP . . .
- "5. . . . The Bureau of Reclamation should not sign other firm water contracts for the CVP which have substantial effects on water availability to meet water quality standards and mitigate damages to fish and wildlife in the estuary until the CVP is authorized and is committed to provide water for such water quality and mitigation."

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Also, the recent Supreme Court decision¹ represents a giant step leading to Bureau compliance with the same Delta protection conditions required of the State.

These and other Delta problems have been considered in developing the program put forth in this report. The most important in-Delta issues are defining acceptable diversion levels, protecting the fishery, and meeting reasonable water quality requirements.

Other important issues that impact water management in the Delta are: (1) population growth and distribution, (2) the future of San Joaquin Valley agriculture, (3) water conservation, (4) waste water reclamation, (5) coordination of SWP and CVP operation, (6) use of ground water storage, (7) preservation of North Coast rivers, and (8) reducing overdraft of San Joaquin Valley ground water basins.

These important issues are discussed throughout this bulletin. In addition to physical facilities, some changes in law and institutional arrangements are suggested as means to facilitate compromises. These changes would enable water authorities to allocate available water supplies equitably among all competing interests.

Objectives

Management and functional objectives were established to guide the formulation of a specific course of action. The management objectives are: (1) to protect the environment and economy of the Delta, (2) to provide dependable water supplies to Delta users and to CVP and SWP users that divert from the Delta, and (3) to protect the financial integrity of the SWP and CVP.

The functional objectives relate to: (1) improving water management, (2) providing a water supply for Delta users, (3) controlling salinity in the Delta, (4) providing water quality protection in the Delta and export service areas, (5) protecting, restoring, and, when feasible, enhancing the fish and wildlife resources of the Delta-Bay estuary and Suisun Marsh, (6) preserving and enhancing recreational opportunities in the Delta, and (7) transferring export water supplies safely through or around the Delta.

Three related Delta needs are: (1) the need for improved flood protection and island preservation, (2) the need for continued use of the Delta's navigable waterways, and (3) the need for continued access in, around, and through the Delta.

These objectives are presented in more detail in Chapter V.

Basic Planning Principles

In addition to the foregoing objectives, the constraints imposed by California and federal law, environmental considerations, and the water contracts now in force, Director Robie gave the staff some

additional principles to be considered during the review. These were:

- The water management plan should make maximum use of water conservation, reclaimed waste water, use of surface and ground storage, and existing physical facilities.
- Limit current planning to meeting future water requirements through the year 2000.
- The plan should be flexible, particularly as it relates to elements of the program more than 10 years in the future.
- Physical facilities should not be built before they are needed (i.e., facilities should not be built until needed to provide firm contract amounts, not surplus water).
- The study process itself must be an open process with significant input at key points from the affected publics.
- The study should include the USBR, the State should not "go it alone".

The Planning Process

Today, in an era where the views of the public have considerable influence, water project formulation is more complex. Local agencies and citizen groups are challenging technical judgments and, at times, replacing them with their own. While technical information must form the basis for discussions among concerned interests, there no longer are absolute technical answers. Technical solutions become just one part of politically and socially acceptable answers which develop out of public review.

In recognition of this change, the review of Delta alternatives was divided into three separate phases —scope of study, initial evaluation, and preliminary results.

Phase I (Scope of Study)

The first phase of the review consisted of:

- (1) a review of legislative acts and administrative decisions relative to the establishment of the scope, objectives, and constraints of the study.
- (2) identification of alternatives that might accomplish, or provide a contribution toward accomplishing, the objectives.
- (3) the establishment of a tentative schedule for the review and reevaluation process.

During this phase it was decided the study would be much broader than a review of the possible physical alternatives or operational procedures in the Delta. While these were central to the study, the scope was designed to include the development of a total management program of Delta water supplies and uses.

Public input to the study was obtained at a hearing held on November 6, 1975, in Sacramento. At the hearing the Department presented a summary of the scope and purpose of the study and a list of alterna-

¹ California v. U.S. -U.S.L.W. 4997 (July 3, 1978)

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A public hearing was held in Sacramento on the Delta Alternatives Program. Input from the public was an essential part of the planning process.

tives to be considered. This list included alternatives for reducing export demands, increasing efficiency of Delta water transfer, and augmenting available water supplies.

In general, the review process was well received. The following are typical examples of comments made at the hearing:

- "There is a great need for a study such as this to truly inform the public. It is a complex issue, but the complexity should not be used to obscure the real concerns which are present."
- ". . . a review of real alternatives should result in a reformulation of the Delta facilities whereby all parties can gain assurance that their interest will be satisfied. The Department's announced open planning procedure is a commendable step in allowing each interest to participate."
- ". . . when the public is convinced that you have truly considered all the alternatives and have established a real need for the project, and when the public is assured by irrevocable commitments that such a project will not add to existing environmental problems or create new ones, then the public will respond favorably. Until then it won't nor should it do so."
- ". . . project operational criteria may well be more important than the physical facility."

Phase II (Initial Evaluation)

The second phase of the study consisted of:

- (1) a preliminary review of the available water supplies and demands for water from the Delta.
- (2) an initial evaluation and screening of the listed alternatives.
- (3) a concept for combining alternative components to formulate a complete plan.

Upon completion of the second phase, two additional public workshops were held on April 13 and 14, 1976, in Stockton and Los Angeles to report progress and conclusions to date and to receive public comment. As usual, the range of comments from workshop participants ran the gamut. However, there was general support for water conservation and additional storage south of the Delta—both surface and underground—by people who otherwise expressed differing views. There seemed to be a general satisfaction with DWR's choice of alternatives to be given further study and its choice of alternatives deferred from further study.

In a spirit of cooperation, the California Water Resources Association and the Sierra Club, in August 1976, adopted a joint resolution regarding water resource management in California. The joint resolution urged that the State and Federal Governments: (1) expedite a solution to the question of equitable and reasonable management and distribution of the water resources of the Central Valley to meet water supply needs, appropriate water quality standards, and fish and wildlife needs; and (2) wherever feasible, provide for conjunctive use of surface supplies and underground storage and the efficient use of off-stream storage reservoirs, which are considered more environmentally acceptable than constructing dams on free-flowing rivers.

Phase III (Preliminary Results)

The third phase of the study consisted of:

- (1) more detailed analysis and comparison of the remaining alternatives. (In some cases discovery of geologic, engineering, or operational problems led to the abandonment of certain alternatives and the development of new ones.)

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- (2) estimating Delta and export requirements and available supplies from existing facilities. (Together, these defined potential shortages and need for additional supplies.)
- (3) formulation of alternative plans for meeting potential shortages and protecting the Delta.
- (4) preliminary conclusions for a recommended plan.

The results of this work were presented in a summary status report (October 1976). The proposal included: (1) Delta protection measures—both physical and statutory; (2) actions south of the Delta; (3) actions north of the Delta; and (4) the three most competitive alternative Delta water transfer facilities—the New Hope Cross Channel-South Delta Intake Channel, the New Hope Cross Channel-Enlarged Clifton Court Forebay, or the Peripheral Canal. Public hearings were held at the following locations to report on the tentative plan and to receive public comment:

October 25, 1976—Stockton
October 26, 1976—Bakersfield
October 27, 1976—Sacramento
October 28, 1976—Los Angeles
October 29, 1976—Oakland
November 3, 1976—Antioch
November 23, 1976—Chico
November 29, 1976—Bakersfield

Public Reaction at DWR Hearings

The following is a brief summary of the comments received.

Southern California Water Users. This group generally expressed the need for a Delta facility at an early date, and most, while indicating that any of the three alternatives would probably do the job, expressed a preference for the Peripheral Canal. The view was offered that a significant amount of water conservation and reuse of waste water is taking place in the south coastal area, and that the estimates of additional savings in the staff report were too high and should be reduced. General approval was expressed on the use of ground water storage and the use of off-stream storage. The need for more detailed study and evaluation was noted, and concern was expressed for the cost and energy needs of some of the facilities.

San Joaquin Valley Water Users. Here a strong preference for the Peripheral Canal was expressed, with the general view that it is needed immediately. A need for 740 cubic hectometres (600,000 acre-feet) of surplus water above and beyond the total 5.22 cubic kilometres (4.23 million acre-feet) yield of the State project was supported by some people testifying. Some support was given for the suggested ground water program, but here again the need for more detailed study was ex-

pressed. The importance of the availability of surplus water in the future was strongly made. The view that the North Coast rivers not be placed in the federal wild and scenic river system was also expressed.

East Side, San Joaquin Valley Water Users.

This group generally supported the entire program, but asked that the Mid-Valley Canal be constructed as one of the first elements of the program.

Delta Water Interests. Delta interests pressed for a requirement that Delta water contracts be executed prior to construction of any Delta transfer facility. All expressed the need for the federal legislation requiring the Bureau of Reclamation to share in the obligation of Delta protection. Most expressed a preference for the non-Peripheral Canal alternatives which would allow export water to flow through the Central Delta. Some questioned the feasibility of constructing fish screens on such a massive scale. Strong emphasis was placed on completing the institutional items, particularly the legislation, prior to construction of any facilities. The need for continued bay outflows ("flushing flows") was emphasized. The matter of guaranteed Delta protection was raised by nearly all speakers. Some felt guarantees were not obtainable, while others thought enforceable contracts and legislation were possible solutions.

Sacramento Valley Interests. People in this area turned out en masse. They vigorously opposed development of ground water in Glenn and Butte Counties to help meet SWP water needs in dry years. They cited land subsidence, falling water tables in 1976, and the increased local needs for ground water in dry years (the years suggested for augmenting Delta supplies). They opposed the suggestion that Sacramento Valley rice farmers grow and store excess rice in wet years and reduce plantings in dry and critical years. Some preferred damming Northern California rivers, including some on the North Coast, because using that water (which flows into the ocean) would not diminish supplies available for local use.

Environmental Interests. Environmentalists advocated that guarantees and institutional requirements to protect the Delta, including federal legislation to require the Bureau of Reclamation to comply with Delta water quality standards, must precede any construction. Most said that once these guarantees and institutional arrangements had been provided, the Peripheral Canal seemed to provide the best environmental protection. The need for continued winter flushing flows through San Francisco Bay and for protection of the Suisun Marsh was expressed by several. Several environmental speakers indicated that the North Coast rivers should be placed in the federal wild river system. They contended that the revised water export demands were probably more

realistic than previous numbers, but still needed to be reevaluated. In particular, the estimated amounts of water included for water conservation and waste water reclamation were too low and should be increased.

The Delta Environmental Advisory Committee (DEAC) was very active in developing and articulating environmental views. DEAC was formed in August 1973 at the invitation of DWR to help improve understanding of environmental concerns related to water development and the Delta. Its members were drawn from some of the larger environmental and citizen groups in the State, but the views expressed by DEAC do not necessarily represent the position of their respective conservation and environmental organizations.¹

DEAC's analysis of the situation led to its conclusion that three fundamentals were basic to solution of Delta water and environmental problems—(1) reducing export demands as much as possible, (2) properly designing, building, and operating a Delta transfer facility such as the Peripheral Canal that eliminates the need to use the Delta as a canal to convey export water, and (3) providing solid institutional guarantees that the affected environments will be adequately protected. In January 1977, DEAC submitted position papers on five major categories of environmental concern: Delta outflow; Delta transfer facilities; the Suisun Marsh; North Coast Rivers; and Delta levees.

Environmentalists also expressed concern about the effects of the proposed San Joaquin Valley Drain on the Delta. In this regard, the Interagency Drainage Program (IDP) was organized in 1975 as a State-Federal sponsored effort to plan and recommend a San Joaquin drainage disposal system. Studies by IDP are directed toward providing facilities for all the potential drainage problem areas. To this end, alternative solutions have been identified for study in five categories: (1) No valleywide action; (2) Disposal by evaporation of drainage effluent; (3) A drain to the ocean; (4) A drain to the San Joaquin River; and (5) A valley drain to tidal waters of the western Delta or Suisun Bay. The IDP's final report, a recommended plan with EIR and financing program, is scheduled for completion in early 1979.

Reaching a Consensus

The Department's Phase III hearings revealed agreement on a number of issues and general acceptance of portions of the preliminary staff plan. However, there were still differing objectives, priorities, and competition for a limited resource. Most questions on what should be done were not techni-

cal or only partially technical. They were primarily policy oriented.

Consequently, in an effort to put together a program that the various groups could support, the Department held a number of meetings so the parties could be part of the negotiations and trade-offs which are an integral part of the decision-making process. At first, these discussions centered on a draft of a federal bill to amend the authorization of the CVP to provide the necessary Delta protection and to participate in needed facilities. Also proposals were made to amend State legislation to provide needed authorization to implement portions of the plan where such authorization was lacking in State law.

At about the same time State Senator Ruben Ayala, Chairman of the Senate Agricultural and Water Resources Committee, introduced Senate Bill 346, which would direct construction of the Peripheral Canal. In June 1977 the Department's program and Senator Ayala's bill were merged after a coalition of water, environmental, labor, farming, and other groups, brought together by Governor Edmund G. Brown Jr., agreed on a number of amendments to Senate Bill 346. The amended bill passed the Senate in June 1977, and after further amendments, was passed by the Assembly and returned to the Senate floor on September 15, the closing day of the session. In the Senate, the amended bill received an affirmative vote of 21 to 16 for concurrence in Assembly amendments. While a majority, this was less than the necessary two-thirds needed to send the bill to the Governor.

The bill was then assigned to a Conference Committee composed of three members from the Senate and three from the Assembly. During November-December 1977, the Conference Committee held six interim hearings throughout the State. In January 1978, when the Legislature reconvened, the Conference Committee met and adopted a large number of amendments. Many were of a noncontroversial and relatively technical nature, but some contained substantive changes, primarily in language for protecting the Delta and Bay areas and implementing prerequisites for the Peripheral Canal.

As a result of the amendments, the Conference Committee report of January 20, 1978, received additional support from such entities as the San Francisco Bay Conservation and Development Commission, the Association of California Water Agencies, and the Contra Costa County Water District. It continued to have the vigorous support of the Metropolitan Water District of Southern California (MWD), the Planning and Conservation League, and the Sierra Club. A more complete list of entities supporting the bill as derived from information in the Department files is shown in Table 1.

Some still object to Senate Bill 346. Most represent regional viewpoints. For example, some Delta water

¹Organizations include: Audubon Society; California Committee of Two Million; California Trout; California Waterfowl Association; California Wildlife Federation; Environmental Defense Fund; League of Women Voters; Pacific Interclub Yacht Association; Planning and Conservation League; Salmon and Steelhead Advisory Board, Sierra Club; Suisun Resource Conservation District; Water Science and Engineering Department, University of California at Davis.

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TABLE 1
SUPPORTERS OF SB 346 (Ayala-Gualco)
(Partial List, June 1978)

Sierra Club
Metropolitan Water District of Southern California
Planning and Conservation League
East Bay Municipal Utility District
California Labor Federation
San Francisco Bay Conservation and Development Commission
Association of State Water Project Agencies
San Diego County Water Authority
Association of California Water Agencies (ACWA)
Santa Clara Valley Water District
California Water Commission
Alameda County Water District
Delta Environmental Advisory Committee
Los Angeles Area Chamber of Commerce
Municipal Water District of Orange County
San Diego County
California-Nevada Conference of Operating Engineers
Los Angeles County Federation of Labor
Orange County Water District
Vista Irrigation District
California Waterfowl Association
East Branch State Water Project Contractors
Southern California Water Conference
Calleguas Municipal Water District
Contra Costa County Water District
City of Los Angeles
Upper San Gabriel Valley Municipal Water District
Watercare
Operating Engineers Local No. 3
Pacific Coast Federation of Fisherman's Association, Inc.
Central Basin Municipal Water District
San Gabriel Valley Municipal Water District
San Bernardino Valley Municipal Water District
United Water Conservation District
City of South Gate
City of Buena Park
State Building and Construction Trades Council
West Basin Municipal Water District
Central and West Basin Water Replenishment District
State Board of Food and Agriculture
Salmon Unlimited
Mojave Water Agency
Western Growers Association
California Trout

users oppose Senate Bill 346 because they believe it does not give enough protection to the Delta-Bay estuary. They envision export water users bringing irresistible pressure to weaken any institutional guarantees to protect the Delta once the Peripheral Canal is built and there is no longer a physical need for the projects to protect Delta water quality.

On the other hand, some export water users in the San Joaquin Valley oppose the bill because they believe it gives too much protection to the estuary. They perceive that the many restrictions in Senate Bill 346 will prevent the Peripheral Canal from ever being built and that excessively high standards to protect the Delta and Bay will prevent delivery of their full contractual water supplies.

The Department and bill supporters believe that, when all the diverse interests are considered, Senate Bill 346 represents a fair statewide compromise that will meet the reasonable needs of the interests involved.

However, on February 2, 1978, the Conference Committee report was rejected in the Senate by a vote of 20 ayes, 14 noes, and 6 not voting. A two-thirds vote, or 27, was needed for passage. The author, Senator Ayala, obtained the right for reconsideration by a vote of the Senate so that another vote could be held at a later date.

The program that follows reflects compromises in many areas. It is acceptable to most entities, meets the program objectives, and is the recommended plan of the Department of Water Resources.

Water Requirements

The overall net water requirements in the Delta include internal consumptive uses and net Delta outflow for controlling salinity to protect agricultural, municipal, industrial, and fish and wildlife uses. Under the recommended plan, water necessary to meet these requirements will vary from about 4.9 cubic kilometres (4 million acre-feet) in a critical year to about 8.3 cubic kilometres (6.7 million acre-feet) in a wet year as shown in Table 2. As an area of origin, the Delta under California law has priority to available water to meet these needs before water is exported.

TABLE 2

APPROXIMATE DELTA WATER REQUIREMENTS WITH PROPOSED DELTA STANDARDS

Class of Year	Draft Four-Agency ¹		SWRCB Draft Plan ²	
	Cubic Kilometres	Million Acre-feet	Cubic Kilometres	Million Acre-feet
Wet	7.6	(6.2)	8.3	(6.7)
Above Normal	6.8	(5.5)	6.9	(5.6)
Below Normal	6.5	(5.3)	6.5	(5.3)
First Dry Year	5.4	(4.4)	5.4	(4.4)
Second Dry Year and Critical Years.....	5.1	(4.1)	4.9	(4.0)

¹ Based on estimated amounts of water necessary to meet the Draft Four-Agency Fish and Wildlife Agreement for fish, 1975 Basin Plan water quality requirements for agriculture, and Delta consumptive use.

² Based on probable long-range amounts of water necessary to meet the March 1978 SWRCB Draft Water Quality Control Plan (assuming relocation of the Contra Costa Canal Intake and installation of Suisun Marsh facilities), and consumptive use in the Delta.

The combined export demands of the SWP and CVP are expected to grow from 6.8 cubic kilometres (5.5 million acre-feet) per year in 1980 to 9.5 cubic kilometres (7.7 million acre-feet) per year in year 2000. This estimate takes into account reduced population growth, primarily in Southern California, and DWR's year 2000 goal of 860 cubic hectometres (700,000 acre-feet) per year of water conservation and waste water reclamation, primarily in the municipal and industrial areas served by the projects. In a critical dry year these amounts would be reduced to 5.4 and 7.4 cubic kilometres (4.4 and 6.0 million acre-feet) in 1980 and year 2000, respectively. These reduced amounts reflect the dry year water deficiencies allowed in SWP and CVP contracts.

Water Supplies

Firm yield is defined as the annual supply of water that can be sustained in all years, except that, during critical dry periods such as 1928 to 1934, lower supplies (or deficiencies) are permitted in accordance with predetermined provisions in the SWP and CVP water supply contracts. Existing SWP and CVP facilities have enough storage capacity and Delta pumping capacity to produce a firm yield from the Delta of about 6.9 cubic kilometres (5.6 million acre-feet) assuming 1975 Basin Plan Delta criteria, and about 7.2 cubic kilometres (5.8 million acre-feet) per year with the Draft Four-Agency criteria for fish and 1975 Basin Plan criteria for agriculture. Subsequent to studies conducted for this report, the SWRCB issued its March 1978 Draft Water Quality Control Plan for modifying Basin Plan criteria. Preliminary review of the Draft Plan indicates that the resulting firm yield available from the Delta falls between the yields determined from the foregoing studies. These estimated yields do not include two CVP projects under construction, Auburn and New Melones Reservoirs. Also, they do not assume deterioration in yield due to increased use in the areas of origin upstream from the Delta.

Taking these factors into account, the estimated combined CVP and SWP firm yield available from the Delta from existing and under-construction facilities in the year 2000 will be 6.4 cubic kilometres (5.2 million acre-feet) and 6.7 cubic kilometres (5.4 million acre-feet) for 1975 Basin Plan criteria and Draft Four-Agency criteria, respectively. Subtracting the estimated firm yield under year 2000 conditions from the estimated target demands from Delta export shows that there is need for additional supplies in the amount of 2.8 to 3.1 cubic kilometres (2.3 to 2.5 million acre-feet) per year, depending on the Delta water quality criteria adopted. As with 1980 conditions, corresponding values under the March 1978 SWRCB Draft Plan are expected to fall between these two conditions.

Early in the study, it was recognized that no single action would protect the Delta estuary and meet the increasing requirements in areas that receive a portion of their water supplies from the Delta. The Department's program includes: (1) Delta protection measures—physical, institutional, and statutory; (2) an isolated Delta water transfer facility in the form of a staged Peripheral Canal; (3) municipal and industrial water conservation and waste water reclamation in the export service areas; (4) surface and ground water storage facilities and conveyance systems south of the Delta; and (5) water storage facilities north of the Delta. A brief description of these measures is included here and discussed in detail in Chapter V. The location of the physical facilities is shown on Figure 2.

Delta Components

Delta components include water transfer facilities, institutional and statutory measures to protect the Delta-Bay estuary, and physical facilities to meet specific needs in the Delta and Suisun Marsh.

Delta Water Transfer Facility. The Peripheral Canal is included in the plan to eliminate adverse environmental conditions associated with conveying water through the Delta and to help meet increased needs of SWP and CVP. The ultimate issue on selection of a Delta transfer facility was that of an isolated or nonisolated transfer of water through the Delta. Most fishery interests and water users south of the Delta preferred an isolated channel such as the Peripheral Canal. Many Delta water users, on the other hand, prefer any plan which keeps export water in the Delta channels, since such a plan *could* give them a physical rather than a statutory or contractual guarantee that Delta water quality would be protected to some extent. Continuing the status quo also puts off the need for payment by the Delta water users for net benefits received from the projects. The selection of the staged Peripheral Canal over other alternatives was based on the fact that with an isolated conveyance system the needs of *both* the Delta fishery and Delta agriculture could be met, while with a nonisolated alternative many of the fishery requirements could not be met. Inherent in this conclusion was the need for strong guarantees that both the SWP and CVP would be operated to protect the Delta fishery and Delta agricultural, municipal, and industrial uses. The recommended measures for providing these guarantees are discussed below.

Delta-Bay Protection Program. The Delta-Bay Protection Program is made up of five institutional and statutory components and four physical components as follows:

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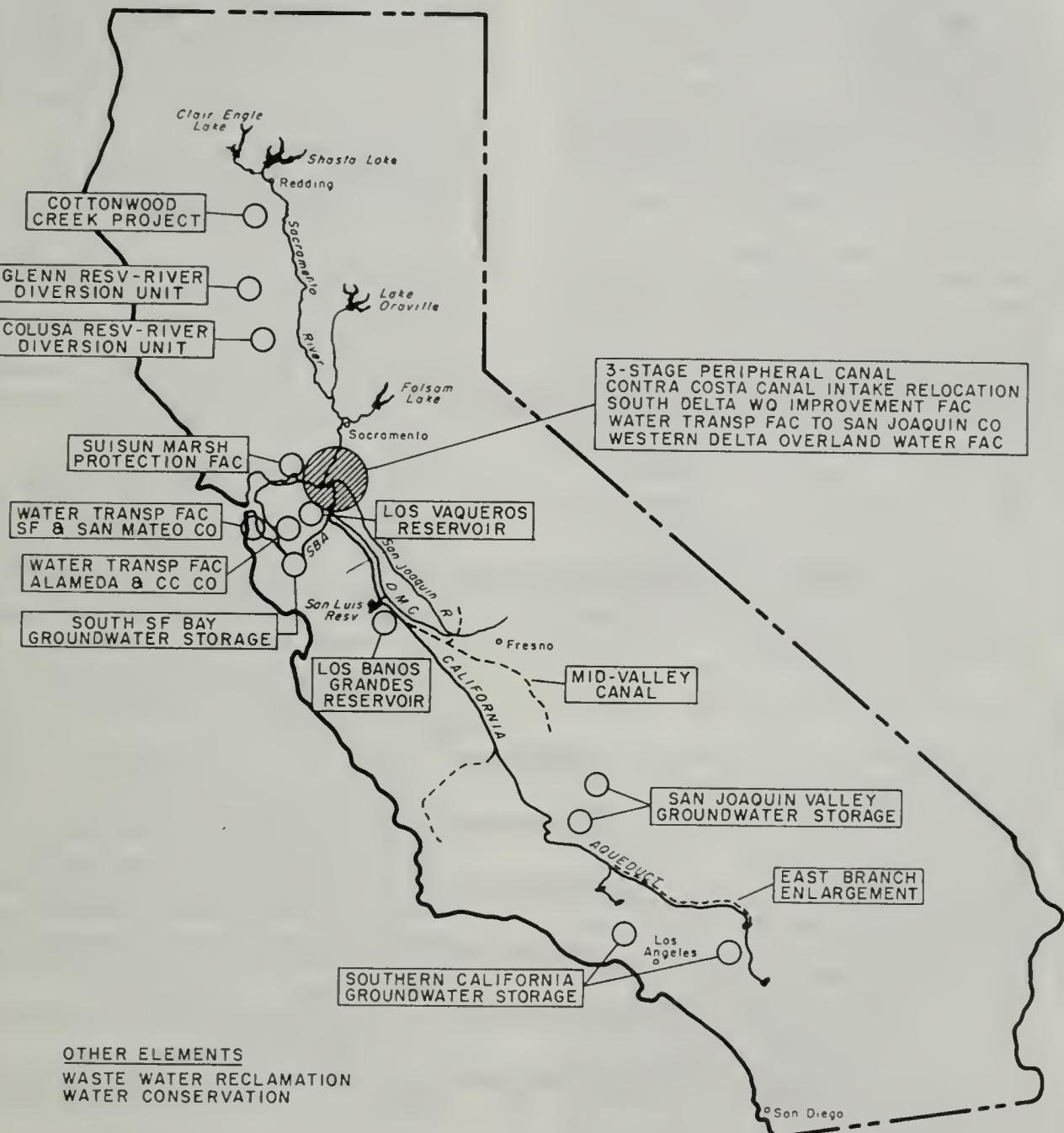


Figure 2. Key elements of the selected plan.

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1. An *Environmental Monitoring* of water quality and fish and wildlife habitat to assure that the desired results are being achieved and to provide early warning if problems arise.
2. A *Four-Agency Fish and Wildlife Agreement* between DWR, USBR, Department of Fish and Game (DFG), and U.S. Fish and Wildlife Service (USFWS) specifying needs and means for protecting fish and wildlife in the Delta-Bay estuary and Suisun Marsh.
3. A *CVP-SWP Coordinated Operation Agreement* whereby the two projects will meet identical Delta water quality standards and will spell out the responsibility and obligations of the two projects in meeting these Delta-Bay and Suisun Marsh needs.
4. A *Periodic Review of Delta Water Quality Standards*, with modifications, where and when necessary, to protect the reasonable balance in the allocation of water between competing uses as generally provided for in Article X, Section 2 of the California Constitution, which requires that the water resources of the State be put to the fullest beneficial use possible, that such uses and methods of use shall be reasonable, and that no water shall be wasted.
5. *State and Federal Contracts* for water quality and water supplies with the eight Delta and Suisun Marsh agencies, with payment by agricultural and municipal and industrial beneficiaries for net benefits received. While getting contracts with all agencies is desirable, no agency will be permitted to block the rest of the program by refusing to sign a contract.

In the form of physical facilities, Delta protection includes:

1. *South Delta Water Quality Improvement Facilities* to distribute good quality water to south Delta areas which now have poor quality water.
2. *Relocation of the Contra Costa Canal Intake* to divert water from Clifton Court Forebay to improve the water quality for eastern Contra Costa County and to save water otherwise needed for water quality control at the present point of diversion.
3. *Western Delta Overland Water Facilities* on Sherman Island, Jersey Island, and Hotchkiss Tract to provide good quality water to these agricultural areas where it would otherwise take excessive amounts of water (outflows) large enough to maintain adequate water quality.
4. *Suisun Marsh Facilities* to improve water quality for Marsh management in a more efficient manner than possible under present conditions.

Components South of the Delta

Components south of the Delta include measures to: (1) reduce the rate of increase and demand for water to be exported from the Delta; (2) increase the

dependable supplies of the CVP and SWP systems south of the Delta; and (3) enlarge or provide new conveyance facilities south of the Delta.

Specifically the program includes:

1. *Water Conservation and Waste Water Reclamation* in municipal and industrial service areas to provide a more efficient use of existing and future water supplies in the amount of 860 cubic hectometres (700,000 acre-feet) per year by the year 2000. Water conservation and reclamation by federal, State, and local water agencies is contemplated.
2. Use of available *Ground Water Storage in the San Joaquin Valley and Southern California* to bank excess Delta supplies in normal and wet years for use in dry and critical years. This feature envisions banking up to 4.1 cubic kilometres (3.3 million acre-feet) to produce an incremental firm yield for the SWP of 490 cubic hectometres (400,000 acre-feet) per year. This component also includes enlarging the East Branch of the California Aqueduct to provide sufficient conveyance capacity to deliver available Delta supplies to the Chino Basin for recharge.
3. Construction of *Los Vaqueros Off-Stream Storage Reservoir* in Contra Costa County to a capacity of about 1200 cubic hectometres (950,000 acre-feet). This would: (a) provide an incremental dry period yield to the SWP-CVP system of about 200 cubic hectometres (160,000 acre-feet) per year; (b) facilitate meeting project demand south and west of the Delta during periods of reduced export pumping; (c) protect striped bass in the spring; (d) facilitate the use of ground water storage described in No. 2 above; and (e) provide an emergency gravity supply to over 250,000 people in Contra Costa County Water District, which presently has reserve storage for only a 2 or 3 day supply.
4. *Los Banos Grandes Off-Stream Storage Reservoir* is included as a partial alternative to Los Vaqueros Reservoir. At 2.7 cubic kilometres (2.2 million acre-feet) of storage capacity, it would provide a somewhat greater increment of yield to the system but would not offer the same operational flexibility to the system nor could it serve as an emergency supply to Contra Costa County Water District.
5. Construction of the *Mid-Valley Canal* to serve the east side of the San Joaquin Valley and alleviate a portion of the ground water overdraft in the areas north and south of Fresno.

Components North of the Delta

Components north of the Delta consist of tributary and off-stream storage reservoirs in the Sacramento River basin to augment the supply available at the Delta and increase the yield of the SWP and CVP. Specifically the program includes:

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Related Items

1. Construction of the authorized Corps of Engineers' *Cottonwood Creek Project* to provide a yield for the SWP of approximately 190 to 250 cubic hectometres (150,000 to 200,000 acre-feet) per year during critical dry periods. It is contemplated that the Corps of Engineers would build the project and that the State would contract for water under the Water Supply Act of 1958 for municipal and industrial uses in the SWP service area.
2. Construction of the *Glenn Reservoir-River Diversion Plan* to a storage capacity of 10.7 cubic kilometres (8.7 million acre-feet) per year to increase the water available at the Delta and the yield of the SWP and the CVP by approximately 1.2 cubic kilometres (1 million acre-feet) per year.
3. The *Colusa Reservoir—River Diversion Plan* is included as a partial alternative to the Glenn Reservoir—River Diversion Plan.

In Senate Bill 346 the Legislature added facilities to provide for transportation of water to serve the counties of San Joaquin, San Francisco, San Mateo, Alameda, and Contra Costa. To date, the specific nature of such facilities has not been determined.

Senate Bill 346 would also appropriate \$750,000 per year for DWR to conduct a 5-year comprehensive agricultural water conservation and management program. In addition the bill would establish a \$50,000,000 loan fund to provide farmers low-interest loans to assist in the implementation of agriculture water conservation programs.

Schedule

A schedule and sequencing of facilities to add increments of new yield sufficient to meet the projected demands set forth in this report is shown in Figure 3.

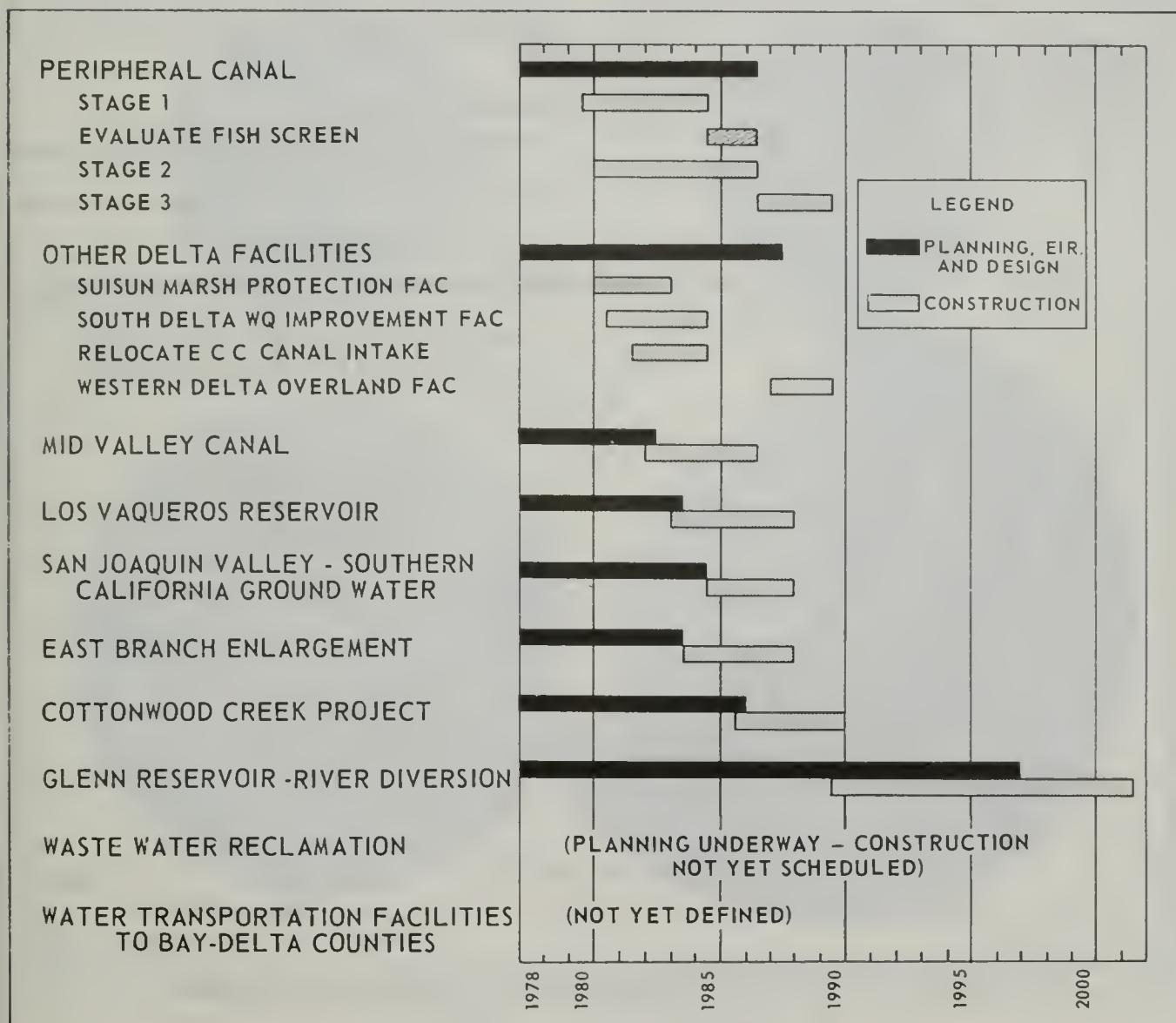


Figure 3. Schedule for selected facilities.

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Yield from the Selected Facilities

The estimated firm annual yield from the Delta of the SWP and CVP would be increased by 3.7 cubic kilometres (3 million acre-feet) per year—from 6.4 to 10.1 cubic kilometres (5.2 to 8.2 million acre-feet) per year in year 2000 as shown in Figure 4¹. The approximate values of yield from each of the various facilities are also shown. This yield exceeds the projected year 2000 export demands by 620 cubic hectometres (500,000 acre-feet) per year. This provides a contingency against uncertainties in forecasting future events or may be used for increases in SWP or CVP contracted demands beyond the year 2000.

Uses of Delta Water Supply

Figure 5 depicts the variation in average annual water supply and disposal at the Delta for 1980² and the year 2000³ over a 50-year period of hydrology. It also shows the same information for typical dry year conditions (the average of the 16 driest years) and

¹ Based on preliminary analysis, the yield would be approximately the same under the March 1978 SWRCB Draft Water Quality Control Plan.

² For 1980 required Delta outflow based on conditions without the Peripheral Canal assuming 1975 Basin Plan water quality criteria plus carriage water needed to maintain water quality at the export pumps.

³ For 2000, required Delta outflow based on conditions with Peripheral Canal and other components of the selected plan assuming 1975 Basin Plan agricultural and Draft Four-Agency fish and wildlife water quality criteria

typical wet year conditions (the average of the 16 wettest years) in the 50-year period of study.

Where the Water is Used

Figure 6 shows the areas where CVP and SWP water exported from the Delta will be used under "normal" and critical year conditions for 1980 with the existing SWP and CVP facilities. Figure 7 shows the same information for the projects under year 2000 conditions, with implementation of the selected program.

Costs

The estimated capital costs to build the facilities of the plan total approximately \$3.4 billion at 1977 price levels. With an assumed escalation rate of 6 percent per annum to allow for inflation, the estimated capital outlay to build the facilities over a 20 to 25 year period would be \$7.2 billion. These costs are depicted graphically on Figure 8, which also shows the estimated cost for each of the components in the plan.

Sources of Funding

It is proposed that several program facilities would

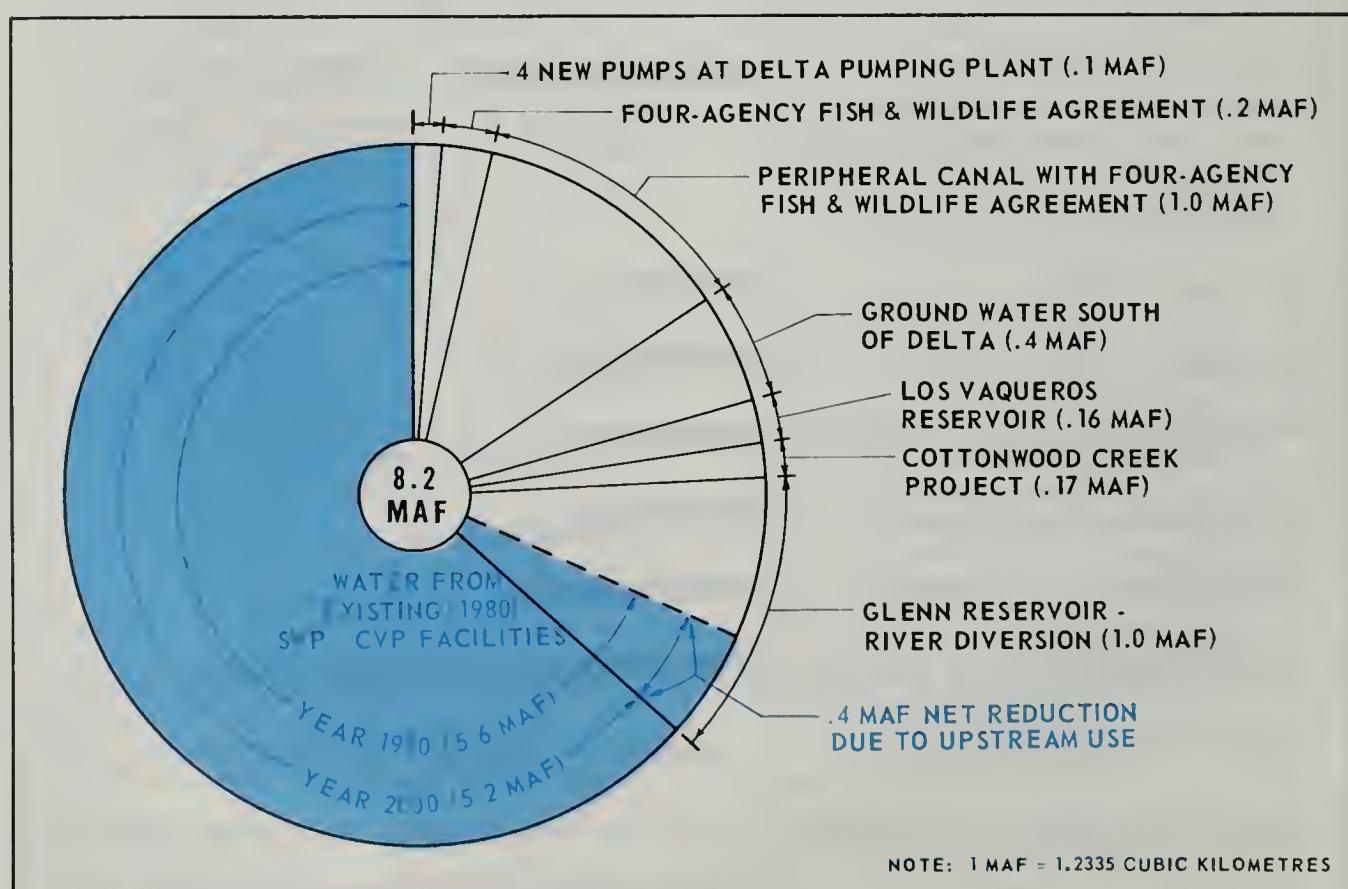
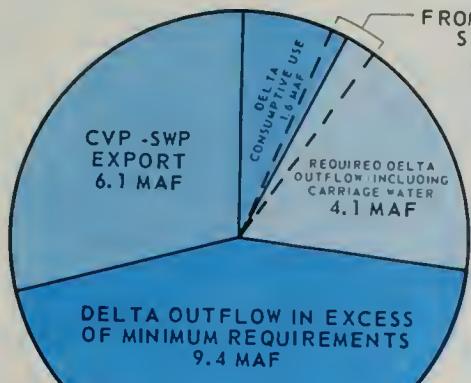
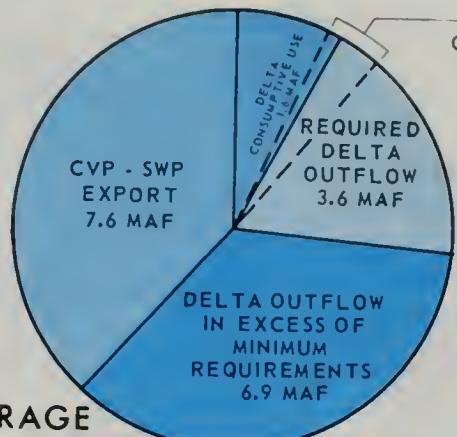


Figure 4. Sources of water for Delta export with selected facilities, year 2000.

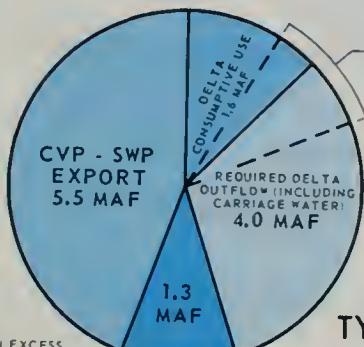
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YEAR 1980 - 21.2 MAF

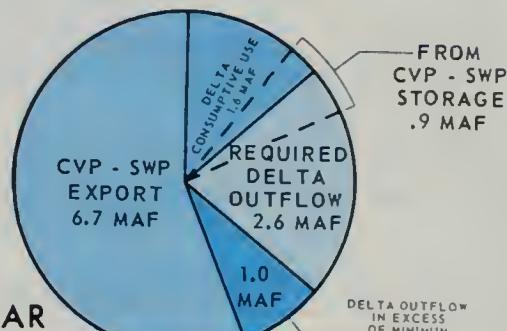


YEAR 2000 - 19.7 MAF

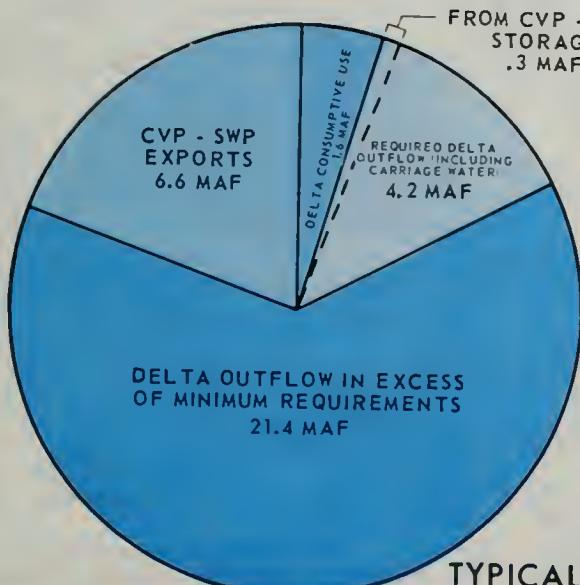


TYPICAL DRY YEAR

YEAR 1980 - 12.4 MAF

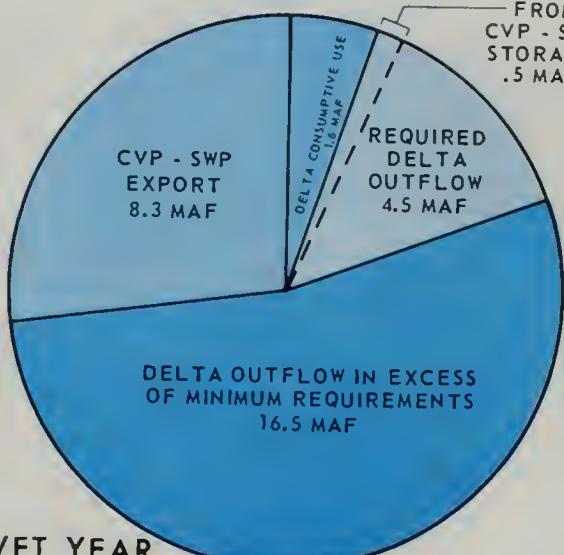


YEAR 2000 - 11.9 MAF



TYPICAL WET YEAR

YEAR 1980 - 33.8 MAF



YEAR 2000 - 30.9 MAF

NOTE: 1 MAF = 1,2335 CUBIC KILOMETRES

Figure 5. Uses of Delta water.

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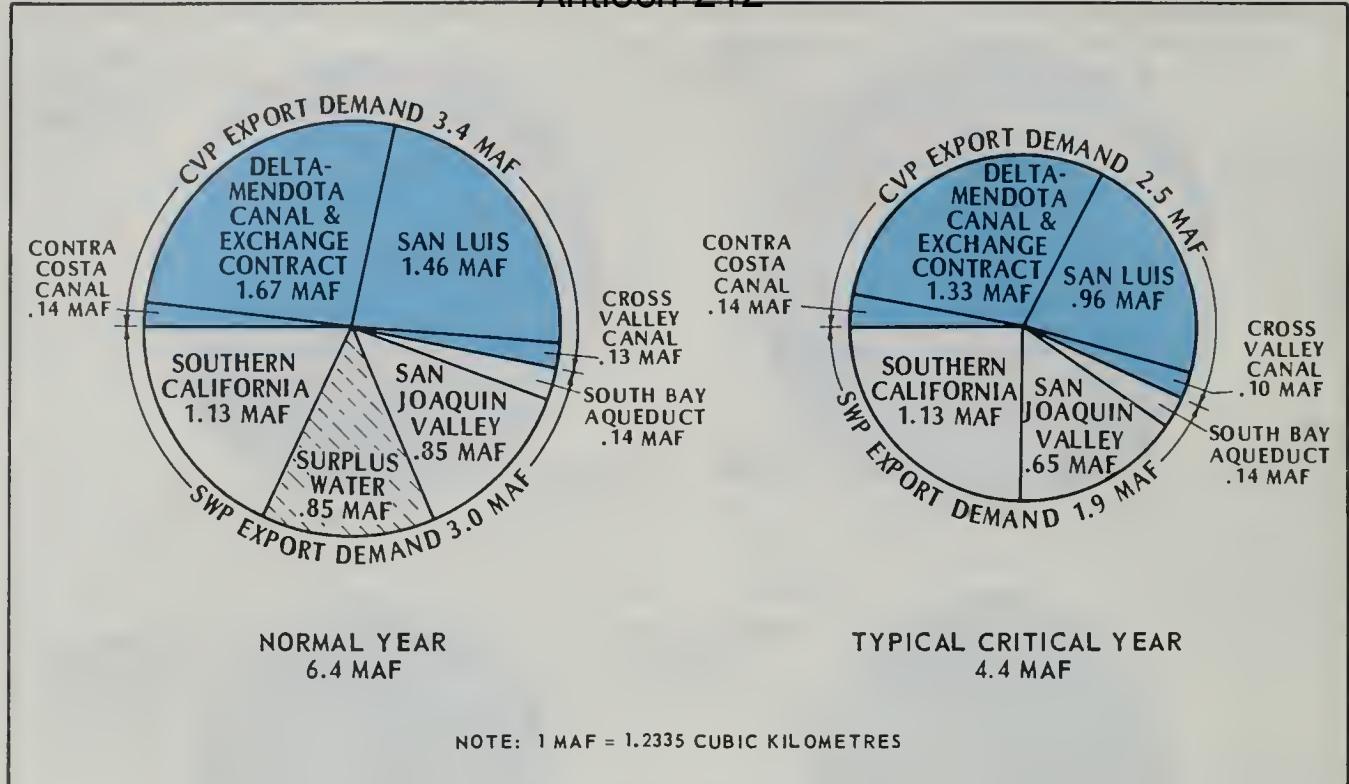


Figure 6. Where the water is used - Year 1980.

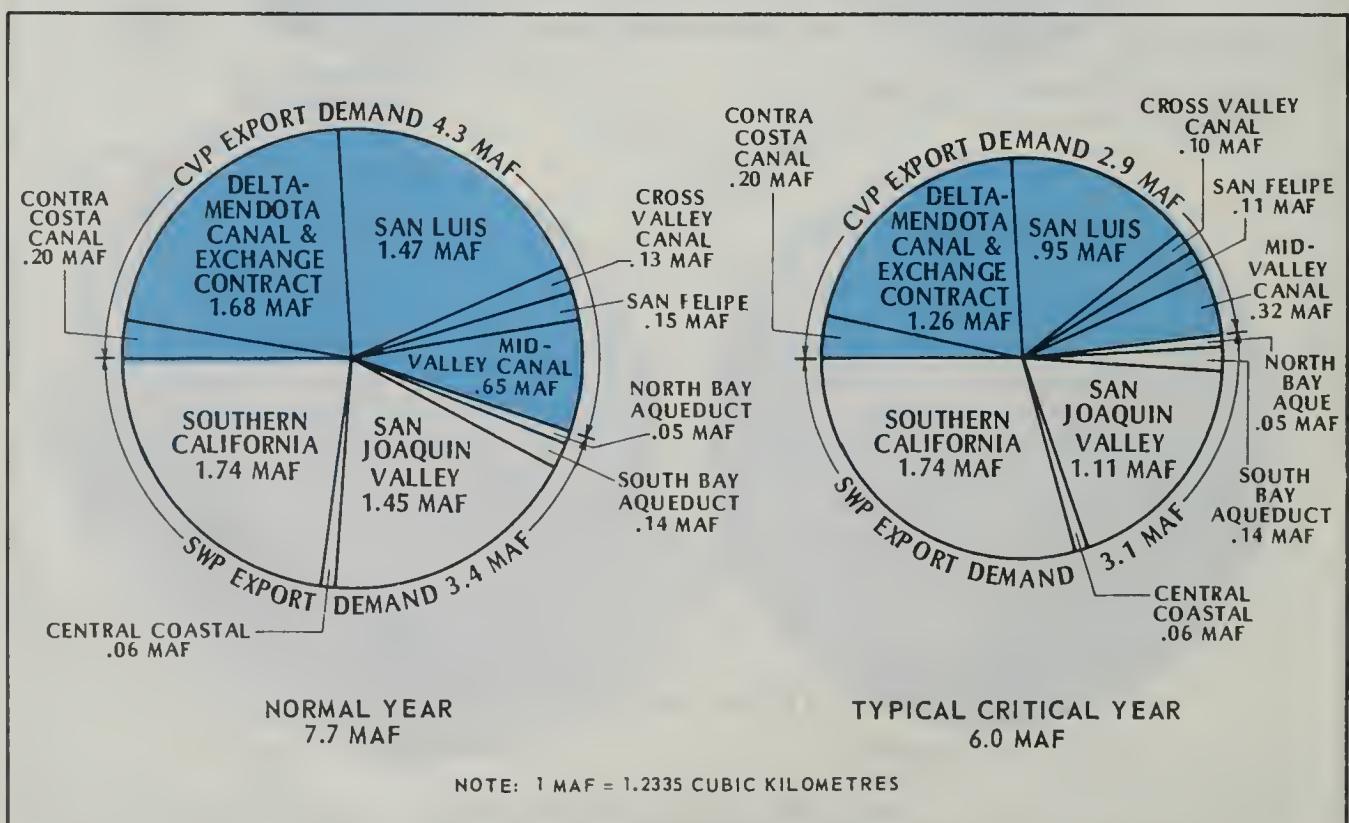


Figure 7. Where the water is used - Year 2000.

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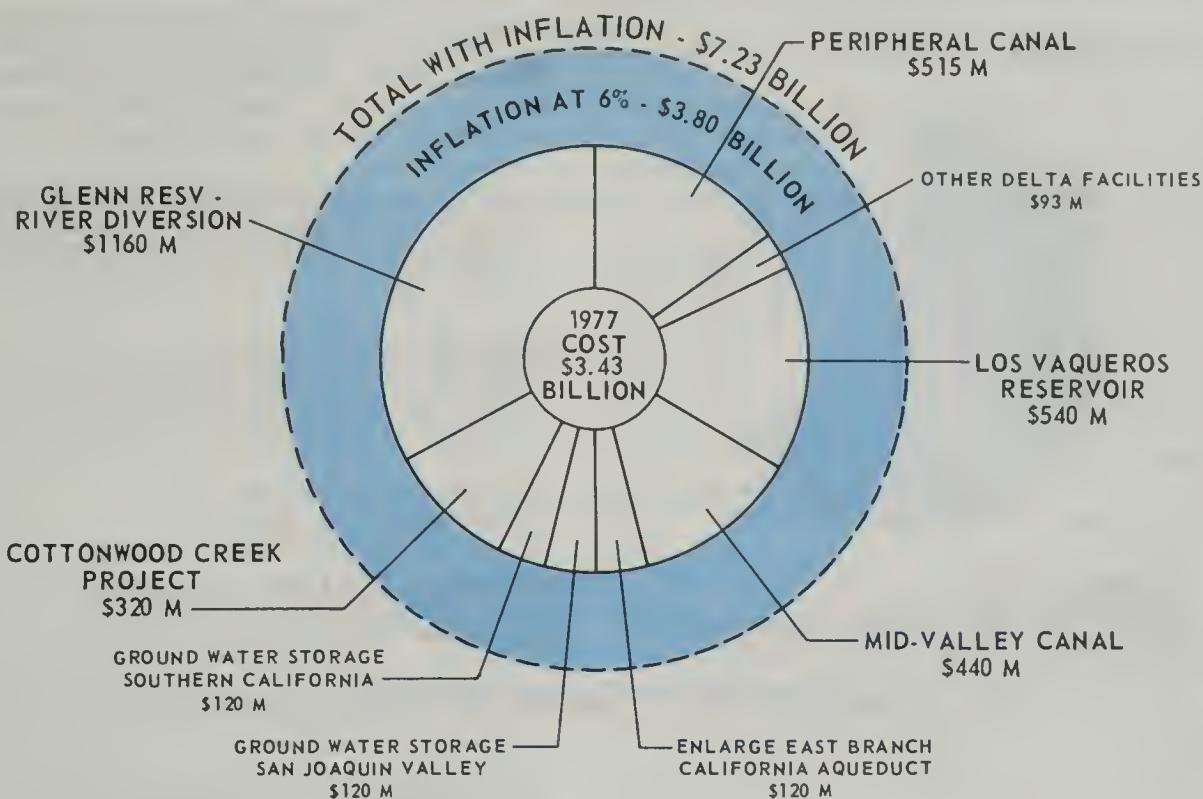


Figure 8. Estimated total capital cost of selected facilities.

be constructed and financed by the State and the United States. The assumed sharing of costs is shown in Table 3. It is based on both projects meet-

ing identical water quality standards and on the water allocation formula in the unsigned coordinated operation agreement for the SWP and CVP. The fed-

TABLE 3
SHARING OF COSTS OF SELECTED FACILITIES

Facilities	Assumed Sharing Percent		First Cost, \$ Million (1977 Dollars)		
	State	Federal	Total	Assumed Sharing	Federal
<i>Delta Components</i>					
Peripheral Canal	50	50	515	257.5	257.5
Relocation of Contra Costa Canal Intake.....	50	50	16	8	8
So. Delta Water Quality Improvement Facilities	50	50	25	12.5	12.5
Western Delta Overland Water Facilities.....	50	50	10	5	5
Suisun Marsh Facilities	50	50	42	21	21
<i>South of Delta Components</i>					
Enlarge E. Branch California Aqueduct	100	-	120	120	-
So. California Ground Water Storage	100	-	120	120	-
San Joaquin Valley Ground Water Storage.....	100	-	120	120	-
Los Vaqueros Reservoir	25	75	540	135	405
Mid-Valley Canal.....	-	100	440	-	440
<i>North of Delta Components</i>					
Cottonwood Creek Project	70	30 ¹	320	224	96
Glenn Reservoir-River Diversion	50	50	1160	580	580
Totals			3,428²	1,603²	1,825

¹ For portions of the project not allocated to water supply at the Delta such as local water supply, flood control, recreation, etc.

² Does not include approximately \$22 million for final four pump units at Delta Pumping Plant nor about \$400 million for completion of other features of the California Aqueduct, both of which are scheduled independently and concurrently with the selected program.

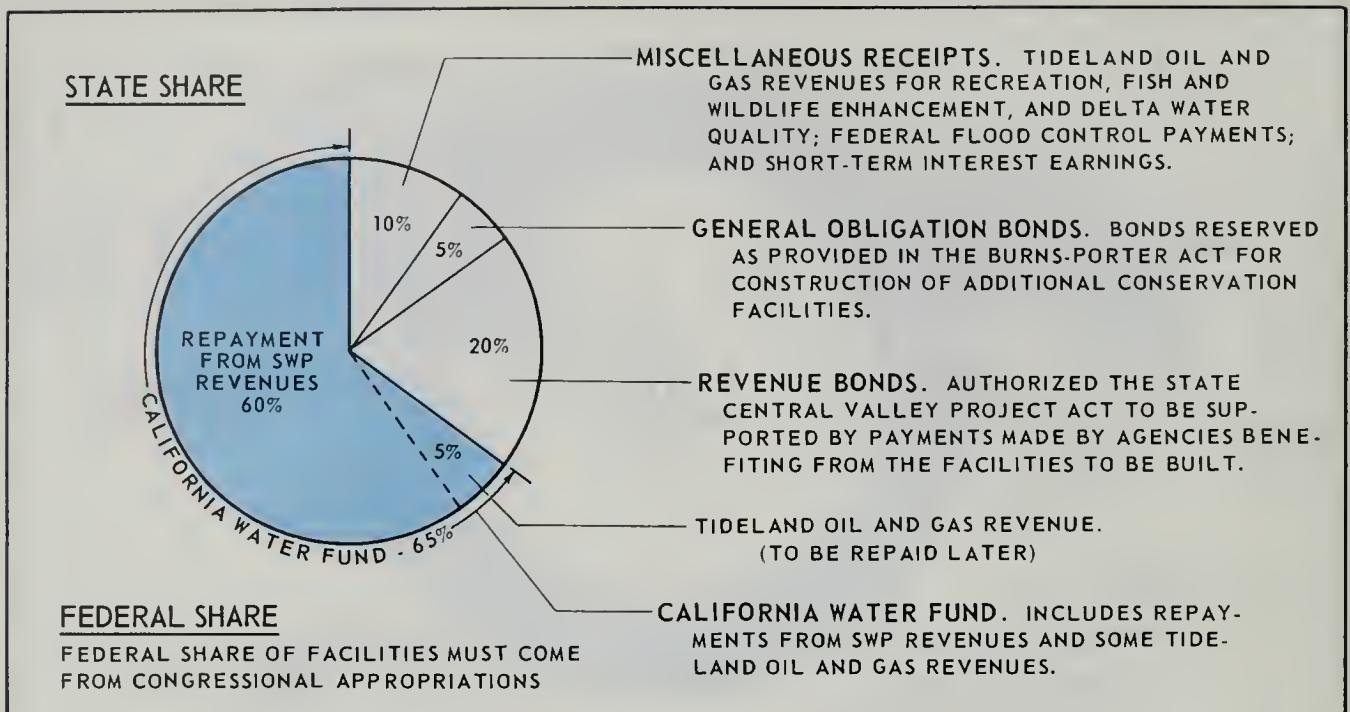


Figure 9. Sources of funding for selected facilities and programs.

eral share of the costs would have to come from congressional appropriations after the particular facilities were authorized. The State's share would come from available financing sources as shown on Figure 9.

All the State sources, except revenue bonds, are active, and funds are accruing to them on a predetermined basis. The State's Central Valley Project Act authorizes the Department to issue revenue bonds to pay the costs of carrying out any of the objectives of the Act. This Act also permits the Department to add additional facilities that are consistent with the project and the object of the Act. Consequently, there will be considerable work to be done in putting together a revenue bond financing program for an additional conservation facility. However, the basic concepts have been developed for issuance of such bonds (for example, revenue bonds used to finance Devil Canyon Power Plant on the East Branch of the California Aqueduct).

None of these State funding sources requires new legislation. The appropriations in Senate Bill 346 were for related matters.

Repayment

Water agencies contracting with the USBR pay for water in accordance with pricing policies of the Federal Government. For federal projects, costs for flood control, fish and wildlife enhancement, and recreation are nonreimbursable.

The 31 agencies contracting with DWR for SWP water would repay over 90 percent of the costs of the

SWP facilities, including the State's share of the cost of the selected facilities which are allocated to water supply. Project costs are also expected to be allocated to nonreimbursable functions such as providing water for water quality, fish, wildlife, and recreation in the Delta, Suisun Marsh, and San Francisco Bay. This arrangement would compensate for nonproject depletions which have reduced the amount of water naturally available to those areas. These costs would not be repaid by the water users. Provisions to this effect are incorporated in Senate Bill 346.

Implementing the Program

In addition to the advance planning, feasibility, and environmental reports and the preparation of designs and specifications that are necessary before any component goes to construction, there are a number of institutional and legislative actions that should be taken.

The SWP and the federal CVP both supply water to and export water from the Delta, but they currently operate to different water quality standards.¹ It is physically impossible to separate their operations or operational effects, and both projects feel the effects of salinity intrusion and share other operations problems. Thus, Delta protection can only be achieved through State and federal participation in any facilities for transporting water across the Delta and correlative facilities for distributing water within the Delta and the Suisun Marsh. Furthermore, since

¹ See discussion of recent Supreme Court decision, *California v. U.S.*—U.S.L.W. 4997 (July 3, 1978) in Chapter II.

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under California law both projects have equivalent water rights and priority obligations to protect the Delta ahead of exports, federal participation necessarily extends to the operational aspects of the project.

An important element for guaranteeing fair and equitable Delta protection would be congressional legislation, or other federal arrangements, authorizing and obligating federal participation in Delta facilities and protective measures. These should include: (1) compliance with identical water quality standards in the Delta;¹ (2) execution of contracts for water quality and water supply with willing Delta water users; (3) completion of a fish and wildlife agreement to protect the Delta and Suisun Marsh; and (4) completion of a coordinated operation agreement for the SWP and the CVP. These actions should be conducted concurrently with the planning, environmental, and design studies for the recommended plan and ideally should precede construction of the Peripheral Canal.

All of the foregoing concepts are embodied in State Senate Bill 346. One of the main purposes of this bill is to provide a clear expression that California's elected representatives support the Department's program to resolve the Delta controversy and provide water for the federal and State projects. Pas-

sage of Senate Bill 346 would show the Federal Government that California agrees on its water future and that USBR cooperation and assistance are needed.

After the many months of restudy and numerous public hearings by both the Department and the Legislature, it is time to begin implementation. Senate Bill 346 notwithstanding, the first steps have been taken to implement the program. As a result of the Special Task Force Report on the (federal) San Luis Unit, and meetings between Secretary of the Interior Andrus and Governor Brown, the Federal Government has now indicated a willingness to do its share in protecting the Delta. When applied to the Delta, the recent Supreme Court decision¹ holding that the Bureau must comply with conditions in water rights permits that are not in conflict with congressional directives will require the Bureau to comply with the same Delta protection conditions required of the State.

Negotiations toward the specific nature and extent of federal participation are in progress. DWR has taken the initial steps toward implementing the ground water storage plan and the interim protective facilities for the Suisun Marsh, and has begun work toward the necessary geologic exploration and feasibility reports for the storage reservoirs in the program.

¹ In view of the recent Supreme Court decision (*California v. U.S.*—U.S.L.W. 4997 (July 3, 1978)) the requirement for federal legislation may not be needed for compliance with identical water quality conditions, but other actions may require Congressional concurrence.

¹ *California v. U.S.*—U.S.L.W. 4997 (July 3, 1978). See Chapter II for discussion.

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*Smith River at the confluence of the North Fork and Middle Fork.
This river, within the North coast of California, is included
in the State's Wild and Scenic Rivers Act (1972).*

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CHAPTER II. BACKGROUND

"Pipe the Water to the People" could be the title of a large chapter in California's water development book.

Through interbasin transfer systems, the Owens Valley supplies Los Angeles, the Colorado River supplies the South Coastal Plain and the Imperial Valley, the Sierra Nevada supplies San Francisco and the East San Francisco Bay area, the Eel River supplies the North Bay area, and the Trinity River supplies the Sacramento Valley. Reservoirs in the mountains and foothills provide long-term supplies to scores of smaller towns (and agricultural entities) throughout the State. Imported supplies usually supplement local surface and ground water. As the State has grown, larger storage works and longer conveyance systems have been built to meet the growing requirements for water. Some 4,000 separate organizations now exist in California to supply the State's water needs.

The two largest water supply systems within California, the CVP and the SWP, impound water north of the Delta and release it for use in the Sacramento Valley and the Delta. Regulated supplies, together with unregulated flows not needed for water supply and salinity control in the Delta, are diverted from the Delta for use south and west of the Delta. Thus, the Delta is the focal point of California's water industry and an area subject to enormous environmental and political pressures. This chapter presents a brief history of water development in the State and the Delta, and retraces the years of planning for a Delta facility.

The California Water Picture

California has been faced with the problem of how best to control, protect, conserve, and develop its most vital resource—water. This subject was a matter for discussion at the first meeting of the State Legislature in 1850. The continued growth of the State's population, industry, and agriculture has served to compound the planning considerations that must be faced in arriving at balanced solutions to the problem. Plans for water resources development within the State must recognize the diverse needs that exist and show both imagination and foresight in meeting them.

California is a land of contrast. Its 40 million hectares (100 million acres) include both the highest and lowest elevations in the contiguous United States. Its northern and southern borders are separated by 10 degrees of latitude, its eastern and western extremities by 10 degrees of longitude. The climate ranges from subtropical to alpine. Annual precipitation varies from less than 50 millimetres (2 inches) to more than 2500 millimetres (100 inches), and floods and droughts occur often, sometimes in the same year. California has large, heavily populated cities and vast

desolate areas. Highly productive agricultural developments are located in arid and semiarid regions of the State. Most of the State's population lives in areas close to the sea coast and remote from abundant water supplies. These contrasts are responsible for most of California's water problems. To a large extent, they have determined the scope and direction of the water development planning effort in the State.

California's basic water problem is not one of inadequacy. Rather, it is one where natural supplies do not occur at the right time or place to meet requirements. The State's average annual runoff exceeds its present and estimated future requirements by a wide margin, but most runoff comes during winter and spring when needs are at a minimum. Also, the major sources of water are in Northern California, while the major urban and agricultural lands are in the central and southern portions of the State. Great distances and rugged mountains intervene between the source areas and areas of demand. About 70 percent of the total streamflow occurs north of the latitude of Sacramento, while 80 percent of the ultimate consumptive water requirements lie south of that line. The large variations of runoff from year to year are another part of California's water problem. The typical pattern consists of a dry period of several years followed by one or more years of above-normal runoff. Years of average runoff are the exception rather than the rule.

Adjusting the water distribution problem in time and place is the heart of California's water development program. Winter flows are stored in reservoirs for use during the summer growing season, and the excess runoff of wet years is captured for use during drought periods. To a certain extent, this is accomplished naturally. Snow accumulates in the mountains during the winter, and it melts and produces streamflow during the ensuing spring and summer months. Huge quantities of runoff are stored in ground water basins and serve as a natural mechanism for ironing out the irregularities and discrepancies in water supply. Over the years, these ground water reservoirs have furnished a major part of California's water supplies. Some of the largest and most productive ground water reservoirs are located in the San Joaquin Valley and in Southern California. Unfortunately, many have been heavily exploited to the point where extractions exceed replenishment, creating a condition of overdraft.

Early Development

The record of water development in California dates back to the latter part of the 18th century when Spanish missionaries diverted water from streams to irrigate crops in the valleys of Southern California.

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The gold rush of 1849 gave impetus to water development, and many ditches were constructed in the Sierra Nevada for placer mining. Some of these ditches were later used for irrigation and power, and some of them are in use even today.

Until the present century, water developments in the State generally were accomplished by individuals or companies. As California grew and the need for water increased, private initiative was followed by community enterprises, irrigation districts, public utilities, and municipal projects of steadily increasing size and complexity. The metropolitan centers, Los Angeles, San Francisco, and the Oakland area, were leaders in developing projects to import water.

Before the 1920's, water development planning in California was conducted primarily by local entities to solve local problems. These plans were conceived and executed without the benefit of a statewide framework to provide guidance and coordination.

In 1921, the State Legislature authorized the State's water officials, then in the Department of Public Works, to conduct a statewide water resources investigation. The Department made several reports to the State Legislature during the next 10 years and in 1931 submitted a report on the "State Water Plan". The plan provided for a transfer of surplus water between the north and south portions of the Central Valley, and served as the basis for the present federal Central Valley Project.

The Federal Central Valley Project

In 1933, two years after the original State Water Plan was presented to the California Legislature, the Legislature passed the State Central Valley Project Act to implement the CVP, the initial feature of the State Water Plan. After passage of the bill, it was placed before the voters of the State in a special election held on December 19, 1933, and won the voters' approval. State funds to begin construction could not be obtained, however, because the nationwide depression made the revenue bonds unmarketable. Consequently, arrangements were made for federal authorization and financing of the CVP, first administratively, and later under the Rivers and Harbor Act of 1937. The project was authorized to improve navigation, regulate the flows of the San Joaquin and Sacramento Rivers, control floods, store water, reclaim arid and semiarid lands, and generate electric energy.

The authorizing act declared that the dam and reservoirs "shall be used first for river regulation, navigation and flood control; second for irrigation and domestic uses; and third for power". Salinity control in the Delta was not specifically listed as a project purpose, although a 1954 reauthorization did add as a purpose, "the use of waters thereof for fish and wildlife purposes, subject to priorities as are applicable under previous acts".

A principal function of the CVP is to transport wa-

ter from the Sacramento, Trinity, American and San Joaquin River basins to the water-deficient areas of the Sacramento and San Joaquin Valleys (see Figure 10). The key water supply feature is Shasta Reservoir on the Sacramento River. Water stored here is first used to generate power—as at most CVP reservoirs—and then flows south in the natural channel of the Sacramento River toward the Delta. Diversions from Trinity Reservoir also flow in the Sacramento River to the Delta. Water conserved by the Friant Division is transported to the Tulare Basin via the Friant-Kern Canal and to the San Joaquin Basin via the Madera Canal.

At Red Bluff a diversion dam diverts water from the Sacramento River to the Corning Canal and the Tehama-Colusa Canal to irrigate lands in Tehama, Glenn, Colusa, and northern Yolo counties. In addition, numerous CVP water users divert their supply directly from the Sacramento River.

Thirty-two kilometres (20 miles) east of Sacramento, American River water is stored in Folsom Reservoir for use in the Folsom-South service area and for release into the Sacramento River upstream of the Delta.

Forty-eight kilometres (30 miles) south of Sacramento, the Delta Cross Channel serves as a controlled diversion channel between the Sacramento River and the Mokelumne River at the north edge of the Delta. In conjunction with Georgiana Slough, a natural channel, the Cross Channel directs Sacramento River water across some 48 kilometres (30 miles) of Delta to the Rock Slough Intake to the Contra Costa Canal and to the export pumps near Tracy, while improving the quality of irrigation supplies in the central Delta.



The Delta Cross Channel - the diversion upstream from Walnut Grove that routes Sacramento River water to the central Delta via the Mokelumne River.

From Rock Slough in the southern Delta, the CVP supplies water to the Contra Costa Canal, the first unit of the CVP to become operational (1940). This canal extends westerly 77 kilometres (48 miles) along the south shore of Suisun Bay to Martinez, transporting water from the Delta for municipal, industrial, and irrigation uses.

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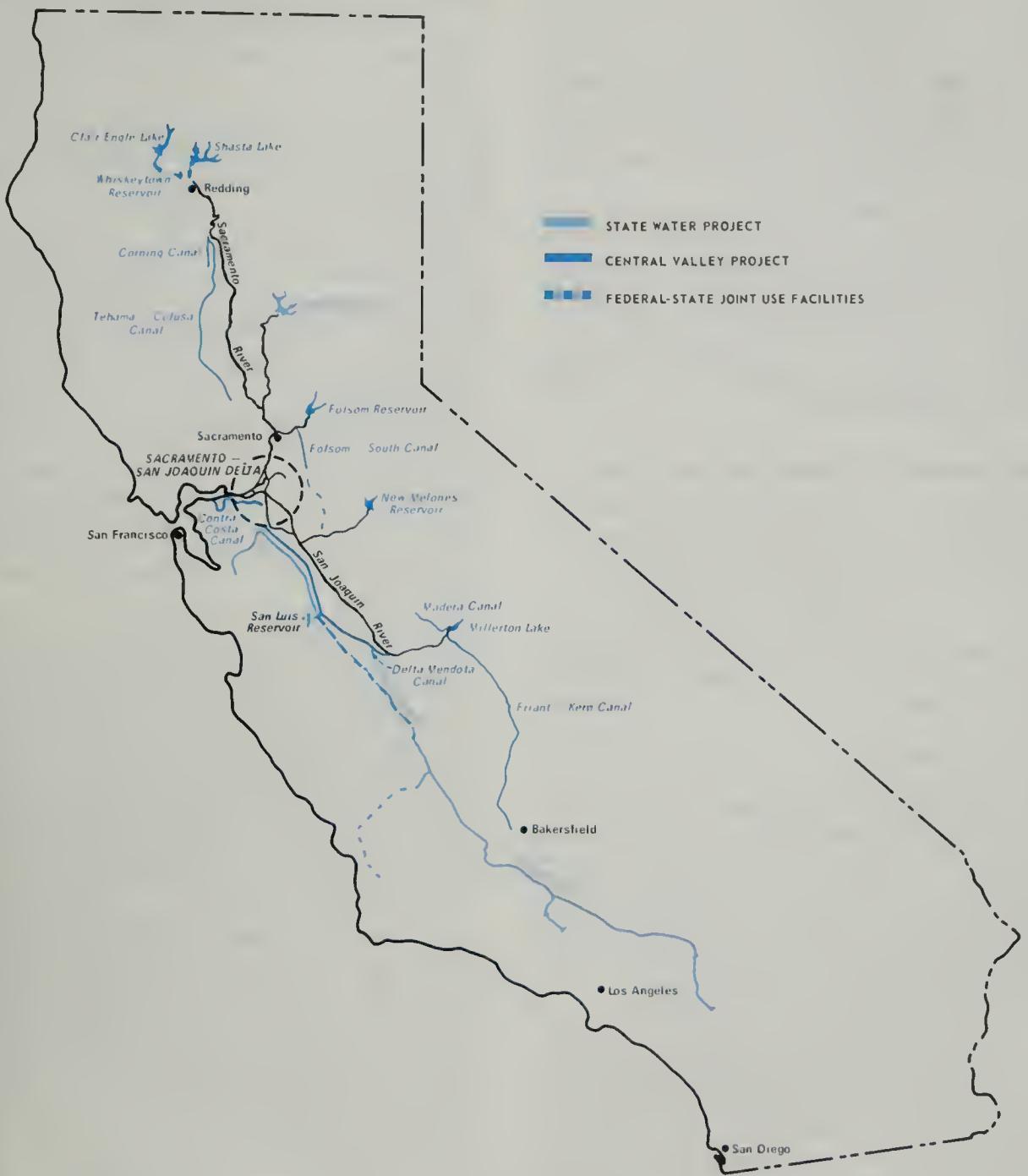


Figure 10. Major features of the Central Valley Project.

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The six pumps of the federal Tracy pumping plant lift as much as 130 cubic metres per second (4,600 cubic feet per second) 60 metres (197 feet) into the Delta-Mendota Canal, which delivers water to the lower San Joaquin Valley as far south as 188 kilometres (117 miles) into the San Joaquin River at the Mendota Pool. There it replaces a portion of the natural flows of the San Joaquin River that are stored by Friant Dam and Reservoir in the Sierra Nevada foothills northeast of Fresno. Friant water is distributed north and south at these higher elevations by the Madera and Friant-Kern Canals.

About 96 kilometres (60 miles) south of the Delta, between the Delta and the Mendota Pool, is the federal-State, joint-use San Luis Dam and Reservoir, an off-stream storage facility of the CVP and the SWP. Water diverted from the Delta via both the Delta-Mendota Canal (CVP) and the California Aqueduct (SWP) is pumped into San Luis Reservoir during the winter and early spring for release to service areas during the summer and fall.

The California State Water Project

Planning for the SWP began after World War II. It was stimulated by the unprecedented growth and development of California and the corresponding increase in the need for water. At that time the State's Division of Water Resources conducted two programs. One concentrated on collecting basic data and developing a statewide water plan, the California Water Plan. The other considered a specific project as a State-constructed portion of the plan, the State Water Project.

In regard to the latter, Mr. A. D. Edmonston (State Engineer, 1950-1955) presented the first complete report on the Feather River Project in May 1951. This report proposed a multiple-purpose dam and reservoir on the Feather River near Oroville complete with power plant, an afterbay dam and power plant, a Delta cross channel, an electric power transmission system, an aqueduct to transport water from the Delta to Santa Clara and Alameda Counties, and an aqueduct to transport water from the Delta to the San Joaquin Valley and Southern California.

The proposed project was authorized by the Legislature in 1951 under the State Central Valley Project Act. It was designated "The Feather River and Sacramento-San Joaquin Delta Diversion Projects". Under the State Central Valley Project Act, the Division of Water Resources was authorized to continue necessary investigations, surveys, and studies, including the preparation of plans and specifications for the construction of the authorized works, and to submit its plans to the then Water Project Authority for approval.

The Division of Water Resources continued its studies and investigations and, in 1955, after approval by the Water Project Authority, submitted another

report to the Legislature on the proposed Feather River Project.

The 1955 report showed that the project had engineering and financial feasibility and recommended that the Legislature appropriate funds to start construction. The report also recommended adding San Luis Reservoir on the west side of the San Joaquin Valley.

During late 1955 and early 1956, Northern and Central California were subjected to the greatest flood in the area's history of recorded streamflow. The intense flood-producing precipitation occurred over 60 percent of the area of the State.

Also in 1956, the Legislature took an important step to further the development of the State's water resources program. It provided for a reorganization of the water agencies of State Government. Effective July 5, 1956, the State Department of Water Resources was created by act of the Legislature (Chapter 52, Statutes of 1956, First Extraordinary Session, see Water Code Sections 120-127). The new department was created by transferring to it all the functions of the Water Project Authority and the functions of the Division of Water Resources of the Department of Public Works, except those relating to the appropriation of water and the determination of water rights, which were vested in a new State Water Rights Board (now the State Water Resources Control Board).

Construction funds for the SWP were first made available to the Department in 1957, when the Legislature, in reacting to the floods of the previous year, appropriated over \$25 million in state tidelands oil revenues to initiate relocation of highways and railroads around the Oroville reservoir site. Year-to-year appropriations were made through 1960, to permit continuation of Oroville relocations and to permit initial construction of the South Bay and California Aqueducts in 1959. Eventually, about \$103 million of project expenditures were financed by special legislative appropriations.

An assured source of project funds was established when the Legislature enacted the California Water Resources Development Bond Act (Burns-Porter Act) in 1959 and the California voters approved it in November 1960. The Act authorized issuance of \$1.75 billion in general obligation bonds, backed by the State's credit, and appropriated all moneys in, and accruals to, the California Water Fund for the construction of the SWP.

SWP facilities extend from Plumas County in the north to Riverside County in the south (see Figure 11). The 1959 Bond Act includes, as part of the SWP, Delta facilities "... for water conservation, water supply in the Delta, transfer of water across the Delta, flood and salinity control, and related functions ...". The State has contracted to deliver an ultimate 5.22 cubic kilometres (4.23 million acre-feet) of water annually to service areas in Northern, Central, and Southern California (a list of the individual contract-

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Figure 11. Major features of the State Water Project.

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Fish screening facilities at the intakes to the SWP Delta (left) and CVP Tracy (right) Pumping Plants. With water in the adjacent channels flowing toward the export pumps, fish have a difficult time avoiding the pumping plants and must be screened out. Large fish are screened out completely but the louvre screens are not as efficient in screening small fish. Those that are screened out are collected and transported in tank trucks to the western Delta. Some of those not screened survive and grow to adulthood to form a significant fishery in the aqueduct systems as shown below.

Recreationists enjoy a newly-created source of lake fishing at Pyramid Lake, an off-stream storage reservoir on the California Aqueduct. The striped bass in the hands of a happy angler made a long journey down the California Aqueduct from the Delta.



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ing agencies and their maximum contractual entitlements are shown in Chapter IV). However, to meet these contract entitlements, additional facilities will be required. The 715-kilometre (444-mile) California Aqueduct is the principal water transportation facility of the project, which now includes 20 dams and reservoirs, 5 power plants, 17 pumping plants, and an additional 161 kilometres (100 miles) of branch aqueducts.

Water released from the main storage facility, Lake Oroville, flows through an underground hydroelectric power plant, through the Thermalito Afterbay, down the Feather River into the Sacramento River, and then into the network channels of the Sacramento-San Joaquin Delta.

Near the northern edge of the Delta, the North Bay Aqueduct, scheduled for completion before 1990, will deliver water to Napa and Solano Counties. Interim facilities presently operated by the State serve water to Napa County with water made available by the USBR's Solano Project.

At the southern edge of the Delta, 24 kilometres (15 miles) southwest of Stockton and 16 kilometres (10 miles) northwest of Tracy, are the Clifton Court Forebay, the Delta Fish Protective Facility, the intake channel to the Delta Pumping Plant, and the Delta Pumping Plant.

The Clifton Court Forebay serves as a water-regulating reservoir ahead of the SWP Delta Pumping Plant. It insures the reliability and flexibility of pumping project water at the Delta Pumping Plant. It allows a substantial portion of the pumping requirement of the California aqueduct system to be accomplished at night and other times when the cost for power is less expensive (termed off-peak pumping). It also allows diversion from the Delta to be adjusted to coincide with favorable tide conditions.

The Delta Fish Protective Facility is built directly across the intake channel to the Delta Pumping Plant. The entire intake flow to the pumps passes through the primary channel of the Fish Protective Facility. The main purpose of the protective facility is to prevent floating debris and fish from being carried into the pumps.

At the Delta Pumping Plant, water is lifted 74 metres (244 feet) into the California Aqueduct. The South Bay Aqueduct branches at this point and delivers water as far west as San Jose. Water is conveyed by the California Aqueduct to the San Joaquin Valley and Southern California. A future addition is planned to serve the Central Coastal Area.

The Changing Delta

The Delta is essentially a 2800-square-kilometre (1,100-square-mile) farm divided into over 60 islands and tracts by 1100 kilometres (700 miles) of waterways (see Figure 12). Cities, industries, freeways, and railroads surround the Delta but relatively few people live in the heart of the Delta.

The land is flat. Much of it is between 1.5 metres (5 feet) above and 6 metres (20 feet) below sea level. This area is known as the Delta lowlands. With few exceptions, the towns and orchards are located above the 1.5-metre (5-foot) contour. Although originally agricultural, these upland areas, particularly in the western Delta, have undergone steady industrialization and urbanization.

To a large degree, today's Delta is an environment of human origin with an introduced ecology that is artificially maintained. In 1850, the year California became a state, the Delta was still a natural tidal marsh overlying a deep peat bog, but the transformation had begun before statehood.

The Delta began to change in 1830 when trappers discovered and then began to trap the large beaver and otter populations. Market hunters killed and sold elk, antelope, bear, deer, and waterfowl harvested in the Delta. By 1849, most of the trees had been felled to fire the boilers of steamboats carrying miners to the gold fields.

In 1851, people began to modify the land itself. Delta farms were created by building levees to protect the land from tides and floods, burning off the tules and drying the peat, and cultivating the soil. Intensive farming led to the disappearance of most large wild animals (deer, antelope, bear, elk) from the Delta. The levees built to withstand high tides were no match for California floods and the mining debris brought down from the placer mines. As levees were built higher and higher, using steam-powered equipment to dredge material from channel bottoms, the land inside them was sinking. Peat soil, baked by the sun, burned and tilled by humans, oxidized by the air, and eroded by the wind, is now as much as 6 metres (20 feet) below sea level. Seepage through or under levees resulting from hydraulic pressure plagues many islands and has to be pumped back to the channels. Most islands have been flooded at least once due to levee failure.

As land use changed, so did the use of the Delta's waterways. Channels that once echoed to the passage of hundreds of steamships carrying passengers and cargo between dozens of Delta ports and to San Francisco now serve as water supply conduits, drains for unwanted wastes, habitat and migration paths for fish, avenues for the passage of flood waters, and playgrounds for recreationists. Deep channels now serve as passageways for commercial ships passing between the ports of Sacramento and Stockton and the Pacific rim ports.

Natural gas pumped from beneath the Delta is sometimes listed as one of the Delta's most valuable resources, but fresh water may be its most precious resource. All the unused runoff, reservoir releases, and return flows from the Central Valley streams pass through the Delta on their way to the ocean. The Delta is the principal source of water for Delta uses and for export by the state and federal water projects.

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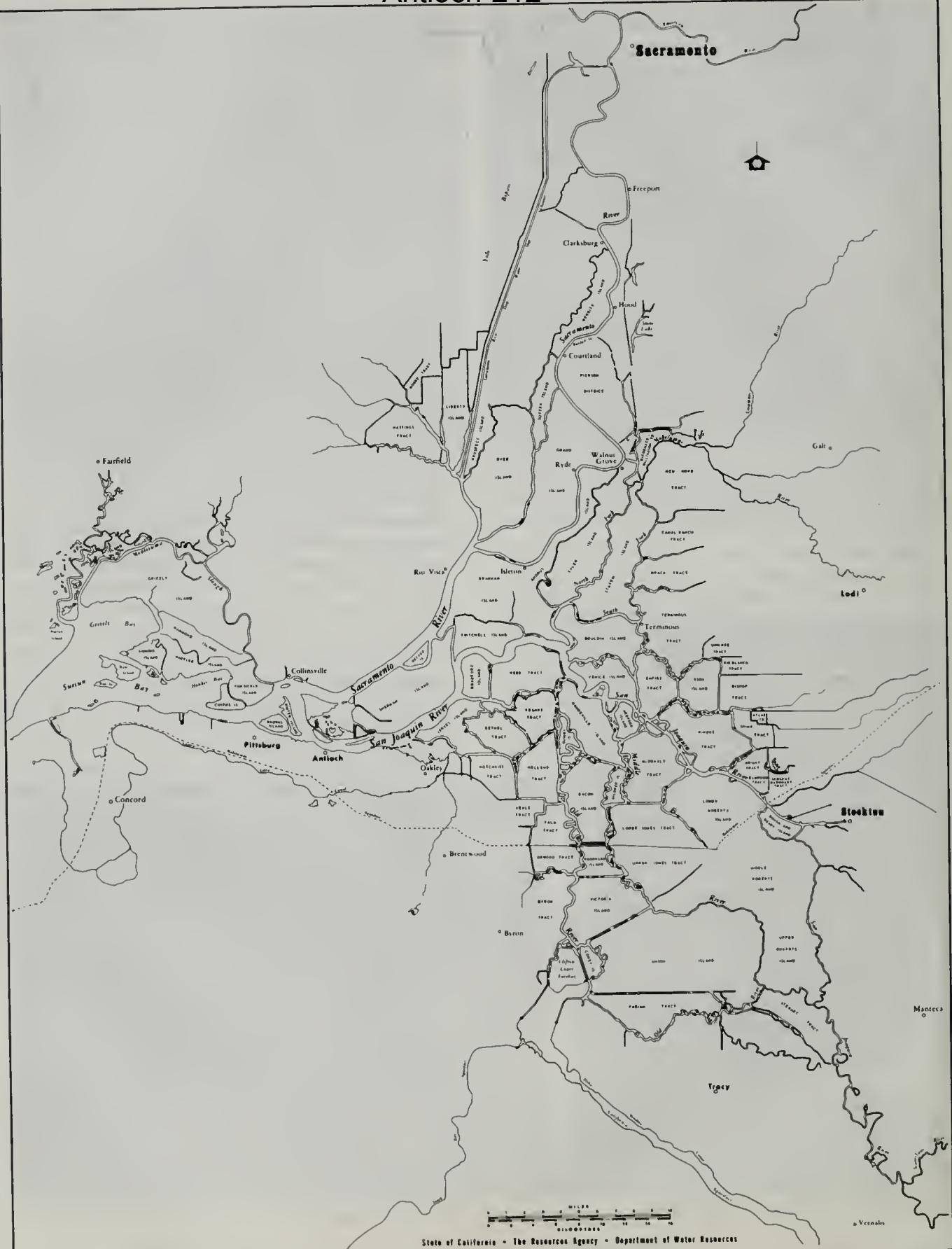


Figure 12. Sacramento-San Joaquin Delta.

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Because the Delta is open to the San Francisco Bay complex and the Pacific Ocean and its channels are below sea level, it never has a shortage of water. If the inflow from the Central Valley is insufficient to meet the consumptive needs of the Delta, saline water from the bay fills the Delta from the west. Thus, the local water supply problem in the Delta becomes one of poor water quality, not insufficient quantity. Today degradation by agricultural, municipal, and industrial waste discharges in the San Francisco Bay-Delta area compounds the problem.

Since the Delta's supply of *usable* water depends on the magnitude of Delta outflows, whatever affects these outflows affects the Delta's water supply. During the 24-year period from 1920 to 1944, there were 7 years of severe salinity intrusion in the interior Delta. As the use of water upstream and export from the Delta has steadily increased, average annual Delta outflow has been steadily reduced. However, since 1944 the CVP, and more recently the SWP, storage reservoirs in Northern California have provided supplemental water to augment the Delta outflows needed to repel ocean salinity during low flow periods. Salt water is generally controlled to the western Delta to protect the quality of water at the export pumps and in accordance with applicable water quality standards. However, in 1976 and 1977, rainfall and snowmelt reaching the Delta fell to unprecedented low levels and water available for both salinity control and export was reduced.

History of Planning for a Delta Facility

The first proposal for a Delta water facility, a physical barrier, was made in the 1860's by the early settlers of California who recognized salinity intrusion as a potential problem to water supplies. In 1879-80, State Engineer William Hammond Hall studied a barrier in conjunction with flood control and concluded that, while a physical barrier could be constructed, the costs would exceed the benefits.

Water resources planning studies during the 1920's and 1930's pointed out the need for large-scale transfers of water from north to south to meet the growing needs of California. The Delta was recognized as a natural location to which surplus Northern California river flows and developed supplies would flow via the Sacramento River and other river channels. These waters could then be diverted from the Delta and pumped into canals and offstream storage reservoirs for use in the areas of deficiency south and west of the Delta.

Studies again concluded that a physical barrier was not economically justified and that, with conditions of upstream development at that time, the most economical solution for controlling salinity intrusion and providing the desired water supplies would be achieved by constructing upstream storage reservoirs. These reservoirs would store surplus winter and spring flows for release during periods of low

natural summer flows for diversion from the Sacramento River and the Delta and to maintain a freshwater outflow from the Delta to control salinity intrusion (a hydraulic barrier).

Shasta Reservoir on the Sacramento River was constructed by the USBR as an outgrowth of early State planning efforts and began operation in 1944. Although Delta protection is not acknowledged as a specific project purpose by the Federal Government, releases from the CVP reservoirs (in coordination with Oroville Reservoir of the SWP since 1968) have provided an effective control over salinity intrusion in the western Delta since 1944.

In the 1950's projected expanding water uses in the State stimulated reconsideration of physical barriers, hydraulic barriers, and other plans for solving salinity intrusion, water conservation, and related purposes in the Delta. In 1960, the Burns-Porter Act included Delta facilities as part of the SWP for water supply and other functions, including salinity control. In December 1960, DWR published the preliminary edition of Bulletin 76, which recommended the "Single Purpose Alternative", a version of the Waterway Control Plan, as part of the SWP. Subsequent public hearings before the California Water Commission disclosed much opposition to the plan, and it was never adopted.

Several other plans were advanced by governmental agencies and interest groups to solve specific problems, but none offered a comprehensive integrated plan to resolve all the problems of the Delta as a whole. This led to formation of the Interagency Delta Committee (IDC) in September 1961, which was assigned the task of defining a plan that would be mutually acceptable to the member agencies and which would also meet the objectives of Delta water uses and water transfer. The IDC was comprised of representatives from DWR, USBR, and USCE. Advice on fish and wildlife needs was supplied by DFG.

The IDC proposed and, after holding public hearings, adopted a set of functional objectives for a Delta facility. These objectives involved water quality and transfer, local water supply, fish and wildlife, recreation, flood control, seepage and drainage control, navigation, and vehicular transportation. Then the IDC developed a Peripheral Canal concept as the recommended Delta transfer facility and transmitted a proposed Plan of Development in the Delta to the California Water Commission in September 1964 for review and comment. The plan centered on the Peripheral Canal concept but also included several other components:

1. Peripheral Canal, including releases for water quality control.
2. Kellogg Project, consisting of three reservoirs and about 35 kilometres (22 miles) of canal for the purpose of increasing the quality and quantity of water available to Contra Costa County through the Contra Costa Canal.

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3. Western Delta Agricultural Water Facilities consisting of overland water supply facilities to substitute for diversions from Delta channels.
4. Southern Solano County Water Facilities to provide municipal, industrial, and agricultural water supplies to presently undeveloped lands of southern Solano County.
5. Delta Levee and Bank Protection Project, to provide a minimum of 50-year flood protection to the Delta islands.
6. Stockton Deep Water Channel Improvement Project.
7. Suisun Marsh Management Program.
8. Suisun Marsh Recreation Facilities, to provide access to recreation and hunting facilities for the Suisun Marsh area.
9. Delta Game Management Areas.

Review was made of all the comments on the proposed report. In January 1965, the committee published its final report which recommended the Peripheral Canal concept as the best alternative for adaptation to the full range of water-associated needs in the Delta while meeting the water transfer requirements of the state and federal water projects.

The USBR prepared a feasibility report on the Peripheral Canal as an additional unit of the CVP (a prerequisite to securing Congressional authorization) and the Secretary of the Interior submitted it as his draft report to interested agencies for review and comment in July 1969. The project was to be a CVP-SWP joint-use facility with costs shared equally.

On April 28, 1970, the Secretary for Resources forwarded the official State comments to the Secretary of the Interior. He recommended Congressional authorization and funding of the Peripheral Canal, contingent on certain protective measures for the Delta and Suisun Marsh.

In 1974, DWR released a draft Environmental Impact Report (EIR) on the Peripheral Canal. The elapsed time and changing conditions since 1965 and the controversy generated during preparation and review of the State EIR led to this reanalysis of Delta alternatives.

Legal Aspects

A long and complex listing of legislation and court cases relate to this review of Delta alternatives. The key statutes and cases are discussed in the following paragraphs.

Statutory Framework

A number of statutes have been enacted by the State and Federal Governments which are directed specifically to the Delta or applicable to activities that affect the Delta. State laws make it clear that reasonable, beneficial uses of water in the Delta have priority over diversions of the state and federal projects for export from the Delta. The extent to

which State law applies to the USBR in its operation of the CVP is dependent on the application of the recent Supreme Court decision¹ construing federal reclamation laws to the situation in the Delta. The extent of CVP obligations to protect the Delta under other federal law is unclear and dependent on legislation that Congress may enact.

Additional Facilities, SWP. The Burns-Porter Act provides that the State Water Resources Development System shall include, in addition to the initial State Water Facilities, additional facilities that may be authorized by the Legislature, or DWR, to augment water supplies in the Delta and to meet local needs including flood control. These facilities may consist of multiple-purpose dams, reservoirs, aqueducts, and appurtenant works in the watersheds of the Sacramento, Eel, Trinity, Mad, Van Duzen, and Klamath Rivers.

Wild and Scenic Rivers. The Klamath, Trinity, and Smith Rivers and the undeveloped portions of the lower American River and the North Fork of the American River have since been included in the California Wild and Scenic Rivers System.² Large storage reservoirs cannot be built on the rivers included in the System. The Eel River is also included in the System, but with a special provision for a report by DWR by December 1984, followed by legislative hearings, to determine if any portion of the Eel River should be eliminated from the System.

Delta Protection. The Delta Protection Act³ was enacted in 1959 at the same session of the Legislature at which the Burns-Porter Act was adopted. Section 12201 of the Delta Protection Act recognizes both the needs of the Delta and the needs for exportation of water from the Delta to other parts of the State.

"12201. The Legislature finds that the maintenance of an adequate water supply in the Delta sufficient to maintain and expand agriculture, industry, urban, and recreational development in the Delta area as set forth in Section 12220, Chapter 2, of this part, and to provide a common source of fresh water for export to areas of water deficiency is necessary to the peace, health, safety and welfare of the people of the State, except that delivery of such water shall be subject to the provisions of Section 10505 and Section 11460 to 11463 inclusive, of this Code."

Water Code Sections 12202 to 12204 make it clear that the first priority is the satisfaction of the reasonable needs for water in the Delta, provided that payment is made for benefits from the project. The Delta needs protected by this Act include consumptive

¹ *California v. U.S.—U.S.L.W.*, 4997 (July 3, 1978).

² Section 5093.54 of the Public Resources Code.

³ Part 4.5 (commencing with Section 12200) of Division 6 of the California Water Code.

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uses such as agricultural, municipal and industrial use, and in-place requirements such as those for fish, wildlife, recreation, and other environmental values.

The Delta water users, however, are required to pay for benefits they receive from the SWP. The Burns-Porter Act¹ provides that:

"The Department subject to such terms and conditions as may be prescribed by the Legislature shall enter into contracts for the sale, delivery or use of all water or power, or for other services or facilities, made available by the State Water Resources Development System . . ." (Section 12937 of the Water Code).

Additional authority requiring repayment for benefits furnished by the SWP is contained in the State Central Valley Project Act.² For example, Water Code Section 11462 specifically states that provisions of the Watershed Protection Act ". . . shall not be so construed . . . to require the department to furnish to any person without adequate compensation therefor any water made available by construction of any works by the Department." Benefits from federal projects that are not specifically identified as being nonreimbursable must also be paid for by the beneficiaries.

Fish, Wildlife, and Recreation. The Legislature has established and implemented the policy that preservation and enhancement of fish and wildlife are to be accomplished by the SWP.³ In planning water development projects, DWR must give full consideration to all beneficial uses of the State's water resources. These include irrigation, generation of electric energy, industrial consumption of water and power, control of salinity intrusion, preservation of fish and wildlife resources, and recreation facilities.⁴

The California Environmental Quality Act.⁵ CEQA establishes a strong public policy for the preservation and enhancement of the State's environment. It also provides that environmental factors should be considered in planning and feasibility studies.⁶ Any facilities to be constructed by or under the authority of the State or one of its political subdivisions requires the preparation of an environmental impact report if the facilities have a significant effect on the environment.⁷

The National Environmental Policy Act.⁸ NEPA contains a strong federal commitment to preserve and enhance the human environment. It provides for preparation of an environmental impact statement for facilities constructed by the Federal Government or its licensees where there would be an impact on the environment. The Bureau of Reclama-

¹ Water Code Section 12937(b)

² Sections 11454, 11455, and 11462 of the Water Code

³ Chapter 10 (commencing with Section 11900) of Part 3 of Division 6 of the Water Code

⁴ Section 12581 of the Water Code

⁵ Division 13 (commencing with Section 21000) of the Public Resources Code

⁶ Section 21102 of the Public Resources Code

⁷ Section 21109 of the Public Resources Code

⁸ 42 U.S.C. Section 4321 et seq.

¹ Water Code Section 13263(g)

² Water Code Sections 10505 and 11460 to 11463

³ Water Code Section 12931

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tion stipulated in a suit¹ that to the extent that contracts covering the operation of the SWP and the CVP significantly affect the environment, an EIS under federal law is required. In a case requiring an EIR and an EIS, both requirements can be satisfied by one document prepared jointly by the State and federal agencies, provided the document meets the requirements of both CEQA and NEPA.

Delta Water Quality Standards

Water quality standards for the Delta are established in two ways:

1. By conditions in water rights permits issued by the SWRCB, and
2. By water quality plans developed by Regional Water Quality Control Boards², adopted by the SWRCB, and approved by the Environmental Protection Agency (EPA).

While these standards are applicable to operation of the SWP, there was, until the recent Supreme Court decision,³ substantial controversy as to the applicability of both processes to the USBR in the operation of the CVP. Review of the actions of the SWRCB concerning water rights is necessary to understand the litigation on this subject. This review also summarizes the water rights now available for the State and federal projects. Chapter III discusses the specific water quality criteria and the related water requirements for meeting them.

Water Rights for SWP and CVP. Applications to appropriate unappropriated water for both the SWP and for the CVP were originally filed by the State Department of Finance in 1927 under the authority of Water Code Section 10500 ("State Applications"). Applications for the SWP were assigned to DWR and those for the CVP to the USBR. The USBR also filed a number of additional applications in its own behalf.

Commencing in 1959, the State Water Rights Board, a predecessor of the SWRCB, held hearings on the principal applications for the CVP including those to store water in Lake Shasta and to divert and redivert water from the Delta. In 1961, that Board issued Decision 990 which ordered issuance of permits to the USBR, but reserved jurisdiction to fix at a future date the requirements for salinity control in the Delta and coordinated operation of the CVP and SWP systems. During the next several years permits were issued to the USBR on applications for other features of the CVP with a similar reservation of jurisdiction.

In 1966, hearings were commenced on applications for the SWP to store water in Lake Oroville and

the San Luis Reservoir, and to divert and redivert water from the Delta. In 1967, the Board issued Decision 1275 and amended it by Decision 1291, which together approved permits to DWR with a reservation of jurisdiction on salinity control and coordinated operation similar to the reservation in Decision 990. Jurisdiction in regard to fish and wildlife requirements in the Delta was also reserved.

Water rights permits pursuant to Decision 1275 and 1291 were issued to DWR in 1972. These permits include a provision limiting the storage or direct diversion⁴ of water for the project in April, May, and June unless a quality of 250 milligrams per litre (250 parts per million) or less of chloride is maintained at Blind Point in the western Delta. No similar condition has been included in permits on CVP applications.

In 1969, the SWRCB commenced hearings to determine the degree of salinity control required in the Delta under the reservation of jurisdiction in all of the permits for the SWP and the CVP. On July 28, 1971, the Board issued Decision 1379 establishing water quality criteria in the Delta to be met by the two projects.⁵ After a review of State law, Decision 1379 characterizes the protection to be afforded to the Delta as follows:

"The effect of these sections . . . is to give first priority to satisfying all needs for water in the Delta and to relegate to second priority all exports of water from the Delta to other areas for any purpose."

"Of course, statutory policies are subject to the overriding constitutional policy that all uses of water and diversions of water must be reasonable (Calif. Const., Art. X, Sec. 2)." (Decision 1379, p. 13)

"To the extent there is an existing statutory liability for payment for diversions in excess of vested rights . . . it can and should be enforced by appropriate legal action . . . Nowhere does the Board find any California law which provides that the Delta users shall be provided with supplies in excess of their vested rights without payment." (D-1379, p. 15)

In a related matter, in 1970 the Board approved permits to the USBR for the proposed Auburn Project by the issuance of Decision 1356 which included a reservation of jurisdiction to require flows in the lower American River for recreation and for fish and wildlife enhancement. After further hearings, the Board, in April 1972, issued Decision 1400, specifying the flows that must be maintained for those purposes upon completion of Auburn Dam.⁶

¹ Environmental Defense Fund v. Morton, et al. CA 1537-71, S 2259 (6-17-75).

² Water quality plans can be adopted by the State Board, thus eliminating the Regional Board proceeding. This is being done for the Delta (Water Code Sec. 13170).

³ California v. U.S.—U.S.L.W. 4997 (July 3, 1978)

⁴ Rediversion of water released from upstream storage is excluded.

⁵ By Superior Court action, enforcement of D-1379 criteria has been stayed.

⁶ This condition applies to the Auburn water right permits, but does not affect the operation of Folsom under D-893.

Some water users¹ of the SWP and the CVP filed two separate lawsuits challenging the validity of Decision 1379. The court granted a stay of the provision of Decision 1379 pending a final court determination. Federal water contractors also challenged Decision 1400 in the courts. A number of parties intervened and the three cases were removed to Federal Court when one of the intervenors, the Contra Costa County Water Agency, sought to join the United States as a party. The Federal Court in Sacramento has not yet issued a decision as to whether the United States can be joined in the lawsuits or as to whether they should be remanded to state court, but postponed further action pending the decision of *California v. United States*.

Water rights applications for the New Melones Unit, under construction by the USCE for operation by the USBR, were brought to hearing and a decision was issued before construction had proceeded very far. The Board's Decision 1422, issued in April 1973, limits until further order, storage in the reservoir to such quantity as is needed for preservation and enhancement of fish and wildlife, flood control, and such additional water as is needed to maintain a specified level of water quality in the San Joaquin River and to satisfy prior rights at the existing Melones Dam. Since this would be only about one-half the total storage capacity, the white water reaches of the Stanislaus River would be preserved until the storage limitation is lifted.

SWRCB Jurisdiction over CVP. In two related actions (listed below as 5 and 6), the SWRCB and the United States each filed suit to determine whether the CVP is subject to the jurisdiction of the SWRCB under certain circumstances.

The issue of the SWRCB's jurisdiction over operation of the CVP by the Federal Government is also involved in four other cases pending in the federal courts. The first five cases listed below have been held in abeyance while the issue was being litigated in the sixth.

1. **Central Valley East Side Project Association, et al v. SWRCB**
(Filed 10/12/71 to set aside Delta Water Rights Decision 1379)
2. **Kern County Water Agency, et al vs. SWRCB**
(Filed 10/15/71 to set aside Delta Water Rights Decision 1379)
3. **San Joaquin County Flood Control and Water Conservation District vs. SWRCB**
(To set aside Lower American River Water Rights Decision 1400)
4. **Natural Resources Defense Council vs. Stamm**
(To compel operation of Auburn Dam and Fol-

¹SWP water users included Kern County Water Agency, Tulare Lake Basin Water Storage District, Devil's Den Water District, and Dudley Ridge Water District. CVP water users included Central Valley Eastside Project Association, Friant Water Users Association and others.

om South Canal in accordance with SWRCB water rights permits)

5. **People ex rel. SWRCB vs. Morton**
(To compel CVP compliance with SWRCB water rights permits)
6. **United States of America vs. State of California, State Water Resources Control Board**, filed 10/73, United States District Court (Sacramento) CIV S-3014, Declaratory Judgment.
(To declare that the USBR is not subject to SWRCB water rights regulations and to set aside portions of New Melones Water Rights Decision 1422)

This suit arose from conditions imposed by the SWRCB in Decision 1422 on the USBR water rights for the New Melones Dam project. The Bureau sought a declaratory judgment that the State Board does not have the authority to place operational limitations on the project. The dispute centers on whether Section 8 of the Federal Reclamation Act of 1902 gives the states authority to place conditions on federal reclamation projects.

Section 8 reads in part:

"Nothing in this act shall be construed as affecting or intended to affect or to in any way interfere with the laws of any State or Territory relating to the control, appropriation, use, or distribution of water used in irrigation, or any vested right acquired thereunder, and the Secretary of the Interior, in carrying out the provisions of this act, shall proceed in conformity with such laws. . . ." Act of June 17, 1902, 32 Stat. 388, 390.

On October 9, 1975, U.S. District Judge Thomas MacBride held that the United States is not required to comply with the conditions in Decision 1422.¹ He ruled that the United States can appropriate unappropriated water necessary for use in any federal reclamation project in California and need apply to the SWRCB for a determination of the availability of unappropriated water only as a matter of comity. The court further held that the State must grant such applications if unappropriated waters are available and that Section 8 of the Reclamation Act of 1902 does not allow State agencies to impose terms or conditions on such applications. The State appealed the decision to the Ninth Circuit Court of Appeals.

Although the Department was not a party, on April 7, 1976, it filed a friend of the court brief supporting the SWRCB.

On April 1, 1977, the Ninth Circuit Court of Appeals upheld the District Court judgment, substantially for the reasons stated by the District Court. The U.S. Supreme Court granted California's petition for certiorari. Fifteen western states filed friend of the court briefs supporting California's position. The U.S. Supreme Court decided the case, now called *California*

¹403 F. Supp. 874

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v. United States¹ on July 3, 1978.

The Court decided in favor of California. It held that the State may impose conditions on the control, appropriation, use, or distribution of water through a federal reclamation project that are not inconsistent with clear congressional directives respecting the project. It also held that the Bureau of Reclamation can condemn water rights only in conformity with State law.

The Court reviewed the history of water development in the Western United States in the 19th Century and discussed the series of congressional acts, including the Desert Lands Act of 1877,² that recognized State authority over water rights and water development. Its decision rests primarily on a careful analysis of the legislative history of Section 8 of the Reclamation Act of 1902. It concluded:

"The legislative history of the Reclamation Act of 1902 makes it abundantly clear that Congress intended to defer to the substance as well as the form, of state water law. The Government's interpretation would trivialize the broad language and purpose of Section 8."

The Court reviewed three cases affecting water development in California and disavowed as erroneous dicta the statements in those cases to the effect that Section 8 did not require federal compliance with State law. The cases are *Ivanhoe Irrigation District v. McCracken*³ in which the validity of the federal acreage limitation was upheld; *City of Fresno v. California*⁴ involving the city's right to receive water from Friant Dam and *Arizona v. California*⁵ in which rights to the water of the Colorado River were determined.

The Court left two issues undecided since they had not been dealt with by the Court of Appeals. California claims (1) that it is too late for the United States to challenge particular provisions of the New Melones decision and (2) that in any case the conditions in that decision are not inconsistent with congressional directives. The Supreme Court directed the Court of Appeals to determine whether the United States could still attain judicial review of specific conditions and if so, to make a determination, after the taking of additional evidence if necessary, as to whether any of the conditions in the New Melones decision conflict with congressional directives. The majority opinion was delivered by Justice Rehnquist and concurred in by the Chief Justice and four other justices. The dissenting opinion was written by Justice White (joined by Brennan and Marshall).⁶

¹ U.S.L.W. 4997

² 19 Stat. 377

³ 367 U.S. 275, 291-292 (1958)

⁴ 372 U.S. 627, 630-631 (1963)

⁵ 373 U.S. 546, 586-587 (1963)

⁶ Justice White read the major cases involving the Federal Central Valley Project as not requiring compliance with State law in distributing federal project water by reason of Section 8 of the Reclamation Act. To him the majority misinterpreted those rulings by transforming them into "discardable dictum." He found "All of the relevant cases are to the contrary" and "only the revisionary zeal of the present majority can explain its misreading of [the] cases."

Water Quality Control. The Federal Water Pollution Control Act of 1965 and the related provisions of State law provide for the establishment of water quality standards for interstate and coastal waters. Water quality standards for the Delta were adopted by the SWRCB's predecessor, the State Water Quality Control Board (Water Quality Control Policy for Sacramento-San Joaquin Delta, June 1967). These standards were supplemented and modified by Resolutions 68-17 and 73-16 adopted by the SWRCB and were approved by the EPA or its predecessors.

The Federal Water Pollution Control Act amendments of 1972 provide that each state must establish and submit to the EPA water quality standards covering the waters of the United States within its boundaries. In California, this authority was placed with the SWRCB and the California Regional Water Quality Control Boards by the Porter-Cologne Act.¹ The Bay-Delta estuary was covered by water quality control plans for Basin 2 (the San Francisco Bay area) and Basin 5B (the portion of the Central Valley that includes the Delta). These plans have been approved by the SWRCB and EPA and are now in effect. Their provisions are essentially the same as the water quality provisions of water rights Decision 1379. A summary of criteria established for Delta waters that directly relate to water project management is shown in Table 4.

Modifying Water Quality Standards. During its adoption of the water quality standards for the Sacramento-San Joaquin Delta and Suisun Marsh, the SWRCB recognized that changing conditions and operating experience on the SWP and CVP might require revisions or adjustments to these standards from time to time. Actual experience in implementing these standards, and information developed since their adoption, have verified this need. For instance, experience has demonstrated that some existing standards have too limited a scope while others need clarification, particularly to account properly for seasonal fluctuations, and that the definition of dry and critical year criteria should be revised.

Accordingly, in April 1976, the State Board initiated a new hearing process directed toward obtaining a record upon which the State Board can formulate and adopt a modified water quality control plan for the protection of beneficial uses in the Delta and Suisun Marsh. The hearings were conducted for two distinct but interrelated actions by the State Board: (1) adoption of an improved water quality control plan, and (2) a basis for modifying the terms and conditions of the water right permits of the SWP and CVP.

On March 15, 1978, the SWRCB released its Draft Water Quality Control Plan for the Delta—a modified Basin Plan (see Table 5). Its most significant change

¹ Water Code Section 13263 (g)

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SUMMARY OF DELTA SALINITY AND ENVIRONMENTAL CRITERIA RELATED TO WATER DEVELOPMENT IN THE DELTA AREA

USE PROTECTION		STATION	TYPE OF YEAR ¹	PERIOD	PARAMETER ²	CRITERIA DOCUMENTS ³ (Criteria designated by Article number)																				
						NOVEMBER 19 1965 (CP-SWP)	DECISION 1275 & 1291 (SWP) 1967	STATE WATER QUALITY CONTROL POLICY, 1967	SWRCB RESOLUTION 66-17, 1968	SECRETARY OF INTERIOR (CVP) 1969	DECISION 1278 SW-CVP	SWRCB RESOLUTION 73-16, 1973	SFBWOCB 1975 BASIN 2 PLAN	CVRMOCB 1975 BASIN 5B PLAN												
Western Delta Agriculture	Without substitute (overland) supply	Jersey Point and Emmerton	NC C C	Jan-Dec Jan-Jul Aug-Dec	1000 ppm Cl ⁻ (10-DA) 1000 ppm Cl ⁻ (10-DA) 1400 ppm Cl ⁻ (10-DA)	D.1	D.1	B.1					Cl ⁻ 3 ^a													
			All	Apr-Jun	250 ppm Cl ⁻ (MSZS)		15 ^b																			
		Blind Point	NC NC C	Apr-Jul Aug-Dec Apr-Dec	350 ppm Cl ⁻ (14-DA) 1000 ppm Cl ⁻ (14-DA) 1000 ppm Cl ⁻ (14-DA)					A.1																
			NC NC C	Apr-Jul Aug-Dec Apr-Dec	EC 2.2 mmhos/cm (14-DA) EC 3.1 mmhos/cm (14-DA) EC 3.6 mmhos/cm (14-DA)								EC 2													
	With substitute (overland) supply	Three-mile Sl @ Soc and San Joaquin R (after 1980)	N C C	Jan-Dec Jan-Jul Aug-Dec	1000 ppm Cl ⁻ (10-DA) 1000 ppm Cl ⁻ (10-DA) 1400 ppm Cl ⁻ (10-DA)	E	E																			
		Jersey Point and Emmerton	NC NC C	Apr-Jul Aug-Dec Apr-Dec	350 ppm Cl ⁻ (14-DA) 1000 ppm Cl ⁻ (14-DA) 1000 ppm Cl ⁻ (14-DA)					A.1																
Delta Agriculture (flushing)	Jersey Point and Emmerton	N, BN	Apr-May		200 ppm Cl ⁻ (10-CD)	D.2	D.2	B.2		A.1			Cl ⁻ 4													
Interior Delta Agriculture	Terminus, Rio Vista, San Andreas Landing, and Clifton Court Ferry	N	Jan-Dec		500 ppm TDS (MA)	D.3b D.4	D.3b D.4	B.3b B.4	A.24				TDS 5 TDS 6													
		BN	Jan-Jul Aug-Dec		500 ppm TDS (MA) 600 ppm TDS (MA)																					
		D, C	Jan-Mar Apr-Dec		500 ppm TDS (MA) 600 ppm TDS (MA)																					
	Bifurcation of Middle and Old R				Same as above stations after initial operation of the Peripheral Canal	D.3b D.4	D.3b D.4	B.3b B.4																		
	Sacramento R @ Green's Landing (adjustment)				Whenever values exceed 150 ppm TDS (MA), max values for above stations may be increased by adding 1.5 times the excess	D.5	D.5	B.5	A.24				TDS 7													
Agriculture, Municipal and Industrial	Clifton Court Ferry	All	Jan-Dec		600 ppm TDS (MA)			16a																		
	Eastern Delta channels	All	Jan-Dec		700 ppm TDS (MA)			16a					TDS 4													
Contro Costa Canal Municipal and Industrial	Vernalis	All	Jan-Dec		500 ppm TDS (MA)	G ^c	G ^c	16d					TDS 3													
Vallejo Municipal and Industrial	Rock Slough @ Contro Costa Canal Intake	All	Jan-Dec		250 ppm Cl ⁻ (MTC) & 100 ppm Cl ⁻ (MTC) at least 65% of yr		17a 16c	B.14					Cl ⁻ 1 TDS 2													
					750 ppm TDS (MTC) & 380 ppm TDS (MTC) at least 65% of yr																					
Striped Bass	Above Three-mile Sl in Sacramento R & between Jersey Pt & Venical Isl in San Joaquin & Folsom R	N			Until initial operation of Peripheral Canal, 350 ppm TDS (DA) from April 1 until water temperature reaches 60°F, thereafter, 180 ppm TDS (DA) for five weeks				B.2 ^d																	
					For 5 wks.beg. when water temp. reaches 60°F		1000 ppm TDS (14-DA)						C-1a A-2 ^e C-1a A-2 ^e													
							350 ppm TDS (14-DA)																			
Neomysis	Antioch Water Works Intake	All	For 5 wks.beg. when water temp. reaches 60°F		1000 ppm TDS (14-DA)								EC 1													
	Prisoner's Point	All			350 ppm TDS (14-DA)								EC 1													
Salmon and Steelhead	Export pumping	All	Apr 25-May 31		Minimize export								C-1b													
	Chipp's Island	All	Jan-Dec		4000 ppm Cl ⁻ (14-DA)								C-1c VI-1													
Duck food - Suisun Marsh	Principal channels of the Sacramento-San Joaquin Delta	All	Jan-Dec		Positive downstream flow, 95% salvage of diverted salmon and steelhead				C-2a C-2b																	
Southern and Eastern Delta	Southern and Eastern Delta	All	Sep-Nov		Predominantly San Joaquin River flow				C-2b																	
Duck food - Suisun Marsh	Suisun Marsh	All	Apr 15-Jun 1		9000 ppm TDS average (1st 12" of soil)				C-3a			VI-3														

¹ N = Normal; BN = Below Normal; C = Critical; NC = Non Critical; D = Dry.

² ppm = parts per million (ppm is equivalent to milligrams per litre); Cl⁻ = Chlorides, TDS = Total Dissolved Solids; (10-DA) = 10-day average.

³ (10-CD) = Daily average for at least 10 consecutive days, (14-DA) = 14-day average, (MA) = Monthly average, (MTC) = Mean Tidal Cycle.

(AT) = All Times, (MSZS) = Maximum Surface Zone Salinity, (DA) = Daily average.

³ State Water Quality Control Policy (1967), Resolution 68-17(1968), and Resolution 73-16(1973) have been adopted as Federal policy. (June 20, 1973).

⁴ EC values converted to estimated equivalent TDS values.

⁵ Until June 30, 1970. Reestablished September 26, 1972 by Water Right Permit numbers 16477 thru 16483.

⁶ Until September 30, 1972. Extended on November 2, 1972 to operate within the Project capability.

⁷ May be modified for fishery experiments.

⁸ Provided not more than 70,000 AF released from New Melones Reservoir for water quality control.

⁹ 14-day average.

**TABLE 212
MARCH 1978 DRAFT WATER QUALITY OBJECTIVES FOR THE**

BENEFICIAL USE PROTECTED AND LOCATION	PARAMETER	DESCRIPTION	YEAR TYPE ²	VALUES
MUNICIPAL AND INDUSTRIAL				
CONTRA COSTA CANAL INTAKE at Pumping Plant No. 1	CHLORIDE	MAXIMUM MEAN DAILY	ALL	250 mg/l
CITY OF VALLEJO INTAKE at Cache Slough	CHLORIDE	MAXIMUM MEAN DAILY	ALL	250 mg/l
INTAKE TO CLIFTON COURT FOREBAY of West Canal	CHLORIDE	MAXIMUM MEAN DAILY	ALL	250 mg/l
DELTA MENDOTA CANAL at Tracy Pumping Plant	CHLORIDE	MAXIMUM MEAN DAILY	ALL	250 mg/l
AGRICULTURE				
WESTERN DELTA	EMMATON on the Sacramento River	ELECTRICAL CONDUCTIVITY	MAXIMUM 14-DAY RUNNING AVERAGE OF MEAN DAILY EC IN MMHOS	0.45 EC APR 1 TO DATE SHOWN ³ EC FROM DATE SHOWN ³ TO AUG 15 WET ABOVE NORMAL BELOW NORMAL DRY CRITICAL AUG. 15 ~ JUL. 1 0.63 JUNE 20 1.14 JUNE 15 1.67 -- 2.78
JERSEY POINT on the San Joaquin River	ELECTRICAL CONDUCTIVITY	MAXIMUM 14-DAY RUNNING AVERAGE OF MEAN DAILY EC IN MMHOS	WET ABOVE NORMAL BELOW NORMAL DRY CRITICAL AUG. 15 -- AUG. 15 -- JUNE 20 0.74 JUNE 15 1.35 -- 2.20	
INTERIOR DELTA	TERMINUS on the Mokelumne River	ELECTRICAL CONDUCTIVITY	MAXIMUM 14-DAY RUNNING AVERAGE OF MEAN DAILY EC IN MMHOS	WET ABOVE NORMAL BELOW NORMAL DRY CRITICAL AUG. 15 -- AUG. 15 -- AUG. 15 -- AUG. 15 -- -- 0.54
SAN ANDREAS LANDING on the San Joaquin River OLO RIVER opposite Rancho Del Rio VICTORIA CANAL at Middle River	ELECTRICAL CONDUCTIVITY	MAXIMUM 14-DAY RUNNING AVERAGE OF MEAN DAILY EC IN MMHOS	WET ABOVE NORMAL BELOW NORMAL DRY CRITICAL AUG. 15 -- AUG. 15 -- AUG. 15 -- JUNE 25 0.58 -- 0.87	
SOUTHERN DELTA	VERNALIS on the San Joaquin River	TOTAL DISSOLVED SOLIDS	MAXIMUM 30-DAY RUNNING AVERAGE OF MEAN DAILY TDS IN mg/l	ALL (after New Melones Reservoir becomes operational and until the objective below becomes effective) 500 mg/l
TRACY ROAD BRIDGE on Old River OLO RIVER near Middle River BRANDT BRIDGE on San Joaquin River VERNALIS on San Joaquin River	ELECTRICAL CONDUCTIVITY	MAXIMUM 30-DAY RUNNING AVERAGE OF MEAN DAILY EC IN MMHOS	ALL (to become effective only upon the completion of suitable circulation and water supply facilities) ⁴ 0.7 MMHOS APRIL 1 TO AUGUST 31 1.0 MMHOS SEPTEMBER 1 TO MARCH 31	
FISH AND WILDLIFE				
STRIPED BASS SPawning	PARTNERS POINT on the San Joaquin River	ELECTRICAL CONDUCTIVITY	AVERAGE OF MEAN DAILY EC FOR THE PERIOD NOT TO EXCEED	0.550 MMHOS APRIL 1 TO MAY 5
CNIPPS ISLAND	DELTA OUTFLOW INDEX IN CFS	AVERAGE OF THE DAILY DELTA OUTFLOW INDEX FOR THE PERIOD, NOT LESS THAN	ALL	6,700 CFS APRIL 1 TO APRIL 14
ANTIOCH WATERWORKS INTAKE on the San Joaquin River	ELECTRICAL CONDUCTIVITY	AVERAGE OF MEAN DAILY EC FOR THE PERIOD, NOT MORE THAN	ALL	1.5 MMHOS APRIL 15 TO MAY 5
ANTIOCH WATERWORKS INTAKE	ELECTRICAL CONDUCTIVITY (Relaxation provision - replaces the above Antioch and Chipps Island objective whenever project users are taking deficiencies in firm supplies) ⁵	AVERAGE OF MEAN DAILY EC FOR THE PERIOD, NOT MORE THAN THE VALUES CORRESPONDING TO THE DEFICIENCIES TAKEN (LINEAR INTERPOLATION TO BE USED TO DETERMINE VALUES BETWEEN THOSE SHOWN)	ALL - whenever project users are taking deficiencies in firm supplies ⁵	TOTAL ANNUAL DEFICIENCY, MAF APR 1 TO MAY 5 EC IN MMHOS 0 1.5 0.5 1.9 1.0 2.5 1.5 3.4 2.0 4.4 3.0 10.3 4.0 25.2
STRIPED BASS SURVIVAL	CNIPPS ISLAND	DELTA OUTFLOW INDEX IN CFS	AVERAGE OF THE DAILY DELTA OUTFLOW INDEX FOR EACH PERIOD SHOWN, NOT LESS THAN	WET ABOVE NORMAL BELOW NORMAL SUBNORMAL SNOWMELT DRY ⁶ DRY ⁷ OR CRITICAL MAY 6-13 14,000 14,000 10,000 14,000 10,700 7,700 11,400 9,500 6,500 6,500 5,400 3,600 4,300 3,600 3,200 3,000 3,100 2,900
SALMON MIGRATION	RIO VISTA on the Sacramento River	COMPUTED NET STREAM FLOW IN CFS	MINIMUM 30-DAY RUNNING AVERAGE OF MEAN DAILY NET FLOW	WET ABOVE NORMAL BELOW NORMAL DRY & CRITICAL FEB 1 - MAR 15 JUN 16 - JUNE 30 JULY AUG. SEPT. 1 - DEC 31 2,500 3,000 5,000 2,000 1,000 5,000 2,500 2,000 3,000 2,000 1,000 2,500 2,500 2,000 3,000 2,000 1,000 2,500 1,500 1,000 2,000 1,000 1,000 1,500
SUSIUM MARSH	CNIPPS ISLAND or Q&A FERRY LANDING	ELECTRICAL CONDUCTIVITY	MAXIMUM 28-DAY RUNNING AVERAGE OF MEAN DAILY EC	WET ABOVE NORMAL BELOW NORMAL DRY ⁶ DRY ⁷ OR CRITICAL JAN - OCT. - MAY & DEC 12.5 mmhos 12.5 mmhos 12.5 mmhos 15.6 mmhos 15.6 mmhos 12.5 mmhos 12.5 mmhos 12.5 mmhos 15.6 mmhos 15.6 mmhos
	CHIPPS ISLAND	DELTA OUTFLOW INDEX IN CFS	AVERAGE OF THE DAILY DELTA OUTFLOW INDEX FOR EACH MONTH, NOT LESS THAN VALUES SHOWN MINIMUM DAILY DELTA OUTFLOW INDEX FOR 60 CONSECUTIVE DAYS IN THE PERIOD	WET SUBNORMAL SNOWMELT 10,000 CFS FEBRUARY - MAY 10,000 CFS FEBRUARY - APRIL ABOVE NORMAL AND BELOW NORMAL 12,000 CFS JANUARY - APRIL
			AVERAGE OF THE DAILY DELTA OUTFLOW INDEX FOR EACH MONTH, NOT LESS THAN VALUES SHOWN	ALL (if greater flow not required by above objectives) - whenever storage is at or above the minimum level in the flood control reservoirs envelope of two out of three of the following: Shasta Reservoir, Oroville Reservoir, and CVP storage on the American River
OPERATIONAL CONSTRAINTS				
MINIMIZE DIVERSION OF YOUNG STRIPED BASS FROM THE DELTA	INSTANTANEOUS DIVERSIONS IN CFS	THE STATE WATER PROJECT (DEPARTMENT) WILL NOT EXPORT FROM THE DELTA MORE THAN VALUES SHOWN THE CENTRAL VALLEY PROJECT (BUREAU) WILL NOT EXPORT MORE THAN VALUES SHOWN	ALL - whenever the daily Delta outflow index is greater below 10,000 cfs	MAY - 3,000 CFS JUNE - 3,000 CFS JULY - 3,000 CFS
MINIMIZE DIVERSION OF YOUNG STRIPED BASS INTO CENTRAL DELTA	CLOSURE OF DELTA CROSS CHANNEL GATES FOR UP TO 20 DAYS BUT NO MORE THAN 2 OUT OF 4 CONSECUTIVE DAYS AT THE DISCRETION OF THE DEPARTMENT OF FISH AND GAME UPON 12 HOURS PRIOR NOTICE		ALL - whenever the daily Delta outflow index is greater than 12,000 cfs	APRIL 16 - MAY 31
MINIMIZE CROSS DELTA MOVEMENT OF SALMON	CLOSURE OF DELTA CROSS CHANNEL GATES WHENEVER THE DAILY DELTA OUTFLOW INDEX IS GREATER THAN 12,000 CFS		ALL	JANUARY 1 - APRIL 15

FISH PROTECTIVE FACILITIES

Maintain appropriate records of the numbers, sizes, kinds of fish salvaged and of water export rates and fish facility operations

STATE FISH PROTECTIVE FACILITY

The facility is to be operated to meet the following objectives to the extent that they are compatible with water export rates:

- (a) King Salmon – from November through May 14, criteria shall be as follows:
 - (1) Approach Velocity – 3.0 to 3.5 feet per second
 - (2) Bypass Ratio – maintain 1.2:1.0 to 1.6:1.0 ratios in both primary and secondary channels
 - (3) Primary Bay – not critical but use Bay B as first choice
 - (4) Screened Water System – the velocity of water exiting from the screened water system is not to exceed the secondary channel approach velocity. The system may be turned off at the discretion of the operators.
- (b) Striped Bass and White Catfish – from May 15 through October, criteria shall be as follows:
 - (1) Approach Velocity – in both the primary and secondary channels, maintain a velocity as close to 1.0 feet per second as is possible
 - (2) Bypass Ratio
 - (i) When only Bay A (with center well) is in operation maintain a 1.2:1.0 ratio
 - (ii) When both primary bays are in operation and the approach velocity is less than 2.5 feet per second, the bypass ratio should be 1.5:1.0
 - (iii) When only Bay B is operating the bypass ratio should be 1.2:1.0
 - (iv) Secondary channel bypass ratio should be 1.2:1.0 for all approach velocities.
 - (3) Primary Channel – use Bay A (with center well) in preference to Bay B
 - (4) Screened Water Ratio – if the use of screened water is necessary, the velocity of water exiting the screened water system is not to exceed the secondary channel approach velocity
 - (5) Clifton Court Forebay Water Level – maintain at the highest practical level.

TRACY FISH PROTECTIVE FACILITY OBJECTIVES

The secondary system is to be operated to meet the following objectives, to the extent that they are compatible with water export rates:

- (a) The secondary velocity should be maintained at 3.0 to 3.5 feet per second whenever possible from February through May while salmon are present
- (b) To the extent possible, the secondary velocity should not exceed 2.5 feet per second and preferably 1.5 feet per second between June 1 and August 31, to increase the efficiency for striped bass, catfish, shad, and other fish. (Secondary velocities should be reduced even at the expense of bypass ratios in the primary, but the ratio should not be reduced below 1:1.0.)
- (c) The screened water discharge should be kept at the lowest possible level consistent with its purpose of minimizing debris in the holding tanks
- (d) The bypass ratio in the secondary should be operated to prevent excessive velocities in the holding tanks, but in no case should the bypass velocity be less than the secondary approach velocity.

-
- 1 Except for flow, all values are for surface zone measurements. Except for flow, all mean daily values are based on at least hourly measurements. All dates are inclusive.
 - 2 The year type shall be determined as described in Figure II-1 "Draft, Water Quality Control Policy", March 1978. The type determined for any year shall remain in effect until the February forecast for Bulletin 120 or until an earlier estimate becomes available.
 - 3 When no date is shown in the adjacent column, EC limit in this column begins on April 1.
 - 4 If contracts to ensure such facilities and water supplies are not executed by January 1, 1980, the Board will take appropriate enforcement actions to prevent encroachment on riparian rights in the southern Delta by junior appropriators.
 - 5 For the purpose of this provision firm supplies of the Bureau shall be any water the Bureau is legally obligated to deliver under any CVP contract of 10 years or more duration, excluding the Friant Division of the CVP, subject only to dry and critical year deficiencies. Firm supplies of the Department shall be any water the Department delivers under Table A entitlements of water supply contracts.
 - 6 Dry year following a wet, above normal or below normal year.
 - 7 Dry year following a dry or critical year.
 - 8 Scheduled water supplies shall be firm supplies for USBR and DWR plus such additional water ordered from DWR by a contractor the previous September, and which does not exceed the ultimate annual entitlement for said contractor.

NOTE: EC values are mmho/cm at 25°C.

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takes into account the variations in water-year types based on unimpaired flows throughout the Sacramento Valley. It recognizes that in wet years the projects have greater flexibility and can provide better conditions than were included in the 1975 Basin Plan. In addition, it permits relaxations in water quality during water-short years when the projects have a minimum of flexibility. This is reflected in all types of uses—municipal, industrial, agricultural, and fish and wildlife. There are also many changes in specific criteria for the various uses, and the water quality objectives are very complex, with many overlapping controls. Our analysis of the new draft plan to date indicates that overall it seems to provide a significant improvement in the way standards are applied.

Water Quality Obligations of SWP and CVP. In operating the SWP, DWR is required to comply with the Delta water quality standards established under provisions of State law and the Federal Clean Water Act.¹ The USBR, in operating the CVP, has historically taken the position that it is not required to comply with such standards. A September 15, 1975, opinion of the U.S. Department of the Interior² stated that the Federal Water Pollution Control Act does not require the USBR to release water for salinity regulation in the Delta. Further, the opinion argued that water developed by the CVP must be utilized for water service authorized by the Congress and only water not required for the project could be released for salinity control.

In an October 1, 1975, opinion, the Office of the Chief Counsel of DWR took an opposite view. After reviewing the legislative history, it concluded that the federal Water Pollution Control Act did apply to the operation of the CVP. It pointed out that congressional authorizations relied on in the Interior opinion were not so rigid as to preclude the use of CVP water for salinity control. The Regional Office of the EPA and the California Attorney General have also taken the position that the CVP is required to operate in conformity with water quality standards as established by the State and approved by the EPA.³

In the summer of 1975, DWR and the USBR signed contracts with water users who would be served by the Cross Valley Canal in Kern County. The contracts also provided that the water would be transported (wheeled) through the California Aqueduct. In an exchange of letters between DWR and the USBR, it was agreed that DWR could wheel the water only when the CVP was in compliance with federally approved water quality standards.

On September 2, 1975, DWR and the Santa Clara Valley Water District reached agreement for propor-

tionate reductions in deliveries from the San Felipe Project to the extent that federally adopted water quality standards for the Delta are not met, if State facilities are used to transport San Felipe water. Since the authorization of the San Felipe Project in 1967, USBR and DWR have been considering a negotiated agreement under which San Felipe project water would be transported (wheeled) to San Luis Reservoir through the California Aqueduct. DWR proposes to include such a water quality agreement in any arrangement for "wheeling" San Felipe water. The Bureau is also considering the option of transporting water from the Delta to San Luis Reservoir through the Delta-Mendota Canal.

The Four-Agency Fish and Wildlife Agreement, which is under negotiation among the DWR, the DFG, the USBR, and USFWS, could also lead to an agreement and ultimate resolution of the problem of compliance of the CVP with water quality standards in the Delta. Most of the standards of the draft Four-Agency Agreement have been included by the SWRCB in the March 1978 Draft Delta Water Quality Control Plan.

Early in 1978 the "Special Task Force Report on San Luis Unit", CVP, was issued. To fulfill the requirements of PL 95-46, this Task Force was established by the U.S. Department of Interior to review the management, organization, and operations of the San Luis Unit and to determine the project's compliance with the purpose and intent of current law. With respect to the effect on the Delta of furnishing additional water to the Westlands Water District, a customer of the San Luis Unit, the Task Force recommended that no additional water under the proposed amendatory contract be furnished to Westlands unless and until the CVP is clearly authorized and committed to meet Delta water quality standards and to mitigate CVP caused damages to fish and wildlife resources in the Sacramento-San Joaquin Estuary.

Subsequently, Secretary of the Interior, Cecil D. Andrus, in a letter to Governor Brown dated March 10, 1978, indicated his commitment to use whatever authority he has at his disposal to improve the condition of federal and State water programs in California, including the implementation of the water quality commitment of the CVP as recommended by the Task Force. In April 1978, federal and State agencies began negotiations on this issue, and the Solicitor of the Department of the Interior is reviewing existing laws to determine the authority of the CVP to provide for salinity control and to meet water quality requirements in the Delta.

The obligation of the United States to meet water quality standards established under the Federal Clean Water Act will not be determinative with respect to the Delta. Section 1258 of the Water Code authorizes the SWRCB to subject water rights permits to water quality standards established in water

¹ Section 13247 of the Water Code.

² Memorandum to the Commissioner of Reclamation from Hugh Garner, Associate Solicitor, Energy and Resources, U.S. Department of the Interior, Office of the Solicitor.

³ Letter dated February 13, 1978, to Clara Dedrick, Secretary for Resources, from Paul De Falco, Jr., Regional Administrator, Environmental Protection Agency; letter dated April 7, 1978, to Hugh Garner, Associate Solicitor, Department of the Interior from Richard C. Jacobs, Deputy Attorney General.

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quality control plans. It reads:

"In acting upon applications to appropriate water, the board shall consider water quality control plans which have been established pursuant to Division 7 (commencing with Section 13000) of this code, and may subject such appropriations to such terms and conditions as it finds are necessary to carry out such plans."

SWRCB has indicated its intention to establish identical standards in DWR and USBR water rights permits as in the water quality control plans. Under the recent Supreme Court opinion,¹ these permit conditions will be binding on the Bureau.

Status of Other Lawsuits

The following is a discussion of the issues and current status of other lawsuits that relate to the Delta alternatives review and eventual resolution of Delta issues.

Delta Protection vs. Delta Export. A case that could affect the amount, method, and conditions of Delta exports is pending. It is:

Sierra Club, Friends of the Earth, Hank Schramm, and William Dixon v. Morton, Livermore, Tee-rink, et al., filed 3/16/71, U.S. District Court (Northern Dist.) C-71 500 CBR; Injunction.

Plaintiffs seek to enjoin federal and state defendants, including the Director of DWR, from constructing or continuing construction or operation of the Delta Pumping Plant, the proposed Peripheral Canal, and certain existing or proposed CVP facilities. The principal statutes involved are the National Environmental Policy Act of 1969, the California Environmental Quality Act of 1970, and the Rivers and Harbors Act of 1899.

On July 28, 1975, Judge Charles B. Renfrew issued a Memorandum of Opinion, which stated that the proposed Peripheral Canal would, and the Delta and Tracy Pumping Plants did, affect the "navigable capacity" of navigable waters in the Delta. He therefore ordered the State and federal defendants to obtain permits for these facilities from the USCE.

The Corps must consider Environmental Impact Statements before issuing any permits for these facilities and may, through its permit authority, impose restrictions on the operation of the facilities.

No injunction has been issued. All parties in the case met with the judge and are continuing to meet with one another to establish schedules for compliance with the Corps' permit requirements and to resolve technical issues with regard to a final order by the court.

Although the State and all other defendants have filed appeals, DWR has begun compliance by filing for two permits to divert water through the Delta

Pumping Plant. One application is for the installation of four new pumps to be used for pumping with cheaper off-peak energy, and not for expanded diversions. Such off-peak pumping would minimize on-peak pumping and have a positive effect on the entire State energy supply. The other application is for full capacity diversion including use of the four additional pumps. These applications would be dropped if the trial court is reversed, but in the interim DWR will help the Corps prepare an EIS for the latter permit in case the appeal fails.

Appellate briefs were filed in the Ninth Circuit Court of Appeals on June 21, 1976; the Sierra Club's brief was filed September 19, 1976, and the State's and intervenor's reply briefs were filed on November 19, 1976. On March 29, 1978, the federal defendants filed a "Motion to Accelerate Oral Argument" in order to obtain a decision before the EIS must be filed. Oral argument was heard on May 9, 1978.

Release of Stored Water for Delta Protection. Three cases challenge DWR's authority to make releases from stored water for Delta quality control that are larger than those needed for exporting water of suitable quality.

1. *Berrenda Mesa Water Storage District v. Department of Water Resources*, filed 9/10/76, Sacramento County Superior Court No. 262976; Injunction, declaratory judgment.

On September 10, 1976, the Berrenda Mesa Water Storage District filed suit against DWR and also named as defendants Contra Costa County Water District, Contra Costa County Water Agency, and the North, Central, and South Delta Water Agencies.

The Complaint seeks to enjoin releases of water to the Delta above those that are required for operation of the SWP. It claims that the releases are in violation of:

- (a) The constitutional prohibition against impairment of the obligation of contract with regard to the contract between the State and Kern County Water Agency and the contract between the Agency and Berrenda Mesa.
- (b) The contract with the bondholders, particularly the provisions of Water Code Section 12937 which bar impairment of the contract by subsequent legislation.
- (c) The priorities established by Water Code Section 106 which give irrigation the second highest priority to the use of water.
- (d) Article 10, Section 3 of the California Constitution requiring the reasonable beneficial use of water.
- (e) The stay order of the Sacramento Superior Court staying operation of Decision 1379.

The complaint asks for both a preliminary and permanent injunction: (1) against giving prior-

¹California v. US, USLW 4997 (July 3, 1978)

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ity to Delta water users over Berrenda Mesa; (2) against enforcing Decision 1379; (3) against impairing the obligation of contracts for the supplying of surplus water to Berrenda Mesa; and (4) against releasing more water to the Delta than is necessary to operate the SWP.

The complaint also asks for a declaratory judgment determining the issues that it raises. DWR filed a demurrer which was heard on December 16, 1976. The major points were: (1) the plaintiff's lack of standing to enforce the Kern County Water Agency contract with DWR; and (2) that this proceeding is an inappropriate forum in which to complain of alleged enforcement by DWR of D-1379.

On July 21, 1977, the trial court sustained DWR's demurrer on the grounds that: (1) plaintiff lacks standing to sue to enforce the Kern County Water Agency contract with the Department, and (2) plaintiff did not plead that it is a third party beneficiary to any contract. Plaintiff has voluntarily dismissed this action without prejudice.

2. *Tulare Lake Basin Water Storage District v. State of California, et al.*, filed October 19, 1976, Sacramento County Superior Court No. 263582, Declaratory Relief, Preliminary and Permanent Injunctions, undetermined amount of damages.

On October 19, 1976, Tulare Lake Basin Water Storage District and Dudley Ridge Water District, both SWP water supply contractors, filed suit against DWR.

The complaint alleged that DWR had acted illegally in releasing water into the Delta that should have been sold as surplus water. Specifically the complaint alleged: (1) violation of the water supply contracts which obligate DWR to furnish surplus water to the plaintiffs; (2) illegal departmental action that depleted project revenues to the detriment of the holders and owners of all general obligation bonds issued under the California Water Resources Development Bond Act, Sections 12930 et seq. of the California Water Code, in violation of Section 12937 of the Water Code and Section 5 of the water supply contracts; (3) impairment of the obligation of the water supply contracts between parties to the contract and the landowners within the plaintiff's service area who allegedly are third-party beneficiaries of the water supply contracts, in violation of the United States Constitution (Fifth and Fourteenth Amendments) and the California Constitution (Article 1, Section 9); (4) impairment of the obligation of the contracts between the plaintiffs and their bondholders, the bonds having been issued and bought in reliance on the water supply contracts, in violation of the U.S. and California Constitutions; (5) violations of Article 10, Section 2 of the California Constitution and Section

100 of the California Water Code requiring the reasonable beneficial use of water; (6) violation of the injunction staying the operation of State Water Resources Control Board Decision 1379; (7) violation of DWR's duties to obey the injunction and to deliver surplus water to the plaintiff.

The complaint asked for a preliminary and permanent injunction declaratory relief, and damages (unascertainable at the time) on both tort and contract theories.

On October 5, 1977, the trial court sustained DWR's demurrer with leave to amend. The judge found that the court has no jurisdiction to take any action concerning the alleged violation of the stay of Decision 1379 since the matter of Decision 1379 is pending before a federal court.

Plaintiff amended the complaint by omitting references to Decision 1379. DWR has filed a demurrer to this first amended complaint, claiming that California statutes authorize DWR to operate the project to protect the Delta from salinity intrusion, the plaintiff lacks standing to enforce the project bond contracts, and the sale and use of "surplus" water does not jeopardize the bond contracts. The demurrer was overruled on June 30, 1978, and DWR is preparing an answer to the complaint.

3. *Salyer Land Co. v. State of California, Department of Water Resources*, filed 5/9/77, Sacramento County Superior Court, No. 267012, \$3.7 million.

This suit was filed by the Salyer Land Company against DWR on May 9, 1977; an amended complaint was filed on July 1, 1977.

The plaintiff company farms land in the service area of the Tulare Lake Basin Water Storage District, a SWP contractor. The plaintiff alleges that it is a third party beneficiary of the water supply contract between DWR and the Tulare Lake Basin Water Storage District, and that DWR's actions allowing water to flow out of the Delta in 1976 until the present violated the terms of that contract. The complaint specifically alleges violations of the provisions which: (1) require DWR to supply water in satisfaction of the contract commitments, and (2) require DWR to furnish surplus water. The complaint alleges also that DWR violated the stay order against State Water Resources Control Board Decision 1379 and wrongfully diverted water, which belonged to the plaintiff, into the Sacramento-San Joaquin Delta.

The plaintiff is pursuing this suit on its own behalf and, as a class action, on behalf of all other similarly situated landowners. The plaintiff alleges damages in the amount of \$3.7 million, which includes damage to crops and soil due to the consequent use of ground water which has a high sodium content, costs of ener-

gy for pumping, and cost of drilling additional wells. Additional damages, including attorneys fees, will be added when they are known.

On July 28, 1977, DWR filed a demurrer which claimed that the plaintiff failed to state a cause of action. The grounds for the demurrer were: (1) that the plaintiff lacks standing to enforce the contract between DWR and the Tulare Lake Basin Water Storage District; (2) that the plaintiff lacks standing to seek damages resulting from a violation of an injunction issued in another action; (3) that any violation of an injunction entered in another action may be raised only in that action; (4) that a cause of action for damages cannot be stated until the court in the other action determines that an injunction has been violated; and (5) that the injunction in any case would not bind DWR or any of the defend-

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ants. The demurrer was overruled on June 14, 1978, and DWR is preparing an answer to the complaint.

Coordinated Operation of CVP and SWP.
The case involving this issue is:

Environmental Defense Fund v. Morton, filed Aug./71, U.S. District (Sacramento) S. 2259 East-ern Dist. of Cal., Injunction.

This case seeks to enjoin the USBR from approving an agreement for coordinated operation of the CVP and the SWP until an EIS is prepared pursuant to the National Environmental Policy Act of 1969.

The EDF originally filed this suit in the U.S. District Court in Washington.

The United States has agreed to prepare an EIS and the case was dismissed with a stipulation to that effect.

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Over 200,000 hectares (500,000 acres) of land in the Delta is devoted to irrigated agriculture -- field crops, truck crops, forage crops, and fruits and nuts. Sugar beets are processed at a plant located at Clarksburg.

CHAPTER III. Antioch-212 DELTA REQUIREMENTS

Water-associated activities in the Delta and San Francisco Bay areas contribute significantly to the economy of California. This chapter examines the requirements to sustain these activities and resources.

Agricultural Water

Delta agricultural water requirements form the base water requirement for the Delta, since water withdrawn for irrigation depletes supplies otherwise available for in-channel requirements.

Historic agricultural development closely paralleled reclamation of swamplands and was accomplished by construction of levees around a marsh area and dewatering the area to form an island. By 1930, essentially all of the Delta lowlands had been reclaimed, but since then some areas have been inundated several times and some remain inundated to-

day (Franks Tract, West Sherman Island, and Big Break).

Today, most of the Delta area is cultivated and irrigated. Yearly statistics on Delta agriculture are difficult to obtain, because the Delta includes portions of six counties and statistics are reported on a county basis. The growth of agriculture has, therefore, been measured through special periodic land use surveys.

Crops produced in the Delta may be grouped into four main categories: field crops, truck crops, fruits and nuts, and forage crops. Historically, the Delta was noted for its asparagus, potatoes, celery, and other varied truck crops. Recently greater emphasis has been devoted to field corn and safflower, with reduction in asparagus. While crop patterns have varied with agricultural economics, the percentage of area cropped has remained fairly stable during the past 20 years.

TABLE 6
CROPPED AND IRRIGATED AREAS
SACRAMENTO-SAN JOAQUIN DELTA SERVICE AREA
Hectares (Acres)

Year of Survey	Total Irrigated Area	Total Cropped Area	Gross Area ^a	Percent of Area Cropped
1931	137 300 (339,300)	143 700 (355,000)	197 500 (488,000)	72.8
1938	135 800 (335,600)	141 600 (349,900)	181 600 (448,800)	78.0
1950	148 000 (365,800)	153 300 (378,900)	181 400 (448,300)	84.5
1955	202 200 (499,600)	209 700 (518,100)	272 800 (674,100)	77.0
1961	181 300 (448,000)	212 100 (524,000)	274 400 (678,000)	77.4
1976	203 800 (503,700) ^b	205 800 (508,600)	274 400 (678,100)	75.1
1977	205 700 (508,400)	206 600 (510,500)	274 500 (678,200)	75.3

^a The difference between gross area and cropped area is comprised of urban and recreational lands, levees, native vegetation areas, and water surfaces.

^b Double cropped lands provided an additional 6200 hectares (15,300 acres) of irrigated grain.



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Consumptive Use

Net water use in the Delta Uplands—those areas above elevation 1.5 metres (5 feet)—has been estimated from evapotranspiration data for various crops, rainfall records, and records of water pumped from, and return flow back to, the channels. Water consumed by various crops in the Delta Lowlands—those areas below elevation 1.5 metres (5 feet)—is

determined from field or laboratory measurements of unit consumptive use. Channel depletions are estimated by adjusting consumptive use to account for changes in soil moisture throughout the year to more nearly represent actual demands for water from Delta channels. The estimated average annual agricultural water requirement is about 2.0 cubic kilometres (1.6 million acre-feet). Average monthly requirements are shown in Table 7.

TABLE 7
AVERAGE MONTHLY CHANNEL DEPLETION BY AGRICULTURE
FOR CROP PATTERN IN 1961
Cubic Hectometres (Thousand Acre-feet)

Month	Lowlands		Area Uplands		Total Delta	
October	165	(134)	10	(8)	175	(142)
November	127	(103)	1	(1)	128	(104)
December	117	(95)	0	(0)	117	(95)
January	70	(57)	0	(0)	70	(57)
February	47	(38)	0	(0)	47	(38)
March	63	(51)	1	(1)	64	(52)
April	96	(78)	27	(22)	123	(100)
May	101	(82)	60	(49)	161	(131)
June	160	(130)	76	(62)	236	(192)
July	238	(193)	93	(75)	331	(268)
August	218	(177)	93	(75)	311	(252)
September	158	(128)	58	(47)	216	(175)
Annual	1560	(1,266)	419	(340)	1979	(1,606)

This estimate is based on the irrigated area and crop pattern in the 1961 survey. Channel depletion may have changed somewhat since then but estimates from the 1976 and 1977 land use survey were not available for use in this study. While total annual net use is relatively constant, requirements for water from Delta channels vary from year to year because of variations in effective rainfall.

Various methods are used to irrigate crops in the Delta.



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Water Quality

Because the Delta waters are at sea level (channel bottoms are below sea level) and open to the San Francisco Bay complex and the Pacific Ocean, there is never a shortage of water in the Delta. If freshwater inflow from the Central Valley is insufficient to meet the consumptive needs of the Delta, saline waters from the Bay will enter from the west. Therefore, the agricultural water requirements include the added dimension of water required to repel salinity.

Specific water quality criteria for Delta agriculture were first proposed on November 19, 1965, as part of the Delta water entitlement (water rights) negotiations among Delta interests, USBR, and DWR. Although contracts incorporating these criteria were never executed, water rights for the SWP under decisions D-1275 and 1291 adopted in 1967 were conditioned on meeting these criteria. The history of Delta water quality standards since then, including the current process for modifying them, is discussed in Chapter II. State and federal agricultural water quality criteria presently in force are those set forth in California's Water Quality Control Plan for Basin 5B (see Chapter II, Table 4). Proposed changes appear in Table 5.

Urban, Municipal, and Industrial Water

Since the early 1900's, industrial development of the Delta area has kept pace with the tremendous economic growth of California. The cities of Stockton, Antioch, and Pittsburg have become major industrial centers, with lesser development in the Rio Vista and Tracy areas. Industry was attracted to the western Delta by abundant fresh water; railroad, highway, and waterborne transportation facilities; large assimilative capacity for industrial wastes; available labor forces; and availability of land for future expansion.

Few people live on the Delta islands, but many live on the higher ground of the upland areas of the Delta. Over 90 percent of these reside in cities and towns of the western Delta (in northeastern Contra Costa County), the City of Tracy, part of Stockton, and West Sacramento. Except in the western Delta, local municipalities obtain their water supplies from sources other than the Delta channels. Some cities in the Contra Costa County Water District rely on direct offshore diversions from the lower San Joaquin and Sacramento Rivers during periods of high Delta outflow when the salinity is low; but the District, much of which lies outside the statutory Delta, obtains most of its water from the Contra Costa Canal, which diverts from the interior Delta at Rock Slough.

Municipal and industrial supplies are also diverted to areas outside the Delta via the California Aqueduct and the South Bay Aqueduct of the SWP; the Contra Costa Canal and the Delta-Mendota Canal of

the CVP; and the Cache Slough Diversion to the City of Vallejo. Except for the Cache Slough Diversion, diversion for M&I uses are discussed as CVP and SWP exports from the Delta, and are covered in Chapter IV. This section discusses the M&I water requirements of the western Delta and the Cache Slough Diversion.

Western Delta

Municipal and industrial water users in the western Delta maintain dual freshwater supply systems—one to divert offshore water when the quality is good, and the other to accept water from the Contra Costa Canal (either directly or through the City of Antioch system) when the quality of offshore water is poor. Contra Costa County Water District (CCCWD) and the City of Antioch use offshore water. The Contra Costa County Water District diverts a portion of its water supply at Mallard Slough, opposite Chippis Island, when the mean tide chloride ion (Cl^-) content of the water is 100 milligrams per litre (mg/l) or less. The City of Antioch diverts its total water supply from the adjacent San Joaquin River when the high-high-tide chloride ion content of the water is 250 mg/l or less. Both shift to the Contra Costa Canal when these values are exceeded.

Historic availability of 100 mg/l Cl^- or better water at Mallard Slough has varied from a low of 0 days (1976-77 water year) to a high of 240 days (1937-1938). The April 1967 water entitlement agreement between DWR and CCCWD states that the availability of this quality water averaged 142 days per year. Historic availability of 250 mg/l Cl^- or better water (high-high-tide) at Antioch has varied from a low of 0 days (1976-77) to a high of 285 days (1937-38). The April 1968 water entitlement agreement between DWR and the City of Antioch states that the availability of this quality water averaged 208 days.

Like the municipalities, several industries in the Antioch-Pittsburg area of the western Delta use offshore water when it is of acceptable quality to meet their needs, and depend on the Contra Costa Canal supplies when offshore water becomes too saline during the summer.

According to SWRCB Decision 1379, diversion of high quality water from the offshore supply for M&I uses averages about 49 cubic hectometres (40,000 acre-feet) per year. These diversions range from about 25 cubic hectometres (20,000 acre-feet) in a dry year to about 68 cubic hectometres (55,000 acre-feet) in a wet year. These amounts are very small when compared to the large amount of Delta outflow (on the order of an extra 2.5 cubic kilometres [2 million acre-feet]) needed to produce the acceptable quality water. Release of such large amounts of Delta outflow to allow the relatively small diversion would not be a reasonable, beneficial use of water. In addition to industrial process water, more than 2.5 cubic kilometres (2 million acre-feet) of water are diverted

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Water-using industrial complex near Antioch east of the confluence of the Sacramento and San Joaquin Rivers. The new Antioch Bridge, scheduled for completion in late 1978, can be seen in the background.

annually for industrial cooling water but, according to D-1379, this water has no quality limit and therefore is not considered in this analysis.

Cache Slough Diversion

The City of Vallejo diverted about 18.5 cubic hectometres (15,000 acre-feet) from Cache Slough in 1970. This requirement is expected to grow to about 27 cubic hectometres (22,000 acre-feet) by year 2000. The City also obtains water from Lake Berryessa under contract with Solano County Flood Control and Water Conservation District.

During the 1977 drought, the SWRCB found that the City was making unauthorized diversions at Cache Slough during the summer, even though no water was available under its water right permits and licenses. As a result of action taken by SWRCB, the City has contracted to install additional pumps to increase its capability to obtain water from Lake Berryessa under its existing contract with the District. This expanded supply from Berryessa is scheduled to be available in the summer of 1978 and will be sufficient to supply all of Vallejo's requirements. The City will continue to divert from the Delta when water is available under its water right. However, in order to

avoid certain operational problems and not cause water shortages elsewhere in the District, Vallejo has asked DWR to aid in finding a replacement supply. Vallejo, as a member agency of Solano, is a future customer for SWP water via the North Bay Aqueduct.

Water Quality

Like agriculture, Delta M&I requirements must include water for salinity control. The historical and present M&I salinity criteria are summarized in Chapter II, Table 4. The Antioch M&I quality criteria are not applicable when adequate substitute supplies are available to affected water users. M&I water users in this area have an overland supply facility, the Contra Costa Canal, which is capable of furnishing a full substitute supply. This is recognized in the SWRCB's March 1978 Draft Plan shown in Table 5. With the completion of Delta water transfer facilities, the outflow requirement to meet Rock Slough M&I criteria would no longer be necessary if the intake to the Contra Costa Canal were moved to Clifton Court Forebay, as proposed in this report. However, outflow to protect other beneficial uses would still be required.

STRIPED BASS**KING SALMON****AMERICAN SHAD**

Figure 13. Fish spawning and nursery areas and major migration routes in the Delta.

(Upper left) Major spawning migration routes and principal spawning and nursery areas of the striped bass. Some spawning also occurs in other parts of the Delta and over 50 percent of the total spawning occurs in the Sacramento River above the City of Sacramento. Concentrations of striped bass in the nursery areas vary annually depending upon flow conditions. Location of the major King salmon migration routes (above) are based on tagging and trawling studies made by the Department of Fish and Game. Principal American shad nursery areas and migration routes (left) were determined by shad catches during midwater trawl surveys.

Fishery Resources

The Delta comprises a unique and varied environment important to the survival of a large segment of California's fishery resources—and to the commercial and sport fishing industries they support. Salmon, steelhead, shad, and sturgeon are migratory fish that pass through the Delta on their upstream spawning run. The young later move seaward through the Delta. Striped bass also migrate from the ocean into the Delta and upstream. From one-third to one-half of Central Valley basin striped bass spawn in the Delta. The remainder spawn upstream from the Delta, but essentially all the young use the Delta channels as a nursery area. Figure 13 shows some of the main fish migration routes and spawning and nursery areas.

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Several species of resident game fishes are also found throughout the Delta. These include several kinds of catfishes and members of the sunfish family, such as crappie, large-mouth bass, and bluegill. In addition, several species of nongame fish native to the Central Valley also live in the Delta.

Present adverse environmental conditions in the Delta are due, in part, to upstream water development in the San Joaquin River system and to the influence of the CVP and SWP pumping plants. Under the present method of water transfer, export pumping directly from the southern Delta causes a net "reverse flow" pattern in the western and southern Delta channels. Also, in the fall, a dissolved oxygen deficiency (below 5 mg/l) develops in the San Joaquin River near Stockton and blocks migrating salmon. This oxygen deficiency is the combined result of upstream diversion, fertilization, and irrigation; a deepened ship channel; waste discharges from the Stockton sewage treatment plant; and flow reversal caused by export pumping from the Delta.

In addition, a large percentage of "home-stream" water released from upstream water projects on the San Joaquin River and its tributaries is diverted directly to the export pumping plants. Collectively, these conditions interfere with the salmon migrating through the Delta, draw large numbers of free-floating striped bass eggs and larvae through the louver screens into the export pumps, and decrease fish food supplies in the Delta channels.

At the DWR November 1975 public hearing on the Delta Alternatives Study, DFG outlined the following general requirements for maintaining and restoring the Delta fishery.

1. Utilize only truly surplus flows when meeting export needs. As high a portion of needs as possible should be met by exporting flood flows.
2. Eliminate cross-Delta flows to restore the Delta's capacity as a nursery area and migration route for fish.
3. Maintain net downstream flows in all channels. Such flows should be large enough to prevent water quality problems and to facilitate fish migrations, but not so large as to deplete the food supply for fish. Locating the diversion point as far downstream on the Sacramento River as is compatible with other needs might help satisfy this characteristic with minimum impact on water supply.
4. Maintain as much of the Delta as possible as part of the tidal estuary.
5. Locate diversion points so that fish are not drawn out of their normal migratory path and to avoid having to transport salvaged fish.

Fishing for the popular striped bass constitutes over half of the angler effort in the Delta.

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6. Provide sufficient capability for curtailing diversions as necessary to protect striped bass eggs and larvae.
7. Place effective fish screens at all project diversions.
8. Design, locate, and operate water control works in a manner which will not impede fish migrants or increase predation on game species.
9. Restrict release of Sacramento River water into the Delta in such a way as not to confuse salmon migrants.
10. Maximize the downstream flow component at diversion points to increase fish screen efficiencies.

As part of water rights Decision 1379, the SWRCB established specific water quality and environmental criteria designed to protect the fishery resources of the Delta-Bay estuary. Species for which criteria were included were salmon and steelhead, striped bass, and *Neomysis* (an important food organism of the striped bass and other fish). Those criteria pertaining to water quality were also included as objectives in the 1975 Basin Plans adopted by the SWRCB and approved by the EPA, as discussed in Chapter II.

Unlike the municipal, industrial, and agricultural requirements, these 1975 Basin Plan water quality criteria are the same in dry and critical years as in all other years. However, both the DFG and the SWRCB have since adopted the policy of incorporating provisions for dry year relaxations of these criteria. The concept being followed in negotiating a Four-Agency¹ Fish and Wildlife Agreement, is that fishery resource needs can be met with outflows that are lowest in dry years, intermediate in normal years, and highest in wet years, so long as an average equivalent resource is maintained. While the agreement is not yet completed, sufficient progress had been made to include the draft criteria in the planning of the Delta Alternatives and as recommendations for the 1976-77 SWRCB hearings to modify the 1975 Basin Plan criteria. The SWRCB's March 1978 Draft Water Quality Control Plan (Table 5) proposes to adopt most of these recommendations.

Wildlife

At the DWR November 1975 public hearing on the Delta Alternatives Study, DFG outlined the following general requirements for maintaining wildlife of the Delta and Suisun Marsh:

1. Preserve existing wildlife habitat, or compensate fully for any unavoidable degradation, and utilize opportunities to enhance such habitat.
2. Avoid adverse impacts on rare or endangered plants and animals. If such damage is unavoidable, acre-for-acre, in-kind, full compensation for lost habitat is essential.

The Delta is one of the important wildlife areas of the State. Species are numerous and include ducks, geese, swans, sandhill cranes, pheasants, over 200 different species of nongame birds, 39 species of mammals, 19 species of reptiles, and 8 species of amphibians. Corn and other grains left after harvesting supply millions of waterfowl with high quality feed each winter.

Rare or endangered wildlife species, such as the California black rail, giant garter snake, salt-marsh harvest mouse, and yellow-billed cuckoo, inhabit the natural marsh and riparian areas scattered throughout the Delta waterways.

The preservation of wildlife habitat in the Delta mainly depends on three factors:

1. Water quality sufficient to maintain existing marsh and riparian vegetation; (water quality requirements of Delta agriculture are sufficient).
2. Enhancement of Delta marshlands and riparian vegetation on channel islands and levees.
3. Perpetuation of Delta agriculture. (Some of the wildlife, such as muskrats and beavers, are undesirable for agriculture because of the damage they do to levees.)

Water quality requirements for Delta wildlife habitat (except the Suisun Marsh) are satisfied by standards for fisheries and agriculture.

Suisun Marsh

Suisun Marsh is south of Fairfield between the Delta and San Francisco Bay. This area was once farmed but farming was discontinued because of salt water intrusion. The Marsh now has 23 000 hectares (57,000 acres) of managed marshlands and approximately 11 300 hectares (28,000 acres) of intertidal bays and sloughs, and represents about 13 percent of the natural wetlands in the State. The Marsh supports over 200 species of birds, 36 species of mammals, and 7 species of rare or endangered wildlife, and provides important nursery areas and habitats for striped bass and other fishes. It is best known for its waterfowl resources and is a major wintering area for ducks and geese of the Pacific Flyway. In low rainfall years the Marsh has supported over a million waterfowl, or about 28 percent of the State total. The DFG owns and operates for public use the Grizzly Island and Joice Island Waterfowl Management areas, which total about 4 450 hectares (11,000 acres). The remainder of the marshlands is owned by over 150 private duck clubs.

Two features that attract waterfowl to the Marsh are the widespread water areas and the abundant natural food plants. More than 180 species of plants grow in the Marsh, about 20 percent of which regularly appear in the diet of ducks. The three most important waterfowl food plants are alkali bulrush, fat hen, and brass buttons.

¹DWR, USBR, DFG, and USFWS

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The Suisun Marsh is 23 000 hectares (57,000 acres) of managed marshlands and 11 300 hectares (28,000 acres) of intertidal bays and sloughs. The marsh is best known for waterfowl resources and as a major wintering area on the Pacific Flyway for ducks and geese.

A significant change occurred in the vegetation between 1959 and 1973. Salt grass was reduced by 56 percent and fat hen and alkali bulrush were increased by 200 percent and 100 percent, respectively. This transition from highly salt-tolerant plants to the more important food plant species, which require fresher soil salinities, reflects a major improvement in water management.

The vegetative composition of the Marsh, and thus its value to waterfowl and other wildlife, is highly dependent on the kind of water management programs used by the various landowners. Three basic types of marsh management presently employed in the Marsh are: (1) permanent ponding; (2) "wet land—dry land"; and (3) spring flooding.

Permanent ponding requires the year-round retention of water in the ponds and usually results in dense stands of cattails, tules, and pondweeds. Wet land—dry land management calls for flooding of the ponds in early fall and complete drainage as soon as possible following the close of the waterfowl season in late January. The spring flooding type of management requires early fall flooding for shooting, cyclic flooding and draining (leaching) in the spring to reduce soil salinities, and water retention until mid-May or early June. Ponds managed by the latter consistently produce a wider variety and greater abundance of preferred waterfowl food plants than do the other two types of management.

Wildlife biologists consider alkali bulrush a particularly useful plant on which to base future as well as present marsh management practices. Using alkali

bulrush as a target species will ensure a wide variety of marsh and upland plants and will not result in the complete eradication of any other plant species.

Of the many environmental factors that control the distribution and growth of plants in the Suisun Marsh, two exert the greatest influence: (1) length of soil submergence, and (2) soil salt concentration. Optimum soil submergence for alkali bulrush ranges between 7 and 8 months of near-continuous submergence each growing season. Competition from undesirable plants increases as the period of submergence is increased or decreased. The least competition from undesirable species occurs when the mean annual soil salt concentration in the first foot of soil is about 20 500 mg/l TDS. Mean annual values below 10 000 mg/l TDS result in competitive advantages for cattail, tule, and other freshwater plants.

Fresher soil water conditions are required during the spring to assure germination of alkali bulrush. It is also important that salt concentrations during seed-head formation, normally from mid-April to mid-May, range between 7 000 to 14 000 mg/l TDS. Peak seed production occurs at 9 000 mg/l TDS.

Since duck club ponds are filled from tidal sloughs, the salinity of water in marsh channels significantly affects the distribution and production of plant species in the Marsh. The following tabulation shows the relative importance of monthly water quality in channels adjacent to the Marsh in relation to the production of preferred waterfowl food plants. This is indicated on a basis of one to ten, with ten being the most important.

January	6	May	10	September	2
February	6	June	4	October	4
March	8	July	1	November	4
April	10	August	1	December	4

Specific water quality criteria to protect the waterfowl habitat of Suisun Marsh are included in the 1975 Basin Plans adopted by SWRCB and approved by EPA. Table 4, Chapter II, summarizes these criteria. During the Delta Alternatives review, DFG determined that these criteria would not adequately protect the quality of habitat in the Marsh. Although the soil salinity standard requiring 9 000 mg/l TDS in the first foot of soil from April 15 to June 1 is theoretically adequate, it would be virtually unenforceable due to prohibitive costs and the technical difficulty of conducting a monitoring program. Assuring adequate salinity water for the Marsh solely by maintaining Delta outflow would require about one-third of the combined CVP-SWP yield. Essentially all parties agree that that would be too costly. The permanent solution to be implemented (see Chapter V) will provide facilities that will deliver water to the Marsh more efficiently. Meanwhile some interim water distribution facilities to be constructed (see Chapter V) and the SWRCB's March 1978 Draft Water Quality Control Plan (Table 5) will provide for improved protection.

Recreation

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The Delta, with its extensive waterways and picturesque settings, constitutes one of the major recreational attractions in California. A wide variety of waterborne and shore based recreational activities is available, including fishing, cruising, water skiing, sailing, camping, picnicking, swimming, and hunting.



Recreation constitutes the most extensive use of our Delta waterways. Sailing, houseboating, and water skiing are a few of the many benefits realized from this vast expanse of meandering water.



Discovery Bay in the southwest Delta provides the opportunity for recreational living.

In 1963, a State survey revealed that approximately 2.4 million recreation days were enjoyed in the Delta. Recreation use has increased substantially since then, but more recent surveys of total use are not available.

The demand for recreational facilities in the Delta has surpassed the existing capacity. Recreational activities are largely unregulated and conflicts do occur. Nearly all the waterways are open to the public by water access but most of the adjacent levees are privately owned as is the land between the public waterways and the public roads. In most instances, the recreationist approaching overland must trespass to use the waterways for any recreational activity. Also, certain activities compete with one another when they occur at the same time and place, for example, water skiing and boat fishing.

Waste discharge from recreation vessels is another problem, contributing to visible wastes and high coliform levels at some locations, particularly in the summer months. New regulations to control these discharges are being considered by the SWRCB.

In the context of the Delta Alternatives Study, any water plan should:

1. Provide for the continued use of Delta waterways for recreation.
2. Not add to the existing problems of recreation.
3. Be designed to provide for additional recreational facilities. Domestic water requirements for recreation are negligible compared to water requirements for other uses.



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Flood Control

All of the floodflows from the Central Valley Drainage Basin (about 40 percent of the land area of the State) drain through the Delta by way of the Sacramento and San Joaquin Rivers and their tributaries. These two rivers join near the City of Pittsburg and discharge into the Pacific Ocean by way of Suisun, San Pablo, and San Francisco Bays.

Many of the Delta islands lie below sea level; most are protected from flooding and high tides by levees. Initially the levees were small, and the reclaimed land surface was essentially at mean sea level. However, with the passage of time, the organic soils have subsided as much as 6 metres (20 feet). The levees are much larger today due to the continued placement of material on levees to compensate for foundation consolidation. Except for levees included in the federal Sacramento River and San Joaquin River Flood Control Projects, Delta levees are not maintained to any uniform standards and need improvement in many areas.

The flood control requirements in the Delta are twofold: (1) to provide and maintain a levee system sufficient to protect the surrounding lands from flooding; and (2) to provide and maintain sufficient channel capacity to carry floodflows from the Central Valleys to the ocean.

In regard to the first requirement, DWR completed its study and recommendations in May of 1975 with the release of Bulletin No. 192, "Plan for Improvement of the Delta Levees". The Nejedly-Mobley Delta Levees Act of 1976 (Water Code Sections 12225-12227 and Section 12987 as amended) approved Bulletin 192 as a conceptual Delta levees plan.

The plan recommends improvement of about 500 kilometres (310 miles) of substandard levees that surround all or portions of 55 islands or tracts in the Delta. About 72 kilometres (45 miles) of levee would be improved to 100-year protection, which is considered adequate for urban uses. The remaining 426 kilometres (265 miles) would be improved to provide 50-year protection, which is considered adequate for agricultural land use. The plan also provides for planting suitable vegetation on levees, building recreation facilities, and improving roads. Of 50 planned recreation access sites, 40 would be for fishing access and 10 would include launching ramps, parking areas, picnic facilities, freshwater supplies, and sanitary facilities.

The estimated capital cost of the project of \$128 million (1974 prices) would be shared by federal, state, and local governments. The recommended financing plan for capital costs is 50 percent federal, 30 percent state, and 20 percent local. Maintenance costs would be shared, 60 percent local and 40 percent state. Construction funds would be needed throughout a 20-year rehabilitation period. The U.S. Corps of Engineers is studying the extent of federal interest and participation in the project.

The second requirement relates to the Delta Alternatives Study. In this regard, any Delta water transfer plan must maintain or improve the flood carrying capacity of Delta channels, or include alternative means for conveying floodflows to prevent any material increase in the threat of flooding Delta lands. Any proposed changes to Delta channels or levees should be made compatible with recommendations in DWR Bulletin 192 and the Nejedly-Mobley Delta Levees Act.

The Brannan-Andrus flood of June 1972 was caused by the failure of a section of levee along the San Joaquin River.



Navigation

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Historically, the navigable waterways in the Delta and the lack of an adequate road system meant that produce, products, and people were moved to market by river steamer. Today, side-wheelers and stern-wheelers have given way to more modern cargo ships, tugs and barges, and thousands of pleasure boats.

Both the Port of Stockton and the Stockton Deep Water Channel were completed in 1933. The Port of Sacramento and the Sacramento Deep Water Channel became operational in 1963. Between the ports of Stockton and Sacramento and the western edge of Suisun Bay, the ship channels are maintained to a depth of 9.1 metres (30 feet). From Suisun Bay to San Francisco Bay the depth is 10.7 metres (35 feet).

(The location of the channels is shown on Figure 14.)

Commercial traffic consists of both shallow and deep-draft vessels. Tugs and barges carry petroleum and farm produce.

The secluded sloughs of the Delta offer a haven to fishermen and cruiser operators, and long stretches of relatively wind-free waters are widely used by water skiers. Recreation boating activities also include sailing, fishing, and racing.

Unregulated development of boat marinas hampers water skiing and high speed boating. Conflicts between pleasure boating and commercial traffic also occur. The Resources Agency's Delta Master Recreation Plan (revised in September 1976) includes a waterway use (zoning) plan to minimize these conflicts and to guide public agencies in issuing permits for waterside developments.

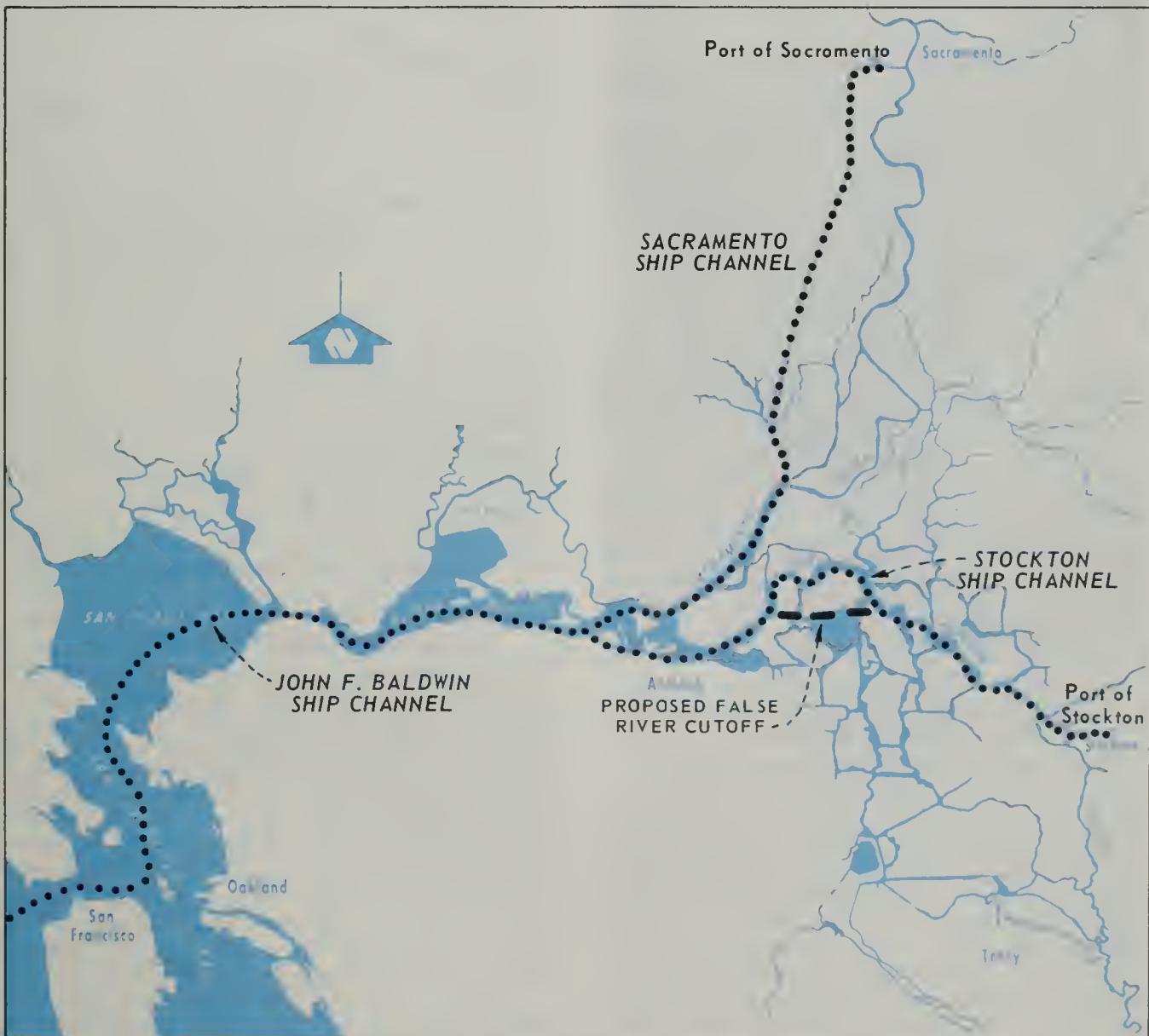


Figure 14. San Francisco Bay to Stockton and Sacramento ship channel projects.

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In 1965, Congress authorized the San Francisco Bay to Stockton Ship Channel Project (also known as the John F. Baldwin and Stockton Ship Channel Project). The project involves modification of existing navigation projects extending from beyond the Golden Gate upstream through San Francisco and Suisun Bays and the Delta to Stockton. Authorized improvements in the Delta include deepening the Stockton Deep Water Channel from 9.1 metres (30 feet) to 10.7 metres (35 feet), realigning the channel to follow False River, constructing a new turning basin and maneuvering area 10.7 metres (35 feet) deep, constructing public recreation areas and facilities along the route, and placing rock revetment on levees along the channel. Preconstruction planning has been completed by the U.S. Army Corps of Engineers and environmental impact statements are being prepared.



Deep-water channels through the Delta allow cargo to move on a large scale to and from the Ports of Stockton and Sacramento. The Port of Sacramento shipped a record tonnage exceeding 1.8 megatonnes (2 million tons) in the 1977-78 fiscal year.

The existing deepened channel, combined with Stockton sewage disposal, low inflows, and changed flow conditions of CVP and SWP operations, has resulted in an annual zone of depressed dissolved oxygen that hampers migrating salmon in the fall. This problem has been alleviated somewhat by annual construction (and removal) each fall, of a temporary rock closure at the head of Old River. The rock barrier forces more of the San Joaquin River inflow past Stockton and helps flush pollution from the

channel (see Figure 15). When more water is needed, releases are made from the federal Delta-Mendota Canal into the Westley Wasteway to augment San Joaquin River flows.

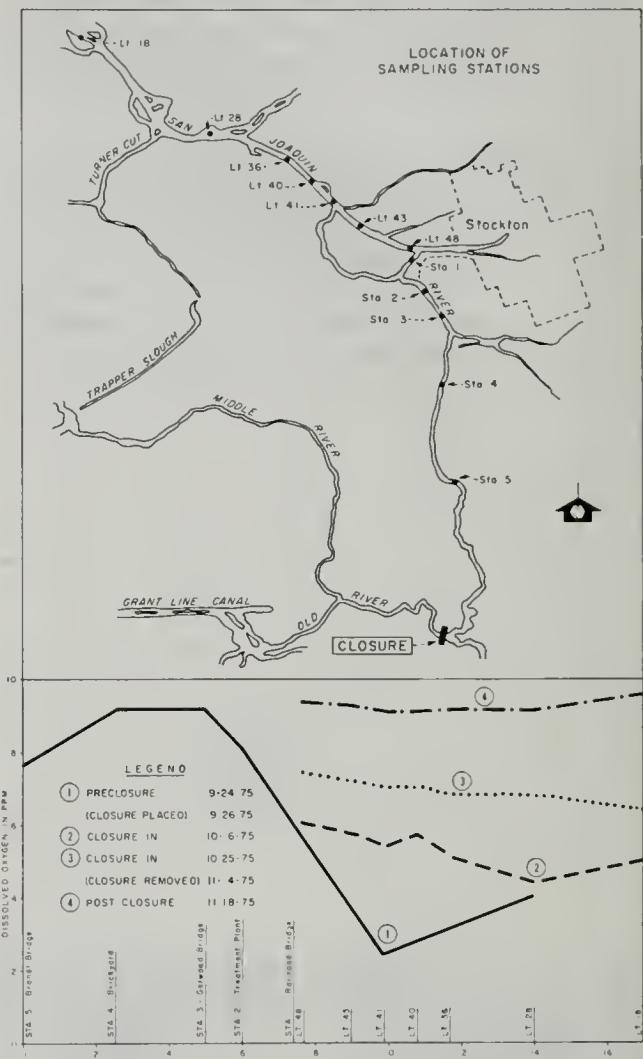


Figure 15. Dissolved oxygen conditions in San Joaquin River near Stockton.

Further deepening of the ship channel in this reach can be expected to worsen these conditions unless remedial measures are taken. The Corps has indicated that the problem could be solved by installing a battery of compressors in the ship channel near Stockton to restore dissolved oxygen concentrations to an acceptable level.

Contemplated channel improvements could also expose the Delta to increased salinity intrusion, which, in turn, could result in a need to increase the minimum Delta outflow necessary to meet salinity control criteria established by the SWRCB and approved by EPA. Deepening the channel would increase the cross sectional area and tidal action; straightening the channel (via the False River Cutoff) would shorten the path of salinity intrusion.

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Hydraulic model studies were used by the Corps of Engineers to estimate the increase in Delta outflow required to repel the additional salinity that would result from deepening the ship channel. These tests showed an increase of ocean salts in the interior Delta of from 100 to 150 mg/l TDS and indicated an additional outflow of about 8.5 cms (300 cfs) may be required.

It has long been the policy of the State of California that:

"... any program for deepening the Stockton Channel include provisions for maintaining dissolved oxygen levels insofar as such levels are influenced by the Deep Water Channel."¹

"Any need for an increase in the Delta outflow to repulse salinity intrusion because of channel deepening would need to be provided by a federal project."²

In commenting on the Corps' Draft Environmental Impact Statement for the Stockton Ship Channel Project (summer 1976), DWR again indicated that any increase in salinity in the Delta channels was unacceptable. DWR stated that the Corps should accept the responsibility for providing restoration flows to repel any increase in salinity caused by the ship channel projects. As part of the Delta Alternatives Study, DWR staff suggested that the yield of the Corps' authorized Marysville Reservoir project might be used for that purpose.

The Corps, however, has since determined that providing reservoir capacity and restoration flows would not be a proper use of water from a federal project. Instead, the Corps has proposed a submerged barrier at Carquinez Strait to block off the heavier saline water that would intrude upstream in the deepened channel. Initial test results on the Corps' hydraulic model at Sausalito with a barrier at 15 metres (50 feet) below mean low water are encouraging from a water quality viewpoint. Additional tests on salinity and studies of the possible effects on flood flows, fish, sediment, and nutrients are underway.

In the context of the Delta Alternatives Study, any Delta water plan should provide for continued use of Delta waterways for commercial and recreational navigation. Any proposed change in present conditions should be governed by requirements of the Corps of Engineers and the Coast Guard in their capacity of issuing permits for any projects affecting navigable waters. In regard to deepening the commercial ship channels, the Corps should mitigate any decrease in dissolved oxygen or increase in salinity intrusion by means other than providing restoration flows. For this reason, no additional water require-

ments for salinity control due to this navigation project have been assumed in this study.

San Francisco Bay

The San Francisco Bay complex is the largest estuary along California's 1600 kilometre (1,000 mile) coastline. It covers almost 1130 square kilometres (435 square miles) and has a shoreline of about 440 kilometres (275 miles) at mean sea level (Figure 16). Millions of people who inhabit its shore and environs use it for recreation, commerce, aesthetic pleasure, and disposal of municipal and industrial sewage.



Industry and Recreation in the San Francisco Bay Area.

A wide variety of fish and invertebrates are supported in the Bay complex. During periods of high freshwater outflow, the species less tolerant to fresh water are found more toward the ocean; and they reappear in the upper bays during the summer when river flows are low.

Four major wildlife habitats—tidal marshes, tidal flats, salt production ponds, and open waters—exist in and around the bay. These support a wide variety of resident and migratory birds and mammals. Although shore birds are the most abundant group of birds found in the bay system, the area is used as a nesting place, feeding area, and wintering ground for a segment of the bird populations on the Pacific Flyway.

The Central Valley rain- and snow-fed rivers drain over 153 000 square kilometres (59,000 square miles) and contribute the largest freshwater inflow (Delta outflow). Summer and fall inflow comes mainly from CVP and SWP reservoir releases for salinity control. Annual Delta outflow, adjusted for present water regulation and use, is estimated to average about 18 cubic kilometres (15 million acre-feet), ranging from a low of less than about 4.9 cubic kilometres (4 million acre-feet) in a very dry year to more than 49 cubic kilometres (40 million acre-feet) in a very wet year.

¹ Letter of October 19, 1964 (and attachment) to Lieutenant General Walter K. Wilson Jr., Chief of Engineers, Department of the Army from Hugo Fisher, Administrator The Resources Agency of California (page XXXIX)

² Letter of February 19, 1971, to Brigadier General Frank A. Camm, Division Engineer South Pacific Division, Corps of Engineers, from Ford B. Ford, Assistant Secretary for Resources The Resources Agency of California (page 5)

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More than 77 local streams draining approximately 8,940 square kilometres (3,450 square miles) enter the Bay between the Delta and the Golden Gate. Their flows vary from negligible amounts during the summer to winter maximums that may have localized effects on circulation and flushing of the Bay.

Bay waters are basically a salt water environment and are too saline for domestic and agricultural supplies. Consequently, the major M&I supplies are imported from the Central Valley via aqueduct system, with lesser water supplies being derived from ground water and local runoff.

The SWRCB has identified all beneficial uses of Bay waters and any known quality requirement of such uses. The most westerly Basin Plan salinity standard for the Bay complex is in Suisun Bay (see Chapter II, Table 4).

Many of the uses of the Bay depend on chemical quality other than salt content. Waste water, whether of municipal, agricultural, or storm water origin, is a complex mixture of many different types of pollutants. In the early 1960's, because of the bacterial public health hazard, many shallow areas of the Bay were posted to prevent shellfishing and water contact recreation. With the establishment and enforcement of stricter standards, more recent surveys by the Department of Public Health show an improvement, especially in the area from the San Mateo Bridge to the Mare Island breakwater where bathing standards are now generally being met. Waste discharges harmful to aquatic life are also under better control.

Tidal action is the primary mechanism ultimately removing pollutants from the Bay complex. The tidal prism (the volume between high and low tides) is about 20 percent of the average total volume of water in the Bay. Twenty-four percent of this tidal prism is replaced by new ocean water during each tidal cycle.¹ This daily tidal exchange of new water at the Golden Gate is equivalent to about 7100 cms (250,000 cfs) year-round, while the median monthly Delta outflow ranges from about 110 cms (4,000 cfs) during the summer to 1600 cms (55,000 cfs) in the winter.

The flushing of the Bay is closely related to circulation patterns, which are controlled by tides during the summer and by a combination of tides and freshwater outflow during the winter.

Operation of the CVP and SWP does have an impact on inflows to the Bay complex. In general, the projects provide greater inflow in the summer (and early fall of the drier years) than would otherwise exist, and reduce inflows during fall, winter, and spring. In the bay west of Carquinez Strait, however, circulation is dominated by tidal action except during flood conditions.

For the bays west of Chipps Island, a model test¹ was made to compare the percentage change in pol-



The beauty of the Delta-Bay complex is exemplified by the Bay Bridge and the City of San Francisco skyline as a backdrop to a waving palm on Treasure Island. San Francisco, the City by the Bay, uses its Bay for recreation, commerce, aesthetic pleasure, and sewage disposal. The Bay waters are cleansed primarily by tidal action, but winter floodflows provide some flushing action.

lution concentrations at two assumed levels of summertime Delta outflow, 50 and 140 cms (1,800 and 5,000 cfs). This test showed that changes were most noticeable in the region east of Carquinez Strait, where the almost threefold increase in outflow reduced pollutant levels by 10 to 40 percent. In San Pablo Bay, reductions ranged from 3 to 10 percent, and in the central and south bays, the effects of the increase in outflow were insignificant.

The effects of floodflows on flushing extend throughout the bay and are significant. Density stratification generally occurs in winter and early spring in Suisun, San Pablo, and Central San Francisco Bays, but in South Bay it occurs only for short periods in years of extremely high outflow. In mid-December 1969, South Bay was not stratified, even though outflow for the previous three months had averaged about 480 cms (17,000 cfs). New data presented at the recent SWRCB hearings on Delta water quality standards indicate a change in Delta outflow of about 280 cms (10,000 cfs) or greater could bring about significant salinity changes in the central and south-central portions of the Bay.

Delta outflow is subject to wide seasonal variations for all but the driest years. About 80 percent occurs during the six months from December through May. Thus, the time between the higher seasonal flows is usually at least six months. In contrast, it takes only 1 to 3 months for pollutant concentrations to approach equilibrium steady-state conditions for a particular flow condition. Consequently, maximum pollution concentrations can be expected each summer regardless of the amount of flushing associated with density stratification produced by winter floods. This means that flushing by floodflows

¹ California State Water Resources Control Board Publication No. 45, "Dispersion Capability of San Francisco Bay-Delta Waters", 1972

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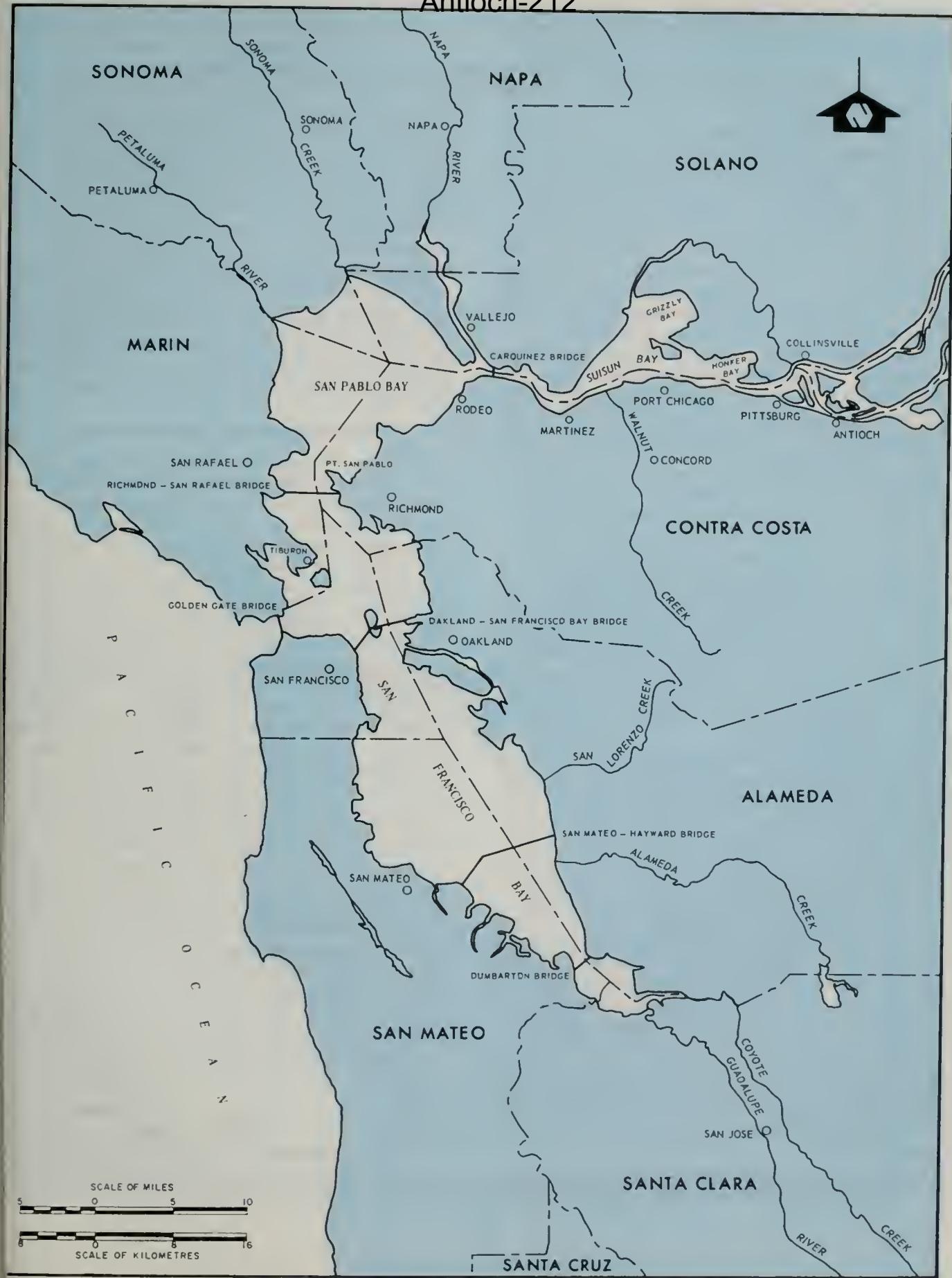


Figure 16. San Francisco Bay complex.

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is not a reliable basis for planning or designing an effective year-round waste treatment and discharge system. Rather, such a system must be designed to function properly at low flow summer conditions when circulation is lowest and chronic pollution problems most troublesome.

The 1975 Basin Plan standards do not include a requirement for flushing flows for the Bay. Waste discharges are not a protected right under California law. Water use must be both beneficial and reasonable, and dilution of pollution is not considered a reasonable beneficial use of water. It is impossible in any practical or useful sense to manage Central Valley Basin flows to reduce people-caused phosphate concentrations to acceptable levels in San Francisco Bay. Proper treatment and discharge of wastes is the only practical and legal solution to pollution.

Many people have expressed concern that future reduction of Delta outflow may adversely affect the Bay estuary in other ways. The ecological benefits of unregulated outflows, and the salinity gradients and water circulation established by them, may be important in several ways: (1) for distribution and migration of free-swimming organisms; (2) for creation of counter-currents moving upstream along the bottom of the Bay, which are believed necessary for the migration of certain crabs and shrimps; and (3) for transporting young anadromous fish and maintaining adequate food supplies. However, the Draft SWRCB Water Quality Control Plan (March 1978) concludes that information is not currently available for quantifying such beneficial effects. Accordingly, rather than adopting a flushing flow requirement, the Board is proposing to adopt guidelines to water development agencies for preserving a portion of the existing unregulated outflows pending completion of studies of their benefits.

Concerns have been expressed by DEAC and some hearing participants regarding possible harmful impacts on the San Francisco Bay System west of the Delta (and the aquatic life it supports) that might occur unless sufficient unregulated Delta outflows are maintained for its protection. Consequently, Senate Bill 346, as amended in Conference Committee, would provide for DFG to administer a comprehensive study to determine the interrelationships between Delta outflow (including flushing flows) and the fish and wildlife resources of the Bay system. It also provides for the study and work plan to be reviewed by a committee with representatives from the San Francisco Bay Conservation and Development Commission (BCDC), SWRCB, and DWR.

Irrespective of the outcome of this legislation, the Four-Agency Directors (DFG, DWR, USBR, and USFWS) have approved budgeting \$60,000 in 1979-80 to initiate the study. The general objectives of the study will be:

1. To determine how planned changes in Delta outflow will affect fish and wildlife resources in

San Francisco and San Pablo Bays; and

2. To develop flow and salinity standards or other management strategies to maintain fish and wildlife at historical levels.

In summary, there are as yet no specific salinity or Delta outflow requirements for the Bay complex west of Suisun Bay that apply to the operation of the SWP or CVP. This is not to say there will be no fresh-water inflow to San Francisco Bay. Controlled Delta outflow to protect designated beneficial uses in the Delta and Suisun Marsh will constitute a major source of inflow to the San Francisco Bay. Moreover, substantial unregulated flows in excess of flows for designated uses will continue in all but the driest years. These flows are estimated to average 11.6 cubic kilometres (9.4 million acre-feet) per year under 1980 conditions and 8.5 cubic kilometres (6.9 million acre-feet) per year under year 2000 conditions. The SWRCB plans to adopt guidelines for their preservation pending determination of specific needs.

Environmental Monitoring

The complex interplay between inflows, Delta uses, fishery needs, export diversions, waste disposal, tidal action, and salinity intrusion makes it impossible to predict exact future environmental conditions in the Delta. An extensive monitoring system is required to be sure that all needs are being met. For example, salinity data from several strategic locations are telemetered on a continuous basis to the operation centers of the SWP and CVP. The unprecedented dry years of 1976 and 1977 have amply demonstrated this monitoring need for operating the SWP and CVP.

Various other conditions in the Delta have been monitored for many years. The magnitude and extent of such monitoring was increased greatly following SWRCB Decision 1379 in July 1971. Part of that decision included a comprehensive monitoring program, a large part of which has already been implemented by DWR. During 1975, 1976, and 1977, 25 water quality stations throughout the Delta were monitored on a biweekly basis. Four additional stations were monitored to provide supplemental information for the Interagency Ecological Study Program, a cooperative effort by DWR, DFG, USBR, and USFWS. Data related to water quality and fish and wildlife are collected under these efforts. These sites are shown on Figure 17. The new SWRCB Draft Water Quality Control Plan (March 1978) proposes specific modifications to the current monitoring program. However, it emphasizes general goals to be accomplished and is designated to be flexible to meet changing conditions.

At each station, the parameters measured include chlorides, electrical conductivity, dissolved oxygen, pH, silica, suspended solids, dissolved solids, air and water temperature, turbidity, alkalinity, inorganic and organic nitrogen, total phosphates, chlorophyll, wind

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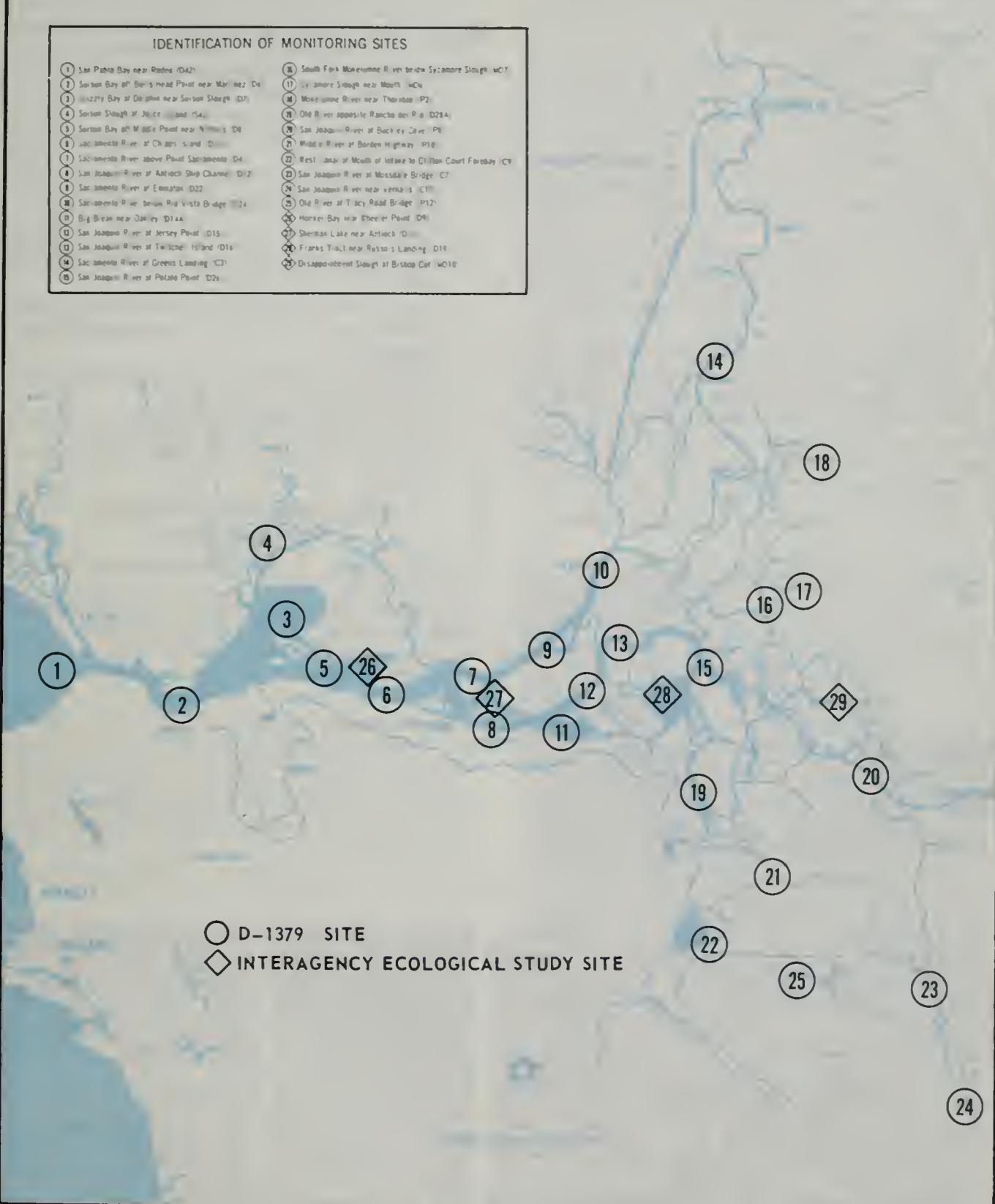


Figure 17. Water quality monitoring sites.

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velocity and direction, and phytoplankton. At certain selected stations, additional parameters, such as benthos, biochemical oxygen demand, heavy metals, pesticides, polychlorinated biphenyls, and light transmittance, are measured.

Continuous monitoring runs using automated equipment aboard the Department's laboratory workboats are also made to look for problem areas. Fishery monitoring, under contract with DFG, consists of studies on young striped bass, eggs, and larvae; tagging of adult striped bass to develop an index of adult population abundance; Neomysis and zooplankton surveys; and salmon management studies. This information is used to determine factors affecting survival of the fishery. DWR monitors other environmental factors in the vicinity of proposed water project facilities, including ground water levels, land use, and channel scour.

Knowledge of resource requirements is sufficient to develop safeguards and allow modification of the estuary to provide more capability and flexibility to protect and meet the many requirements being placed on the Delta. Data and study findings clearly demonstrate that facilities to eliminate reverse flows in the western and southern Delta channels would be beneficial to overall Delta water quality, fishery resources, and export of water from the Delta. Howev-

er, following construction of Delta facilities, a meaningful period of trial operation and concentrated monitoring will be required to ensure that the desired results are being obtained before final operating criteria are adopted. Also, monitoring of environmental conditions must continue to:

1. Establish pre-project base conditions.
2. Provide the real-time data necessary to operate the SWP and CVP in conformance with established criteria.
3. Obtain information for planning, designing, constructing and operating project facilities in the Delta.
4. Help predict the effect of proposed projects and project operation on the Delta-Bay environment.
5. Assure that applicable State and federal water quality standards (criteria) are met by project operations.
6. Determine if desired results of protecting fish and wildlife are being achieved.
7. Ascertain if changes in water quality, fishery, or project operating criteria are needed.
8. Evaluate the impact of projects when implemented.

Summary of Delta Water Requirements

The wide range of water-associated resources and activities in the Delta result in many interrelated requirements: consumptive use of water, inchannel flows for quality control and fish and wildlife, and control of waste discharges to prevent impairment of other beneficial uses. The overall net water requirements are made up of internal consumptive uses (channel depletions) and net Delta outflow for controlling salinity to protect agricultural, municipal, industrial, and fish and wildlife uses. The total net requirements are not merely a summation of all consumptive uses and individual outflow requirements, since meeting one use can contribute toward meeting other uses.



DWR's floating laboratory, the San Carlos (above) is used to monitor water quality in the Delta waters. The working crew (below) performs a wide variety of tests and analyses on board the vessel.



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Based on the controlling outflow needed to meet SWRCB 1975 Basin Plan water quality standards, and taking into account anticipated facilities, the estimated annual Delta water requirements total about 6.3 cubic kilometres (5.1 million acre-feet) as shown in Table 8. Except for drought-emergency relaxations, 1975 Basin Plan standards were the criteria applica-

ble during this study. It was the bench mark for formulating recommended plans, including suggested modifications to the 1975 Basin Plan criteria. The principal modifications suggested were those of the draft Four-Agency Fish and Wildlife Agreement, which became a recommended component of the selected course of action.

TABLE 8
ESTIMATED DELTA WATER REQUIREMENTS
Cubic Hectometres (Thousand Acre-Feet)

PURPOSE	O	N	D	J	F	M	A	M	J	J	A	S	Annual
Delta Agriculture	175	128	117	70	47	64	123	161	236	331	311	216	1979
	(142)	(104)	(95)	(57)	(38)	(52)	(100)	(131)	(192)	(268)	(252)	(175)	(1606)
Delta M&I													
Offshore CCC ¹	—	—	10	10	10	10	10	—	—	—	—	—	50
	—	—	(8)	(8)	(8)	(8)	(8)	—	—	—	—	—	(40)
City of Vallejo ²	2	2	1	1	2	2	2	3	3	3	3	3	27
	(2)	(2)	(1)	(1)	(2)	(2)	(2)	(2)	(2)	(2)	(2)	(2)	(22)
Subtotal	2	2	11	11	12	12	12	3	3	3	3	3	77
	(2)	(2)	(9)	(9)	(10)	(10)	(10)	(2)	(2)	(2)	(2)	(2)	(62)
Outflow ³	342	331	342	342	308	342	488	444	331	342	342	331	4285
	(277)	(268)	(277)	(277)	(250)	(277)	(396)	(360)	(268)	(277)	(277)	(268)	(3472)
TOTALS	519	461	470	423	367	418	623	608	570	676	656	550	6341
	(421)	(374)	(381)	(343)	(298)	(339)	(506)	(493)	(462)	(547)	(531)	(445)	(5140)

¹ These amounts are only diverted when outflows are much higher than shown. When outflows are low, this requirement would be met through the Contra Costa Canal.

² Subject to availability of water under the City's 1948 permit to divert water at Cache Slough (see discussion).

³ Based on controlling criteria in SWRCB 1975 Basin Plan standards, assuming Contra Costa Canal meets the "adequate substitute supply requirement" so that the Antioch M&I criteria does not apply but does not assume relaxation of fishery criteria in dry or critical dry years. Assumes construction of Delta facilities such that Rock Slough criteria no longer controls. Also assumes that Suisun Marsh requirements are met by means other than Delta outflow. These figures are subject to change by adoption of modified plan by SWRCB.

Concurrently, the SWRCB was independently conducting proceedings to modify the 1975 Basin Plan standards and in March 1978 released a draft of the modified plan for the next 10 years. The revised standards reflect a closer fit to hydrologic conditions and available supplies. The draft also indicated that the Board will continue to review and modify the plan as new facilities are constructed, and as additional information becomes available.

Concerning fish and wildlife, the draft plan generally follows the criteria proposed in the draft Four-Agency Fish and Wildlife Agreement. Concerning agricultural standards, the draft plan has very high quality criteria during the spring and early summer of all but critical years. For M&I uses, the draft plan recognizes that the existing Contra Costa Canal is available for all of the water users in the vicinity of Antioch and Pittsburg. Therefore, the Board has dropped the offshore M&I water supply criteria that is in the present (1975) Basin Plan. It provides a sliding scale for water quality between wet and dry years at the Contra Costa Canal Intake and moves the control point further west to Pumping Plant No. 1 in the Contra Costa Canal.

Looking west along the Contra Costa Canal.



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Table 9 shows a comparison of annual Delta water requirements (consumptive and in-stream) for different water quality criteria. Although the draft plan had not been fully analyzed nor adopted as this report was being prepared, preliminary estimates of

water requirements are included for both the 10-year short range (as now drafted) and preliminary estimates of probable long-range conditions, assuming certain facilities are constructed as recommended in this report.

TABLE 9
COMPARISON OF CONSUMPTIVE AND IN-STREAM
DELTA WATER REQUIREMENTS FOR DIFFERENT WATER QUALITY CRITERIA
Cubic Kilometres (Million Acre-Feet)

<i>TYPE OF WATER YEAR</i>	<i>1975 BASIN PLAN¹</i>	<i>DRAFT FOUR-AGENCY²</i>	<i>DRAFT PLAN³ (SHORT RANGE)</i>	<i>DRAFT PLAN⁴ (PROBABLE LONG RANGE)</i>
Wet	6.3 (5.1)	7.6 (6.2)	9.0 (7.3)	8.3 (6.7)
Above Normal	6.3 (5.1)	6.8 (5.5)	8.4 (6.8)	6.9 (5.6)
Below Normal.....	6.3 (5.1)	6.5 (5.3)	7.9 (6.4)	6.5 (5.3)
Dry.....	6.3 (5.1)	5.4 (4.4)	6.0 (4.9)	5.4 (4.4)
Critical ⁵	6.3 (5.1)	5.1 (4.1)	5.3 (4.3)	4.9 (4.0)

¹ Assumes Contra Costa Canal meets adequate substitute supply requirements, construction of Delta water transfer facilities, and Suisun Marsh facilities.

² Same assumptions as for 1975 Basin Plan except draft Four-Agency fishery criteria are substituted for 1975 Basin Plan fishery criteria.

³ SWRCB Draft (10-year) Water Quality Control Plan, March, 1978.

⁴ Assumed effect of relocating Contra Costa Canal and installing Suisun Marsh facilities in SWRCB Draft (10-year) Water Quality Control Plan of March 1978.

⁵ Includes dry years following a dry or critical year.

CHAPTER IV. DELTA EXPORTS—PAST, PRESENT, AND FUTURE

California's agricultural and metropolitan areas are dependent on developed water supplies. Most of California's crops are grown in its arid central and southern regions and are dependent upon irrigation. Most of California's people live in the arid south coastal and Bay area regions. Extensive water storage and conveyance facilities supply water for these people and crops. Most of the water for potential additional development originates north of the Delta, and most of the need for additional water is south and west of the Delta. Both the CVP and the SWP depend upon transfer of water across the Delta to pumping plants in the south Delta to fulfill contracts in the San Francisco Bay area, the San Joaquin Valley, and Southern California.

Adequate design of a program for Delta protection requires that plans for improved water transfer include estimates of future diversions from the Delta. The purpose of this chapter is to review historic Delta exports, estimate the firm yield of existing facilities available for export from the Delta, and project reasonable needs for Delta exports, with emphasis on the period through the year 2000.

Present SWP and CVP Delta Export Capability

Existing facilities of the SWP and CVP serve water throughout California from the north Sacramento Valley to the south coastal plain. A large percentage



Clifton Court Forebay serves as the main Delta diversion point for the SWP. The Tracy Pumping Plant pumps water directly from Old River into the CVP Delta-Mendota Canal.

of the water served by these two systems is diverted from the Delta via the California Aqueduct, South Bay Aqueduct, Delta-Mendota Canal, and Contra Costa Canal. Major facilities of the SWP and the CVP that provide water to the Delta or that pump and deliver water from the Delta are shown on Figure 18 and listed in Table 10.

TABLE 10
MAJOR SWP AND CVP FACILITIES, 1978

	<i>Capacity</i>		
	<i>Cubic Hectometres</i>	<i>(Thousand Acre-feet)</i>	<i>First Year of Operation</i>
<i>CVP Delta Supply Facilities</i>			
Clair Engle Lake	3020	(2,448)	1960
Shasta Lake	5615	(4,552)	1944
Whiskeytown Reservoir	297	(241)	1963
Auburn Reservoir	2869	(2,326)	Under Construction
Folsom Lake	1246	(1,010)	1955
New Melones Reservoir	2960	(2,400)	Under Construction
<i>CVP Delta Diversions</i>			
Delta Cross Channel	Variable—depends on flow in the Sacramento River		1953
Contra Costa Canal	10 cubic metres/second	(350 cubic feet/second)	1940
Delta-Mendota Canal	130 cubic metres/second	(4,600 cubic feet/second)	1951
<i>SWP Delta Supply Facilities</i>			
Lake Oroville	4364 Cubic Hectometres	(3,538 thousand acre-feet)	1968
<i>SWP Delta Diversions</i>			
California Aqueduct	283 cubic metres/second	(10,000 cubic feet/second) ¹	1967
South Bay Aqueduct	8 cubic metres/second	(300 cubic feet/second)	1962
<i>Joint SWP and CVP Facilities</i>			
<i>South of the Delta</i>			
San Luis Reservoir	2515 Cubic Hectometres	(2,039 thousand acre-feet)	1967
San Luis Canal	371 cubic metres/second	(13,100 cubic feet/second)	1967
Capacity at the Delta Pumping Plant is built for eventual enlargement to 292 cubic metres/second (10,300 cubic feet/second) using 11 pumps to supply water to both the California and South Bay Aqueducts. Today there are 7 pumps installed with a capacity of 171 cubic metres/second (6,030 cubic feet/second)			



Figure 18. Major features of the SWP and CVP that supply water to and divert from the Delta, 1978.

Firm Yield of Existing Facilities for Delta Export

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DWR conducted two operation studies of the existing SWP and CVP systems to estimate firm yield available from the Delta. These studies used new 50-year hydrology for the period 1921-22 through 1970-71. Both studies assumed 1980 level of upstream development and no change in existing Delta facilities. Study 1 was based on SWRCB 1975 Basin Plan Delta water quality criteria and assumed that the Contra Costa Canal would be diverting at Rock Slough and would serve as the overland facility, thus permitting deletion of the Antioch M&I objective. It was also assumed that improved marsh management practices and/or interim facilities would achieve Suisun Marsh soil salinity standards. Study 2 substituted the interim fish and wildlife criteria in the draft Four-Agency Fish and Wildlife Agreement for the fishery objectives in the 1975 Basin Plan criteria. Subsequent to these studies, the SWRCB issued its March 1978 Draft Water Quality Control Plan—a modified Basin Plan (see Chapters II and III for discussion of the

various criteria). While the March 1978 Draft Plan was not available (nor adopted) during this study, preliminary review indicates that the resulting firm yield available for Delta export would fall in between those yields determined in the two studies.

Both studies assumed a yearly Delta export, including interim and surplus water, of 7.9 cubic kilometres (6.4 million acre-feet). However, as shown on Figure 19, there were numerous dry years when that demand could not be met, necessitating curtailment of interim and surplus water supplies and unscheduled deficiencies, in addition to scheduled deficiencies permitted by contract for agricultural supplies. In several of the wetter years, the study showed a potential for additional intermittent exports.

Adjusting for shortages, the studies indicate that existing SWP and CVP facilities have enough storage capacity and Delta pumping capacity to produce a firm yield from Delta exports of about 6.9 cubic kilometres (5.6 million acre-feet) per year in Study 1, and 7.2 cubic kilometres (5.8 million acre-feet) per

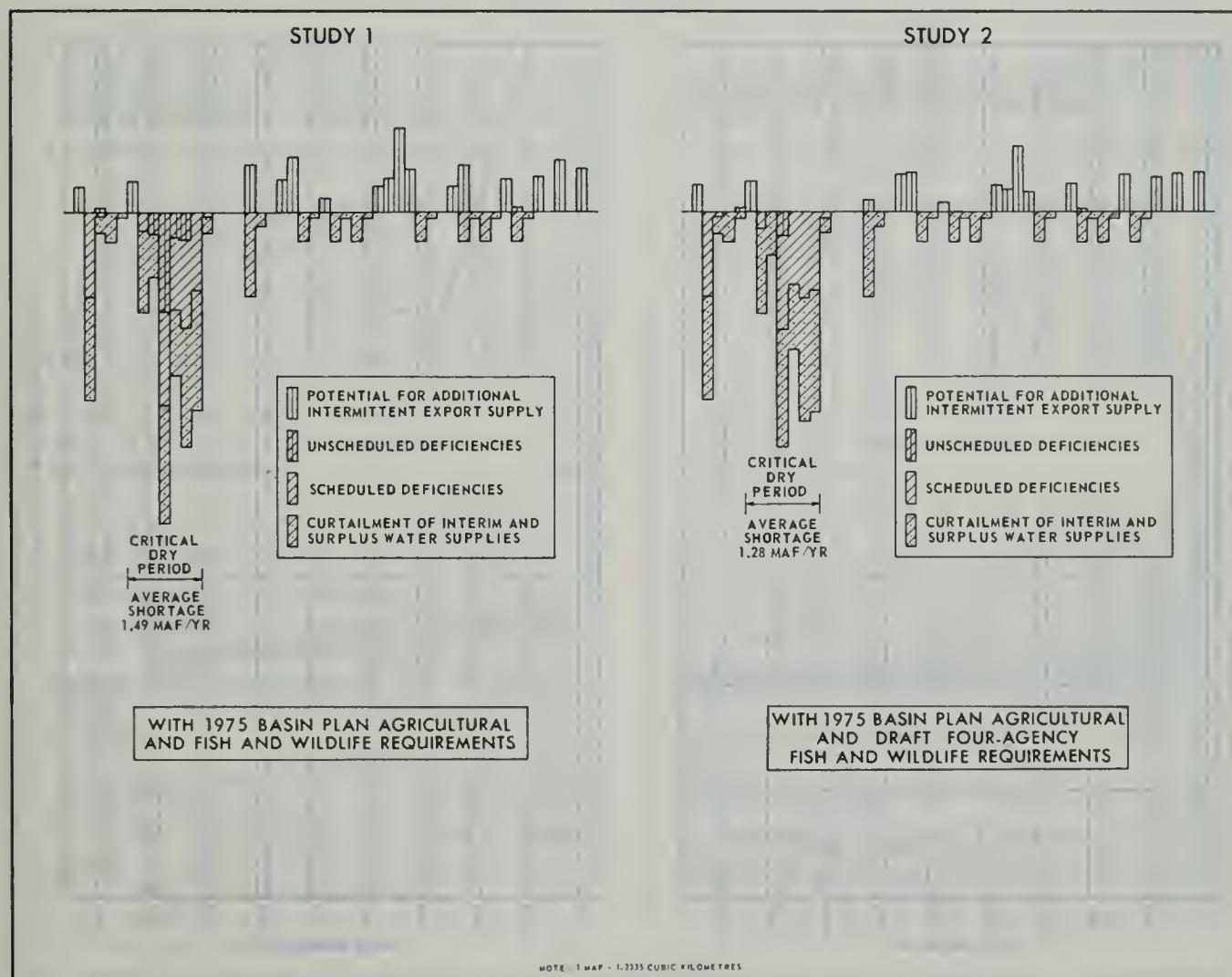


Figure 19. CVP and SWP systems operation, 1980 level of development.

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year in Study 2. Firm yield is defined as the annual supply of water that can be sustained in all years, except that, during critically dry periods, lower supplies (or deficiencies) are permitted in accordance with predetermined provisions in SWP and CVP water supply contracts.

In the studies, the annual Delta export supply over the historic 7-year critical dry period (1928-1934) averaged about 6.0 cubic kilometres (4.9 million acre-feet) and 6.3 cubic kilometres (5.1 million acre-feet) for Studies 1 and 2, respectively. The studies also showed that in most years the system would be capable of supporting greater exports.

Figure 20 provides a statistical overview of annual Delta water supply and disposal for all types of water years without a Delta water transfer facility for both Study 1 (left figure) and Study 2 (right figure). The top line on each figure shows the variation of inflow

(including rainfall) to the Delta from wet to dry years for 1980 conditions. The labeled areas below the inflow lines show the disposition of these waters. In addition to water needed to meet Delta standards, minimum required Delta outflow includes varying amounts of carriage water needed to maintain water quality at the export pumps without a Delta water transfer facility. The percentage of time (years) that the varying amounts are expected is shown along the bottom, with the wetter years to the left and the drier years to the right. While not available for inclusion in this report, a figure depicting conditions under the March 1978 SWRCB Draft Plan would closely resemble the figure for Study 2. While Delta export would be slightly less, the minimum required Delta outflow would follow a similar sliding scale from wet to dry years, but would be greater, as discussed in Chapter III.

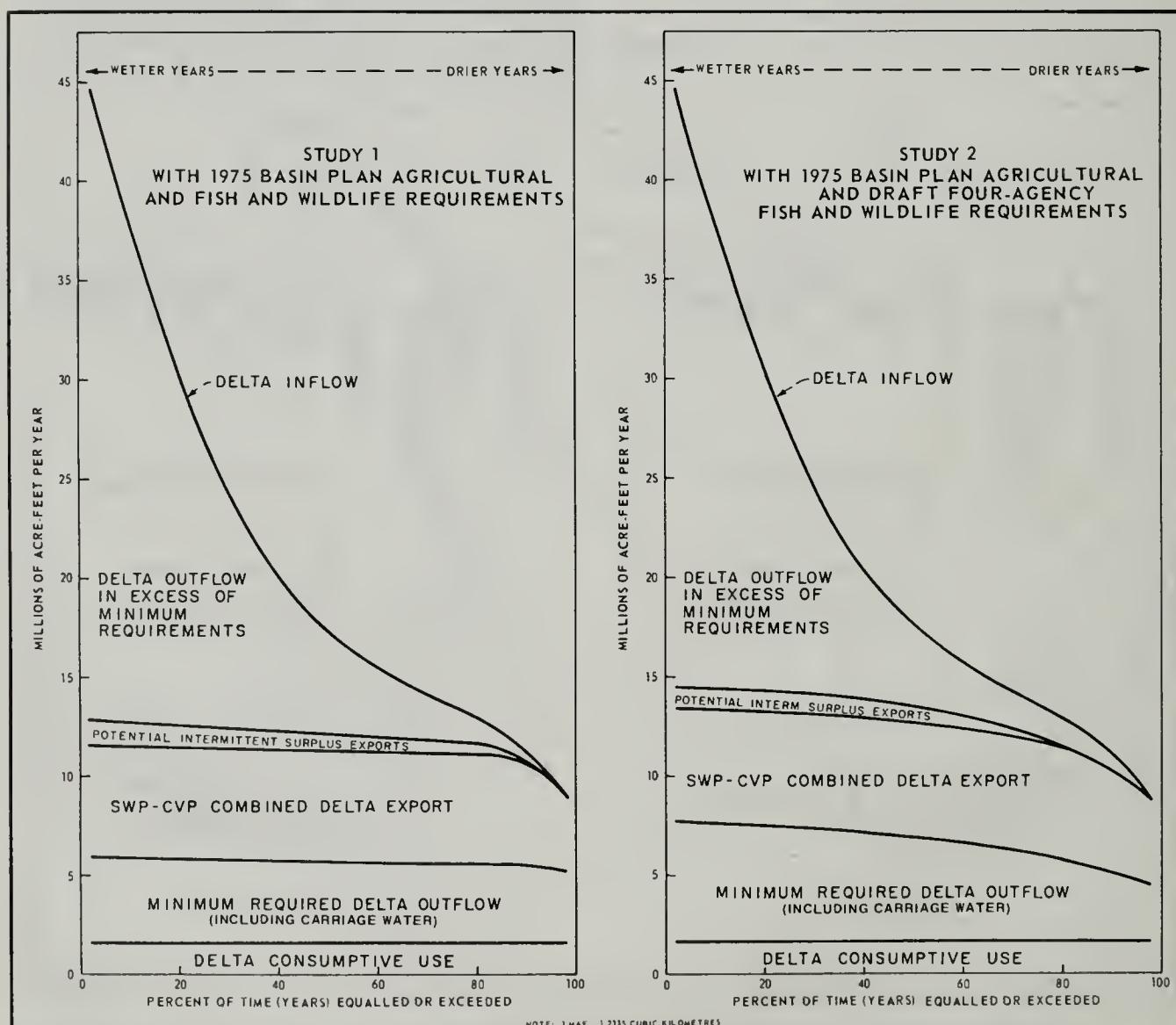


Figure 20. Annual Delta water supply and disposal, 1980 level of development.

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Effect of Ongoing Construction and Future Area of Origin Depletion

The yield studies of existing facilities did not include two CVP projects under construction—Auburn Reservoir and New Melones Reservoir. Also, State law gives the areas of origin priority for water over export. By the year 2000, the estimated net effect of these two factors will be a reduction in the firm yield available from the Delta to 6.4 cubic kilometres (5.2 million acre-feet) and 6.7 cubic kilometres (5.4 million acre-feet) for Studies 1 and 2, respectively (see Table 11). Therefore, any additional need for firm yield available from the Delta must

be met by construction of additional water supply facilities and Delta water transfer facilities.

Imports from the Trinity River Diversion of CVP to the Sacramento Valley are expected to diminish somewhat in the future due to increased releases for fish. Since the advent of the Diversion, the Trinity River fishery has declined severely. Studies and negotiations between the USBR and the fishery agencies are underway to determine the amount and scheduling for the increased releases. However, these studies and negotiations are not sufficiently advanced to include estimated effects on project yield.

TABLE 11

ESTIMATED ANNUAL FIRM YIELD AVAILABLE FROM THE DELTA WITH EXISTING FACILITIES IN YEAR 2000 Cubic Kilometres (Million Acre-feet)

<i>Elements</i>	<i>Study 1</i>	<i>Study 2</i>
Existing SWP and CVP System.....	6.9 (5.6)	7.2 (5.8)
New Melones Reservoir (Delta interim supply to year 2000)	+0.1 (+0.1)	+0.1 (+0.1)
Auburn Reservoir.....	+0.4 (+0.3)	+0.4 (+0.3)
Sacramento Valley Depletions.....	-0.5 (-0.4)	-0.5 (-0.4)
Folsom-South Service Area Depletions.....	-0.5 (-0.4)	-0.5 (-0.4)
Total firm yield of existing and under-construction facilities in year 2000.....	6.4 (5.2)	6.7 (5.4)

Historic Delta Exports by SWP and CVP

The CVP first exported water from the Delta in 1940, when the Contra Costa Canal began operation. Exports remained relatively small until 1951, when the Delta-Mendota Canal first became operational and exports began to increase at a rapid rate. In the 1960's, exports took another jump, with the initial operation of the federal San Luis Unit of the CVP, and the California Aqueduct of the SWP. Table 12 lists historic exports by the CVP and SWP since 1950.

Trends in Population and Agriculture

After World War II, California's population grew at unprecedented rates. In the early 1960's, California became the most populous State in the union. It was during these years of rapid growth that estimates of water needed from the SWP were made and contracts signed.

In the 1970's, however, population growth rates have slowed, and forecasts for the future reflect this recent trend. Slower growth is generally evident in Southern California, the largest urban area receiving water from the Delta by either the SWP or CVP.

In 1974, DWR published Bulletin No. 160-74, "The California Water Plan Outlook in 1974". Here, four alternative scenarios on population growth from 1972 to the year 2020 were presented. These were based on different combinations of fertility rates and net

migration levels as shown in the following tabulation of population factors.

<i>Alternative Projection</i>	<i>Population Series</i>	<i>Fertility Rate¹</i>	<i>Net Migration</i>
I	C	2.8	150,000
II	D	2.5	150,000
III	D	2.5	100,000
IV	E	2.1	0

¹ Fertility rates indicate the average number of children a woman will have during her child-bearing years.

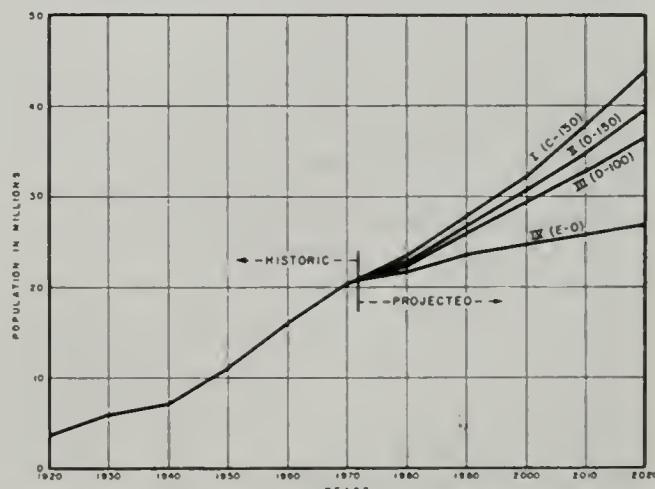


Figure 21. California historical and projected population growth.

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TABLE 12

HISTORIC EXPORTS FROM THE DELTA BY CVP AND SWP Cubic Hectometres (Thousand Acre-feet)

Year	CVP Contra Costa Canal ¹	CVP Tracy Pumping Plant ²	SWP Delta Pumping Plant ³	Total CVP-SWP Delta Export
1950	32 (26)	— —	— —	32 (26)
1951	38 (31)	233 (189)	— —	271 (220)
1952	38 (31)	207 (168)	— —	245 (199)
1953	43 (35)	967 (784)	— —	1010 (819)
1954	52 (42)	1289 (1045)	— —	1341 (1087)
1955	60 (49)	1431 (1160)	— —	1491 (1209)
1956	56 (45)	833 (675)	— —	889 (720)
1957	67 (54)	1516 (1229)	— —	1583 (1283)
1958	62 (50)	830 (673)	— —	892 (723)
1959	88 (71)	1670 (1354)	— —	1758 (1425)
1960	95 (77)	1712 (1388)	— —	1807 (1465)
1961	97 (79)	1847 (1497)	— —	1944 (1576)
1962	81 (66)	1673 (1356)	— —	1754 (1422)
1963	78 (63)	2014 (1633)	— —	2092 (1696)
1964	106 (86)	2048 (1660)	— —	2154 (1746)
1965	86 (70)	1776 (1440)	— —	1862 (1510)
1966	109 (88)	2035 (1650)	— —	2144 (1738)
1967	86 (70)	1541 (1249)	16 (13)	1643 (1332)
1968	125 (101)	2779 (2253)	1122 (910)	4026 (3264)
1969	91 (74)	1885 (1528)	831 (674)	2807 (2276)
1970	115 (93)	2078 (1685)	672 (545)	2865 (2323)
1971	96 (78)	2710 (2197)	942 (764)	3748 (3039)
1972	126 (102)	2614 (2119)	1888 (1531)	4628 (3752)
1973	113 (92)	2624 (2127)	1555 (1261)	4292 (3480)
1974	96 (78)	2685 (2177)	2298 (1863)	5079 (4118)
1975	95 (77)	3485 (2825)	2328 (1887)	5908 (4789)
1976	154 (125)	3406 (2761)	1662 (1347)	5222 (4233) ⁴
1977	118 (96)	1358 (1101)	1035 (839)	2511 (2036) ⁴

¹ Supplies water to parts of Contra Costa County.

² Supplies water to San Joaquin Valley via the Delta-Mendota Canal. Years 1962-1966 include some water pumped for the SWP South Bay Aqueduct.

³ Supplies water to South Bay area, San Joaquin Valley, and Southern California. Includes both entitlement and surplus water and also includes some water pumped for CVP.

⁴ Reduction due to drought conditions.

None of the four alternatives were designed to represent the most probable future. Recent estimates by the California Department of Finance show that the State's population as of July 1, 1977, was 21.9 million, which falls between projections II and III. Figure 21 shows the historic growth of California's population from 1920 through 1972, and the four alternative projections to year 2020.

Since World War II, American agriculture has gone through a major revolution—a revolution little noticed by the average urban dweller. Among the changes, there has been increased mechanization, involving more tractors, hay balers, combines, harvesters, and other equipment; and new scientific agricultural practices, including greater use of fertilizers and cover crops, improved varieties of seeds and animal breeds, and more effective controls of insects, diseases, and weeds.

As a result, the production and availability of foods and fibers have increased dramatically. Today, the average American spends about 20 percent of his after-tax income on food. Two hundred years ago, the purchase of basic food necessities took more than 70 percent of a worker's income.

Continued growth of California agriculture is being stimulated by increased demand for food throughout the United States and the world. About 40 percent of California's total exports are agricultural products.

A University of California Food Task Force projects that continuing to feed the world through 1985 will require a 50 percent increase in the production of rice, sugar, and vegetables; a 40 percent increase in grains needed for meat production; and a 63 percent increase in production of fruit.¹ A large

¹ "A Hungry World, The Challenge of Agriculture", University of California, Berkeley, 1974, pg. 27

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part of this need will be supplied by the United States, partly because of the unexcelled agricultural efficiency and partly because the Nation needs exportable products to offset the trade deficit. From July 1975 to April 1976, agricultural exports totaled \$18½ billion, while agricultural imports totaled only \$8¼ billion.¹

California plays a large and important role in agriculture. It consistently ranks among the top three agricultural states in the United States. The reasons for this are many and varied. High on the list are its deep, rich soils, well suited to a wide variety of crops; its long-growing season; its extensive irrigation network; and the high degree of mechanization on California farms.

The production center of California's agriculture is the San Joaquin Valley that stretches almost 480 kilometres (300 miles) from the Sacramento Valley on the north to the Tehachapi Mountains on the south. This valley accounts for over one-half of California's production of field crops and from one-fourth to one-third of its vegetable crops. With an average annual rainfall of only 250 millimetres (10 inches) and limited surface and ground water supplies, much of the valley agriculture is dependent on water imported from the Delta via the CVP and SWP.

¹United Business Service, August 16, 1976

Early in this study it was concluded that meeting the reasonable water demands in the SWP and CVP export service areas for the year 2000 would be a realistic goal for planning future courses of action. At that time, the expected year 2000 Delta export demand was 10.4 cubic kilometres (8.4 million acre-feet) and this requirement could possibly be as high as 12.3 cubic kilometres (10 million acre-feet) per year or as low as 7.6 cubic kilometres (6.2 million acre-feet) per year, depending on a number of future events and actions (see Figure 22).

Subsequent review has led to a lower year 2000 target demand of 9.5 cubic kilometres (7.7 million acre-feet) per year for water deliveries for this analysis. This lower estimate reflects reduced population growth and significant water conservation and waste water reclamation measures.

State Water Project

Thirty-one public agencies have contracted for long-term water supplies from the SWP. Of these, 28 receive (or will receive) water transported through and exported from the Delta. Figure 23 lists the 28 agencies, gives their maximum annual water entitlements, and shows their general location.

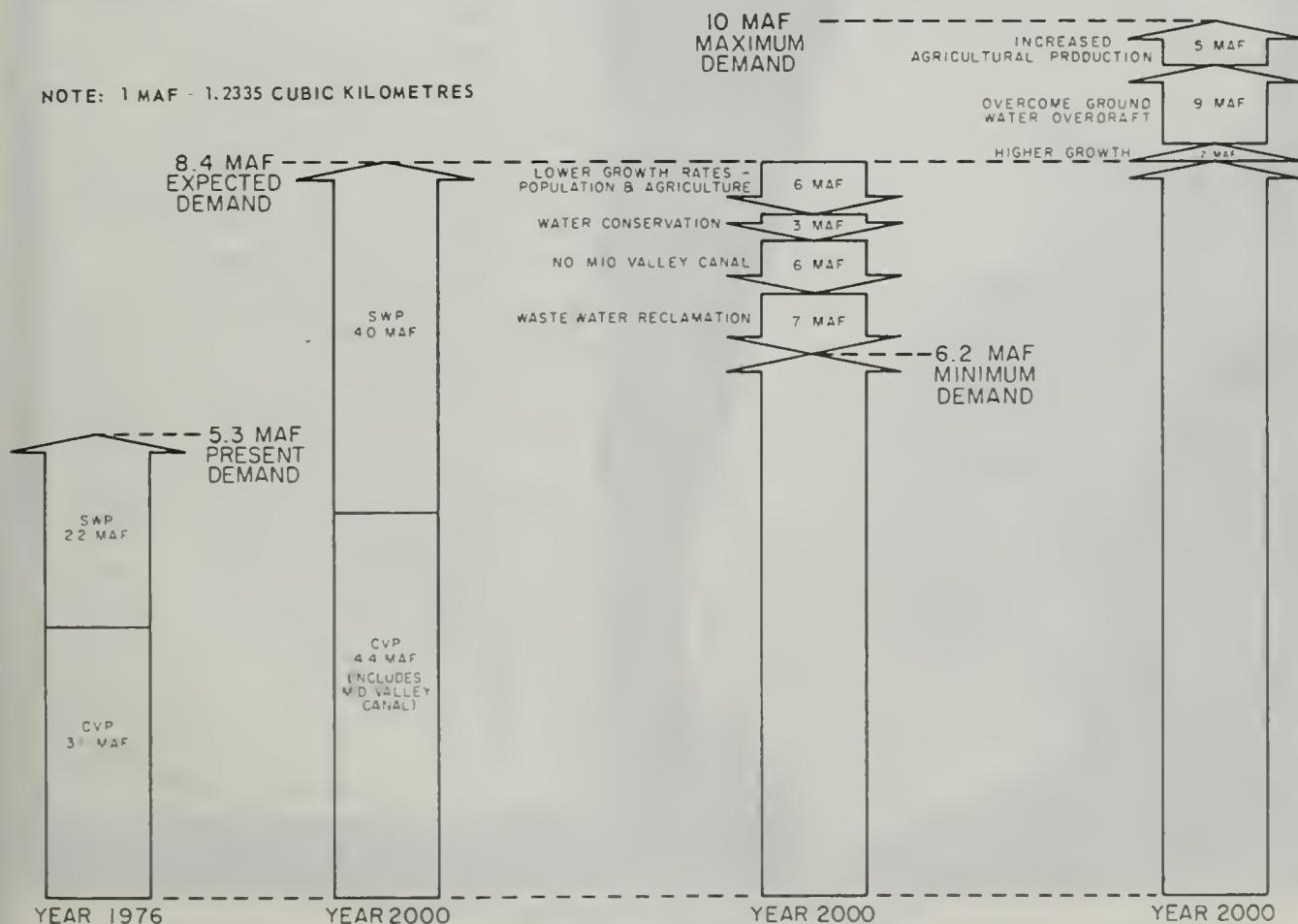


Figure 22. Present and range of future annual Delta export demands (Phase II study).

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Loca- tion Na.	Contracting Agency	Maximum Annual Entitlement (acre-feet)
NORTH BAY AREA		
1	Napa County Flood Control and Water Conservation District	25,000
2	Solano County Flood Control and Water Conservation District	42,000
Subtotal		67,000
SOUTH BAY AREA		
3	Alameda County Flood Control and Water Conservation Dist., Zone 7	46,000
4	Alameda County Water District	42,000
5	Santa Clara Valley Water District	100,000
Subtotal		188,000
SAN JOAQUIN VALLEY AREA		
6	County of Kings	4,000
7	Devil's Den Water District	12,700
8	Dudley Ridge Water District	57,700
9	Empire-West Side Irrigation District	3,000
10	Hacienda Water District	8,500
11	Kern County Water Agency	1,153,400
12	Oak Flat Water District	5,700
13	Tulare Lake Basin Water Storage District	110,000
Subtotal		1,355,000
CENTRAL COASTAL AREA		
14	San Luis Obispo County Flood Control and Water Conservation District	25,000
15	Santa Barbara County Flood Control and Water Conservation District	57,700
Subtotal		82,700
SOUTHERN CALIFORNIA AREA		
16	Antelope Valley-East Kern Water Agency	138,400
17	Costaic Lake Water Agency	41,500
18	Coachella Valley County Water Agency	23,100
19	Crestline-Lake Arrowhead Water Agency	5,800
20	Desert Water Agency	38,100
21	Littlerock Creek Irrigation District	2,300
22	Mojave Water Agency	50,800
23	Palmdale Water District	17,300
24	San Bernardino Valley Municipal Water District	102,600
25	San Gabriel Valley Municipal Water District	28,800
26	Son Gorgonio Pass Water Agency	17,300
27	The Metropolitan Water District of Southern California	2,011,500
28	Ventura County Flood Control District	20,000
Subtotal		2,497,500
TOTAL		4,190,200

NOTE: 1 ACRE-FOOT = 1233.5 CUBIC METRES

Figure 23. SWP Delta export service areas.

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In estimating the year 2000 target demand for the SWP, DWR reviewed past estimates, contractor requests, projections by The Metropolitan Water District of Southern California for its service area, and information supplied by Kern County Water Agency for its service area. In addition, testimony and comments received during the course of the study were reviewed and considered.

Annual contractor requests (Fall 1976) for future delivery of SWP entitlement water in areas receiving water exported from the Delta are summarized in Table 13. The corresponding contract entitlement,

plus losses, in the SWP water service contracts is also shown. The difference between current projections and contract entitlements represents the slower buildup of demand, primarily due to slower population growth. Subsequent contractor requests (Fall 1977) for use in Bulletin 132-78 show a higher demand in the early years, but essentially the same demand for year 2000.

Entitlement water is considered a "dependable supply" by some SWP contractors, even though contracts allow deficiencies in the annual agricultural water deliveries of up to 50 percent in any one year

TABLE 13

SWP CONTRACTOR REQUESTS FOR ENTITLEMENT WATER DELIVERIES Cubic Hectometres (Thousand Acre-feet)

SWP Service Areas Supplied from the Delta	1980	1990		2000		Maximum Entitlement
North Bay	7	(6)	58	(47)	67	(54)
South Bay	167	(135)	199	(161)	224	(182)
San Joaquin Valley	949	(769)	1671	(1355)	1671	(1355)
Central Coastal	0	(0)	62	(50)	85	(69)
Southern California	1354	(1098)	2255	(1828)	2666	(2161)
Subtotals.....	2477	(2008)	4245	(3441)	4713	(3821)
Losses and Recreation Water	240	(195)	260	(211)	260	(211)
Totals.....	2717	(2203)	4505	(3652)	4973	(4032)
Contracted Entitlements ¹	2986	(2421)	5383	(4364)	5429	(4401)
¹ Including estimated losses and recreation water, but excluding Feather River service area						

and up to 100 percent in any seven consecutive years.¹ DWR project yield studies and planning of facilities to meet the contracts have all assumed that such deficiencies would be imposed during a drought, like the historic seven years from 1928 to 1934 and other critically dry years. This is the same basis on which the project was formulated and on which the contracts were prepared. Since about one-third of the project yield is for agricultural use, these deficiencies reduce the requirements on the project substantially in such years as shown in Table 14.

TABLE 14 APPROXIMATE ALLOWABLE SWP AGRICULTURAL DRY PERIOD DEFICIENCIES Cubic Hectometres (Thousand Acre-feet)

Year	7-Year Average	Maximum Yearly per Contracts
1980.....	120 (100)	490 (400)
1990.....	250 (200)	860 (700)
2000.....	250 (200)	860 (700)
Full Entitlement	250 (200)	860 (700)

¹ While contracts allow two years with 50 percent deficiency in a seven-year period present planning assumes four years with a maximum of 25 percent deficiency to reduce economic hardship in any one year

During the 1977 drought, DWR found it necessary to cut agricultural deliveries of entitlement water by 50 percent plus all uses by an additional 10 percent. This resulted in a total deficiency in entitlement deliveries of about 570 cubic hectometres (460 thousand acre-feet). No surplus water was delivered. However, by exchange agreements, four SWP water contracting agencies in southern California released a total of about 440 cubic hectometres (355,279 acre-feet) of their SWP supplies¹ for use in areas of need in northern California. The exchange was possible because their available supply from all sources (Colorado River for MWD and mainly ground water for the other agencies) exceeded their needs for the remainder of the year. After giving priority to urban areas of need, much of this exchange water was made available to SWP agricultural water users in the San Joaquin Valley, lessening the severity of the large deficiencies. After the Central Arizona Project begins operation in the late 1980's, MWD will not have extra Colorado River water available.

While contract deficiency provisions reduce requirements on the project during dry periods, actual

¹ Metropolitan Water District of Southern California 395 cubic hectometres (320,000 acre-feet), San Bernardino Municipal Water District, 19.7 cubic hectometres (16,000 acre-feet), Desert Water Agency 14.4 cubic hectometres (11,700 acre-feet), and Coachella Valley County Water District, 9.3 cubic hectometres (7,579 acre-feet)

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service area needs are usually increased. For example, effective rainfall on agricultural lands (soil moisture) is about 11 percent less in a critical dry year than a normal year. Conversely, service area requirements are as much as 15 percent less in very wet years for the opposite reason.

Besides providing for a specific water supply (entitlement water), SWP contracts provide for a surplus water supply subject to reduction or termination at any time by the State. During many years some surplus water above entitlements is available from the project. Surplus water includes only water that can be furnished without interfering with (1) annual entitlements, (2) needs for project construction, (3) operational requirements for recreation and fish and wildlife uses, (4) needs for project power generation, (5) exchanges of water and variations in reservoir storage necessary for operational flexibility, and (6) losses in connection with (1) and (5) above. Such water can be diverted only after all reasonable beneficial needs and prior rights in the Delta have been met. Further, DWR planning has been to stage facilities only in time to meet requests for entitlement water, and not to assure the availability of surplus water.

In the contracts, surplus water for agricultural and ground water replenishment has priority over other uses for surplus water. This priority was established to reduce the average price of water to agricultural contractors during the early years of the buildup of demand when expenses are high and returns small. The contracts also provide that no surplus water deliveries that would encourage the development of an economy dependent upon a sustained delivery of surplus water will be approved by the State.

In the financial feasibility studies related to SWP contracts (DWR Bulletin 119 series), maximum amounts of surplus water were assumed about 1978 and, for most contractors, these amounts were considerably less than 50 percent of their maximum annual entitlements. No surplus water was assumed for any years after 1981 and for some prior years because of reservoir filling, pump staging, or other operational reasons. The actual deliveries of surplus water have already proven to be much greater than assumed in the feasibility studies. Table 15 summarizes the fall 1976 contractor requests for surplus water through the year 2000. No surplus water was available in 1977 due to the drought.

TABLE 15
SWP CONTRACTOR REQUESTS FOR SURPLUS WATER DELIVERIES
Cubic Hectometres (Thousand Acre-feet)

Year	General Service Areas			Total
	South Bay	San Joaquin Valley	Southern California	
1978	31 (25)	1458 (1182)	88 (71)	1577 (1278)
1979	35 (28)	1411 (1144)	83 (67)	1529 (1239)
1980	38 (31)	1362 (1104)	76 (62)	1476 (1197)
1985	28 (23)	1102 (893)	— (—)	1130 (916)
1990	16 (13)	184 (149)	— (—)	200 (162)
2000	— (—)	184 (149)	— (—)	184 (149)

Central Valley Project

More than 60 entities have contracts for, or have expressed interest in, long-term water supplies from the CVP via the Delta. The USBR is authorized to undertake the San Felipe Unit and is planning the Mid-Valley Canal Unit. Figure 24 lists present and potential customers, their estimated water demands, and the location of the CVP service areas that receive water exported from the Delta.

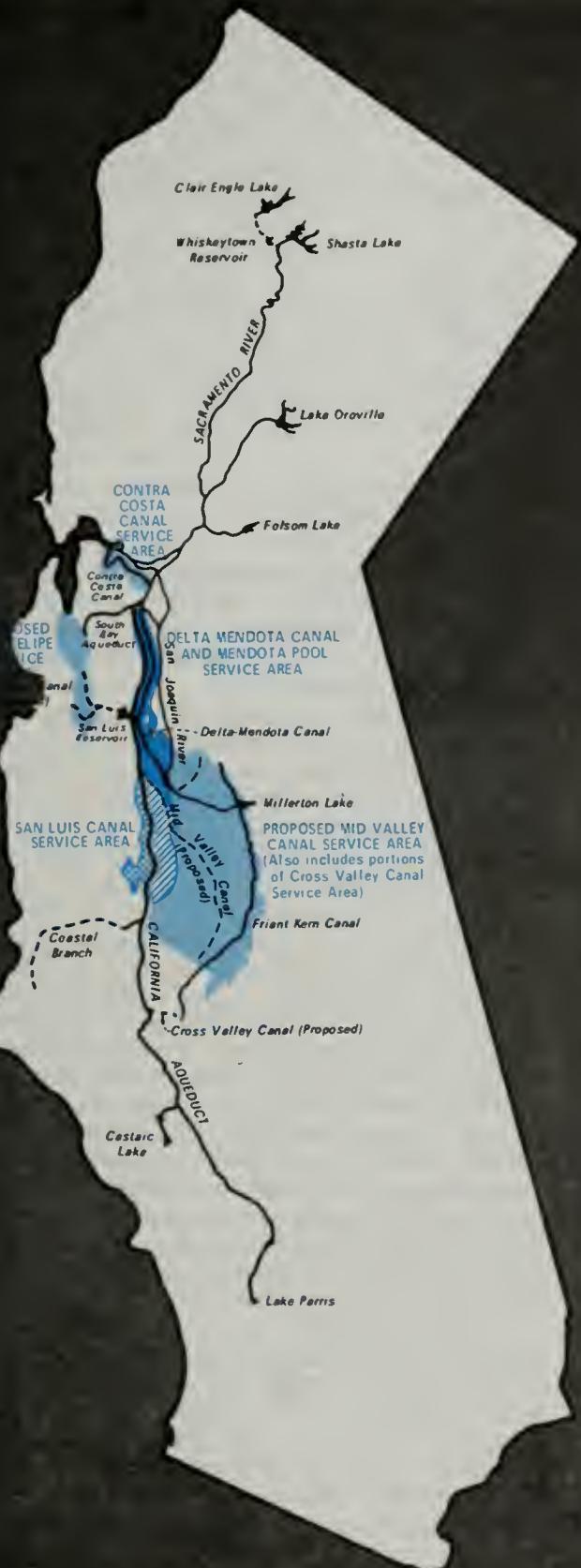
In determining the year 2000 target demands for the CVP, DWR reviewed estimates under the four scenarios in Bulletin 160-74, estimates in Working Document No. 9 of the USBR's Total Water Management Study for the Central Valley Basin, USBR Exhibits 2A and 2B presented at the recent SWRCB Delta water quality hearings, and other data related to specific projects. For this report the projected CVP target demands for water to be exported from the Delta

were based on data in USBR Working Document No. 9, as shown in Table 16.

Water for the Mid-Valley service area is now being supplied by overdrafting the underlying ground water. Therefore, supplying the water from future Delta exports does not involve the irrigation of new lands. Supplying water to this area would become a demand on the Delta if the Mid-Valley Project is authorized by Congress.

CVP contracts have agricultural deficiency provisions similar to SWP contracts. They have the same total deficiency of 100 percent in any seven consecutive years as the SWP, but generally have a lower maximum deficiency in any one year (25-35 percent). Since over 90 percent of CVP Delta exports are used for agriculture, such deficiencies reduce requirements on the project substantially during dry years. Also, in this study, a 100 percent deficiency in "interim" and intermittent water for San Luis and

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SERVICE AREAS AND CONTRACTORS	CONTRACTED AND ESTIMATED YR 2000 REQUIREMENTS (AF/YR)
DELTA MENDDTA CANAL	
Banta-Carbana Irrigation District	25,000
Broadview Water District	27,000
Centinella Water District	3,000
Davis Water District	5,400
Del Puerto Water District	12,060
Eagle Field Water District	4,550
Foothill Water District	10,840
Grossland Water District	15,000
Sam Hamburg Farms, Inc.	64
Hospital Water District	34,105
Kern Canon Water District	7,700
* Lonsdale Water District	2,800
Mercy Springs Water District	13,300
Mustang Water District	14,680
Orestimba Water District	15,860
Oro Loma Water District	4,600
Pacheco Water District	7,100
Panache Water District	66,800
Patterson Water District	22,500
Plain View Water District	20,600
Quinta Water District	8,620
Ramona Water District	4,560
Solada Water District	9,130
San Luis Water District	76,000
Sunflower Water District	16,625
West Side Water District	7,500
West Stanislaus Irrigation District	50,000
Wildern Water District	2,990
* West Side Golf Club, Inc.	150
Tracy, City of	10,000
Exchange Contract	110,000
Projected increase in service area requirements	4,000
Subtotal	612,534
CRDSS VALLEY CANAL	
County of Fresno	3,000
Tri-Valley Water District	982
Lower Tule Irrigation District	31,102
Hills Valley Irrigation District	2,142
Pixley Irrigation District	31,102
Kern-Tulare Water District	40,000
Rag Gulch Water District	13,300
Ducor Irrigation District	1,200
County of Tulare	3,000
Projected increase in service area requirements	2,472
Subtotal	128,300
MENDOTA POOL	
Dudley et al	2,280
Fresno Slough Water District	4,866
Melvin D. Hughes	163
James Irrigation District	45,000
Laguna Irrigation District	1,000
Recl. District No. 1606	570
Traction Ranch	7,853
Tranquility Irrigation District	34,000
Westlands Water District	50,000
* Firebaugh, City of	2,000
* Mendota, City of	2,000
State of California	20,143
Duck Clubs (8)	1,330
* James W. Wilson, et al	426
Grasslands Water District	35,000
Exchange Contract	730,000
Subtotal	936,631
SAN LUIS CANAL	
Westlands Water District	1,100,000
San Luis Water District	52,000
Panache Water District	27,200
Avenal Community Water District	3,500
City of Coalinga	10,000
City of Huron	3,000
William Alfonso	47
Grasslands Water District	1,575
State of California	4,050
Interim Water	207,000
Projected increase in service area requirements	8,000
Subtotal	1,416,372
CONTRA COSTA CANAL	
Contra Costa County Water District	195,000
SAN FELIPE UNIT	152,000
MID. VALLEY CANAL	650,000
TOTAL (Without Losses)	4,090,837
*Contract not executed as of 4-1-78	
NOTE: 1 ACRE-FOOT = 1,233.5 CUBIC METRES	

Figure 24. CVP Delta export service areas.

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Table 16

PROJECTED ANNUAL CVP WATER DEMANDS¹ Cubic Hectometres (Thousand Acre-feet)

CVP Service Area Supplied from the Delta	1980	1990	2000	Ultimate
Contra Costa Canal.....	167 (135)	232 (188)	241 (195)	241 (195)
Delta-Mendota Canal and Exchange Contract ²	2049 (1661)	2051 (1663)	2066 (1675)	2066 (1675)
San Luis Unit (firm) ³	1552 (1258)	1559 (1264)	1564 (1268)	1564 (1268)
San Luis Unit (interim)	234 (190)	254 (206) ⁴	255 (207) ⁴	255 (207) ⁴
Kern Cross Valley Canal	158 (128)	158 (128)	158 (128)	158 (128)
San Felipe Unit.....	0 (0)	147 (119)	187 (152)	266 (216)
Mid-Valley Canal Unit (firm)	0 (0)	617 (500)	617 (500)	802 (650)
Mid-Valley Canal Unit (intermittent)	0 (0)	185 (150)	185 (150)	0 (0)
Totals	4160 (3372)	5203 (4218)	5273 (4275)	5352 (4339)

¹ Includes losses.

² Includes grasslands.

³ A portion of this water is subject to renegotiation under the so-called amendatory contract (see Special Task Force Report on San Luis Unit, 1978).

⁴ Not provided as firm yield, but continued as intermittent supply to avoid increasing ground water overdraft in the San Joaquin Valley.

Mid-Valley Canal service areas respectively, was assumed in critically dry years and in dry years following critical dry years. The approximate deficiencies, including interim and intermittent water, are shown in Table 17.

TABLE 17

APPROXIMATE ALLOWABLE CVP AGRICULTURAL DRY PERIOD DEFICIENCIES

Cubic Hectometres (Thousand Acre-feet)

Year	7-Year Average	Maximum Yearly
1980.....	740 (600)	1110 (900)
1990.....	990 (800)	1600 (1300)
2000.....	990 (800)	1600 (1300)
Ultimate.....	990 (800)	1600 (1300)

Water Conservation and Waste Water Reclamation

The Delta Alternatives Program was based on the principle that water development and management should make maximum use of water conservation and waste water reclamation.

Water Conservation

It is State policy that the water resources of California should be managed in a manner that will result in the greatest long-term benefit to the people of the State. Water resources already developed should be used to the maximum extent before new sources are developed. Optimum techniques and processes for water conservation should be implemented and waste should be avoided. The recent (1976-1977) drought has forcefully made this need clear. Further-

more, water conservation results in significant energy conservation, which is now a national goal.

DWR Bulletin 198, "Water Conservation in California", dated May 1976, discusses opportunities for water savings throughout the State, and includes recommendations and proposed actions by DWR to implement water conservation programs. The bulletin was used to estimate the potential of water conservation in reducing the rate of buildup in demand for water exported from the Delta.

Some potential for agricultural water conservation exists through more efficient irrigation methods, improvements in irrigation conveyance and drainage systems, and conservation oriented pricing structures. However, such water saving opportunities must be considered on a case-by-case basis with consideration given to impacts on salt balance, water quality, ground water, water supply, drainage, and energy use. Also, part of the return flows from excess applied irrigation water in the San Joaquin Valley contributes low quality water to the water supply available at the Delta and are, therefore, already being used to meet in-Delta uses, export demands, and Delta outflow requirements that otherwise must be met by release of stored water in reservoirs. Furthermore, there is a large ground water overdraft in the San Joaquin Valley and any water conservation savings may simply go to reduce the overdraft. For these reasons, and to be conservative in planning future water supplies, no reduction in the net agricultural water requirements to be met by the SWP and CVP was assumed for this study. DWR will, however, vigorously continue in its efforts to promote water conservation in agriculture.

The greatest potential for net water savings is found in areas where significant waste water and return flows are disposed to saline water without

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serving further beneficial use. The three water service areas receiving water from the Delta through the SWP and CVP that meet this criterion are the San Francisco Bay, Central Coastal, and South Coastal areas, where water is used principally for urban, municipal, and industrial purposes. Bulletin 198 estimates that by the year 2000, the three areas will have a potential for annual savings of about 1040 to 1780 cubic hectometres (840 to 1,440 thousand acre-feet).

Waste Water Reclamation

The State Legislature¹ has declared that the people of the State have a primary interest in the development of facilities to reclaim and reuse waste water to supplement existing water supplies, thereby resulting in the greatest long-term benefit to the people. Developed water must be used to the maximum extent possible.

The State Department of Health Services establishes "Reclamation Criteria" for those uses of reclaimed waste water that involve public health. The Department of Health Services has issued reclamation criteria for irrigation of food, fodder, fiber, and seed crops; irrigation of pasture for milking animals; and irrigation of landscapes.

When waste water is discharged to fresh water, it naturally becomes available for recycling as long as the resultant quality is adequate for the intended use. Reclamation of waste water creates a new supply of water only when it would otherwise be discharged to saline water, when it has been so degraded that it cannot be discharged to fresh water, or when evaporation losses during treatment of waste water can be eliminated or reduced.

DWR has identified opportunities within SWP and CVP Delta export service areas where the reuse of waste water would be most probable. These were grouped in two classifications: (1) potential supplies for in-basin use, and (2) potential supplies that could be transported from the basin for other uses, such as Delta outflow for salinity control, power plant cooling, and, possibly, irrigated agriculture in the San Joaquin Valley. In determining the effect on Delta export for this study, however, only locally developed reclaimed waste water was considered as contributing to the available water supply. However, DWR is continuing to study interbasin transfer of reclaimed waste water as a potential future source of water.

The effect of local reclamation of waste water is to reduce the rate of build-up in demand for imported water within the affected area. This in turn would slow the need to build new project facilities for imported supplies by extending the present supplies, but would not reduce the ultimate amount of water to be supplied by the SWP under existing contracts.

DWR is also studying the feasibility of reclaiming waste water as a source of new water supply for the SWP. Such SWP constructed facilities would become part of the SWP conservation facilities and the water so developed would become part of the 5.22 cubic kilometres (4.23 million acre-feet) of project yield ultimately to be provided by SWP and paid for by the water contractors. Chapter V discusses this briefly and shows its relationship to the program presented in this bulletin.

On October 13, 1977, the Governor created the Office of Water Recycling with the objective of reclaiming an additional 490 cubic hectometres (400,000 acre-feet) of waste water annually by 1982. Currently, it is estimated that there is about 250 cubic hectometres (200,000 acre-feet) per year of reclaimed water being recycled. The long-range goal for year 2000 is 990 cubic hectometres (800,000 acre-feet). The Office of Water Recycling considers that most of the needed water reclamation projects to satisfy these goals will be implemented as a result of the regional water reclamation studies being conducted in San Francisco Bay area, Los Angeles-Orange County metropolitan area, and San Diego area. These sections of the State include SWP and, in the Bay area, CVP service areas. Studies are currently underway that will identify the specific projects and the quantities of reclaimed water to be recycled under this program.

For example, there are two significant waste water reclamation planning studies underway in the San Francisco Bay Region. The first study is a subregional one conducted by the Santa Clara Valley Water District, in cooperation with DWR and others, to plan, design, and construct a waste water reclamation facility that would serve agriculture water primarily in (although not limited to) South Santa Clara County. The source of water would be the San Jose-Santa Clara Regional Waste Water Treatment Plant. The second study is a joint effort by the major water and sewage agencies in the Bay area and DWR to determine the amount of present and future reclaimed urban waste waters that can be utilized within the Bay Region. In both the subregional and regional studies, the intent is to use waste water as a replacement for existing or planned future uses of potable water supplies and thereby reduce the amount of water exported from the Delta to the San Francisco Bay Region, or to use the San Francisco waste water, either directly or indirectly to augment Delta outflows.

Reduction Goal

The potential annual savings from water conservation practices and in-basin waste water reclamation in the three coastal basins receiving Delta exports range between about 1500 to 2800 cubic hectometres

¹Chapter 7, Porter-Cologne Water Quality Control Act of 1970

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(1,200 to 2,200 thousand acre-feet) as shown below.

Source	Potential Savings by Year 2000	
	Cubic Hectometres/yr	Thousands Acre-feet/yr
Water Conserva- tion	1040-1780	(840-1440)
In-Basin Reclama- tion	490- 990	(400- 800)
Total	1530-2770	(1240-2240)

Actual reduction in the demand for Delta exports may be less than the potential shown. For example, some of the listed beneficial uses for reclaimed waste water, such as in-stream uses for example, may not have been included in the estimated SWP and CVP water demands and thus would constitute "new uses". Uncertainties exist as to costs, adequacy of technology, health considerations, and public acceptance. Not all conservation or reclamation achieved in the three areas should be considered as direct reductions in demands for SWP and CVP water. These are large areas that receive water from several sources other than SWP and CVP. The exact proportion between conservation and reclamation is difficult to predict. If conservation is large, reclamation potential becomes smaller and vice versa. For these reasons, DWR has concluded that 860 cubic hectometres (700 thousand acre-feet) per year of savings from municipal and industrial water conservation and waste water reclamation by the year 2000 represents a conservative goal for project planning purposes.

The major portion of this potential savings would be reflected as a reduction in SWP demands on the Delta, since SWP supplies about 90 percent of the M&I water exported from the Delta. From testimony and comments received during the study, and other preliminary material, DWR learned that approximate-

ly 120 cubic hectometres (100 thousand acre-feet) of new waste water reclamation is already reflected in the year 2000 contractor requests for water. Therefore, a net reduction of 740 cubic hectometres (600 thousand acre-feet) in estimated Delta exports was used in determining target demands for Delta exports as summarized in the next section. The estimated rate of buildup of these savings is tabulated in Table 18.

TABLE 18
GOAL FOR DELTA EXPORT REDUCTION FROM
WATER CONSERVATION AND RECLAMATION
Cubic Hectometres (Thousands Acre-feet)

Year	Gross	Net
1980.....	120 (100)	100 (80)
1990.....	490 (400)	425 (345)
2000.....	860 (700)	740 (600)

As part of the actions to protect the Delta and provide for future water needs, DWR will require water service contractors to develop effective programs for water conservation and waste water reclamation to (1) help reduce demand on the Delta and (2) provide a source of water supply to help satisfy the needs that develop between now and year 2000. This action will help stretch available supplies (an waste water reclamation facility developed as a new source of water supply for the SWP could be used to meet project needs after the year 2000 or could also reschedule of other new conservation facilities)

Need for Additional SWP and CVP Delta Export Supplies

The estimated potential shortage, or need for development of additional firm yield, is shown in Table 19.

TABLE 19
TARGET DEMANDS AND POTENTIAL SHORTAGES
Cubic Kilometres (Million Acre-feet)

Item	Annual Amounts		
	1980	1990	2000
SWP Contractor Request for Entitlement Water ¹	2.7 (2.2)	4.6 (3.7)	4.9 (4.0)
CVP Buildup from Document 9 (Incl. Mid-Valley Canal) ..	4.2 (3.4)	5.2 (4.2)	5.3 (4.3)
Subtotals	6.9 (5.6)	9.8 (7.9)	10.2 (8.3)
Less Net Conservation and Reclamation Goal	0.1 (0.1)	0.5 (0.4)	0.7 (0.6)
Subtotals (Target Demands)	6.8 (5.5)	9.3 (7.5)	9.5 (7.7)
Less Firm Yield from Existing and Under Construction SWP and CVP Facilities ²	7.0 (5.7)	6.9 (5.6)	6.4 (5.2)
Potential Shortages (or Need for Additional Supplies)	— (—)	2.4 (1.9)	3.1 (2.5)

¹ Includes losses but excludes surplus water

² Assuming 1975 Basin Plan criteria are applicable. If the draft Four-Agency Fish and Wildlife Criteria are substituted for 1975 Basin Plan Fish and Wildlife Criteria, yield would be increased by 0.25 cubic kilometres/yr (0.2 million acre-feet/yr) and potential shortages would be decreased by 0.25 cubic kilometres/yr (0.2 million acre-feet/yr). Under the March 1978 SWP Draft Plan criteria, yield would be more than 1975 Basin Plan criteria but less than the Four-Agency criteria

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Figure 25 shows, for the period 1978 to 2000, the expected growth in service area demands for water from the Delta, the capabilities of the existing and under construction SWP and CVP facilities to meet these demands, and the potential shortages. The solid curve represents the target demands selected for use in this study. At year 2000, the 9.5-cubic-kilometre (7.7-million-acre-foot) demand excludes surplus water for the SWP and reflects a 1.2-cubic-kilometre (1.0-million-acre-foot) reduction due to slower population growth and the conservation and reclamation savings goal. The sloping line across the bottom shows a decline in firm yield from the Delta from 6.8 cubic kilometres (5.6 million acre-feet) to 5.4 cubic kilometres (5.2 million acre-feet) in year 2000. This yield line would be about 0.25 cubic kilometres

(0.2 million acre-feet) higher under draft Four-Agency criteria. With the March 1978 SWPCB Draft Plan criteria, the yield line would also be higher by a lesser amount.

Chapter V presents a recommended plan for meeting these target demands. That chapter shows how exports in dry years would be reduced according to contract deficiency provisions and how exports would meet surplus water requests in years with abundant supplies. It also shows how plans for conjunctive use of ground water storage and off-stream surface storage south of the Delta would deliver more water from the Delta during wet years so that Delta diversions can be further reduced in dry years while meeting the estimated project service area water demands.

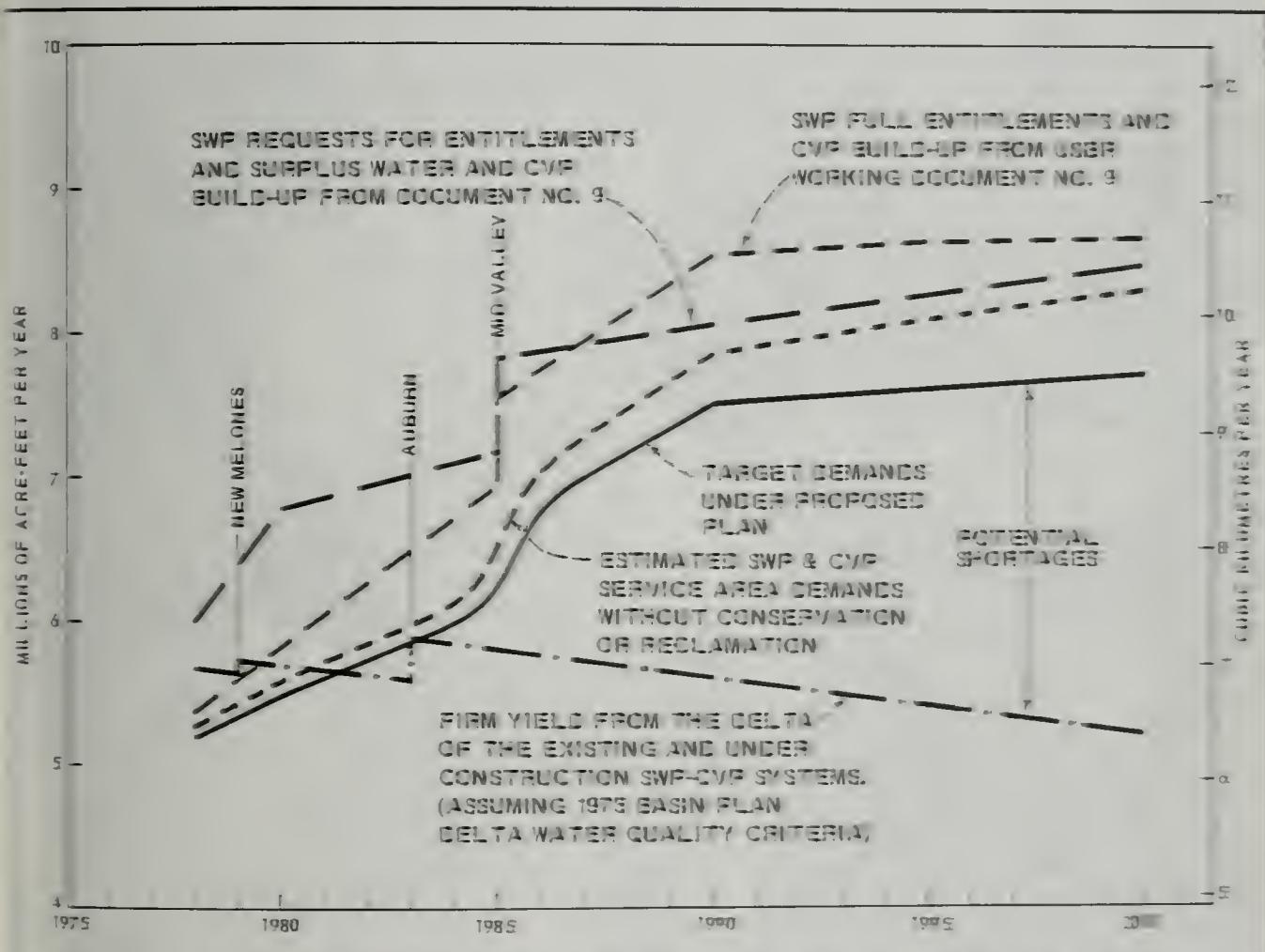


Figure 25. Estimated SWP and CVP Delta export requirements and capabilities.

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Steamboat Slough -- typical waterway winding through the rich agricultural farmlands of the Delta.

CHAPTER V. SELECTED COURSE OF ACTION

Public hearings conducted on the 1974 Peripheral Canal Draft EIR produced a long list of suggested alternatives. During the subsequent review leading to this bulletin, other alternatives were added to the list. Not all, however, were alternatives in the sense of performing the same functions as a Delta water transfer facility. Many which affect Delta water supply or Delta export requirements were outside the Delta. During the review, it was concluded that many of these out-of-Delta alternatives could contribute to an overall solution to Delta problems and these were adopted as part of the selected course of action. Many others proved to be infeasible, at least for the present, and were rejected from further consideration in this study. A discussion of the process of evaluation and selection is contained in Appendix B.

This chapter describes the Department of Water Resources' program for protecting the Delta and providing water supplies through the year 2000 for service areas of the SWP and the CVP that receive water from the Delta. The program is a comprehensive package of components to provide Delta protection, water transfer, water supplies, and improved water management. It is a compromise program to meet the needs of many diverse interests. Following the numerous public hearings by both DWR and the Legislature many compromises were made, and a broad cross section of interests representing many water, environmental, labor, and other groups support the program.

Many program components call for immediate action and implementation. Some program components will need additional in-depth feasibility studies to determine the specific details of the project to be implemented or if a component should be dropped in favor of another alternative.

Success of this total program depends upon cooperation, perseverance, and flexibility. The selected actions involve all levels of government. The program is of sufficient complexity and magnitude that numerous adjustments and changes will need to be made as it progresses. To maintain the support of water users, environmentalists, businessmen, farmers, and the public, these adjustments must be checked against the goals and objectives set out in this bulletin and any legislation enacted related to program implementation.

Management and Functional Objectives

The following management and functional objectives provided the fundamental basis for development of the selected program. These objectives reflect relevant directives and constraints from legislation, constraints from administrative decisions,

presently contracted and currently projected maximum and minimum export requirements, conditions in the Delta, and comments received at public hearings. The basic goal was to find the best way to protect the Delta environment while pumping water from the Delta for the SWP and CVP.

Management Objectives

The fundamental management objectives upon which this study was predicated are:

- To protect the economy and environment of the Sacramento-San Joaquin Delta, including its agricultural, industrial, and urban water supplies, and its fish, wildlife, recreation, and aesthetic resources. This objective includes compliance with all applicable State and federal water quality standards;
- To provide dependable water supplies to meet estimated reasonable year 2000 water needs in the SWP and CVP service areas that take water deliveries via the California Aqueduct, the South Bay Aqueduct, the North Bay Aqueduct, the Delta Mendota Canal, and the Contra Costa Canal; and
- To protect the financial integrity of the SWP and CVP and that of the contracting entities of both projects.

Functional Objectives

Specific functional objectives of an acceptable plan include:

- *Beneficial Use and Water Conservation.* Improve water management efficiency so as to conserve water and prevent its unreasonable and wasteful use in meeting both Delta and export beneficial uses.
- *Delta Water Supply.* Insure a water supply for the Delta of adequate quality and quantity to meet the needs of agriculture, industry, and urban development in the Delta and areas immediately adjacent to the Delta.
- *Salinity Control.* Facilitate efficient protection from ocean salinity intrusion in Delta channels in compliance with applicable State and federal standards as they may be modified from time to time.
- *Water Quality.* Improve the capability and flexibility for water management in the Delta to effect more efficient compliance (i.e., minimize amount of water required) with applicable State and federal standards as they may be modified from time to time; with export quality criteria; and with any contract that may be negotiated with Delta interests for water quality control.
- *Fish and Wildlife.* Protect, restore, or mitigate

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and, where feasible, enhance the fish and wildlife resources of the Delta-Bay estuary and Suisun Marsh through sound water management practices and the construction of needed facilities.

- *Recreation and Aesthetics.* Preserve and enhance the recreational opportunities and aesthetic values in the Delta consistent with the Resources Agency's Delta Master Recreation Plan and other project facilities.
- *Export Water Supply.* Convey surplus water supplies tributary to the Delta (including reservoir releases) for export to water deficient areas of the State, or alternately assuring equivalent water supplies to such areas. (Surplus waters are waters available after reasonable, beneficial needs of the Delta and Bay have been satisfied. For this study, Delta water requirements are considered to be met when direct use requirements and applicable State and federal water quality criteria are both met.)

Since implementation of the foregoing objectives could affect other conditions in the Delta, three additional considerations were:

- *Flood Control.* Maintain or improve the flood carrying capacity of Delta channels or provide alternative means for conveying floodflows so as to reduce or prevent any material increases in the threat of flooding Delta lands that might result from the construction of Delta facilities of the SWP and CVP. Therefore, any proposed changes to Delta channels or levees should be made compatible with recommendations in DWR Bulletin No. 192, "Plan for Improvement of the Delta Levees", May 1975, and the Nejedly-Mobley Delta Levees Act of 1976 (Water Code Sections 12225-12227 and Section 12987 as amended).
- *Navigation.* Maintain the use of Delta waterways for commercial, recreational, and military navigation. Any proposed change in present conditions will be governed by requirements of the Corps of Engineers and Coast Guard in their capacity of issuing permits for any project affecting navigable waters.
- *Vehicular Transportation.* Coordinate the Delta facilities planning and construction with federal, State, and local agencies responsible for providing transportation through and near the Delta, and access to various locations within the Delta.

Selected Program

The Department of Water Resources' program includes: Delta-Bay protection measures—physical, institutional, and statutory; an isolated Delta water transfer facility in the form of a staged Peripheral Canal; municipal and industrial water conservation

and waste water reclamation in project service areas; new surface and ground water storage facilities and conveyance systems south of the Delta, and new water storage facilities north of the Delta.

Delta Components

The Delta components of the overall program consist of institutional and statutory measures for Delta-Bay protection, physical facilities to meet specific Delta and Suisun Marsh needs, and a Delta water transfer facility.

Environmental Monitoring and Studies. An extensive monitoring system is required to provide early warning if problems arise among the wide variety and often competing needs of the Delta-Bay system. The recommended continuous monitoring program discussed in Chapter III would be implemented. This is a modification of the Decision 1379 monitoring program currently being conducted by the Department.

In addition, there would be special-purpose monitoring to obtain information for planning and designing project facilities, establishing pre-project base conditions, evaluating post-project impacts, and for water quality improvement in the Delta. A study would be undertaken to determine the quantity of unregulated freshwater inflow (flushing flows) necessary to protect the Bay. Delta exports would be limited to maintain these adequate freshwater flows.

Four-Agency Fish and Wildlife Agreement. The Department of Water Resources, the Department of Fish and Game, the U.S. Bureau of Reclamation, and the U.S. Fish and Wildlife Service will complete the Four-Agency Fish and Wildlife Agreement. This agreement will set forth operating criteria to restore, protect, and enhance fish and wildlife resources in the Delta-Bay estuary. It will specify the computed Delta outflow and other measures necessary to restore and maintain the adult population of fish and wildlife in the Delta-Bay estuary and Suisun Marsh, but will be flexible by providing for modification as may be appropriate as additional information becomes available. The agreement will recognize month-to-month variations in fishery needs and year-to-year variations in outflow requirements. The concept is that fishery needs can be met with an isolated system of water transfer, reduced exports during striped bass spawning, and Delta outflows that are highest in wet years, intermediate in normal years, and lowest in dry years, so long as average historic populations would be maintained. The goals, responsibilities, and repayment obligations are illustrated diagrammatically on Figure 26.

From the project yield standpoint, reduced Delta outflow in the drier years will represent dry and critical year modifications which 1975 Basin Plan standards do not have. Such modifications will increase

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of the long-standing problem of sharing Delta outflows.

Review and Periodic Revision of Delta Water Quality Standards.

The overriding criterion for balancing allocation of water between competing uses and requirements is set forth in Article X, Section 2 of the California Constitution. This law requires that water resources of the State be put to the fullest beneficial uses possible, that such uses and method of use shall be reasonable, and that no water shall be wasted. This applies to uses both within and outside the Delta.

As discussed in Chapters II and III, the State Water Resources Control Board establishes the water quality and related environmental standards that must be met in the Delta. EPA reviews these standards and has the authority to set standards of its own if the State does not. All standards, whether included in water quality control plans or in water rights decisions in which jurisdiction has been reserved, are periodically reviewed and revised as necessary by the Board. The review of standards should take into consideration any new information from monitoring programs, special tests and studies, operational experience, construction of new physical works, and changes in hydrologic conditions such as the recent drought.

In April 1976, the SWRCB initiated a new hearing process directed toward modifying, in the same proceeding, (1) water quality control plans (1975 Basin Plans) to protect the Delta and Suisun Marsh, and (2) SWP and CVP water rights permits relative to Delta salinity control, protection of fish and wildlife, and coordinated operation of the two projects. As part of these proceedings, the Department of Fish and Game, with concurrence from DWR, introduced the draft Four-Agency Fish and Wildlife Agreement and recommended that criteria in that agreement be substituted for fish and wildlife provisions in current Basin Plan standards. In March 1978, the SWRCB issued its draft Water Quality Control Plan for the Delta. The draft plan generally follows the fish and wildlife criteria proposed in the draft Four-Agency Agreement, but does not recognize separation of responsibilities between the CVP and SWP as does the draft agreement.

Delta Water Agency Contracts. The principal objection voiced by some Delta water users to an isolated Delta water transfer facility is that once the quality of project exports is physically independent of the quality of the water in Delta channels, competition for water will lead, inevitably, to a reduction in project releases for Delta protection. They envision the users of project water bringing irresistible political and economic pressure to bear on the Legislature and regulatory agencies to force changes in the laws and regulations governing the maintenance of water

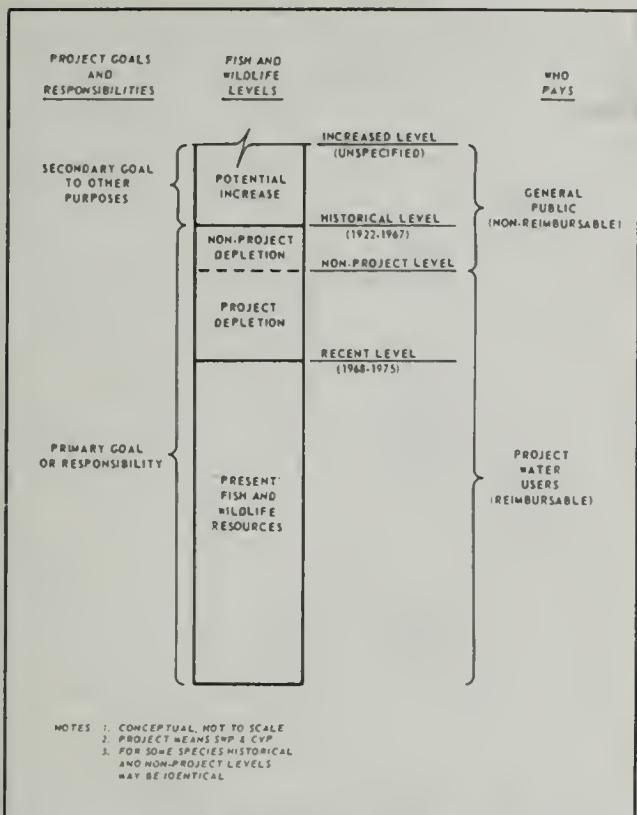


Figure 26. Fish and wildlife goals, responsibilities, and repayment obligations.

the yield from the present system and the proposed Peripheral Canal. Need for such modifications was dramatically demonstrated in the unprecedented dry years of 1976 and 1977. The agreement will define the manner in which exports should be limited to minimize impacts on fish during critical periods. Wildlife needs in Suisun Marsh will be met primarily from facilities to provide water of appropriate quality to the Marsh. Interim provisions will be included to mitigate damages until such facilities could be completed.

SWP-CVP Coordinated Operation Agreement. The DWR and USBR would use their existing and future water conservation and conveyance facilities in a coordinated and cooperative manner. Under a SWP-CVP operating agreement, the two projects would be required to meet identical Delta water quality standards for the protection of the various beneficial uses in the Delta-Bay estuary and to optimize the accomplishments of their other purposes. This agreement would probably be a modification and updating of the draft agreement that was negotiated in May 1971 and used on a year-by-year basis to operate the projects since then. It would spell out each project's responsibility in meeting diversion requirements above the Delta, navigation flows, fish protection flows, requirements for Delta lowlands and uplands, and, of particular importance, a resolution

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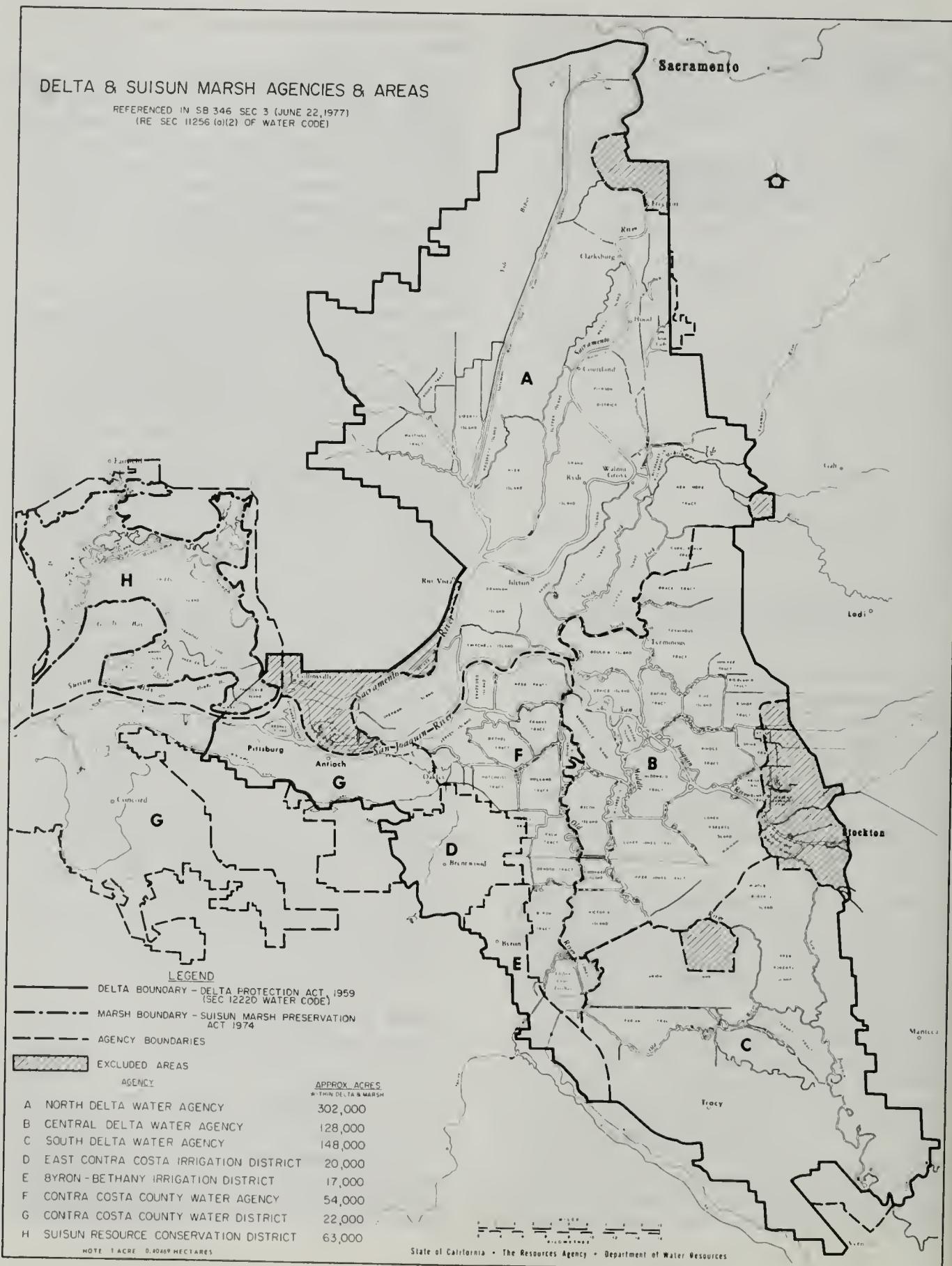


Figure 27. Delta and Suisun Marsh Agencies and areas.

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quality levels in Delta channels. (Note: No bill to weaken the Delta Protection or Area of Origin Act has ever been introduced, even during the 1977 drought when deficiencies in SWP and CVP supplies occurred. In fact, Southern California water users transferred some of their SWP entitlement water to areas of need in Northern California (see Chapter IV.).)

These objecting Delta interests oppose any Delta water transfer facility that does not link the quality of water delivered for export with the quality of water made available for Delta use. They prefer a nonisolated, through-Delta water transfer system (rather than an isolated system) because such a system would physically require the projects to maintain Delta water quality as part of their export operations. This situation reduces the need for some Delta water users to obtain a guaranteed water supply through repayment contracts with USBR and DWR for net benefits to agriculture provided by the CVP and SWP. Other Delta interests feel that suitable contracts between Delta interests and the State and Federal Governments could provide an adequate nonphysical type of protection. The contracts would have to identify project services and assure that those services would be provided; i.e., that a court would require specific performance rather than allowing the projects to pay damages for a broken contract. Congressional concurrence in the contracts could provide additional assurances.

DWR recommends that Delta and Suisun Marsh agencies should enter into contracts for water quality control and water supplies with the State and Federal Governments. The contracts would require payment from agricultural and M&I beneficiaries for net benefits received. Senate Bill 346 would require such contracts with at least a majority of eight Delta and Suisun Marsh agencies covering at least two-thirds of those areas before construction of the Peripheral Canal and Mid-Valley Canal could proceed as part of a compromise plan. In this way physical protection of the Delta would be maintained until additional nonphysical protection is achieved. The eight agencies included are: (a) North Delta Water Agency, (b) Central Delta Water Agency, (c) South Delta Water Agency, (d) East Contra Costa Irrigation District, (e) Byron-Bethany Irrigation District, (f) that portion of Contra Costa County Water District within the Delta, (g) that portion of Contra Costa Water Agency within the Delta and not included within any of the other agencies specified, and (h) the Suisun Resource Conservation District. The locations and acreages of the eight agencies are shown in Figure 27.

South Delta Water Quality Improvement Facilities. New facilities are needed to improve water circulation and dilute concentrations of poor quality inflow from the San Joaquin River and drainage discharges from the South Delta islands and

tracts, and to establish net downstream flows in the major channels used by migrating fish. Six basic alternative plans have been developed for accomplishing these purposes. They are illustrated on Figure 28 and briefly described in the following paragraphs. The specific plan to be selected as part of the Delta protection facilities is a matter of the contract negotiations with the South Delta Water Agency

1. The *Middle River Plan* consists of a 62 cms (2,200 cfs) pumping plant in Middle River, reworking of Middle River, and control structures in Middle, Old, and San Joaquin Rivers.
2. The *Roberts Island Canal Plan* consists of a 62 cms (2,200 cfs) pumping plant in Middle River, reworking of Middle River, a new canal from Middle River across Roberts Island to the San Joaquin River, and a flow control structure in the San Joaquin River.
3. The *Delta Mendota Canal Plan* consists of a 20 cms (700 cfs) pumping plant in Middle River, reworking portions of Middle River, a flow control structure in the San Joaquin River, and a channelization at the end of Westley Wasteway to accommodate releases up to 42 cms (1,500 cfs) from the Delta Mendota Canal.
4. The *Old River Plan* consists of a 28 cms (1,000 cfs) pumping plant and discharge canal from the Delta Mendota Canal intake channel to Old River, a flow control structure in Old River at Tracy intake, a 23 cms (800 cfs) pumping plant at Tom Paine Slough, channelization of Tom Paine Slough with a flow control structure at the San Joaquin River, a 14 cms (500 cfs) pumping plant in Middle River, a flow control structure in the San Joaquin River downstream of Old River, and channelization at the end of Westley Wasteway to provide 20 cms (700 cfs) from the Delta Mendota Canal.
5. The *Stanislaus Plan* consists of a 14 cms (500 cfs) pumping plant in Middle River, reworking of Middle River between Victoria Canal and the pumping plant, a 28 cms (1,000 cfs) pumping plant at the Tracy intake, a 16 kilometre (10 mile) canal from the pumping plant to the Sugar Cut Pumping Plant with 6.4 kilometres (4 miles) of discharge line, a 14 kilometre (9 mile) canal to the San Joaquin River at the Stanislaus River discharging into the river through a control structure, a flow control structure in the San Joaquin River downstream of Old River, and channelization at the end of Westley Wasteway to accommodate releases of up to 20 cms (700 cfs) from the Delta Mendota Canal.
6. The *Old River Plan No. 2* consists of a 14 cms (500 cfs) pumping plant in Middle River, reworking of Middle River, a 28 cms (1,000 cfs) pumping plant and discharge canal from the Delta Mendota Canal intake channel to Old Riv-

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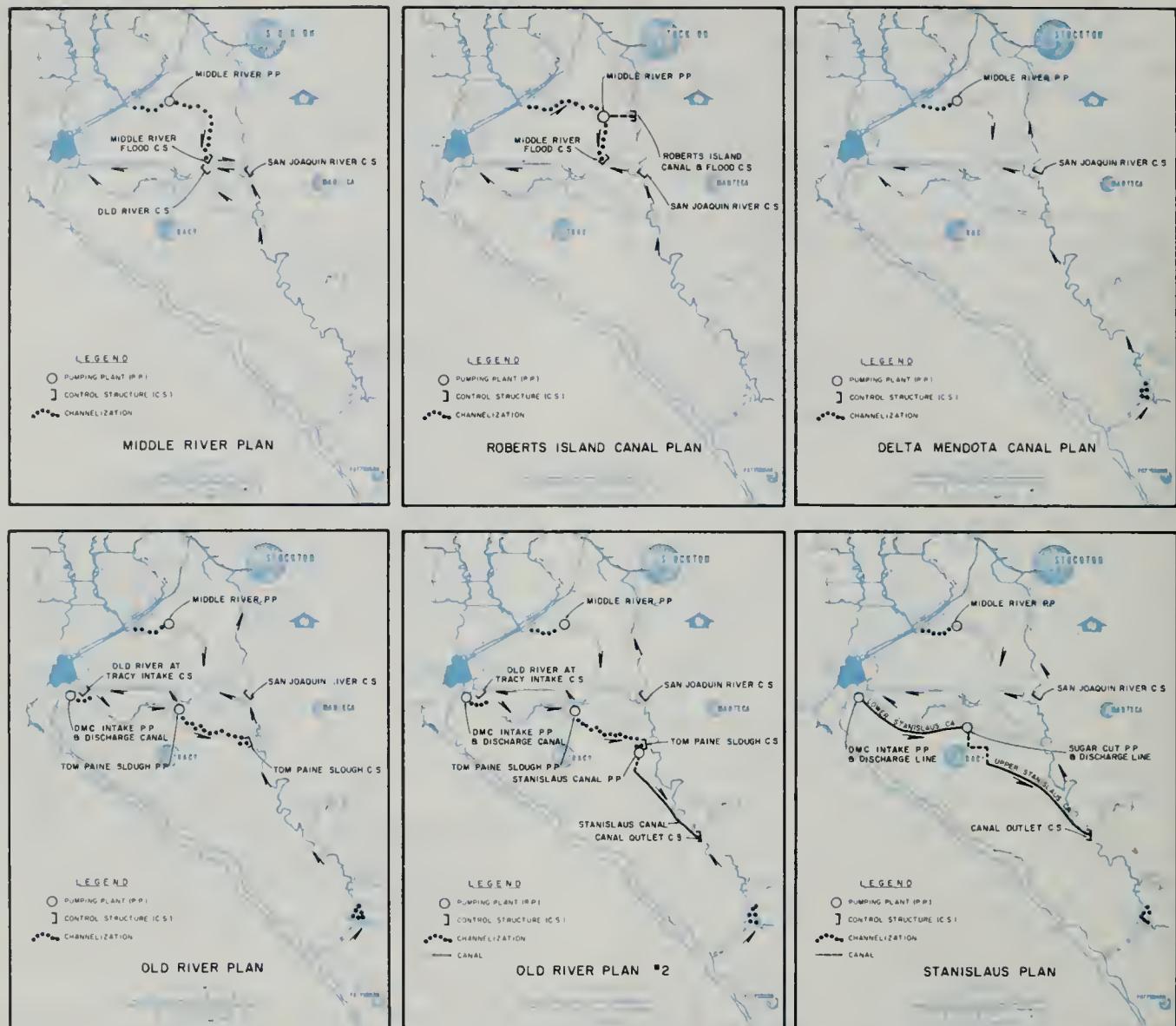


Figure 28. Alternative plans, South Delta Water Quality Improvement Facilities.

er, a flow control structure in Old River near Tracy intake, a 23 cms (800 cfs) pumping plant at Tom Paine Slough, channelization of Tom Paine Slough with a flow control structure at the San Joaquin River, a 20 cms (700 cfs) pumping plant at the upper end of Tom Paine Slough, a 13 kilometre (8 mile) canal to deliver water upstream on the San Joaquin River at the Stanislaus River with a flow control structure at the river, a flow control structure in the San Joaquin River downstream of Old River, and channelization at the end of Westley Wasteway to accommodate releases up to 20 cms (700 cfs) from the Delta Mendota Canal.

This plan is the same as the Old River Plan except for the addition of the 20 cms (700 cfs) pumping plant and canal to deliver the water

from the upper end of Tom Paine Slough further upstream on the San Joaquin River.

The costs of constructing and operating the facilities would be allocated among those responsible for mitigation and those receiving enhancement. Costs allocated to mitigate project impacts would be borne by the projects and would be reimbursable by project water users; costs allocated to restoring water quality degraded by nonproject historic upstream depletions, diversions, and return flows would be nonreimbursable under provisions of Senate Bill 346; and costs allocated to water quality enhancement would be reimbursed by the beneficiaries in the Delta.

Relocation of Contra Costa Canal Intake. The primary water supply for the Contra Costa County

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Water District is obtained from the Contra Costa Canal of the federal Central Valley Project. This canal diverts water from the Sacramento-San Joaquin Delta at Rock Slough and has a diversion capacity of 9.9 cms (350 cfs). Water operation and salt routing studies show that it is more efficient to relocate the Contra Costa Canal intake than to make releases from the Peripheral Canal sufficient to dilute the water to the desired level at Rock Slough. This is because water quality criteria for municipal and industrial uses are more stringent than those for agriculture.

As an integral feature of the Peripheral Canal, the selected Delta protection program calls for moving the Contra Costa Canal intake to divert water from Clifton Court Forebay. This would improve the water quality for eastern Contra Costa County and save water otherwise needed for water quality control. Since the present intake is not screened, moving the intake behind the State's Delta Fish Protective Facility would also eliminate the need for the District to build and operate a separate fish protective facility at Rock Slough. A capacity of 9.9 cms (350 cfs) is needed to match the present capacity of the Contra Costa Canal, and an increase of 5.7 cms (200 cfs) to 15.6 cms (550 cfs) is estimated to be needed to convey the full contracted annual supply of 241 cubic hectometres (195,000 acre-feet).

During the public review period of the preliminary proposal, East Contra Costa County Irrigation District expressed an interest in taking delivery of its Delta water supply from the Contra Costa Canal extension that would pass through the irrigation district service area. The East Contra Costa Irrigation District presently obtains most of its water supply by diverting from Indian Slough in the Delta through an un-screened intake facility. The extra capacity needed to irrigate approximately 6900 hectares (17,000 acres) in the East Contra Costa Irrigation District is approximately 5.7 cms (200 cfs).

Accordingly, DWR and the USBR have investigated several alternative relocations of either supplying water to Contra Costa County Water District alone, or to Contra Costa and East Contra Costa Irrigation Districts. These reconnaissance studies include cost estimates and a listing of the functional advantages and disadvantages of each alternative. Three alignments for the relocation have been identified with alternative design capacities considered for each. These are shown in Figure 29 and are briefly discussed in the following paragraphs.

1. The *Highline Canal* (modified Kellogg alignment) consisting of a pumping plant near the Delta Pumping Plant and a canal extending to the existing Contra Loma Reservoir. The capacity selected, 9.9 cms (350 cfs) or 15.6 cms (550 cfs), will depend upon whether or not the canal is designed to carry the full contracted amount of 241 cubic hectometres (195,000 acre-feet) per year. This alternative could be operated in

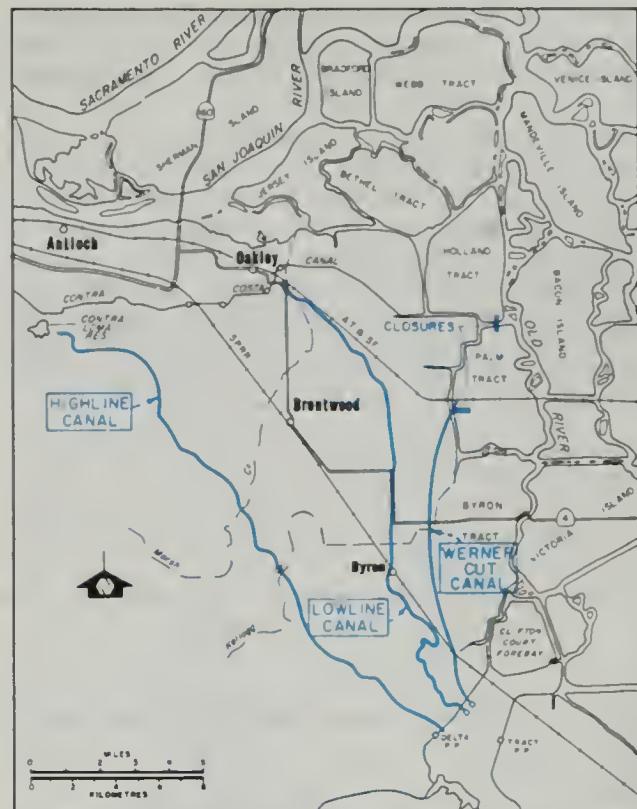


Figure 29. Alternative alignments, Contra Costa Canal intake relocation.

conjunction with the proposed Los Vaqueros Reservoir complex discussed later.

2. The *Lowline Canal* consisting of a pumping plant at the intake channel of the Delta Pumping Plant and a canal extending and connecting to the Contra Costa Canal just above the first existing pumping plant. The capacity of the Lowline Canal would be similar to that of the Highline Canal. Provisions could be made to connect to the existing East Contra Costa Irrigation District's facilities by a 5.7 cms (200 cfs) canal enlargement.
3. The *Werner Cut Canal* (alternative Lowline Canal) consisting of a pumping plant at the intake channel of the Delta Pumping Plant, a canal extending to Werner Cut on Indian Slough, and closures in Rock and Indian Sloughs. As with the Lowline Canal, the East Contra Costa Irrigation District could be served by a 5.7 cms (200 cfs) turnout.

The specific facilities to be constructed and repayment provisions for net benefits received are appropriately subjects for contract negotiations with affected water agencies.

Western Delta Overland Water Facilities. Water supply for Delta agriculture is supplemented by releases from upstream Sacramento Valley reser-

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voirs of the CVP and SWP and Trinity River reservoirs of the CVP. These releases augment natural supplies for consumptive needs and salinity control in the Delta.

The salinity content of water in western Delta channels is responsive to the amount of Delta outflow flowing into the San Francisco Bay. The 1975 Basin Plan agricultural water quality standards, together with the draft Four-Agency Fish and Wildlife Agreement as presently postulated, provides adequate salinity protection except for the westernmost extremities of the Delta. The new March 1978 SWRCB Draft Water Quality Control Plan criteria would improve the situation somewhat.

It would take excessive amounts of water to provide outflows large enough to maintain water quality in this area adequate for agriculture throughout the entire year, particularly in dry and critical years. The

Delta Protection Act (Water Code Section 12202) discussed in Chapter II allows for western Delta overland water facilities. Various decisions of the State Water Resources Control Board (or its predecessors) have indicated that providing such facilities would be in the public interest rather than using large amounts of outflow for the same purpose. Therefore, overland water facilities to supply water to agricultural areas on Sherman Island, Jersey Island, and Hotchkiss Tract are included as part of the Delta protection program.

Studies of various plans for providing such facilities have been prepared over the years by the Department of Water Resources. The specific facilities to be constructed are appropriately a subject for the contract negotiations with the affected water agencies, and it is contemplated that the contracts with these Delta interests will include provisions for these facilities as part of the contracts.

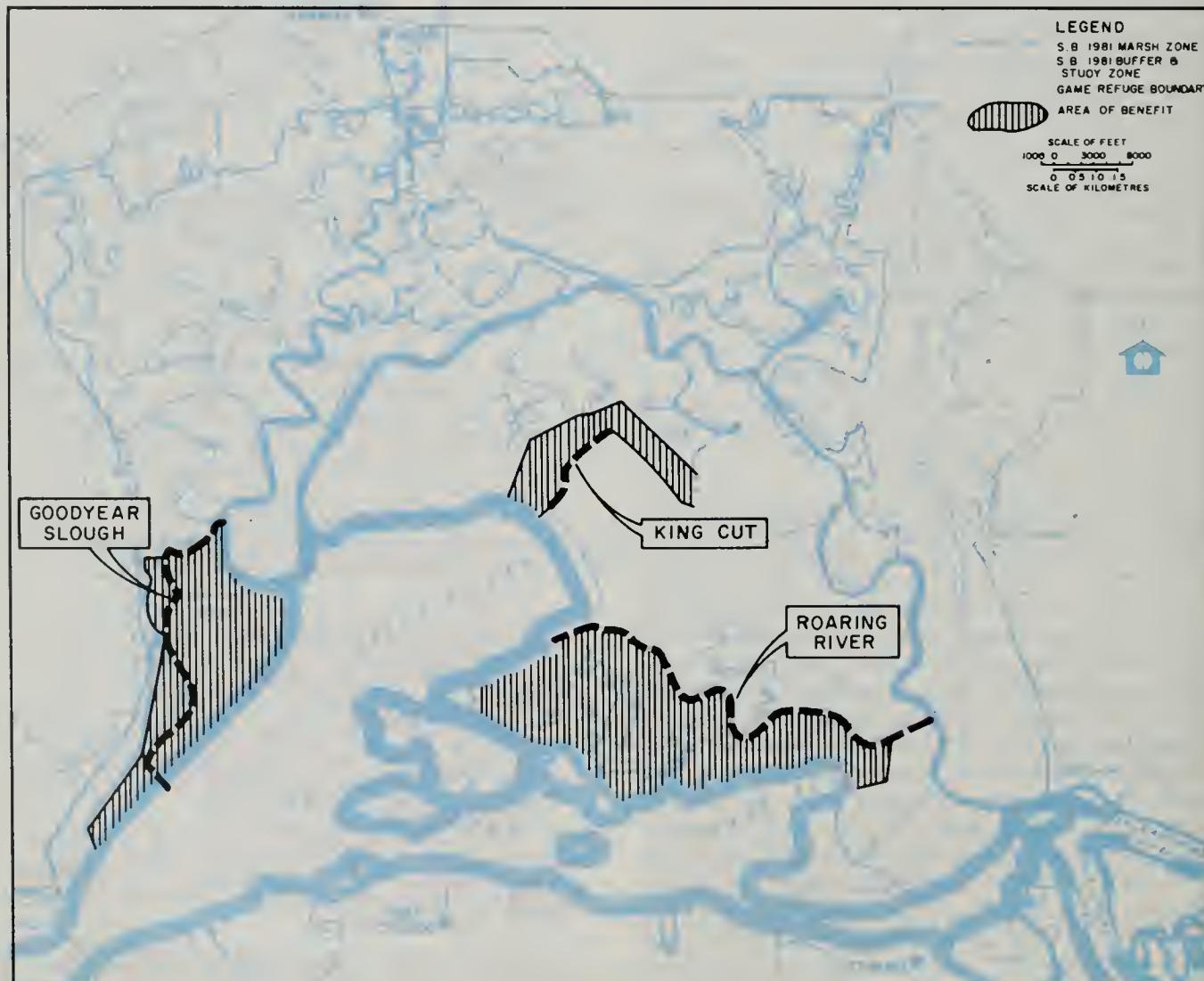


Figure 30. Suisun Marsh, areas served by initial facilities.

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Suisun Marsh Facilities. The location, description, and discussion of the Marsh as a wildlife and recreation resource and its water requirements are included in Chapter III. The Marsh water is brackish, and balance is achieved by repeatedly leaching the soil in the Marsh during February, March, and April through "tidal pumping" of estuarine water. Inlet and outlet structures provide the required one-way flow. The quality and quantity of water flowing through the Delta to the Bay is therefore of direct concern to the well-being of the Marsh.

Under the present level of development, water quality available to most of the Suisun Marsh is generally adequate except in critical dry years. With future reductions of annual quantities of Delta outflow due to both project and nonproject upstream diversions, adequate quality for Marsh management will be available for shorter periods and facilities will be required to speed up leaching cycles or improve quality and assure adequate supplies.

The selected Delta protection program approaches the problem in two steps: (1) initial Suisun Marsh protection facilities, and (2) permanent Suisun Marsh protection facilities.

Initial protection features (see Figure 30) will include water control and management facilities: (1) to deliver water from Montezuma Slough onto (and to manage water on) certain wetland areas located on Grizzly, Simmons, Wheeler, Dutton, Van Sickel, and Hammond Islands, and (2) to deliver water from Goodyear Slough onto (and to manage water on) certain adjacent wetland areas and provide outflow from Goodyear Slough into Grizzly or Suisun Bays.

Initial protection measures will also include substantial amounts of Delta outflow at certain times of the year to protect the quality of water available to the Marsh as provided for in the draft Four-Agency Fish and Wildlife Agreement and, when adopted, the March 1978 SWRCB Draft Water Quality Control Plan. It is intended that the initial protection features will be a part of the permanent plan.

Permanent facilities for Suisun Marsh protection have not been determined at this time. There are several alternatives being evaluated by the Interagency Ecological Study Program (DWR, USBR, DFG, and USFWS) in cooperation with the Suisun Resource Conservation District and with participation by the U.S. Soil Conservation Service. A report on the selected permanent Suisun Marsh protection facilities is scheduled for completion in 1979. When selected, the facilities should be implemented as soon as possible.

As with the initial facilities, specific amounts of Delta outflow will be required to protect Delta-Bay fish and wildlife; however, the amounts needed will be reduced with the completion of permanent facilities that will provide a more efficient method for managing the Suisun Marsh.

Delta Water Transfer Facility (Staged Peripheral Canal). As explained in Appendix B, the Peripheral Canal was selected, over the nonisolated alternatives, as the most effective water transfer facility to transport water across the Delta for the SWP and CVP, while providing the necessary environmental and water quality protection for the Delta. The canal will release fresh water to Delta channels at strategic locations for Delta use, water quality control, and fish. Canal releases will provide positive downstream flows in Delta channels and will contribute to the Delta outflow required for protection from salinity intrusion. By eliminating reverse flows in the western Delta, this facility will reduce the amount of carriage water presently needed for salinity control, and thus conserve water for increased project yield. Provisions for passage of floodflows, migrating fish, and boats will also be included. Figure 31 is a summary of DFG's analysis of the impacts of the Peripheral Canal, compared to the nonisolated and "no project" alternatives, on Delta fish and wildlife at the predicted year 2000 level of Delta export.¹

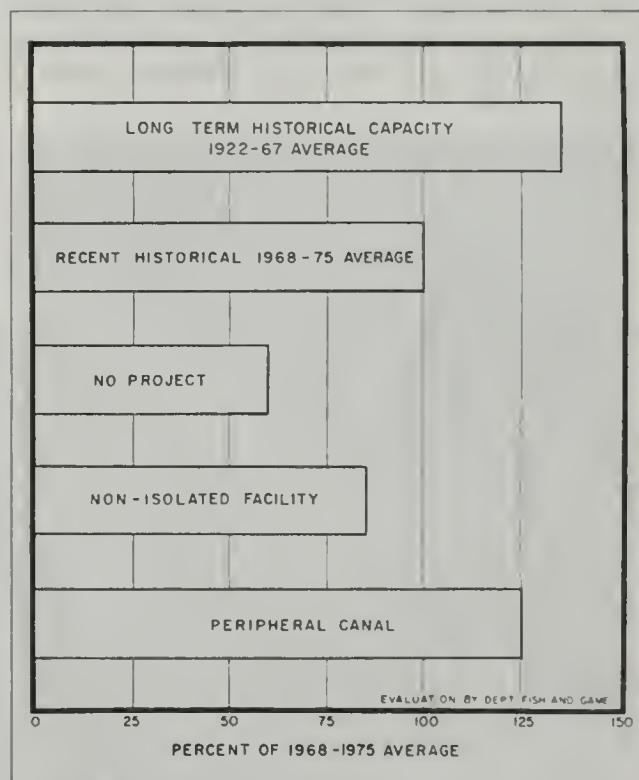


Figure 31.
Summary of impacts on Delta fish and wildlife.

State law, Section 6100 of the Fish and Game Code, requires fish screens on any new diversion of water from any stream having populations of salmon and steelhead, if it is determined that such diversions

¹ California Department of Fish and Game, "Restoration of Fish and Wildlife in the Sacramento-San Joaquin Estuary", June 1978

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will have a deleterious effect on salmon and steelhead. Fish and Game has determined the Peripheral Canal must include an adequate fish screen.

The existing fish protection facilities at the SWP Delta Pumping Plant and the CVP Tracy Pumping Plant use a system that guides the fish along louvers (vertical slats) and into a bypass that carries them to holding tanks. Periodically the salvaged fish are transported to release sites in the Delta away from the influence of the pumping plants. Tests to determine the effectiveness of this system indicate that small fish are not efficiently screened and that there are large losses due to handling and transporting the salvaged fish.

The four agencies (DWR, DFG, USBR, and USFWS) participating in the Interagency Ecological Study Program for the Sacramento-San Joaquin Estuary are considering a positive screening system for Delta water transfer facilities—one which requires all the diverted water to flow through the screen and which will exclude small fish—consisting of plates or rotating drums with small holes and a large enough approach structure to permit low flow velocity through the screen. The Peripheral Canal will include such a screen at the intake facility that will allow the screened fish to return to the Sacramento River without handling.



The Sacramento River at Hood, looking south. The Peripheral Canal would begin here, on the outside curve of the river, and run 42 miles south around the east side of the Delta to Clifton Court Forebay.



Fish screen test facility at town of Hood on Sacramento River. Biological and engineering tests are being conducted at this research and development facility to select the type of intake and fish screening system for the Peripheral Canal.

To insure that the Peripheral Canal can be constructed and operated as specified, significant changes have been made in the scheduling and staging of construction, in canal design, and in proposed operational procedures. The canal, as shown on Figure 32, will still follow the same 68 kilometre (42 mile) path along the eastern rim of the Delta (as shown in the 1974 Peripheral Canal Draft EIR) from Hood on the Sacramento River to Clifton Court Forebay near Tracy at the southern edge of the Delta. Outlets along the way will provide for releases of freshwater into the Delta. The canal will be siphoned under four major river and slough crossings to allow for passage of floodflows, boats, and migrating fish. Floodflows from Morrison Creek drainage and Middle River will be accepted into the Canal. Cross drainage flows in the Beaver-Hog-Sycamore Slough area will be siphoned under the canal.

The DWR program calls for canal construction in three stages. Stage 1 will be an operational stage 39 kilometres (24 miles) long from Hood to Shima Tract. Stage 2 will be a preconsolidation stage 24 kilometres (15 miles) long from the San Joaquin River to Clifton Court Forebay. Stage 3, 29 kilometres (18 miles) from Shima Tract to Clifton Court, will include completion of Stage 2 and construction of the 5-kilometre (3-mile) gap between Shima Tract and the San Joaquin River.

As part of Stage 1, the fish screen and pumping plant will be completed to about one-fourth of their design capacity for use during a 2-year testing period to verify fish screen design criteria and operational release criteria. The release facilities of Stage 1 will

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Disappointment Slough looking west near where the Peripheral Canal will cross. The first stage of the canal, which will be siphoned under the slough, will terminate just south of here. Water from the Peripheral Canal will be released into Disappointment Slough and other sloughs along the canal route to improve the water quality.

be increased from the 59 cms (2,100 cfs) as proposed in the 1974 draft EIR on the Peripheral Canal, to approximately 159 cms (5,600 cfs). This will be done by increasing the capacity of the release structures described in the 1974 EIR and by adding others at new locations. Completion of Stage 1 will increase the export yield of the SWP and CVP by about one-third of the canal's ultimate yield, thereby reducing the risk of water shortages in SWP and CVP service areas during the testing period. The third stage of the canal will not be constructed until both the Director of DWR and the Director of DFG determine from the test results that the fish screen and operational criteria are adequate to protect fish populations in conformity with the Four-Agency Fish and Wildlife Agreement.

Under the provisions of Senate Bill 346, construction of the Peripheral Canal, including the relocation of the intake to the Contra Costa Canal (previously discussed), cannot begin until the following events occur:

1. The Congress enacts legislation and the Secretary of the Interior enters into contracts with DWR to provide for: (a) coordinated operation of SWP and CVP including the requirement that identical water quality standards (with dry and critical year relaxations) for the Delta, Suisun Marsh, and San Francisco Bay system westerly of the Delta be met by the projects; and (b) protection and enhancement of fish and wildlife within the Delta-Bay, including limitations on exports and diversions to storage from the Delta.
2. The Secretary of the Interior, in cooperation



Clifton Court Forebay (center), which presently serves as the main diversion point for the SWP, will be terminus ad quem of the Peripheral Canal. As such, water regulated here will serve both the SWP Delta Pumping Plant (intake to the California Aqueduct, center left), and the CVP Tracy Pumping Plant, left foreground.

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with the State and with any required congressional approval, enters into agreements relating to water quality and water supply with at least a majority of eight Delta and Suisun Marsh agencies covering at least two-thirds of the area of the Delta and Marsh, with payment by agricultural and municipal and industrial beneficiaries for net benefits received.

3. The United States agrees to share in the costs and benefits of the Peripheral Canal.

4. The Congress enacts legislation that shall include protection of the area of origin similar to that provided by existing California law.

Senate Bill 346, as amended September 8, 1977, and the report of the Legislative Committee on Conference, January 1978, are included in Appendix A of this bulletin.

The location and principal features of the Peripheral Canal are shown on Figure 32 and the essential statistics of various features are shown in Table 20.

TABLE 20
PERIPHERAL CANAL STATISTICS

<i>DIMENSIONS</i>		<i>CAPACITIES</i>	
		<i>Cubic Metres (Cubic Feet per Second)</i>	<i>per Second</i>
<i>Length</i> —Total	68 Kilometres (42 miles)		
Stage 1	— 39 Kilometres (24 miles)		
Stage 2	— 24 Kilometres (15 miles) (Preconsolidation)		
Stage 3	— 29 Kilometres (18 miles) (Completion)		
<i>Width</i>			
Bottom	61 Metres (200 feet)		
Top	122–152 Metres (400–500 feet)		
Depth	6–9 Metres (20–30 feet)		
<i>Right of Way</i>	2660 Hectares (6,570 acres)		
<i>Siphons</i>			
Mokelumne R.	4–7.6 Metres (25 feet) square		
	192 Metres (630 feet) long		
Disappointment S1.	4–7.6 Metres (25 feet) square; 165 Metres (540 feet) long		
San Joaquin River	4–7.6 Metres (25 feet) square; 244 Metres (800 feet) long		
Old River	4–6.9 Metres (22.5 feet) square		
	152 Metres (500 feet) long		
<i>OTHER FEATURES</i>			
Fish screen	—positive, low approach velocity type		
Control Gates			
Sediment Basin			
14 Bridges	(13 road, 1 railroad)		
135 Kilometres (84 miles) of public access and operating roads			
16 Kilometres (10 miles) of public and private roads			
<i>Canal</i>			
Hood Intake to Middle River	1.....	617	(21,800)
Middle R. to Clifton Court	.....	518	(18,300)
<i>Export Pumps</i>			
SWP Delta	.....	292	(10,300)
CVP Tracy	.....	130	(4,600)
CVP Contra Costa Canal	.....	10–16	(350–550)
Los Vaqueros	.....	85	(3,000)
<i>Release Facilities</i>			
<i>Stage 1</i>			
Snodgrass Slough West	.....	11	(400)
Lost Slough and Mokelumne River ..	.....	17	(600)
Beaver Slough West	.....	9	(300)
Beaver Slough East	.....	11	(400)
Sycamore Slough West	.....	14	(500)
Sycamore Slough East	.....	11	(400)
White Slough West	.....	21	(750)
White Slough East	.....	21	(750)
Disappointment Slough	.....	43	(1,500)
	Subtotal, Stage 1.....	159	(5,600)
<i>Stage 3</i>			
Fourteen Mile Slough East	.....	3	(100)
San Joaquin River	.....	17	(600)
Whiskey Slough West	.....	3	(100)
Middle River East ²	.....	62	(2,200)
Old River West	.....	34	(1,200)
	Total Release Capacity, Stages 1 and 3	278	(9,800)
<i>Hood Pumping Plant</i>			
Stage 1, 2 units	.....	154	(5,450)
Stage 3, 6 units	.....	463	(16,350)
Maximum Lift—3 Metres (10 feet)	.....	
	Total ¹	617	(21,800)
<i>Fish Screens</i>			
Stage 1	.....	154	(5,450)
Stage 3 ¹	.....	617	(21,800)

¹ Capacity will depend on releases required for water quality in the Delta.

² Subject to change. Depends on which alternative of the South Delta Water Quality Improvement Facilities are selected. These are the subject of negotiations with the South Delta Water Agency for Delta contracts.

Components South of the Delta

Program components south of the Delta consist of several measures. Some of these reduce the rate of increase in demand for water to be exported from the Delta. Some increase the firm yield of the SWP and CVP systems. Others either enlarge or provide new conveyance capacity.

Water Conservation and Waste Water Reclamation. Water—a limited resource in California—is too valuable to waste. Water conservation and waste water reclamation can provide a more efficient use of our existing and future water supplies. Adopted measures will be of a permanent nature wherein the same uses could be satisfied using less

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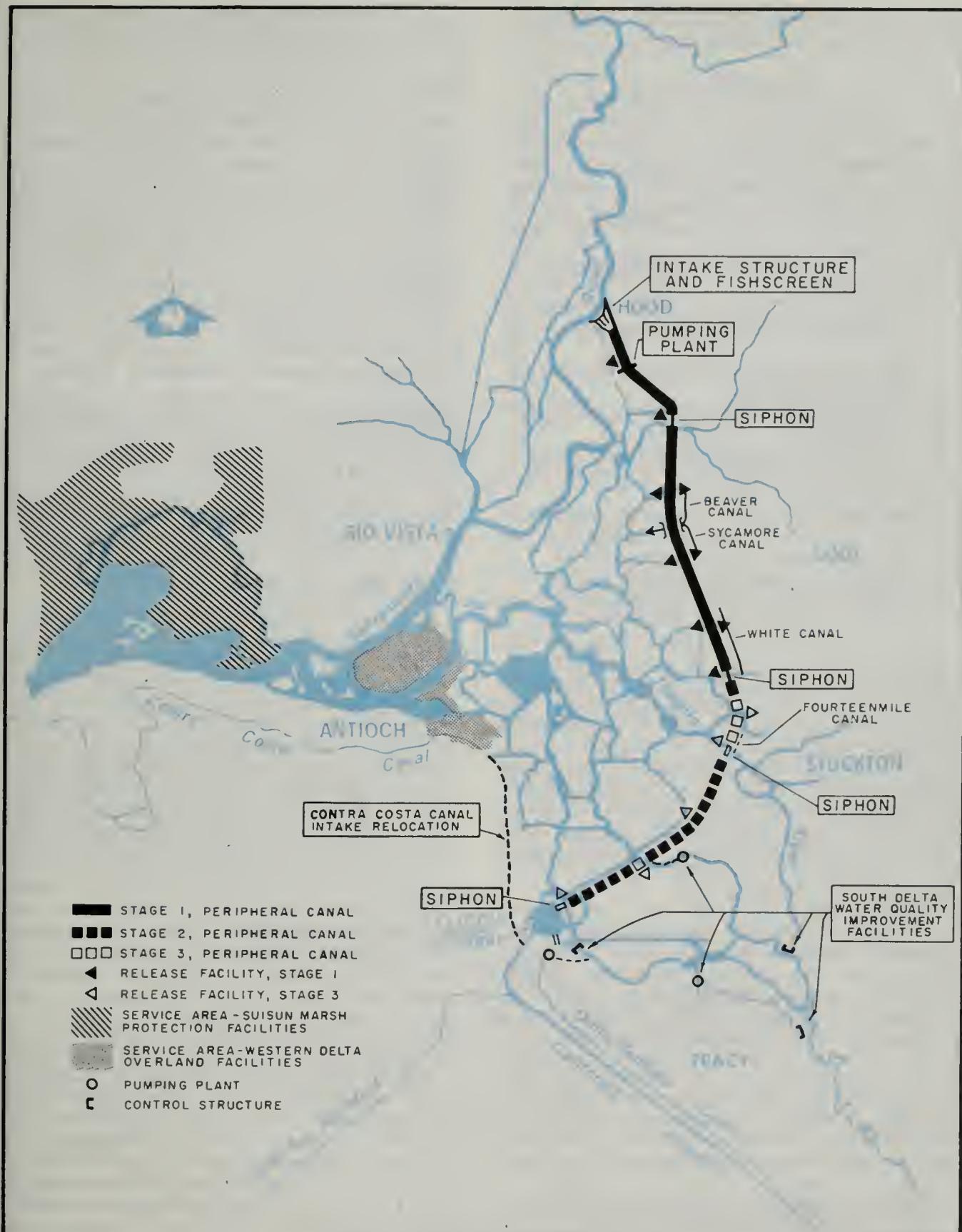


Figure 32. Proposed Delta facilities.

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water. This can be brought about by a wide variety of facilities and by reducing excessive use by the consumer.

For example, Assembly Bill 380, approved in April 1977, appropriated \$600,000 for DWR to conduct a pilot water conservation study of water saving shower and toilet devices. Six communities with varying water conditions were studied. From these devices alone, it was found that if the program were expanded statewide, on a voluntary basis, annual water savings would be enough to satisfy the needs of 430,000 people for one year.

Following are a few of the possible methods of conserving water:

1. Broader use of drip and sprinkler irrigation and coordination of type of crops with available water.
2. More extensive use of lined canals for local distribution systems.
3. Revision of price structure to encourage water conservation.
4. More effort to influence power plant siting in coastal areas if the balance of environmental considerations is favorable.
5. Whenever possible, maintain fish and wildlife resources through planned management actions other than augmenting streamflow.
6. Adoption of urban water-saving practices.
7. Conduct extensive public education programs.

Where feasible, waste water will be reclaimed and recycled into the water supply. Reclamation of waste water will reduce demands for fresh water by substituting the reclaimed water for power plant and other industrial cooling, irrigation of selected crops, ground water recharge, and streamflow augmentation, including Delta outflow. As explained in Chapter IV, reclaimed water will serve as a new supply where the waste water would otherwise be discharged directly to saline waters in the San Francisco Bay and south coastal metropolitan areas. In other areas, such as the Central Valley, waste water is generally returned to the available supply except for losses from evaporation ponds.

DWR is engaged in a statewide program to promote water conservation to the maximum extent feasible before new sources are developed. It also participates with the Office of Water Recycling to achieve the statewide water reclamation goals set by the Governor for 1982 and 2000. As part of the selected program it is estimated that the combined effect of local water conservation and waste water reclamation could reduce the annual Delta export demands in the year 2000 by 860 cubic hectometres (700,000 acre-feet).¹ Conservation or reclamation by the SWP water contractors will not reduce the contract amounts ultimately to be served by the State

Water Project. Such nonproject measures only extend the time at which the full 5.22 cubic kilometres (4.23 million acre-feet) contracted annual entitlements will be required.

In addition, the Department plans to include waste water reclamation facilities as part of the SWP to provide a source of new water supply to the water contracting areas it serves, if the cost of such supplies is economically competitive with alternative new water supply sources. Such reclamation, funded by the SWP, would serve as part of the 5.22 cubic kilometres (4.23 million acre-feet) of annual project yield and would represent a permanent reduction of Delta export. While no specific amount or scheduling of such facilities was determined as part of this study, such SWP funded facilities could be used to supply project needs after the year 2000 or to allow rescheduling of reservoirs included in the plan.

Use of Ground Water Storage Capacity.

Great volumes of underground storage space, with infiltration potential, in partially dewatered ground water basins are available near the California Aqueduct in Southern California and in the San Joaquin Valley. This dewatered capacity could provide additional storage for imported water supplies needed to meet SWP contract obligations. Significant but smaller amounts could be used in conjunction with the South Bay Aqueduct.

DWR studies show that, under future demand conditions when surplus water is available in the Delta, aqueduct capacity would constitute a major constraint in conveying water for ground water storage in these basins for augmenting project yield. However, with limited construction work on the project, installation of ground water recharge and extraction facilities where necessary, and completion of the Peripheral Canal ground water storage in these basins could increase the firm yield of the project by about 0.5 cubic kilometres (400,000 acre-feet) per year. This would require storing up to 4.1 cubic kilometres (3.3 million acre-feet) of water in the underground basins during wet periods for later use during dry periods. This could be accomplished by either or both of two basic modes of operation: (1) wet period spreading and dry period pumping of the previously stored water; and/or (2) through an exchange involving increased delivery of surface water to areas now using ground water with corresponding reduction in ground water pumping during wet periods, followed by increased ground water pumping in dry periods.

Ground water storage programs of this nature would have local advantages. They would raise water levels which would reduce the pumping head required to produce normal ground water supplies and provide long-term benefits in the form of reduced power costs to users of local water supplies. Such programs would also provide greater reliability of continuing project deliveries in times of emergency.

¹The net reduction in previously estimated Delta exports in year 2000 is only 740 cubic hectometres (600 thousand acre-feet) since 120 cubic hectometres (100 thousand acre-feet) was already reflected in SWP contractor requests for water (see Reduction Goal, Chapter IV).

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Estimates of cost and yield were based on using the Kern River Fan and the White Wolf Basin in the southern San Joaquin Valley and the Chino and San Fernando Basins in southern California in conjunction with an enlargement of the East Branch of the California Aqueduct. Collectively, these basins have an estimated 8.4 cubic kilometres (6.8 million acre-feet) of available dewatered storage capacity. Other areas, such as the Raymond Basin, Southern Mojave Basin, and the Orange County portion of the Santa Ana Basin, could serve as alternatives in Southern California. Also, there is a relatively small potential for increasing the conjunctive use of the South Bay Aqueduct and ground water storage in the south San Francisco Bay area as presently practiced by SWP contractors. These ground water basins are shown on Figure 33.

Storage in the Kern River Fan envisions using the California Aqueduct and the existing Cross Valley Canal and its turnouts for conveying surplus water to the Kern River near Bakersfield. In years when water supply is available for such purposes, the riverbed would serve as the spreading basin. In dry years, water would be pumped from existing wells to serve the overlying lands and, to the extent necessary, from a battery of new deep wells discharging into the Cross Valley Canal.

Storage in the White Wolf Basin envisions a system whereby water would be pumped from the California Aqueduct near Wind Gap to a lined canal for delivery to a spreading basin during years when water was available for such purposes. Extraction in dry years would be through existing wells to serve overlying lands or from a battery of new deep wells that would pump water back into the California Aqueduct through a separate channel, or both.

The Chino Basin would be recharged from water delivered through an enlarged East Branch of the California Aqueduct through a pipeline from Devil Canyon Forebay to a spreading basin north of Fontana. To provide enough capacity to transport both



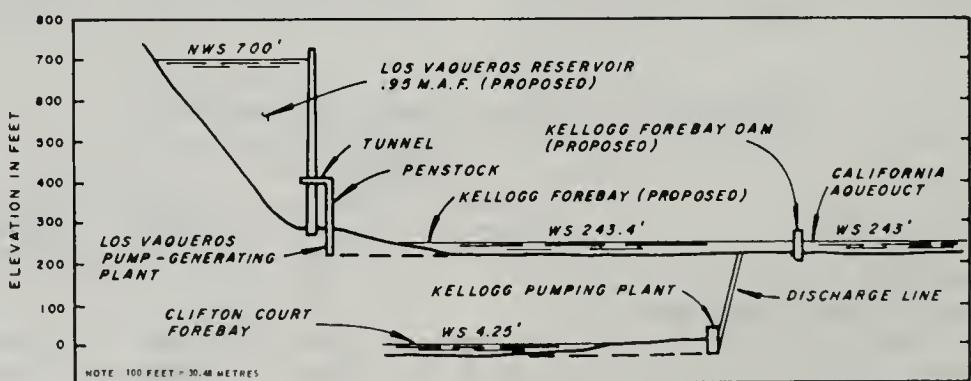
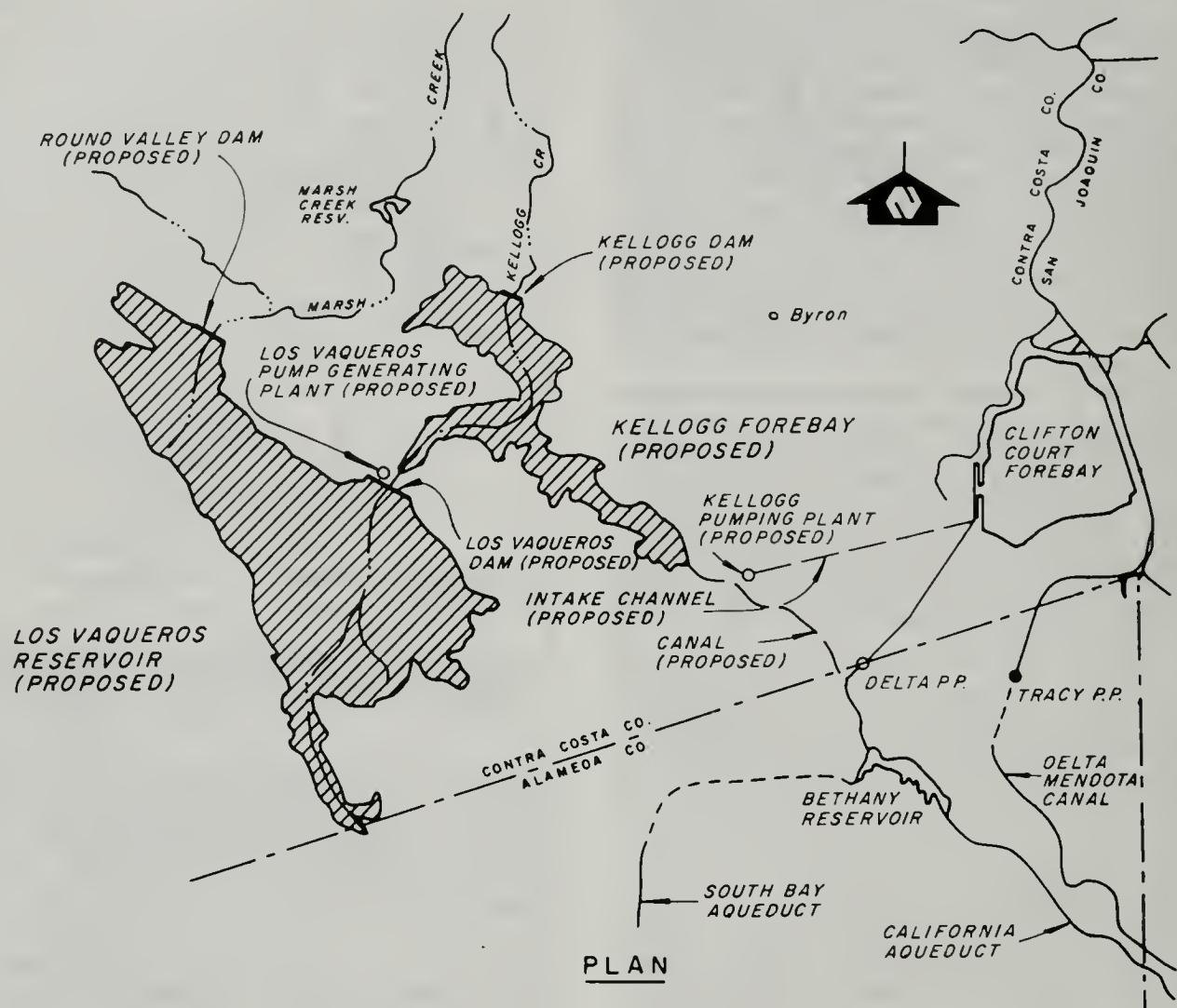
Figure 33. Potential ground water storage sites near California and South Bay Aqueducts.

entitlement water and a significant amount of water for ground water storage, the East Branch enlargement would include enlarging the Mojave Division facilities from the proposed Cottonwood Power Plant to Silverwood Lake and the Devil Canyon Powerplant, from the present limiting capacity of 34 cms (1,200 cfs) to 57 cms (2,000 cfs)—the existing limiting capacity of the San Bernardino Tunnel. Water stored underground would be recovered through existing wells or from a battery of new deep wells and

TABLE 21
GROUND WATER STORAGE SOUTH OF THE DELTA

Basin	Est. Increase in Project Yield		Approx. Storage Capacity Required		Approx. % of Available Storage Capacity
	Cubic Hectometres Per Year	(Thousand Acre-feet Per Year)	Cubic Hectometres	(Thousand Acre-feet)	
<i>Southern California</i>					
Chino, with enlargement of East Branch, California Aqueduct	150	(120)	1 200	(1,000)	55
San Fernando.....	50	(40)	400	(300)	60
<i>San Joaquin Valley</i>					
Kern River Fan, with conveyance through Cross Valley Canal	150	(120)	1 200	(1,000)	35
White Wolf	150	(120)	1 200	(1,000)	65
Total	500	(400)	4 000	(3,300)	50

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Figure 34. Los Vaqueros Project.

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delivered directly to MWD's Foothill Feeder Line, through a new pipeline, or both.

The San Fernando Basin would be recharged from water delivered through the 62 cms (2,200 cfs) West Branch of the California Aqueduct. Extraction in dry years would be made through existing wells that are owned and operated by various cities in the area or by pumping from new wells, or both.

The underground storage operation of surface supplies conveyed through the South Bay Aqueduct to the South San Francisco Bay ground water basins presently employed by State Water Project contractors could and probably should be increased as part of the recommended program. However, no specific estimate of this potential was made as part of the Delta alternatives review study.

The summary of the proposed ground water storage projects south of the Delta is presented in Table 21.

Los Vaqueros Off-Stream Storage Reservoir. Los Vaqueros Reservoir would store surplus Delta flows that generally occur during the winter

and spring and then use the water locally or move the stored water south for either restorage, or direct use, when Delta pumping is at reduced levels. The stored water could be used annually or held for future use during dry years.

The Los Vaqueros Reservoir site is in the hills in eastern Contra Costa County a few miles west of the Delta as shown on Figure 34. It is particularly well suited to operate in conjunction with existing aqueducts and storage south of the Delta and to augment the supplies of the Contra Costa Canal facilities. The plan consists of a new pumping plant and canal with a capacity of 85 cms (3,000 cfs) from Clifton Court Forebay that would lift water 76 metres (250 feet) into a canal flowing into Kellogg Forebay. From Kellogg Forebay water would be pumped into Los Vaqueros Reservoir by the Los Vaqueros Pump-Generator Plant through a tunnel against a head of 140 metres (460 feet). Kellogg Forebay would be formed by an earth-filled dam 49 metres (160 feet) high and would have a capacity of 75 cubic hectometres (61,000 acre-feet).

TABLE 22
PRINCIPAL FEATURES
LOS VAQUEROS RESERVOIR PROJECT

INTAKE CHANNEL		LOS VAQUEROS PENSTOCKS & TUNNEL	
Type	Unlined	Penstocks	
Capacity	85 Cubic Metres/Second (3,000 cubic feet/second)	Capacity	85 Cubic Metres/Second (3,000 cubic feet/second)
Side Slopes	1½:1	Number	3
Bottom Width	12 Metres (40 feet)	Diameter	3 Metres (11 feet)
Depth	6 Metres (20 feet)	Length	91 Metres (300 feet)
Length	5 Kilometres (3 miles)	Tunnel	
KELLOGG PUMPING PLANT		Capacity	170 Cubic Metres/Second (6,000 cubic feet/second)
Capacity	85 Cubic Metres/Second (3,000 cubic feet/second)	Diameter	6 Metres (19 feet)
Capacity	75,000 kW	Length	1900 Metres (6,300 feet)
Head	76 Metres (250 feet)	LOS VAQUEROS DAM	
Discharge	2 4-Metre (12-foot) penstocks	Type	Earthfill
CONVEYANCE-KELLOGG TO BETHANY		Height	140 Metres (450 feet)
Type	Concrete lined	Volume	37.1 Cubic Kilometres (48.5 million cubic yards)
Capacity	170 Cubic Metres/Second (6,000 cubic feet/second)	NWS	210 Metres (700 feet)
Side Slopes	1½:1	Res. Capacity	1170 Cubic Hectometres (950 thousand acre-feet)
Bottom Width	9 Metres (30 feet)	Res. Area	2230 Hectares (5,520 acres)
Depth	7 Metres (24 feet)	ROUND VALLEY SADDLE DAM	
Length	5 Kilometres (3 miles)	Type	Earthfill
KELLOGG FOREBAY		Height	110 Metres (370 feet)
Type	Earthfill	Volume *	22.5 Cubic Kilometres (29.4 million cubic yards)
Height	49 Metres (160 feet)		
Volume	3.1 Cubic Kilometres (4 Million Cubic Yards)		
NWS	73 Metres (240 feet)		
Res. Capacity	76 Cubic Hectometres (61,300 acre-feet)		
Res. Area	590 Hectares (1,450 acres)		
LOS VAQUEROS PUMP-GEN. PLANT			
Capacity	85 Cubic Metres/Second (3,000 cubic feet/second)		
Capacity	140,000 kW		
Head	140 Metres (460 feet)		
Discharge	6 Metres (19 feet) penstock		
	91 Metres (300 feet) long		

* Includes Las Vacas Saddle Dam

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Los Vaqueros Reservoir would have a capacity of 1 172 cubic hectometres (950,000 acre-feet) and would be formed by two earth-filled dams—Los Vaqueros Dam, 137 metres (450 feet) high; and Round Valley Saddle Dam, 113 metres (370 feet) high. Water would be released from storage at a maximum rate of 170 cms (6,000 cfs) to be used either south of the Delta or locally. This release would generate 140,000 kilowatts of electric power.

Los Vaqueros Reservoir is best suited to an annual cycle of filling and withdrawal rather than long-term carryover storage. Hence, the fifty-year average annual releases of about 308 cubic hectometres (250,000 acre-feet) are greater than the 1928–34 dry period average system incremental yield (firm yield) that is about 197 cubic hectometres (160,000 acre-feet) per year. Los Vaqueros Reservoir would add considerable flexibility to project operations and Delta protection. It would facilitate meeting project demands south and west of the Delta during periods of reduced exports to protect striped bass in the spring. It would provide the opportunity to capture and temporarily store winter floodflows and later move them down the aqueduct, when aqueduct capacity is available, for long-term storage in ground water basins. It could also provide a reserve emergency gravity supply to over 250,000 people in Contra Costa County Water District should there be an outage in their pump supply. Presently this district has storage for only a two- or three-day reserve supply. The principal features of the project as presently envisioned are shown in Table 22.

Los Banos Grandes Off-Stream Storage Reservoir. Los Banos Grandes Reservoir is included as an alternative to Los Vaqueros Reservoir. Using the California Aqueduct to transport surplus Delta flows that generally occur during the winter and spring, this reservoir would store such flows for later use during dry periods. It would have more storage capacity and produce somewhat more yield than the Los Vaqueros project, but it would not provide the same operational flexibility to the CVP and SWP as Los Vaqueros.

For example, it could not serve water to all areas between the Delta and San Luis Reservoir during periods of reduced exports; it could not serve as a reserve emergency supply for Contra Costa County Water District; and, as proposed, available flows to fill the reservoir would have to compete for space in the California Aqueduct with water for filling San Luis Reservoir and for ground water storage. In essence, it would operate as an enlargement of San Luis Reservoir.

Los Banos Grandes Reservoir would be in the hills just south of San Luis Reservoir. It would be formed by a dam 140 metres (460 feet) high on Los Banos Creek and four saddle dams that would provide a reservoir with a capacity of 2.7 cubic kilometres (2.2

million acre-feet). A pump-generating plant would pump off-peak from the upper end of San Luis Reservoir through a tunnel into Los Banos Grandes Reservoir. When needed, water would be released back into San Luis Reservoir, generating on-peak power. Unless the California Aqueduct between the Delta and San Luis Reservoir were enlarged, a possibility not included in this proposal, water could be pumped to Los Banos Grandes Reservoir only under the following conditions:

1. When San Luis Reservoir is full.
2. When surplus flows are available in the Delta.
3. When aqueduct capacity would be available in the North San Joaquin Division of the California Aqueduct.

The project as described could increase firm yield of the SWP by about 247 cubic hectometres (200,000 acre-feet) per year. The principal features of the project, as presently envisioned, are shown on Figure 35 and described in Table 23.

TABLE 23
PRINCIPAL FEATURES
LOS BANOS GRANDES RESERVOIR PROJECT

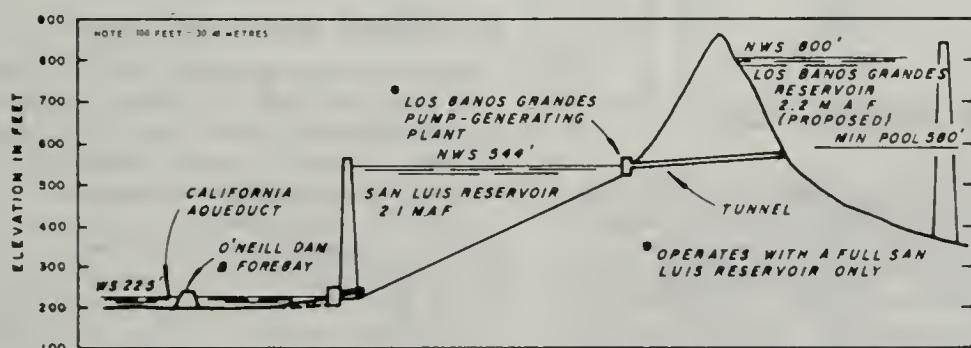
PUMP-GENERATE PLANT	
Capacity	170 Cubic Metres/Second (6,000 cubic feet/second)
Capacity	175,000 kW
Head	88 Metres (290 feet)
Discharge	3 3-Metre (11-foot) penstocks
TUNNEL & OUTLET CHANNEL	
Tunnel Capacity	170 Cubic Metres/Second (6,000 cubic feet/second)
Diameter	6 Metres (21 feet)
Length	2600 Metres (8,500 feet)
Outlet Channel	
Type	Unlined
Capacity	170 Cubic Metres/Second (6,000 cubic feet/second)
Side Slopes	2:1
Bottom Width	18 Metres (60 feet)
Length	2200 Metres (7,200 feet)
LOS BANOS GRANDES DAM	
Type	Earth and Rock
Height	140 Metres (460 feet)
Volume	17 700 000 Cubic Metres (23,200,000 cubic yards)
Normal	
Pool Elev.	244 Metres (800 feet)
Res. Capacity	2.7 Cubic Kilometres (2.2 million acre-feet)
Res. Area	5700 Hectares (14,000 acres)
GASTON BIDE SADDLE DAM	
Type	Earth and Rock
Height	76 Metres (250 feet)
Volume	22 400 000 Cubic Metres (29,300,000 cubic yards)
HARPER LANE SADDLE DAM	
Type	Earth and rock
Height	30 Metres (100 feet)
Volume *	1 070 000 Cubic Metres (1,400,000 cubic yards)

* Includes Basalt Hill and Carriselito Saddle Dams.

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PLAN



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Figure 35. Los Banos Grandes Reservoir Project.

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Mid-Valley Canal. The usable ground water storage capacity in the San Joaquin Valley is estimated to be over 100 cubic kilometres (80 million acre-feet). However, some parts of the basin presently suffer from an annual ground water overdraft of 1.9 cubic kilometres (1.5 million acre-feet). This overdraft results in increased pumping costs, water quality problems, and in some areas, land subsidence. The federal Mid-Valley Canal is proposed to be constructed by the USBR as part of the CVP primarily to alleviate part of this ground water overdraft on the east side of the valley. The present overdraft in the proposed service area averages more than 1.2 cubic kilometres (1.0 million acre-feet) per year.

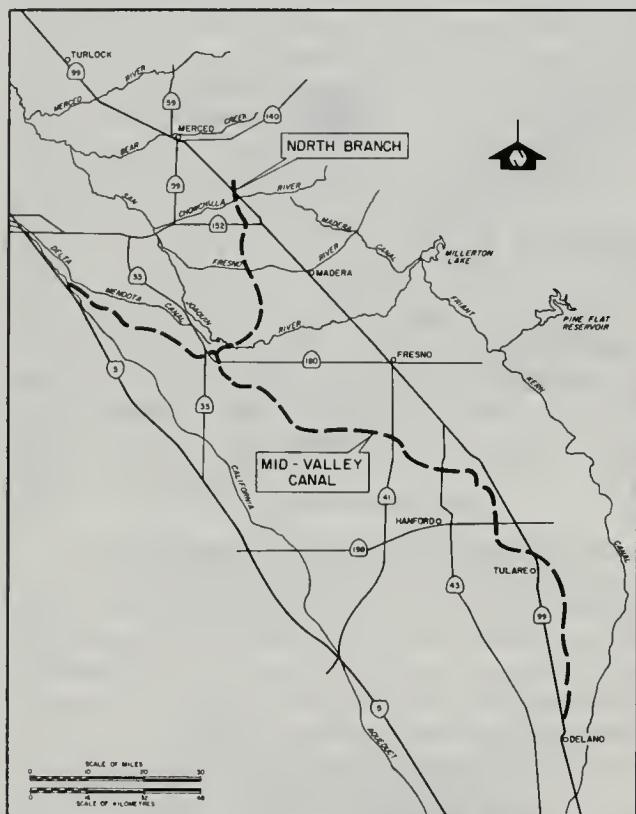


Figure 36. | Mid-Valley Canal.

The location and the principal features of the Mid-Valley Canal are shown on Figure 36. Under this plan, about 617 cubic hectometres (500,000 acre-feet) per year of firm supply and 185 cubic hectometres (150,000 acre-feet) intermittent supply would be made available at the Sacramento-San Joaquin Delta by the federal Central Valley Project. This water would be transported through the Peripheral Canal and then conveyed to the vicinity of O'Neill Forebay by using the California Aqueduct of the SWP, after mutual agreement is reached between the United States and the State. The Delta-Mendota Canal would be enlarged from the vicinity of O'Neill Forebay to Mendota Pool. From Mendota Pool there would be a new

main branch canal proceeding south and a branch canal proceeding north. There would also be distribution facilities and drainage facilities where required. Fishing access sites, increased minimum flows for fish enhancement in the San Joaquin and Kings Rivers, and natural habitat areas would also be included.

Water supplies from the Mid-Valley Canal would be allocated to various entities prior to congressional authorization of the project. The water would be allocated to: (1) agencies which provide letters of intent to purchase Mid-Valley Canal water, (2) agencies essentially developed to irrigated agriculture, (3) areas where an overdraft exists, and (4) agencies that demonstrate that they are willing and able to pay for water service. As a federal project, the 65 hectare (160-acre) limitation and other provisions of reclamation law would apply to this water.

As a result of public hearings conducted by DWR and USBR, more than 40 agencies within the Mid-Valley Canal service area requested more than 2.5 cubic kilometres (2 million acre-feet) of water annually at a price of \$16-\$24/cubic dekametre (\$20-\$30/acre-foot) for agriculture. This is three times the amount of water available from the project, and clearly demonstrates the demand and willingness to purchase such water.

Senate Bill 346 would allow State construction of the Mid-Valley Canal provided the water delivered comes from federal CVP facilities and would authorize the State to pay the required local share of recreational development costs under the Federal Water Project Recreation Act (Public Law 89-72) and the State's Porter-Colby Federal Project Recreation Act (Public Resources Code Section 5094). Also under the provisions of Senate Bill 346, construction of the Mid-Valley Canal would be contingent upon the same conditions that restrict the construction of the Peripheral Canal.

Components North of the Delta

Increasing the regulated supply of water reaching the Delta could reduce the effects of increasing exports by providing more water to the Delta during the dry years. Unlike the yield developed by off-stream surface and underground storage south of the Delta, not all the yield (excluding upstream uses) from reservoirs located north of the Delta would be made available for export unless the efficiency of transport across the Delta is improved by the construction of a Delta water transfer facility. This is because the quantity of carriage water required to protect the quality of water transported through existing Delta channels increases as Delta exports increase.

Components north of the Delta consist of tributary and off-stream storage reservoirs in the Sacramento River Basin to augment the yield of the SWP and CVP. This program does not include dams on the Eel or other North Coast rivers, as the State's Wild and

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Scenic Rivers Act of 1972 prohibits building dams and reservoirs on these rivers. DWR studies show that projected water requirements of the Delta and water demands of the SWP and CVP can be met to or beyond the year 2000 with implementation of all the facilities proposed in this program.

Cottonwood Creek Project. The program includes the authorized Corps of Engineers' Cottonwood Project, which is comprised of two tributary storage reservoirs, Dutch Gulch and Tehama. Dutch Gulch Reservoir on Cottonwood Creek would be formed by a dam 82 metres (268 feet) high and would have a capacity of 1.36 cubic kilometres (1.1 million acre-feet). Tehama Reservoir on the south fork of Cottonwood Creek would be formed by a dam 73 metres (238 feet) high and would have a gross storage capacity of 1.1 cubic kilometres (900,000 acre-feet).

The project would provide substantial flood control benefits along Cottonwood Creek and in downstream areas along the Sacramento River as well as local irrigation, recreation, and fish enhancement benefits. However, the largest benefits would be derived from municipal and industrial water supply for the SWP. The Cottonwood Creek Project is included in this program on the premise that the State

would contract for a major share of the reservoir storage space under the Water Supply Act of 1958. This storage space would increase the firm yield of the SWP by 185 to 247 cubic hectometres (150,000 to 200,000 acre-feet) per year during critical dry periods. This yield would be limited to municipal and industrial use and is in addition to the yield of about 49 cubic hectometres (40,000 acre-feet) per year to meet projected demands (primarily for irrigation) along Cottonwood Creek. Such local needs would be protected and have priority over the SWP by the State's area of origin laws.

The Corps' current study schedule calls for completion of the draft EIS in August 1979 and initiation of the final EIS in October 1979. With this schedule, construction could begin as early as 1982 or 1983.

The principal features of the Cottonwood Creek Project are shown on Figure 37 and the principal statistics are shown in Table 24.

Glenn Reservoir—River Diversion. Glenn Reservoir would be formed by construction of Rancheria Dam 133 metres (435 feet) high on Stony Creek in Glenn County, and Newville Dam 118 metres (387 feet) high on North Fork Stony Creek near the Glenn-Tehama county line. These two dams would create a reservoir with approximately 10.7 cubic kilometres

TABLE 24
COTTONWOOD CREEK PROJECT

Physical Statistics	Dutch Gulch Dam and Reservoir		Tehama Dam and Reservoir		Totals	
	Square Kilometres	Square Miles	Square Kilometres	Square Miles	Square Kilometres	Square Miles
Drainage area	1 020	(394)	961	(371)	1 981	(765)
Elevations						
Dam crest	237	(778)	224	(735)		
Maximum pool	236	(773)	223	(730)		
Top of flood reservation	231	(757)	218	(715)		
Top of conservation pool	224	(735)	211	(692)		
Minimum pool.....	179	(588)	172	(565)		
Streambed	155	(510)	151	(497)		
Dam height	Metres	Feet	Metres	Feet		
	82	(268)	73	(238)		
Capacities	Cubic Hectometres	Thousand Acre-Feet	Cubic Hectometres	Thousand Acre-Feet	Cubic Hectometres	Thousand Acre-Feet
Flood reservation, maximum	300	(243)	300	(243)	600	(486)
Conservation storage	1 015	(823)	773	(627)	1 788	(1,450)
Inactive, dead, sediment	42	(34)	37	(30)	79	(64)
Gross	1 357	(1,100)	1 110	(900)	2 467	(2,000)
Area	Hectares	Acres	Hectares	Acres	Hectares	Acres
Reservoir at gross storage.....	5 140	(12,700)	4 940	(12,200)	10 080	(24,900)
Total land required	9 700	(24,000)	8 900	(22,000)	18 600	(46,000)

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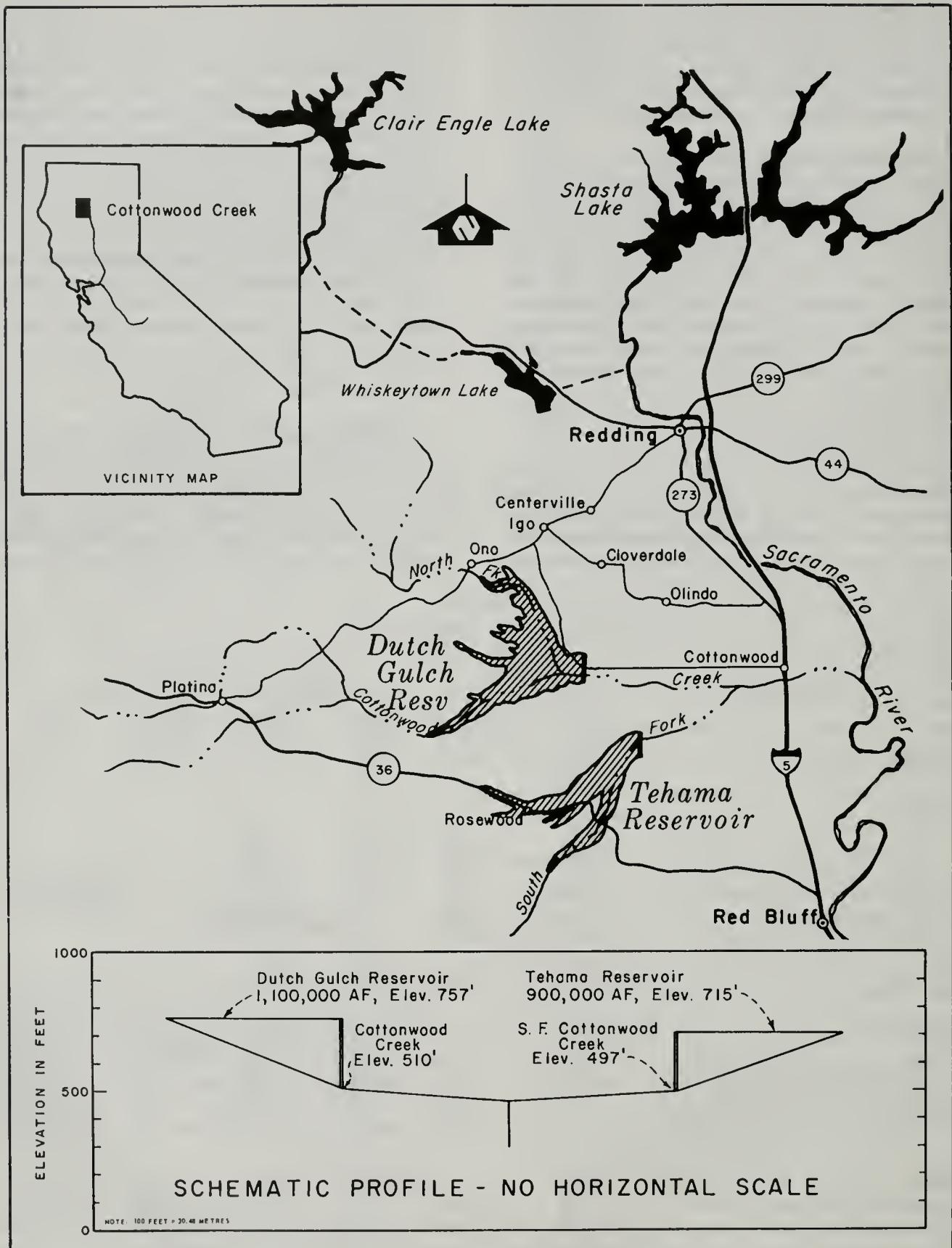


Figure 37. Cottonwood Creek Project.

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(8.7 million acre-feet) of off-stream capacity for storing surplus water pumped from the Sacramento River, as well as natural inflow surplus to local and downstream requirements. Surplus flow in Thomes Creek would also be diverted into Glenn Reservoir by a diversion dam west of Paskenta. The location and principal features of the plan are shown on Figure 38.

Glenn Reservoir is particularly well suited to provide long-term carryover storage of surplus Sacramento River flows for use by the SWP or the CVP. As proposed, surplus Sacramento River water would be diverted from Lake Red Bluff into a new canal just west of the existing Tehama-Colusa Canal. Forty kilometres (25 miles) from Red Bluff the canal would enter a small regulatory reservoir near Kirkwood. From there, a 13-kilometre (8-mile) canal would run west to a pumping plant near the existing Black Butte Dam. This pumping plant would lift the water about 88 metres (290 feet) into Black Butte Reservoir, which would be stabilized near its present maximum

level. A second pumping plant on Black Butte Reservoir near Newville Dam would lift the water an additional 145 metres (475 feet) into Glenn Reservoir. Pump units in the two pumping plants would be reversible to generate power when water was being released from Glenn Reservoir.

As presently envisioned, reservoir releases would travel back through the diversion system to Kirkwood Forebay and then down about 9.7 kilometres (6 miles) of improved creek channels to the Sacramento River at the mouth of Branch Creek. Because of the substantial natural inflow from Stony and Thomes Creeks, the plan would generate more energy than would be consumed in pumping. Integrated operation of this component with the SWP and CVP would increase the firm yield of those projects by about 1.2 cubic kilometres (1 million acre-feet) per year. The project is adaptable to staged construction so that yield could be more closely matched with buildup in demand. The project would improve flood

TABLE 25
GLENN RESERVOIR—RIVER DIVERSION
DAM AND RESERVOIR DATA SUMMARY

Physical Features	Glenn Reservoir				Thomes Creek			
	Newville Dam and Reservoir	Rancheria Dam and Reservoir	Modified Black Butte Reservoir	Diversion Dam and Reservoir				
<i>Drainage area</i>								
Square Kilometres (square miles)	142	(55)	1 550	(599)	225	(87) ¹	456	(176) ²
<i>Elevations, Metres (feet)</i>								
Dam crest	304	(997)	312	(1,025)	157	(515) ³	325	(1,065)
Maximum pool	302	(992)	310	(1,017)	155	(510) ³	322	(1,057)
Top of flood reservation	301	(987)	308	(1,012)	155	(510) ⁴	313	(1,026)
Top of conservation pool	299	(982)	307	(1,006)	155	(510) ⁴	313	(1,026)
Minimum pool	274	(898)	215	(706)	130	(425) ⁴	313	(1,026)
Streambed	186	(610)	180	(590)	114	(375) ³	291	(955)
Dam height, Metres (feet)	118	(387)	132	(435)	43	(140) ³	34	(110)
<i>Capacities, Cubic Hectometres (thousand acre-feet)</i>								
Flood reservation.....	99	(80)	270	(220)	0	(0)	0	(0)
Conservation storage	1 630	(1,320)	6 390	(5,180)	459	(372)	0	(0)
Inactive, dead sediment..	1 230	(1,000)	120	(100)	25	(20)	— ⁵	— ⁵
Gross.....	3 950	(3,200)	6 780	(5,500)	484	(392)	— ⁵	— ⁵
<i>Area, Kilohectares (thousand acres)</i>								
Reservoir at gross stor- age.....	6.9	(17)	15	(37) ⁶	3.4	(8.5) ⁷	— ⁵	— ⁵
Total land required ⁸	9.3	(23)	21	(51)	4.6	(11.5)	— ⁵	— ⁵

¹ Excludes area and runoff tributary to Glenn Reservoir

² Includes 16 square kilometres (6 square miles) tributary to Thomes-Newville Canal.

³ No change from existing Black Butte Reservoir

⁴ Existing Black Butte Reservoir operating levels are: top of joint use flood control-conversion storage = elevation 144 metres (474 feet), 200 cubic hectometres (160,000 acre-feet) gross storage; minimum pool = elevation 126 metres (415 feet), 12.3 cubic hectometres (10,000 acre-feet) storage

⁵ Not calculated

⁶ Includes existing Stony Gorge Reservoir 526 hectares (1,300 acres)

⁷ Existing Black Butte Reservoir area 1 845 hectares (4,580 acres)

⁸ Total land required (including diversion system) 36 400 hectares (90,000 acres)

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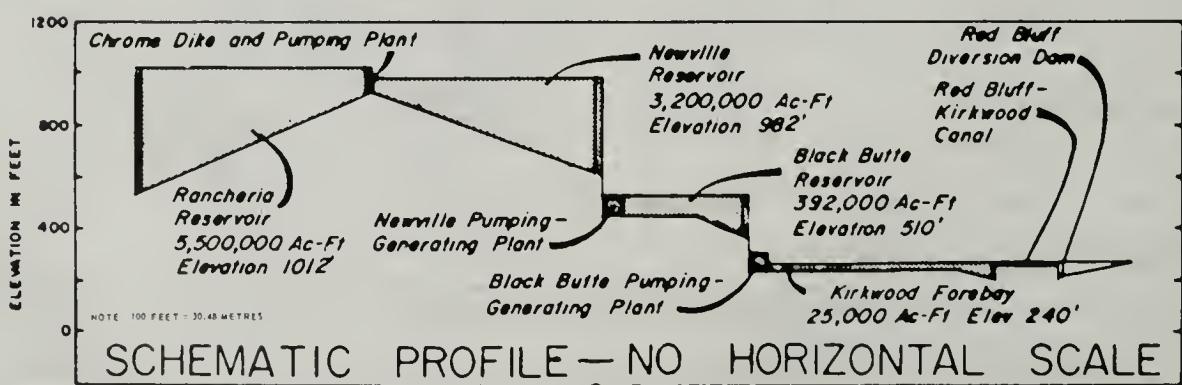
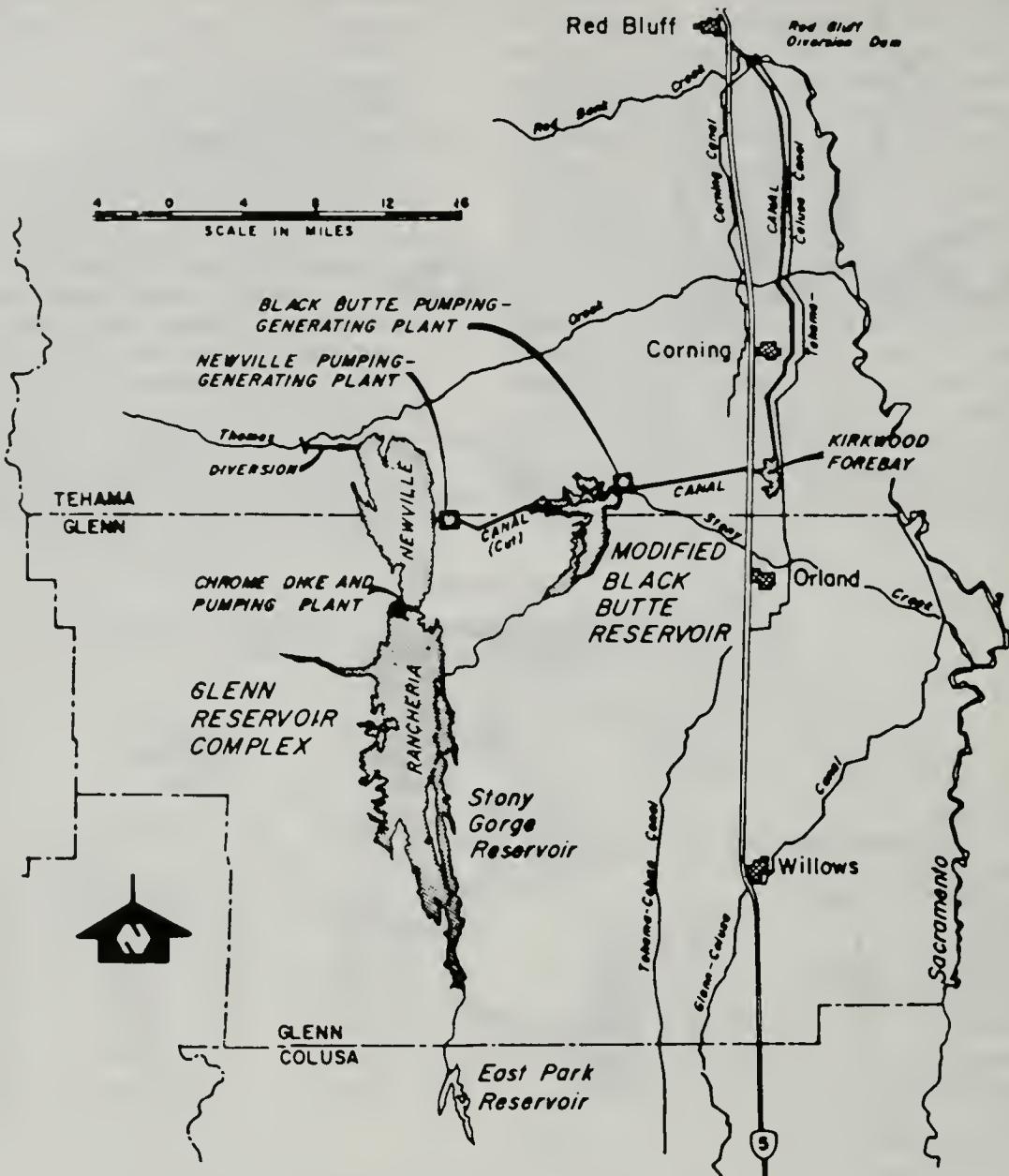


Figure 38. Glenn Reservoir - River Diversion Plan.

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protection along Stony Creek and the Sacramento River and provide a high degree of flood protection on Thomes Creek. The reservoir would inundate the Rancheria Indian Reservation, and the Indians have asked DWR to finance a feasibility study for relocating the tribe, including the sacred dance house, Indian burial grounds, and other displacements.

Dam and reservoir data are summarized in Table 25, and conveyance facility data are summarized in Table 26.

Colusa Reservoir—River Diversion. The Colusa Reservoir-River Diversion is included as a partial alternative to the Glenn Reservoir-River Diversion Plan. Colusa Reservoir would be formed by a series of five dams on Willow, Logan, Hunters, Funks, and

Stone Corral Creeks in the foothills west and southwest of Willows, as shown on Figure 39. The 5 dams would vary in height from a low of 49 metres (160 feet) to a high of 90 metres (295 feet). They would create a gross storage capacity of 3.9 cubic kilometres (3.2 million acre-feet).

Natural runoff to Colusa Reservoir is limited. Its water supply would depend almost entirely on pumping the surplus flows from the Sacramento River. This could be accomplished by a new canal as outlined for the Glenn Reservoir plan, but the Tehama-Colusa and Glenn-Colusa Canals could deliver sufficient water during the nonirrigation season to support Colusa Reservoir. The illustrated plan assumes such off-season use of the existing canals. Since this is only an alternative to Glenn, no attempt has been made to

TABLE 26
GLENN RESERVOIR-RIVER DIVERSION
CONVEYANCE FACILITY DATA

Kirkwood Forebay

Capacity: 31 Cubic Hectometres (25,000 acre-feet)

Canals

Red Bluff-Kirkwood Canal

Type: Concrete-lined

Length: 40.1 Kilometres (24.9 miles)

Capacity: 142 Cubic Metres/Second (5,000 cubic feet/second)

Kirkwood-Black Butte Canal

Type: concrete-lined

Length: 13.0 Kilometres (8.1 miles)

Capacity: 283 Cubic Metres/Second (10,000 cubic feet/second)

Black Butte-Newville Canal

Type: Unlined

Length: 6.8 Kilometres (4.2 miles)

Capacity: 283 Cubic Metres/Second (10,000 cubic feet/second)

Thomes-Newville Canal

Type: Unlined

Length: 3.9 Kilometres (2.4 miles)

Capacity: 1897 Cubic Metres/Second (67,000 cubic feet/second)

Pumping and Power Facilities

Black Butte Pumping-Generating Plant

Operating mode: Pump off-peak, generate on-peak

Design flow: 283 Cubic Metres/Second (10,000 cubic feet/second)

Maximum static head: 88 Metres (290 feet)

Pumping capacity: 290 Megawatts

Newville Pumping-Generating Plant

Operating mode: Pump off-peak, generate on-peak

Design pumping flow at maximum head: 283 Cubic Metres/Second (10,000 cubic feet/second)

Maximum static head: 145 Metres (475 feet)

Pumping capacity: 475 Megawatts

Chrome Pumping Plant

Operating mode: Pump off-peak

Design flow: 142 Cubic Metres/Second (5,000 cubic feet/second)

Maximum static head: 12 Metres (40 feet)

Pumping capacity: 20 Megawatts

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verify that a mutually acceptable agreement with the Glenn-Colusa Irrigation District could be obtained.

The existing fish screens (which are designed for controlled summer flow conditions in the river) would require substantial modification for use during high flow periods with heavy debris loads. Also a small forebay reservoir would be constructed on the Glenn-Colusa Canal about 4.8 kilometres (3 miles) south of Willows. A 6.4-kilometre (4-mile) long canal would connect this forebay to a pumping plant that would lift water about 26 metres (85 feet) to the level of the Tehama-Colusa Canal. A second canal would convey water from both canals about 3.2 kilometres (2 miles) west to a second pumping plant near Logan Dam. This plant would pump water into Colusa Reservoir with a maximum lift of 95 metres (310 feet). Reservoir releases would be made back through the pumping plants which would be equipped with reversible units to recover a portion of the energy used for pumping. (Unlike Glenn, energy consumed would exceed energy generated by approximately 50,000,-000 kilowatthours annually.)

Making reservoir releases into the Glenn-Colusa Canal in exchange for an equivalent amount of water that the irrigation district would not have to pump

from the Sacramento River would be a logical way of making the additional yield available at the Delta. As described, this plan would increase the yield of the SWP and CVP systems by about 567 cubic hectometres (460,000 acre-feet) per year. In addition, some flood protection would be provided to the Willows and Colusa areas.

Colusa Reservoir could be constructed in stages. It is an expanded version of the Sites Reservoir that has been considered by the USBR as part of the CVP to serve the Tehama-Colusa Canal and a possible extension into Yolo and Solano Counties. As an integrated facility of the State and federal systems, the Sites portion of the reservoir or an equivalent capacity in Colusa Reservoir could be used for that purpose at any time. Because the Colusa and Glenn Reservoir plans would depend on nearly the same surplus Sacramento River flows, both should not be constructed at the described sizes, and the yields are not additive. However, some combination of the reduced plans is conceivable, such as a Sites Reservoir and a somewhat smaller Glenn Reservoir.

A summary of dam and reservoir data is shown in Table 27, and a summary of conveyance facility data is shown in Table 28.

TABLE 27

COLUSA RESERVOIR—RIVER DIVERSION DAM AND RESERVOIR DATA SUMMARY

<i>Drainage area</i>	383 square kilometres (148 square miles)
<i>Elevations</i>	
Dam crest:	163 metres (535 feet)
Maximum pool:	158 metres (520 feet)
Top of flood reservation:	Not applicable
Top of conservation pool:	158 metres (520 feet)
Minimum pool:	98 metres (320 feet)
<i>Streambeds:</i>	
Willow dam:	114 metres (375 feet)
Logan dam:	85 metres (279 feet)
Hunters dam:	81 metres (265 feet)
Funks dam:	73 metres (240 feet)
Sites dam:	73 metres (240 feet)
<i>Dam height</i>	
Willow dam:	49 metres (160 feet)
Logan dam:	78 metres (256 feet)
Hunters dam:	82 metres (270 feet)
Funks dam:	90 metres (295 feet)
Sites dam:	90 metres (295 feet)
<i>Capacities</i>	
Flood reservation:	None
Conservation storage:	3824 cubic hectometres (3100 thousand acre-feet)
Inactive, dead, sediment:	74 cubic hectometres (60 thousand acre-feet)
Gross:	3898 cubic hectometres (3160 thousand acre-feet)
<i>Area</i>	
Reservoir at gross storage:	12 100 hectares (30,000 acres)
Total land required:	16 200 hectares (40,000 acres)

TABLE 28

COLUSA RESERVOIR—RIVER DIVERSION CONVEYANCE FACILITY DATA

Tehama-Colusa Canal (Under Construction)

Type: Concrete-lined
Length, Red Bluff to project diversion:
90 Kilometres (56 miles)
Capacity of project diversion:
90 Cubic Metres/Second (56 cubic feet/second)
Maximum water surface elevation at project diversion:
59 Cubic Metres/Second (2,100 cubic feet/second)

Glenn-Colusa Irrigation District Canal (Existing)

Type: Unlined
Length, Sacramento River to project forebay:
37 Kilometres (23 miles)
Capacity at forebay (with planned improvements):
59 Cubic Metres/Second (2,100 cubic feet/second)
Maximum water surface elevation at forebay:
39 Metres (129 feet)

Colusa Forebay

Active storage capacity:
5.2 Cubic Hectometres (4,200 acre-feet)
Operating water surface elevation:
38 to 39 Metres (124 to 129 feet)
Maximum area: 340 Hectares (840 acres)

Lower Connecting Canal (Forebay to Tehama-Colusa Canal)

Type: Unlined, level bottom
Length: 6.1 Kilometres (3.8 miles)
Capacity: 178 Cubic Metres/Second (6,300 cubic feet/second)

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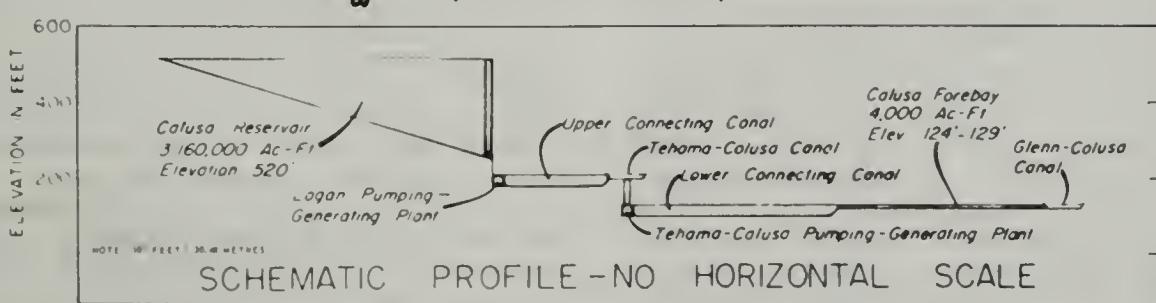


Figure 39. Colusa Reservoir - River Diversion Plan.

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Related Items

Senate Bill 346, with revisions recommended by the Legislative Committee on Conference on January 20, 1978, includes all of the provisions in the Department's program. In addition, the Legislature added facilities to provide for the transportation of water to serve the counties of San Joaquin, San Francisco, and San Mateo. The Legislature also included in the bill facilities to provide for the transportation of a supplemental water supply to those areas in Alameda and Contra Costa Counties not served through the Contra Costa Canal or the South Bay Aqueduct, provided that the water to be delivered would be developed by the facilities of the federal Central Valley Project. The specific nature of these water transportation facilities was unspecified. To date, DWR has not undertaken studies or negotiations to determine the amounts of water that should be transported to these areas or the specific facilities required to do so.

Facilities for San Joaquin County could consist of the Delta-Woodbridge Canal proposed as part of the Folsom South Canal service area negotiations. The facility could transport water from the Peripheral Canal to Lodi Lake on the Mokelumne River at Woodbridge. The canal would be about 13 kilometres (8 miles) long with a pumping plant to lift the water approximately 15 metres (50 feet).

One purpose of this canal would be to provide summer irrigation water to the Woodbridge irrigation area in exchange for holding water back in Camanche Reservoir so that releases for fishery purposes could be made later in the year. A second purpose would be to supply irrigation water to the area in lieu of releases from Folsom South Canal so that water could be released into the American River in accordance with the water rights decisions by the State Water Resources Control Board without causing deficiencies in the Folsom South Canal service area.

The South Bay Aqueduct could be equipped with a turnout to discharge water into the City of San Francisco's San Antonio Reservoir. With this modification, about 25 cubic hectometres (20,000 acre-feet) per year of water could be conveyed to and through the City of San Francisco's water transmission system for conveyance to San Mateo and San Francisco Counties. This concept was used during the 1977 drought emergency. Temporary facilities were installed to discharge water into San Antonio Reservoir and a total of about 11 cubic hectometres (8,939 acre-feet) of water was conveyed from the Delta through the South Bay Aqueduct to San Antonio Reservoir. From there, about 5.3 cubic hectometres (4,345 acre-feet) was conveyed through the City's conveyance system to San Francisco, and about 5.7 cubic hectometres (4,594 acre-feet) was conveyed to Marin County using the East Bay Municipal Utility District conveyance system and a tempo-

rary pipeline across the Richmond-San Rafael Bridge.

Facilities to pump water into the East Bay Municipal Utility District's Mokelumne River Aqueduct from the Delta at Middle River (as was done as an emergency measure during the 1976-77 drought) could be constructed to transport water to Alameda County and western Contra Costa County. The foregoing are only possible facilities and are not a specific part of the DWR plan at this time.

Senate Bill 346 would direct DWR to conduct a five-year investigation of areawide net savings in agricultural water conveyance, use, and management and would appropriate \$750,000 per year for DWR to conduct the program. The "Agricultural Water Conservation Loan Act of 1978" is included in the Bill and would establish a \$50,000,000 loan fund to provide farmers low-interest loans to assist in the implementation of agriculture water conservation programs.

Operating the System

There are many possible ways of operating the State Water Project and the federal Central Valley Project, both with existing facilities and with those to be added by the DWR program. The basic premise of the plan is to obtain a coordinated operation of the two systems within existing and proposed constraints. Some of the key operational concepts are as follows.

Delta operational concepts include: (1) the CVP and the SWP meeting identical Delta water quality criteria; (2) reduction in Delta exports during spring to protect striped bass eggs and larvae; (3) reduction in Delta exports during dry years to reduce impact on aquatic environment; (4) increased Delta exports during normal and above-normal years to enable replenishment of surface and ground water storage facilities south of the Delta, but with limitations on diversions and exports of unregulated freshwater flows (so-called flushing flows) to protect San Francisco Bay from possible harmful effects of diverting too much water; and (5) freshwater releases from the Peripheral Canal into the Delta channels to provide more efficient water quality control and to restore positive downstream flows in virtually all Delta channels.

The Peripheral Canal will provide the major physical means for distributing good quality Sacramento River water throughout the Delta. Other Delta facilities—such as the South Delta Water Quality Improvement Facilities, the Western Delta Overland Water Facilities, and the Suisun Marsh Facilities—will be operated in conjunction with reservoir and canal releases to improve flow distribution and meet the specific needs of the areas they serve.

South of the Delta, the four additional pumps at the Delta Pumping Plant and a new 85 cms (3,000-cfs) pumping plant for Los Vaqueros Reservoir would facilitate off-stream storage during months of excess Delta outflow. (Excess Delta outflows are

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those flows not needed to meet consumptive use requirements and water quality and fish and wildlife criteria in the Delta, Suisun Marsh, and San Francisco Bay.) Water from Los Vaqueros would be released into the California Aqueduct when direct exports from the Sacramento River are reduced to protect striped bass eggs. Water stored in the underground basins would be recovered during the dry years when the annual Delta diversions were reduced to protect the Delta environment.

North of the Delta, the Cottonwood Creek reservoirs and Glenn Reservoir would be filling during months of excess Delta outflow and would be releasing water during the drier months. Major releases from Glenn would normally be made in dry and critically dry years because its major use would be long-term carryover storage. Cottonwood releases would be smaller in size and more frequent.

Rather than maximizing the yield from an individual facility, the goal is to obtain the best overall system supply. Approximate values of firm yield for the various new facilities are computed as incremental Delta export yield added to the combined SWP and CVP systems. These are computed after meeting future upstream depletions in the areas of origin and after meeting water quality and fish and wildlife criteria in the Delta, Suisun Marsh, and San Francisco Bay. Much of the yield in most years comes from direct diversions of uncontrolled excess flows in the Delta.

These direct diversions must be firmed up with releases or extractions from storage either north or south of the Delta during dry periods. State and federal water service contracts allow for planned deficiencies in agricultural deliveries during critical dry periods and project yield assumes such deficiencies.

DWR conducted a 50-year operation study of the entire system of existing and new facilities. The study showed that the projected year 2000 Delta export demand of 9.5 cubic kilometres (7.7 million acre-feet) per year could be met using only a portion of the potential of Glenn Reservoir after meeting all area of origin and Delta requirements (see Figure 40). Expressed in the conventional manner and using the Glenn facilities to their full potential, the indicated year 2000 annual firm yield from Delta export was increased by 3.7 cubic kilometres (3 million acre-feet) per year to 10.1 cubic kilometres (8.2 million acre-feet) per year as shown in Table 29¹. The difference of 0.6 cubic kilometres (0.5 million acre-feet) per year represents a contingency against uncertainties in forecasting future events, or it could be applied to increases in SWP demands beyond the year 2000.

¹ Based on preliminary analysis, the yield would be approximately the same under the March 1978 SWRCB draft Water Quality Control Plan assuming criteria for Suisun Marsh, Western Delta agriculture and the Contra Costa Canal would not be applicable in the long term because of the substitute facilities to be provided to meet their needs.

TABLE 29
ESTIMATED YEAR 2000 FIRM ANNUAL YIELD FROM DELTA EXPORT¹

Feature	Estimated Yield	
	cubic kilometres	million acre-feet
<i>Existing and Ongoing Facilities</i>		
Water from existing SWP and CVP facilities, year 2000 ²	6.4	(5.2)
<i>Proposed Facilities and Actions</i>		
Four new pumps at SWP Delta Pumping Plant	0.1	(0.1)
4-Agency Fish and Wildlife Agreement.....	0.3	(0.2)
Peripheral Canal, with 4-Agency Fish and Wildlife Agreement	1.2	(1.0)
Ground Water Storage South of Delta ³	0.5	(0.4)
Los Vaqueros Reservoir.....	0.2	(0.16)
Cottonwood Creek Project ⁴	0.2	(0.17)
Glenn Reservoir-River Diversion	1.2	(1.0)
New Water Subtotal.....	3.7	(3.0)
<i>Approximate Year 2000 Firm Yield from Delta Export</i>		
Target Demand	10.1	(8.2)
Extra Supply for Contingencies or Needs Beyond Year 2000.....	9.5	(7.7) ⁵
.....	0.6	(0.5)

¹ Amounts subject to reduction in critically dry years in accordance with predetermined provisions in SWP and CVP water contracts, and elimination of intermittent or interim CVP supplies in such years

² Chapter IV (Table 11) explains that the firm annual yield in 1980 of 6.9 cubic kilometres (5.8 million acre-feet) from the Delta via existing SWP and CVP facilities would be reduced to 6.4 cubic kilometres (5.2 million acre-feet) by the year 2000 due to increased use in the upstream areas of origin

³ Includes enlargement of the East Branch of the California Aqueduct

⁴ Amount refers to Delta export portion of Cottonwood yield, which excludes local yield of about 49 cubic hectometres (40,000 acre-feet) per year assumed to be marketed by USBR

⁵ Target demand reflects the net water conservation and local waste water reclamation goal of 740 cubic hectometres (600,000 acre-feet) per year as discussed in Chapter IV, Table 19

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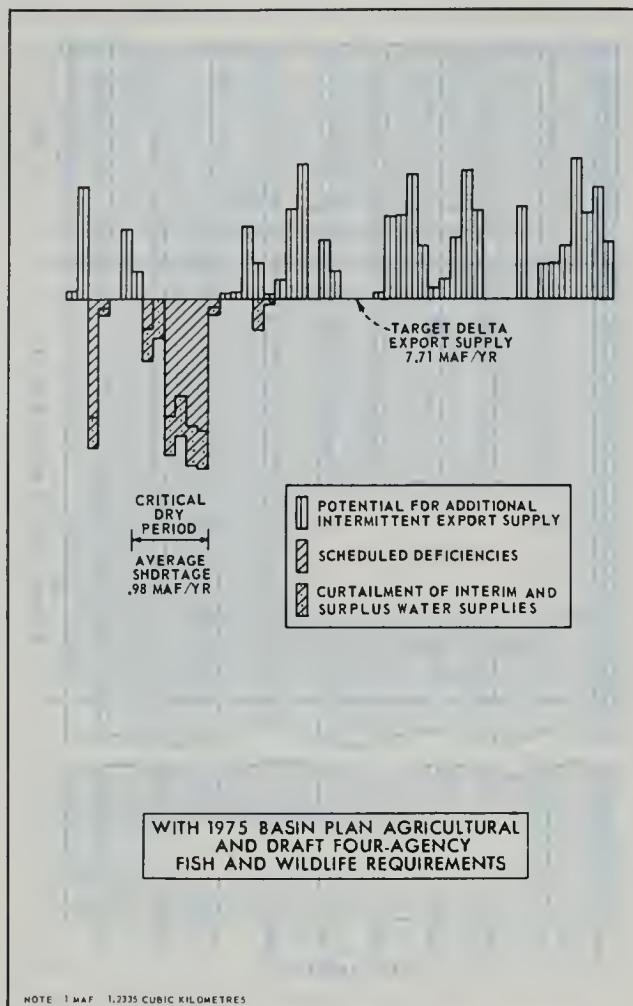


Figure 40. CVP and SWP systems operation, 2000 level of development.

Figure 41 depicts the annual variation in Delta water supply and disposals for the full spectrum of wet and dry years at the year 2000 level of operation. The format is the same as that shown in Chapter IV for operation of existing facilities at the 1980 level of development.

In the studies Delta consumptive use was maintained at a constant 2 cubic kilometres (1.6 million acre-feet) per year. Minimum Delta outflow required to meet water quality and fishery criteria averaged 4.4 cubic kilometres (3.6 million acre-feet) per year, varying from a high of about 6 cubic kilometres (4.9 million acre-feet) in a wet year to 2.7 cubic kilometres (2.2 million acre-feet) in a critical year. Delta export averaged 9.4 cubic kilometres (7.6 million acre-feet) per year, varying from a high of about 11 cubic kilometres (9 million acre-feet) per year to a low of about 6.8 cubic kilometres (5.5 million acre-feet) per year. The potential for intermittent surplus water export averaged about 430 cubic hectometres (350,000 acre-feet) per year with none being available in the drier years. Finally, excess freshwater Delta outflows (so-

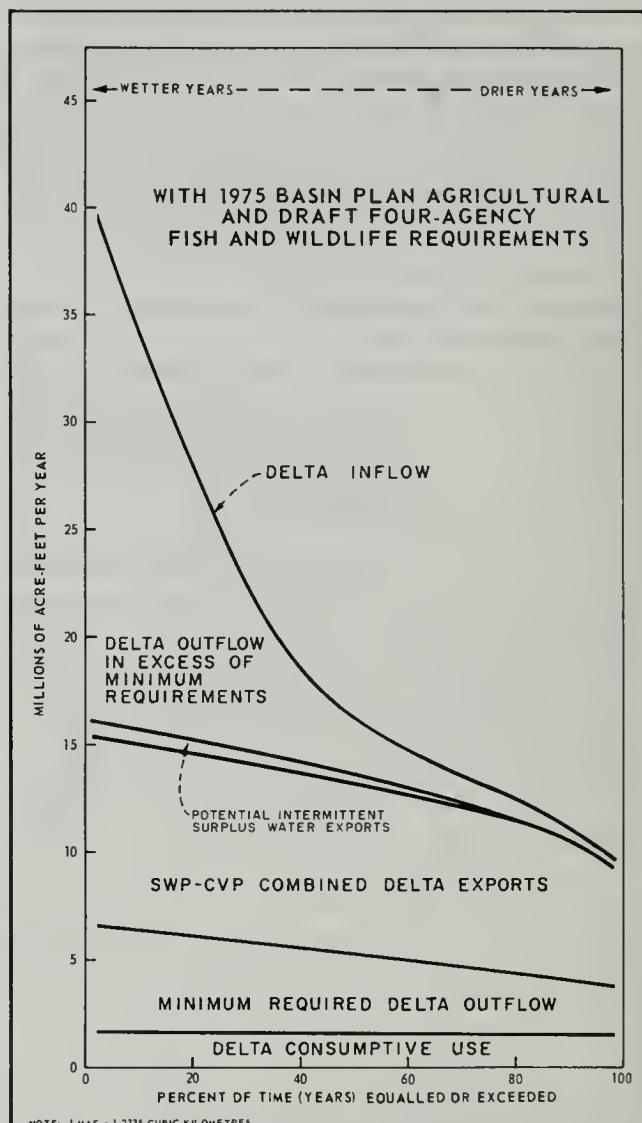


Figure 41. Annual Delta water supply and disposal, 2000 level of development.

called flushing flows) averaged almost 8.6 cubic kilometres (7 million acre-feet) per year, varying from a high of about 31 cubic kilometres (25 million acre-feet) in the wettest year to very little in the driest year.

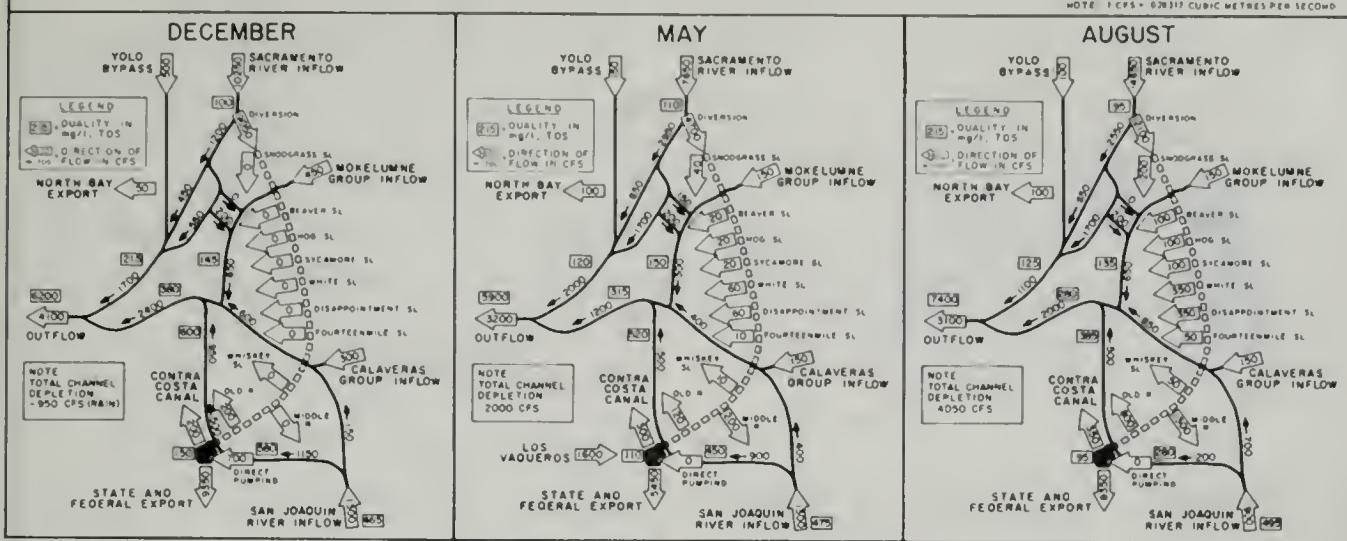
Total Delta outflow, the sum of minimum required Delta outflow and excess Delta outflow, averaged 13 cubic kilometres (10.5 million acre-feet) per year, varying from a high of about 37 cubic kilometres (30 million acre-feet) in a wet year to a low of about 2.7 cubic kilometres (2.2 million acre-feet) in a critical dry year. Had the study been performed using the March 1978 SWRCB draft Delta Water Quality Plan, Figure 41 would look similar except that minimum required Delta outflow would be higher in the wetter years (see Chapter III).

Firm water deliveries of 9.5 cubic kilometres (7.7 million acre-feet) were maintained in about 80 to 85

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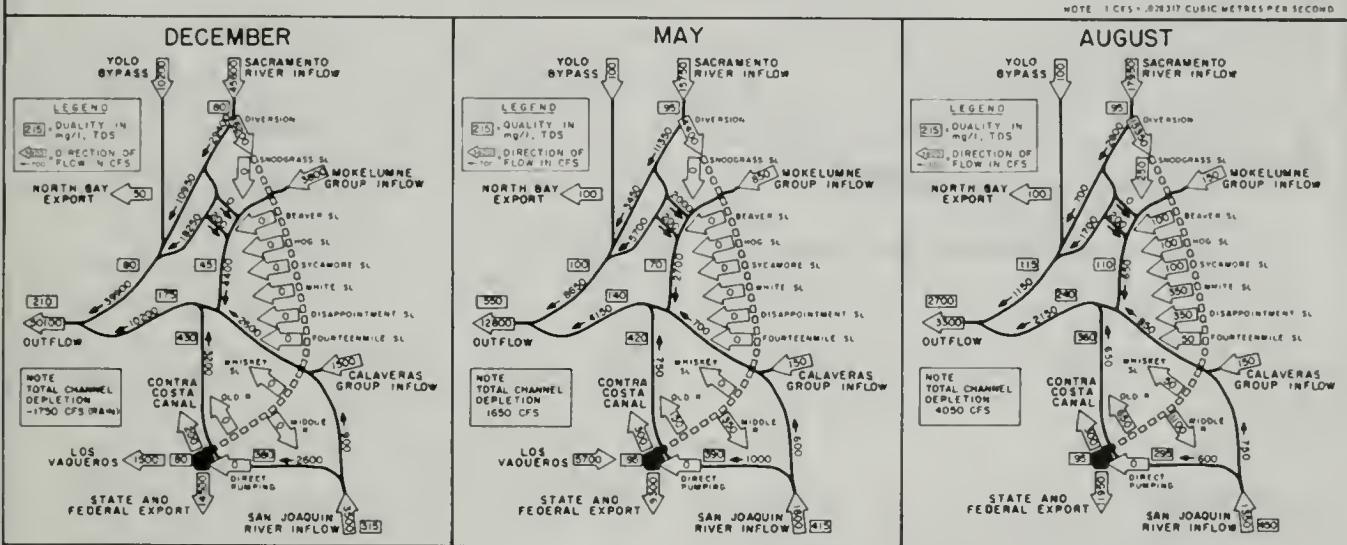
CRITICAL YEAR (1939 - 34)

NOTE: 1 CFS = .028317 CUBIC METRES PER SECOND



ABOVE NORMAL YEAR (1945 - 46)

NOTE: 1 CFS = .028317 CUBIC METRES PER SECOND



WET YEAR (1941 - 42)

NOTE: 1 CFS = .028317 CUBIC METRES PER SECOND

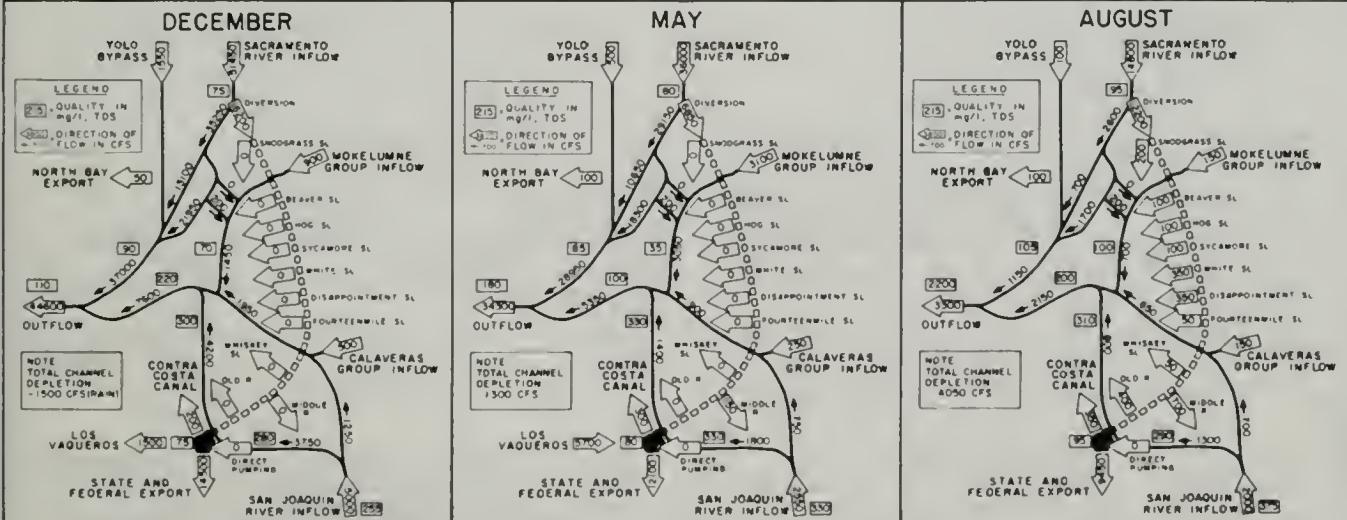
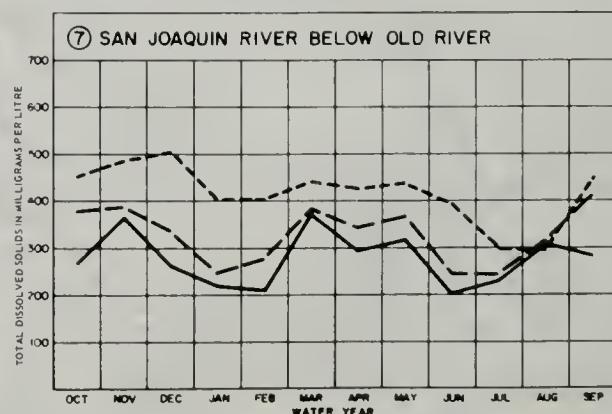
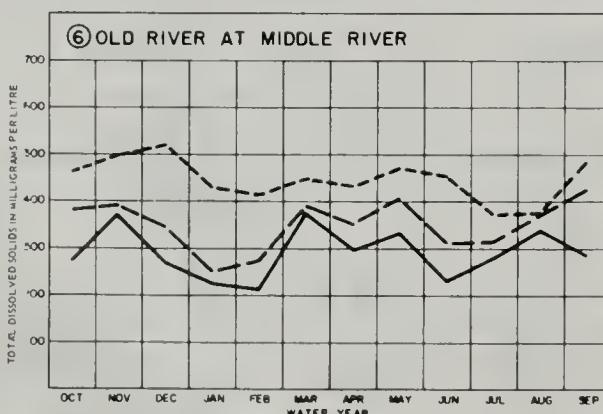
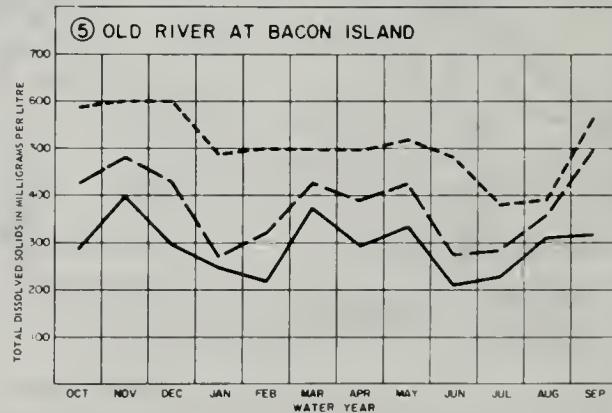
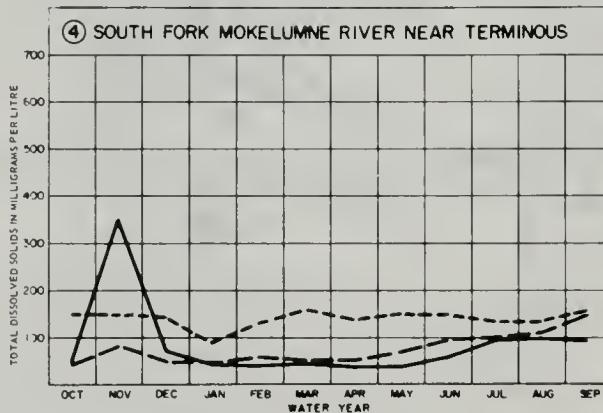
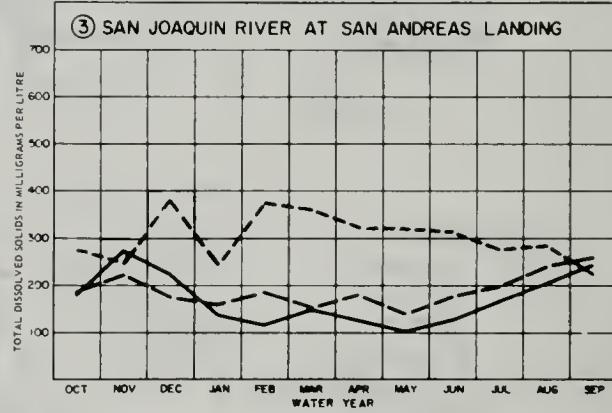
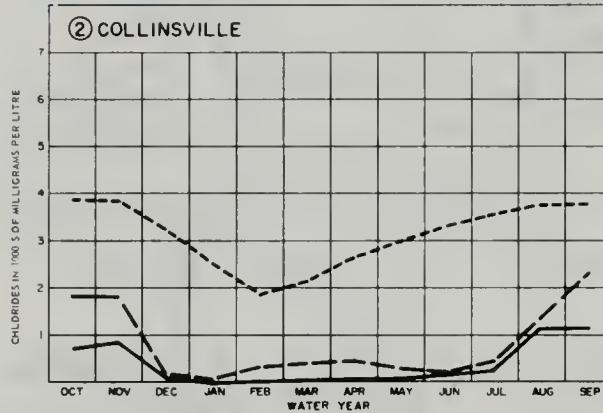
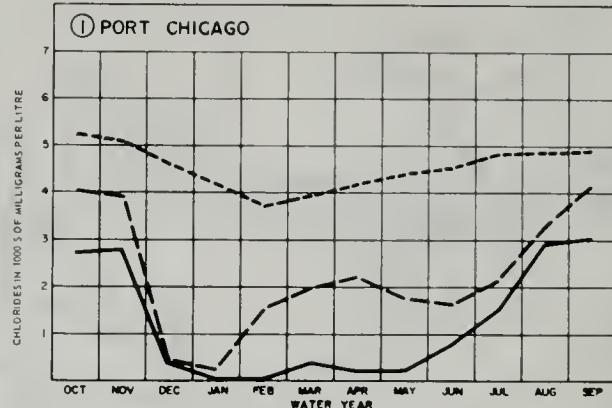
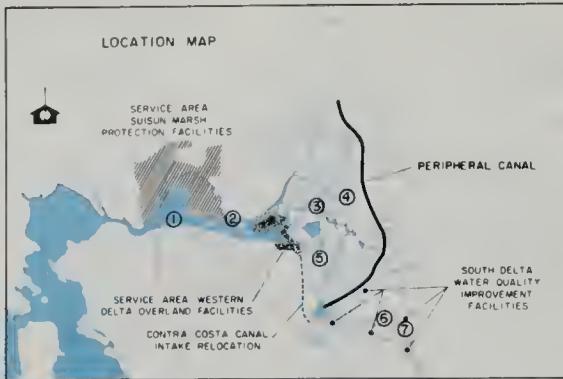


Figure 42. Typical flow and quality routing, year 2000 level of development with Peripheral Canal.

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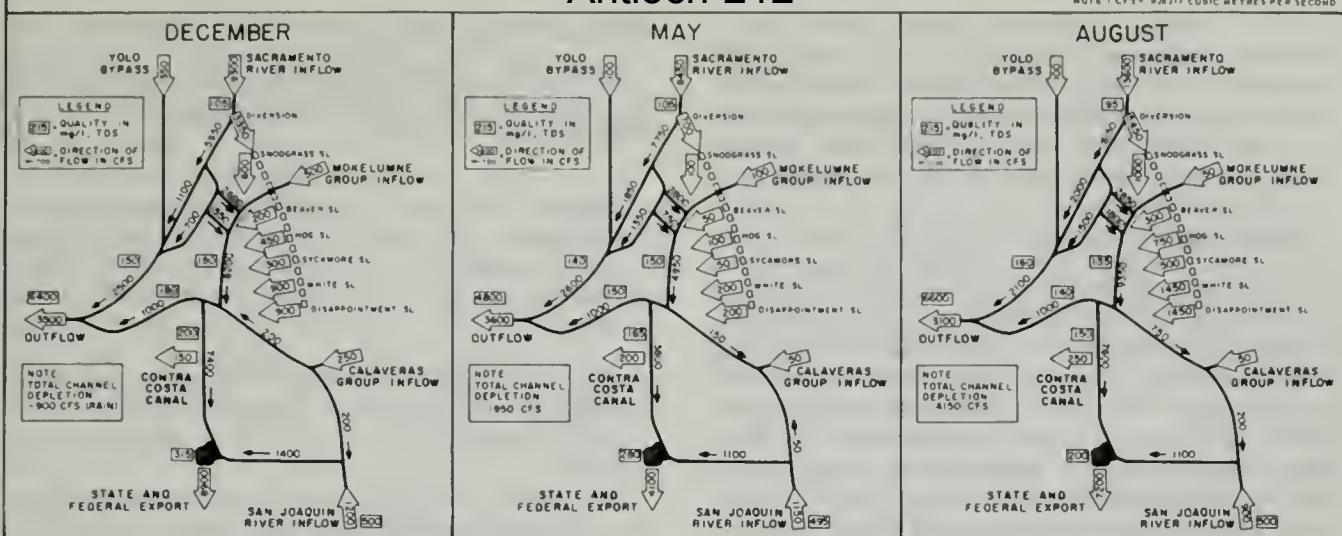
----- CRITICAL YEAR (1933-34)
 - - - ABOVE NORMAL YEAR (1945-46)
 — WET YEAR (1941-42)

NOTE: ASSUMING 1975 BASIN PLAN WATER QUALITY REQUIREMENTS
 AND DRAFT FOUR-AGENCY FISH AND WILDLIFE AGREEMENT
 IN EFFECT WITH SELECTED PLAN.

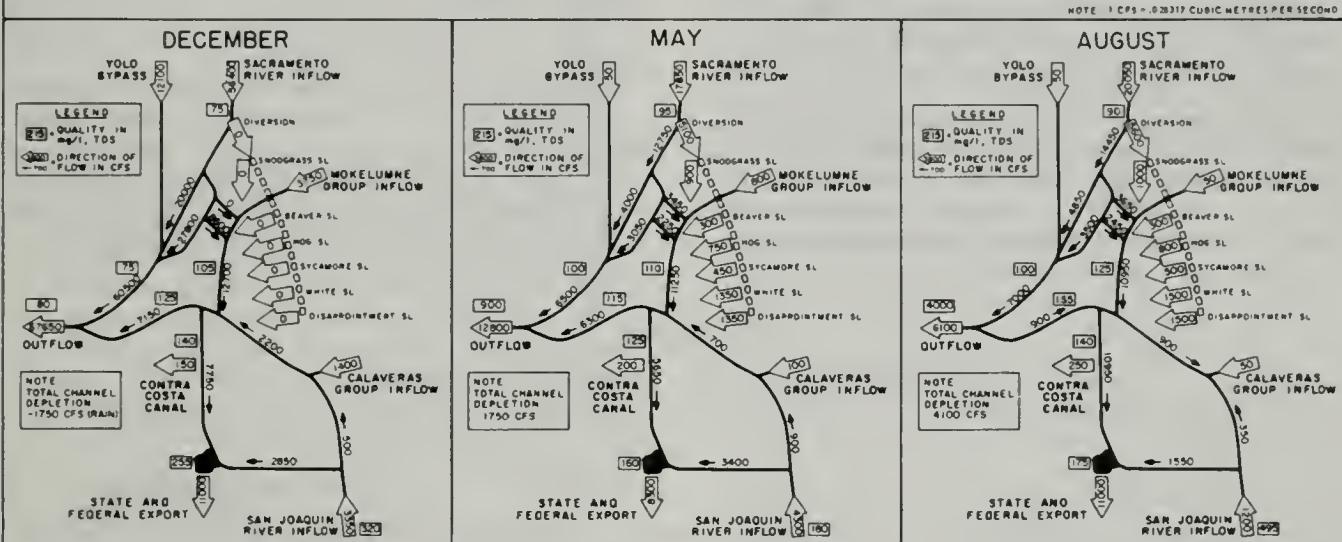
Figure 43. Estimated monthly average water quality, year 2000 level of development.

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NOTE 1 CFS = 0.028317 CUBIC METRES PER SECOND



ABOVE NORMAL YEAR (1945 - 46)



WET YEAR (1941 - 42)

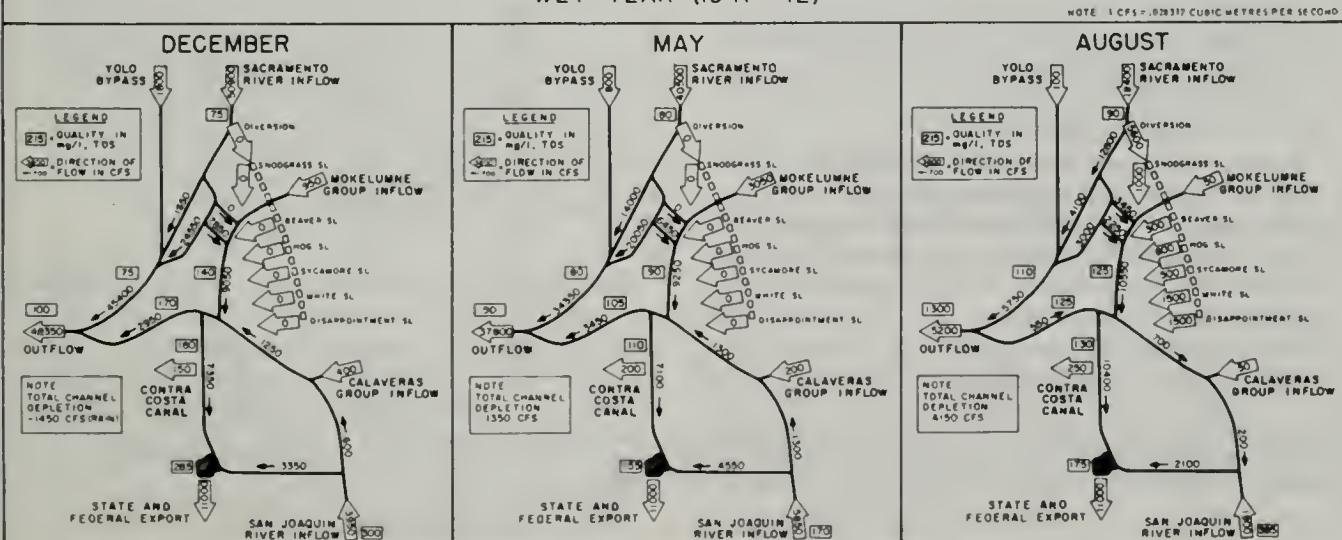


Figure 44. Typical flow and quality routing, year 1985 level of development with first stage Peripheral Canal.

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percent of the years, with the lowest delivery being 7.4 cubic kilometres (6 million acre-feet) per year in a typical critical year. This was accomplished by withdrawing water from project storage—both surface and underground—south of the Delta, and applying predetermined deficiencies to agricultural supplies in critical years.

Because each hydrologic year is different, the amount and timing of both export and releases from the Peripheral Canal will vary from year to year and month to month. To demonstrate operation for projected year 2000 conditions, a typical diversion and release pattern for winter, spring, and summer conditions for a critical year (1934), above-normal year (1946), and wet year (1942), are shown on Figure 42. Figure 43 shows Delta water quality conditions at selected locations for a full 12-month period for each of the same three classifications of years.

Figure 44 shows similar information for interim operation of the first stage Peripheral Canal generally representative of projected conditions for the mid to late 1980's. It is estimated that interim operation of Stage 1, during fish screen testing, would increase the combined SWP and CVP firm yield from Delta export by about 430 cubic hectometres (350,000 acre-feet) per year. This would be accomplished by elimination (or reduction) of the net reverse flows in the vicinity of Antioch in the western Delta, thereby reducing the amount of Delta outflow required to control salinity.

Financial Aspects

Financial aspects include estimated costs to build the facilities, State-Federal sharing of those costs, and sources of funding.

Costs. For many of the plan components, preliminary design and cost estimates were available from previous studies and were adjusted upward for price escalation for use in this study. In other cases, new cost estimates were prepared by applying unit prices for the various materials required to build the project. Since these were done over a two-year period during the course of the study, they too had to be escalated to a common price level for use in this bulletin.

The estimated capital costs to build the selected facilities total approximately \$3.4 billion at 1977 price levels. With an assumed inflation rate of 6 percent per annum, the estimated capital outlay to build the facilities over a 20 to 25 year period is \$7.2 billion. A summary of the preliminary estimated costs for each component is shown in Table 30.

These estimates represent the cost of facilities necessary to resolve the long-standing Delta controversies and develop new supplies for the SWP and CVP. They do not, however, include costs required to complete the California Aqueduct which are scheduled independently and concurrently with the selected facilities.

TABLE 30
SHARING OF COSTS OF SELECTED FACILITIES

Facilities	Assumed Sharing Percent			First Cost, \$Million (1977 Dollars)	
	State	Federal	Total	Assumed Sharing	Federal
<i>Delta Components</i>					
Peripheral Canal	50	50	515	257.5	257.5
Relocation of Contra Costa Canal Intake.....	50	50	16	8	8
So. Delta Water Quality Improvement Facilities.....	50	50	25	12.5	12.5
Western Delta Overland Water Facilities.....	50	50	10	5	5
Suisun Marsh Facilities	50	50	42	21	21
<i>South of Delta Components</i>					
Enlarge E. Branch California Aqueduct	100	—	120	120	—
So. California Ground Water Storage	100	—	120	120	—
San Joaquin Valley Ground Water Storage.....	100	—	120	120	—
Los Vaqueros Reservoir	25	75	540	135	405
Mid-Valley Canal	—	100	440	—	440
<i>North of Delta Components</i>					
Cottonwood Creek Project	70	30 ¹	320	224	96
Glenn Reservoir-River Diversion	50	50	1,160	580	580
Totals			3,428 ²	1,603 ²	1,825

¹ For portions of the project not allocated to water supply at the Delta such as local water supply, flood control, recreation, etc.

² Does not include approximately \$22 million for final four pump units at Delta Pumping Plant nor about \$400 million for completion of other features of the California Aqueduct, both of which are scheduled independently and concurrently with the recommended program.

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Federal-State Cost Sharing. To consider the financial implications on the SWP and the federal CVP separately, it was necessary to identify the features to be allocated to each project. The assumed sharing is shown in Table 30.

Sharing assumes the SWP and CVP are required to meet identical Delta water quality standards and is based on the formula in the unsigned coordination agreement. Of course, the assumed sharing is subject to change depending on the final terms of the agreement.

Funding of the State Share. The planned facilities would be constructed and financed by the State and the Federal Government. The financing of the federal share of the facilities would be from congressional appropriations. This study did not attempt to predict any federal financing. DWR did prepare a financial analysis of the assumed State's share of construction funds that would be required. The SWP, under present law, has three general financing sources available for this purpose.

1. **Burns-Porter Act Financing (California Water Code 12930-12944).** Funds are derived from two sources:
 - a. California Water Resources Development Bonds (water bonds) as approved by the electorate in 1960. Approximately \$167 million of the original general obligation water bonds are reserved ("offset") for the financing of additional conservation facilities in either or both the north coastal area and the Sacramento Valley. (The State cannot develop any North Coast river, and it is contemplated that all of the remaining "offset" bonds would be used for conservation facilities in the Sacramento Valley.)
 - b. The Burns-Porter Act provides that any available money in the California Water Fund shall be used for the construction of the State Water Resources Development System. Monies are deposited into the Fund from two sources.
 - (1) Appropriations from the State's annual tidelands oil revenue (to be repaid later).
 - (2) SWP revenue transferred to the fund which is excess after annual operating costs and bond service payments are met. This source is not expected to be available until after 1980.
2. **Revenue Bond Financing.** Funds are derived from the sale of revenue bonds as authorized by the State Central Valley Project Act (California Water Code Sections 11100-11925). The Act authorizes DWR to issue revenue bonds ". . . to pay the costs . . . of carrying out any of the objects and purposes of (the Act)". The Act permits the Department of Water Resources to add additional units consistent with the project and in further-

ance of the object of the Act. Senate Bill 346 (Ayala) (1977) would amend the Act to specifically authorize construction of facilities described within this report. Once facilities are authorized, DWR could issue revenue bonds for their construction.

In order to provide a flow of funds to support the bonds, DWR would enter into financing contracts with the SWP water supply contractors to cover bond service and operating costs. This financing arrangement would be similar to the Devil Canyon-Castaic Contract in which the State contracted with six water-supply contractors in 1972 to provide repayment of the Devil Canyon-Castaic revenue bonds.

3. **Miscellaneous Receipts.** These receipts are derived from payments and appropriations as authorized by a variety of special contracts, cost sharing agreements, and legislative actions. These include or have included: legislative appropriations prior to the Burns-Porter Act, Contractor advances, federal flood control contributions, investment earnings on unexpended miscellaneous receipts, City of Los Angeles payments for the Castaic-Power Development, and appropriations from tidelands oil and gas revenues for capital costs allocated to recreation and fish and wildlife enhancement.

For this analysis it was assumed that annual appropriations from tidelands oil revenue would be deposited in the (State) Central Valley Water Project Construction Fund as miscellaneous receipts rather than the California Water Fund (item 1b. above) up to a total of \$200 million. This would be in accordance with Senate Bill 346 which provides for reimbursement of construction of facilities to provide water for water quality, fish, wildlife, and recreation in the Delta and the Suisun Marsh. While not an increase in appropriations, this will provide added flexibility in financing the recommended plan.

The State's share of the construction costs were escalated at an annual rate of 6 percent per annum until the year of expenditure to allow for inflation. A deviation from this assumed rate, either up or down, will naturally affect actual future construction costs.

Table 31 shows the amounts projected from each of the above financing sources to finance the assumed State share. Even though the planned facilities are estimated to be complete around the year 2000, there may be financing requirements until 2035. This is due to the financing arrangement anticipated for the Cottonwood Creek Project. It was assumed the U.S. Corps of Engineers would construct the facilities and the State would purchase water storage space from the facilities under the Water Supply Act of 1958; hence the payments to the USCE would be equal annual payments over a period of 50 years. In

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TABLE 31

ESTIMATED FINANCING OF STATE SHARE OF PLANNED FACILITIES (\$ millions)

Years	<i>California Water Fund</i>				<i>General</i>	
	<i>Tidelands Oil</i>	<i>SWP Revenue</i>			<i>Obligation</i>	
	<i>Revenue</i>	<i>Transfers</i>	<i>Bonds</i>	<i>Miscellaneous</i>	<i>Bonds</i>	
1978-1980	6			51		57
1981-1985		96	375	178		649
1986-1990	24	363	180	133	167	867
1991-1995	133	426		9		568
1996-2000	33	835	190	19		1077
2001-2005		243	50	4		297
2006-2015		235				235
2016-2025		235				235
2026-2035		235				235
Total	196	2668	795	394	167	4220

addition to the escalated State share of the construction costs, approximately \$800 million of the total financing required would be the interest portion of the USCE payments.

The actual amount from each of the financing sources is contingent upon several factors. Some of the major factors that would cause changes are:

1. Revisions of construction starts and schedules.
2. Revision of the Federal-State shares.
3. Revision of the financing methods (such as the Cottonwood Creek Complex).
4. Future inflation rates being higher or lower than assumed.

Repayment of the State Share. The repayment of the State share of the additional facilities would be from:

1. The SWP water supply contractors.
2. Legislative appropriations for costs allocated to water quality, fish, wildlife, and recreation purposes.

The 31 long-term SWP contractors would be charged via the Delta Water Charge, which is the contractual method of repaying the State for construction of conservation facilities that save water for later delivery or otherwise contribute to the overall long-term yield of the project. The present Delta Water Charge is calculated to repay, with interest, the "initial project conservation facilities" and includes projected costs for a facility to transfer water across the Delta, i.e., the Peripheral Canal. Therefore, construction of the Peripheral Canal will not cause a future incremental increase of the Delta Water Charge.

The contractors would start repayment of the "additional conservation facilities" (such as Glenn Reservoir) in the year that construction of the facility commences. In that year, the Delta water charge would increase to include the new facility in addition to the existing payments for completed facilities.

These payments would continue until the year 2035 which is currently considered to be the end of the project repayment period.

Not all the State's share of the costs would necessarily be repayable by the 31 water supply contractors. Senate Bill 346 provides that the allocated costs for project net benefits (benefits in excess of any detriments caused by the project) allocated to Delta agricultural, municipal, and industrial water users shall be repayable by the beneficiaries and be nonreimbursable by other contractors of the project. Since the contracts with Delta agencies are still under negotiation, the amounts repayable by them cannot be determined at this time.

Under current practice, legislative appropriations from tidelands oil revenues would continue to repay the nonreimbursable facility costs allocated to recreation and fish and wildlife enhancement. In addition, to compensate for historic "nonproject depletions"¹ of water naturally available in the Delta and Suisun Marsh, Senate Bill 346 would provide that DWR could allocate up to \$200 million in capital costs as nonreimbursable by the water service contractors to cover project costs required for water quality, and fish and wildlife restoration in the Delta and Suisun Marsh.

The structure of SWP financial management is shown diagrammatically on Figure 45. Only the primary accounts and subaccounts are shown for the purpose of simplification.

Energy Analysis

This energy analysis is presented in terms of energy quantity rather than in monetary effects or in comprehensive environmental impacts. With the increased awareness of energy usage brought about by recent energy shortages, both direct and indirect energy quantities associated with a particular proposal must be evaluated.

¹ Nonproject depletions are defined as depletions other than those by the SWP and CVP

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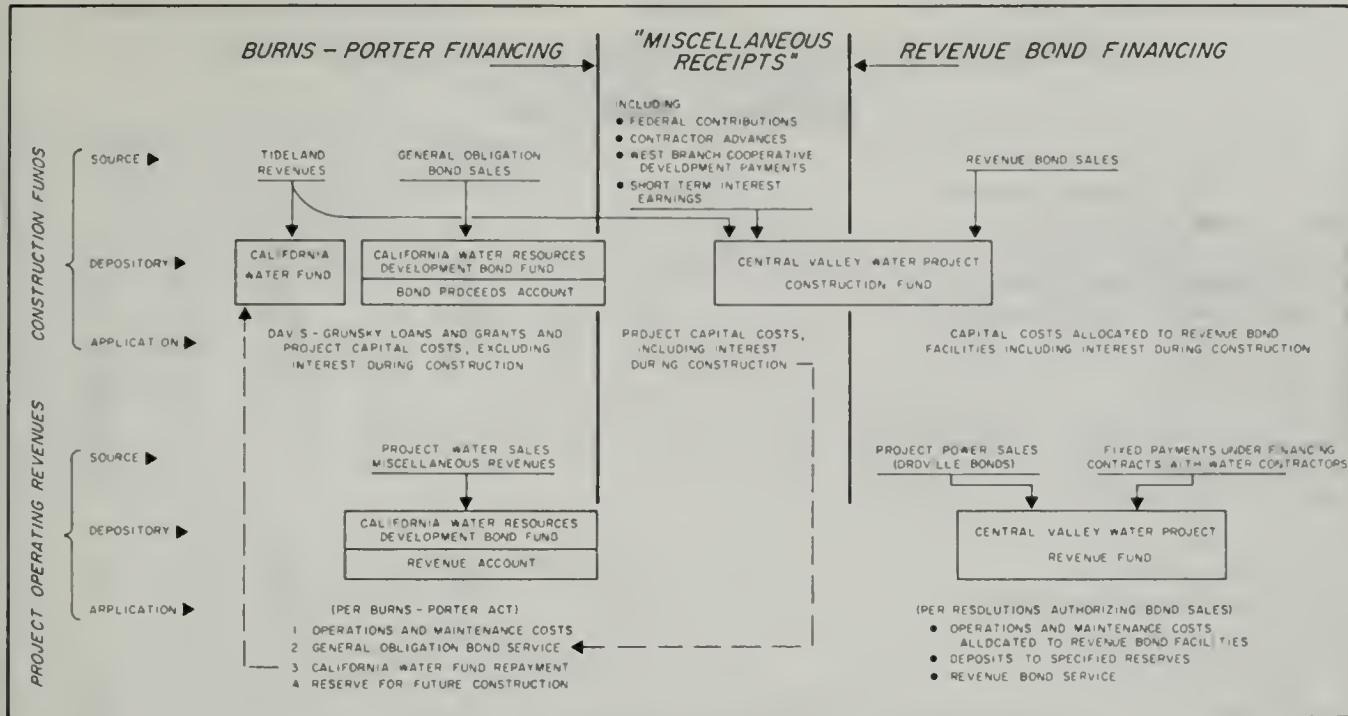


Figure 45. Outline of project financial management.

Direct energy requirements represent electrical energy quantities used or produced in the operation of the respective components under the direct control of component operators. Indirect energy requirements include electrical as well as other forms of energy which occur outside the operation of the respective components and are not under the direct control of component operators. Thus, indirect energy requirements or savings do not change the direct energy amounts required for a component operation, but they do change the impact on the Nation's energy resources.

Table 32 presents an overall summary of the incremental net energy requirements¹ of each component of the selected plan. The energy amounts are expressed in (1) average annual direct and indirect requirements, and (2) total requirements for the 20-odd-year period from now to the year 2000. Positive values represent energy quantities used, and negative values represent energy quantities produced or saved.

The water conservation component has the greatest energy implication. Water conservation and waste water reclamation both indicate significant overall savings. However, both savings are largely contingent on actions by local agencies outside the control of the project. The responsibility for construction and operation of the respective components would thus be shared by State, federal, and local entities. The responsibilities assumed for this evaluation of direct energy requirements are shown

in Table 33.

Projections were made of direct energy requirements (i.e., electrical pumping energy) for the State Water Project by applying the percentages in the above tabulation to the total energy requirements shown in Table 32. These are shown in Table 34. Table 34 also presents a comparison of this projection with the estimated direct energy requirements previously estimated in Bulletin 132-76, "The California State Water Project in 1976".

In comparison with previous estimates, the future annual direct energy requirements of the State Water Project would be reduced through the year 2000. This reduction would be due to the slower build-up of annual demand for conveyance of water caused by local water conservation and waste water reclamation. The reduction of annual energy requirements for conveyance through the year 2000 would more than offset the increases due to the relatively higher energy-using storage components of the recommended plan. On a per unit of water demand basis the future direct energy requirements for both storage and conveyance would be noticeably less through the year 2000 than under previous estimates. This is primarily due to the distribution of the fixed amount of Oroville generation on less water demand and to the reduction in the more energy intensive conveyance demand of Southern California. This is illustrated in Table 35.

While environmentalists generally view offstream storage reservoirs as more desirable than onstream reservoirs, offstream storage generally requires more energy use. Consequently annual direct energy re-

¹ Additional energy required over that which would be used in absence of the plan components

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TABLE 32

INCREMENTAL NET ENERGY REQUIREMENTS OF PLANNED FACILITIES
SWP-CVP COMBINED
(in millions of kilowatthours)

Physical Components	Average Annual Energy Requirements			Estimated Total Thru Year 2000
	Direct ¹	Indirect ²	Total	
<i>North of Delta</i>				
Cottonwood Creek Project ³	0	10	10	120
Glenn Reservoir-River Diversion	-100	40	-60	-480
Colusa Reservoir-River Diversion ⁴	(50)	(50)	(88)	—
<i>Within Delta</i>				
Peripheral Canal	60	17	77	1,309
South Delta Water Quality Improvement Facilities	15	1	16	272
Relocation of Contra Costa Canal Intake	0	1	1	17
Suisun Marsh Facilities	0	2	2	34
Western Delta Overland Water Facilities.....	1	0	1	12
<i>South of Delta</i>				
Los Vaqueros Reservoir	40	25	65	975
Los Banos Grandes Reservoir ⁵	(85)	(20)	(105)	—
Mid-Valley Canal.....	280	-285 ⁶	-5	-80
Ground Water Storage:				
White Wolf	57	-1	56	784
Kern River Fan.....	23	-1	22	308
San Fernando Valley	10	-6	4	56
Chino	83	-5	78	1,092
Waste Water Reclamation (local)	103	-156	-53	-1,325
Water Conservation (local) ⁷	0	-2,275	-2,275	-56,875
TOTAL	572	-2,633	-2,061	-53,781

¹ Consists of electrical energy quantities used (+) or produced (-) in the operation of the components.

² Consists of all energy quantities, not necessarily electrical, used (+) or produced (-) outside of the operation of the component, but caused by such operation.

³ Assumes no power plant.

⁴ Colusa Reservoir is considered as an alternative to Glenn or a possible water supply after the year 2000. Energy quantities, therefore, are shown in parentheses and are not included in the total.

⁵ Los Banos Grandes Reservoir is considered as an alternative to Los Vaqueros Reservoir or as a possible water supply after the year 2000. Energy quantities, therefore, are shown in parentheses and are not included in the total.

⁶ Assumes Mid-Valley Canal would primarily be used for reducing existing ground water overdraft

⁷ Includes reduced pumping, hot water heating, and water treatment

NOTE Incremental energy quantities less than 0.5 million Kwh are shown as zero.

TABLE 33

ASSUMED SHARING OF CONSTRUCTION AND OPERATION RESPONSIBILITIES
(percent)

Components	Assumed Sharing, in Percent			
	Federal (CVP)	State (SWP)	Local	Total
<i>North of Delta</i>				
Cottonwood Creek Project.....			No Direct Requirements	
Glenn Reservoir-River Diversion.....	50	50	0	100
<i>Within Delta</i>				
Peripheral Canal.....	50	50	0	100
South Delta Water Quality Improvement Facilities	50	50	0	100
Relocation of Contra Costa Canal Intake			No Direct Incremental Requirements	
Suisun Marsh Facilities			No Direct Incremental Requirements	
Western Delta Overland Water Facilities	50	50	0	100
<i>South of Delta</i>				
San Joaquin Ground Water Storage	0	100	0	100
Southern California Ground Water Storage.....	0	100	0	100
Los Vaqueros Reservoir.....	75	25	0	100
Waste Water Reclamation	0	0	100	100
Water Conservation	0	0	100	100
Mid-Valley Canal	100	0	0	100

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TABLE 34
PROJECTIONS OF DIRECT ENERGY REQUIREMENTS
FOR THE STATE WATER PROJECT
(Electrical Pumping Energy)

Year	CONTRACT ENTITLEMENTS (Full Table A)				BULLETIN 132-76 (Requested Entitlements Only)				TARGETED DEMANDS (With Recommended Plan)			
	Energy (10^3 kWh)				Energy (10^3 kWh)				Energy (10^3 kWh)			
	(1) (10^3 AF)	Storage (2)	Conveyance (3)	Totals (4)	(5) (10^3 AF)	Storage (6)	Conveyance (7)	Totals (8)	(9) (10^3 AF)	Storage (10)	Conveyance (11)	Totals (12)
1976	1,489	-2,282	3,180	898	1,383	-2,282	3,009	727	1,383	-2,282	3,009	727
1980	2,231	-2,310	5,032	2,722	1,925	-2,310	4,246	1,936	1,825	-2,310	3,975	1,665
1985	3,214	-2,278	6,865	4,587	2,621	-2,278	5,281	3,003	2,371	-2,263	4,674	2,411
1990	4,192	-2,189	8,897	6,708	3,365	-2,189	6,743	4,554	2,965	-1,992	5,774	3,782
1995	4,225	-2,192	8,977	6,785	3,697	-2,192	7,648	5,456	3,146	-2,045	6,328	4,283
2000	4,229	-2,186	9,035	6,849	3,876	-2,186	8,111	5,925	3,172	-2,039	6,442	4,403

Column Footnotes:

- (1) Bulletin 132-76, Table B-4, Col. 38
- (2) Oroville generation plus San Luis generation minus San Luis pumping energy (Bul. 132-76, Table 4)
- (3) Same as (7) except energy for full MWD entitlement included
- (5) Bulletin 132-76, Table B-5B, Col. 38
- (6) Same as (2)
- (7) Bulletin 132-76, Table 4 (Col. 24 plus Col. 17 minus Col. 6)
- (9) Same as (5) except reduced to reflect water conservation and reclamation.
- (10) Same as (2) except energy for SWP portion of Delta Alternatives included
- (11) Same as (7) except reduced to reflect water conservation and waste water reclamation savings

NOTE Excludes energy for the conveyance of any surplus water. One thousand acre-feet (10^3 AF) equals 1,2335 cubic metres

TABLE 35
AVERAGE DIRECT ENERGY REQUIREMENTS PER ACRE-FOOT OF WATER
FOR THE SWP PROJECTIONS SHOWN IN TABLE 34
(10^3 kWh/AF)

Year	CONTRACT ENTITLEMENTS (Full Table A)			BULLETIN 132-76 (Requested Entitlements Only)			TARGETED DEMANDS (With Recommended Plan)		
	Storage (1)	Conveyance (2)	Total (3)	Storage (4)	Conveyance (5)	Total (6)	Storage (7)	Conveyance (8)	Total (9)
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
1976	-1.53	2.14	0.61	-1.65	2.18	0.53	-1.65	2.18	0.53
1980	-1.04	2.26	1.22	-1.20	2.21	1.01	-1.27	2.18	0.91
1985	-0.71	2.14	1.43	-0.87	2.01	1.14	-0.95	1.97	1.02
1990	-0.52	2.12	1.60	-0.65	2.00	1.35	-0.67	1.95	1.28
1995	-0.52	2.12	1.60	-0.59	2.07	1.48	-0.65	2.01	1.36
2000	-0.52	2.14	1.62	-0.56	2.09	1.53	-0.64	2.03	1.39

Column Footnotes:

- (1) (4) (7) Storage energy divided by water, Table 34; Col. (2) + (1), (6) + (5), (10) + (9).
- (2) (5) (8) Transportation energy divided by water, Table 34; Col. (3) + (1), (7) + (5), (11) + (9).
- (3) (6) (9) Net energy divided by water, Table 34, Col. (4) + (1), (8) + (5), (12) + (9).

NOTE One acre-foot equals 1,2335 cubic metres

quirements will exceed previous estimates after the year 2000 since water demands will eventually build up to the maximum annual values under existing contracts. This assumes that the additional water required after the year 2000 is developed in the north and transported to the south. However, if needs beyond the year 2000 are developed from energy-efficient waste water reclamation plants with minimum conveyance requirements, it may be possible to keep the ultimate energy requirements close to those previously estimated. It is important, however, to be cognizant of the direct energy requirements of the proposed reclamation plants to ensure that the

total energy impact is understood, as such requirements can be significant.

The Cottonwood Creek Project, as presently planned by the Corps of Engineers, would be built without generation facilities. The site, however, has the potential for direct energy generation of approximately 75 million kilowatt hours annually. DWR has proposed that the power plant feasibility be reanalyzed assuming power and energy would be purchased for State Water Project pumping. If proven feasible, it would help keep the incremental net energy requirements beyond the year 2000 within the amounts previously estimated for the project.

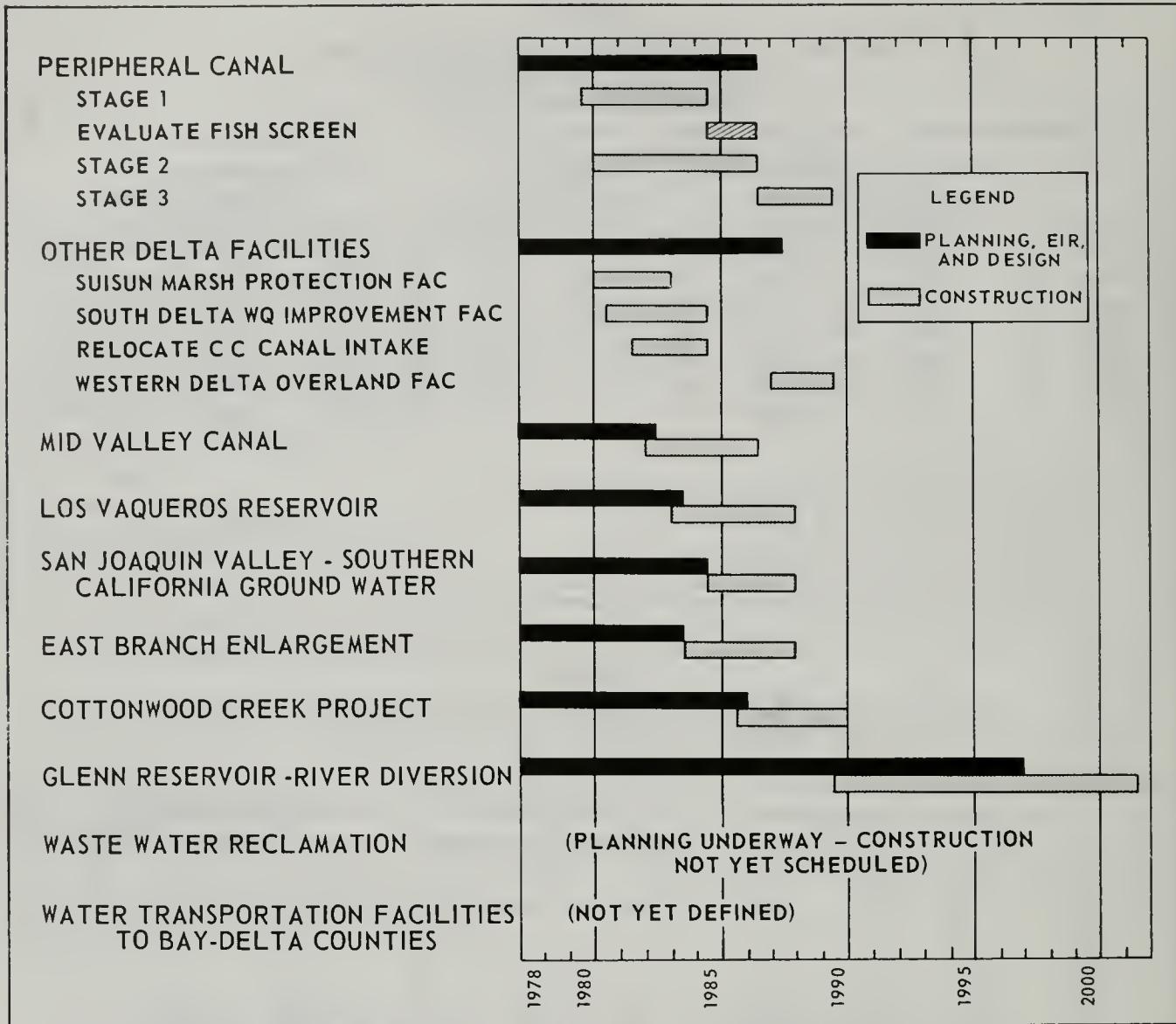


Figure 46. Schedule for selected facilities.

Implementing the Program

Implementation of the program will require the cooperative effort of local, State, and federal agencies. In some cases, additional State and federal legislation is needed or would simplify the implementation process.

Staging and Sequencing the Program

Staging of the facilities should add increments of new yield in time to meet the targeted demand curve set forth in Chapter IV. Delta water transfer facilities, Delta protection facilities, water conservation, and ground water storage portions of the program should be implemented early. Surface water storage facilities and waste water reclamation plans will require more in-depth study, and would come on line

later in the program. Contingent upon certain contractual or legislative action, the tentative schedule and sequencing of facilities that would meet the projected demand schedule is shown in Figure 46.

DWR has prepared a workload report for implementing the program on three alternative assumptions. One assumption is that DWR would do all the work, and the other two assume that the Federal Government would undertake various amounts of the work. This report encompasses completion of EIRs on Delta facilities; feasibility reports and EIRs on water supply components; and design, right-of-way, and construction work for all facilities.

Federal Legislation

Both the SWP and the federal CVP supply water to, and export water from, the Delta, and it is physi-

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cally impossible to separate their operation or operational effects. Thus Delta protection can only be achieved through both State and federal participation. State law already provides a degree of protection for the Delta, but, until the recent Supreme Court decision¹, the protection provided by federal law was in dispute.

An important element for guaranteeing Delta protection is congressional legislation, or other federal agreements, authorizing and obligating federal participation in Delta facilities and protective measures. Such measures need to include: meeting identical water quality standards;² execution of contracts with willing Delta agricultural, municipal, and industrial water users; protection and restoration of fish and wildlife in the Delta; coordinated operation of the CVP and SWP; participation in construction of the facilities for maintaining the productivity of Suisun Marsh; construction of local water supply and water quality improvement facilities in the Delta; and coordinated operation and cost sharing of the Peripheral Canal with the State.

Early in 1977 DWR, in cooperation with the State Water Resources Control Board, began developing draft federal legislation to provide the necessary Delta guarantees. The purpose was to obtain broad public and legislative review and comment as a constructive step in bringing the people of this State together—North, Delta, Central Valley, and South. Subsequently, DWR worked with a large group representing a variety of interests to redraft and modify the proposed legislation to reach a compromise program that would be implementable. In working with the federal agencies, however, it was indicated that DWR would have to get a broad consensus of the State before Congress would entertain the proposed legislation. So efforts were temporarily suspended to work toward that consensus.

State Legislation

Also early in 1977, DWR began drafting State legislation to complement existing State law to (1) extend the life of the Delta water agencies; (2) provide additional time for obtaining contracts with the State and Federal Governments for water quality control; (3) clarify and declare the existing authority of DWR to release stored water for meeting water quality criteria in the Delta; (4) authorize the Secretary of the Resources Agency to participate in, and administer, project land and water areas for recreation and fish and wildlife enhancement in the Mid-Valley Canal area; and (5) propose additional facilities such as Los Vaqueros Reservoir, Los Banos Reservoir, ground water storage projects south of the Delta, waste water reclamation, water conservation programs, relocation of the Contra Costa Canal Intake,

the South Delta Water Quality Improvement Facilities, and the Suisun Marsh Protection Facilities.

At about the same time Senator Ruben Ayala, Chairman of the Senate Agricultural and Water Resources Committee, introduced Senate Bill 346 primarily to sponsor construction of the Peripheral Canal. The Department of Water Resources' plan was incorporated in Senate Bill 346 in early June 1977, after a coalition of water, environmental, labor, farming, and other groups, brought together by Governor Edmund G. Brown Jr., agreed on a number of amendments. One of the main purposes was to unite Californians in support of a compromise plan to meet the needs of many diverse interests and to serve as a basis to draft complementary federal legislation. The full text of Senate Bill 346 and the report of the Legislative Committee on Conference are included in Appendix A of this bulletin.

Senate Bill 346 adds all the facilities and actions of the DWR program to the State Water Project and spells out the legislative intent regarding the need for them. It specifies certain federal actions that are needed as preconditions to building the Peripheral Canal and the Mid-Valley Canal. The Bureau of Reclamation must be authorized to enter into a coordinated operation agreement with the Department of Water Resources and to share in the cost of the Peripheral Canal and other joint-use facilities. The Federal Government will also have to agree to operate the CVP to meet the same standards for water quality in the Delta that the SWP is required to meet; to enter into a Four-Agency Fish and Wildlife Agreement; to contract with the Delta water agencies for water quality and water supply; and to recognize an area of origin priority similar to the State law that would give the Delta priority over exports.

Senate Bill 346 clarifies and restates the existing authority for DWR to release stored water for Delta water quality control. It further specifies that the Delta water users are to pay the costs of net benefits allocated to them and allows DWR to allocate up to \$200 million of nonreimbursable costs for facilities to provide water for Delta water quality, fish and wildlife, and recreation to compensate for nonproject decreases in historical water supply.

Although Senate Bill 346 authorizes the construction of the Peripheral Canal, DWR does not believe State legislative authorization for this facility is necessary. Based on Water Code Section 11260, which authorizes Sacramento-San Joaquin Delta features of the State Central Valley Project, and Water Code Section 12934(d)(3) (Burns-Porter Act), which authorizes Delta water transfer facilities as part of "State Water Facilities", DWR has the authority to construct the Peripheral Canal. The proposed legislation is an attempt to provide a comprehensive water management program for the SWP in conjunction with the CVP and was designed to provide a unified State position on proposed federal legislation. Senate Bill 346 includes facilities already author-

¹ California v. U.S.-USLW 4997 [July 3, 1978]

² In view of the cited Supreme Court decision, federal legislation may not be needed for CVP compliance with identical water quality conditions

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ized by former legislation as well as facilities not previously authorized.

Contracts with Delta Water Users

Senate Bill 346 requires contracts for water quality and water supply with at least a majority of the eight Delta and Suisun Marsh agencies, covering at least two-thirds of the area of Delta and Marsh, a prerequisite to construction of the Peripheral and Mid-Valley Canals. Consequently, DWR has increased the pace of its negotiations with Delta and Suisun Marsh agencies to accelerate completion of the required agreements. Generally, the schedule calls for completing cooperative studies with the concerned agencies on criteria and facilities between mid-1978 and the end of 1978, completing contracts by early 1979, writing necessary EIR's/EIS's by the end of 1979 or early 1980, and securing voter approval within the agencies and congressional approval of the contracts by the end of 1980 or early 1981.

Alternative Methods of Financing and Constructing Peripheral Canal

It has been suggested that DWR construct and operate a *State-only* Peripheral Canal as part of the SWP without federal participation, if such participation is not achieved within a reasonable period of time. Advocates of this approach should understand, however, that the full projected Delta benefits of a federal-state joint-use Peripheral Canal could not be achieved. With a *State-only* Peripheral Canal, the CVP would continue to transport water through Delta channels. By not isolating CVP exports from Delta channels, it would be impossible to correct the reverse flow conditions in the Delta through releases from the canal. Thus, considering projected CVP future (year 2000) requirements, internal flow patterns and magnitudes would be similar to conditions in the mid-1970's (when both the SWP and CVP were pumping from the south Delta) and damages to the fishery would continue unabated.

With federal participation, there is an alternative method for a *State financed and constructed Peripheral Canal* that could guarantee Delta protection. Under this assumption, the State would enter into an agreement with the Federal Government whereby the CVP would meet its share of Delta protection and also agree to repay its share of the Peripheral Canal through a wheeling charge on CVP water transported through the State canal. Such an agreement should be more easily achieved as a result of the recent Supreme Court decision,¹ which held that the Bureau must comply with conditions in the State water rights permits that are not in conflict with congressional directives authorizing federal projects.

The State would then sell revenue bonds to help finance construction of the canal, and the Federal

Government would make payments to the State sufficient to cover bond service for the federal share of project costs. Assuming a 50-year bond issue, interest rates at 7 percent, and a federal share of approximately 50 percent, the annual bond service would be approximately \$42 million per year. This would be equivalent to a \$10 to \$12 per acre-foot charge on CVP water conveyed through the canal depending on when and if the Mid-Valley Canal becomes operational. The federal share of the operation, maintenance, power, and replacement costs would add another \$1.3 million per year, which would be equivalent to an additional 30¢ per acre-foot based on 1977 dollars.

The Assistant Regional Solicitor, Sacramento Region, issued an opinion² that the Secretary of the Interior has the implied authority under two Congressional acts² to enter into a contract for wheeling federal water through a State-financed facility such as the Peripheral Canal where appropriate to achieve the purposes of CVP and where compensation would be paid in cash. He further concluded that any such contract would require a provision that its performance is conditioned upon Congressional appropriations.

The principal advantage of this approach would be that the Federal Government would not have to put up large capital expenditures initially to finance the CVP share. There is an immense competition for federal dollars for water projects. Nationally, there are over 800 federal water projects authorized, but not yet started, totaling an estimated cost backlog of \$34 billion. Further, the President's budget for 1978-79 has no new starts for USBR construction. Presumably, agreement and authorization for federal participation would be easier without the large initial capital outlay of federal dollars.

Project Order for Peripheral Canal

The 1959 Burns-Porter Act includes a Delta water transfer facility as part of the SWP. In 1966, DWR Director William E. Warne issued Project Order No. 12 to describe this feature in more detail as the Peripheral Canal.

As a result of this review of alternatives, DWR again concluded that the Peripheral Canal is the most appropriate Delta water transfer facility and that the Project Order should be amended to reflect proposed changes in staging and conditions for construction evolving from the review.

Future Decisions

Facilities included in the Department of Water Resources' program are planned to meet the needs of the Delta and fulfill existing and contemplated con-

¹ Memorandum from Assistant Regional Solicitor to Regional Director, Bureau of Reclamation, Attention: MP-700. Subject: "Authority of the Secretary of the Interior to Enter into 'Wheeling Contracts' with the State of California", June 19, 1975

² Act of August 26, 1937 (50 Stat. 844) reauthorizing the Central Valley Project and Reclamation Act of 1939 (53 Stat. 1196), 43 U.S.C. Sec. 387, et seq.

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tracts of the SWP and the CVP south and west of the Delta through the year 2000. This includes reducing the long-standing 1.9-cubic-kilometre (1.5-million acre-foot) ground water overdraft in the San Joaquin Valley by over 0.6 cubic kilometres (0.5 million acre-feet) per year via the Mid-Valley Canal. Consequently, there remains a need to provide water for contracted supplies beyond the year 2000 and to reduce or eliminate remaining ground water overdraft.

Water requirements under SWP contracts and CVP contracts (or anticipated contracts) in areas receiving a portion of their supply from the Delta will increase to about 10.7 cubic kilometres (8.7 million acre-feet) per year sometime after the year 2000. This is 1.2 cubic kilometres (1.0 million acre-feet) more than the estimated year 2000 requirement. Table 29 shows that the estimated firm yield from Delta export in the year 2000, with implementation of facilities included in this program, will be 10.1 cubic kilometres (8.2 million acre-feet) per year. There is an extra supply for contingencies or demands beyond the year 2000 of only 0.6 cubic kilometres (0.5 million acre-feet). Adding in the remaining 1.2 cubic kilometres (1.0 million acre-feet) of San Joaquin Valley ground water overdraft shows that DWR will have to plan for the development of about 1.9 cubic kilometres (1.5 million acre-feet) per year. Some additional firm water could be developed from Central Valley water supplies, but not enough for both project new demands and ground water overdraft.

On the other hand, it must be recognized that past attempts to solve the ground water overdraft problem solely by importing new supplies have had only mixed success. While ground water levels in the San Luis service area were largely stabilized when water was imported, ground water levels in Kern County continued to decline (although at a slower rate) af-

ter over 1.2 cubic kilometres (1 million acre-feet) per year of imported water was added to the local supply. The solution to the problem must include controlled development of new land.

Senate Bill 346 would direct the Department of Water Resources in cooperation with other agencies to undertake a comprehensive study of San Joaquin Valley ground water overdraft problems and to propose solutions. The study would address the subjects of economics, drainage, water quality, ground water levels, energy requirements, costs, and improved water efficiency and management. Findings from the study would be submitted to the Legislature on or before December 31, 1981. DWR began this study during the 1977-78 fiscal year as part of ongoing planning studies.

In October of 1977, Governor Edmund G. Brown Jr. issued an executive order creating a new Office of Water Recycling and setting a State goal to supply an additional 490 cubic hectometres (400,000 acre-feet) of reclaimed water by 1982 to be increased to 990 cubic hectometres (800,000 acre-feet) by the year 2000. This is substantially more than the waste water reclamation planned under this program and constitutes an additional source of water which, in effect, would go to meet the needs beyond the year 2000. Also, DWR Bulletin 198 points out additional opportunities to conserve water statewide, beyond levels contemplated in this bulletin.

Because of the magnitude and complexity of the existing program and future programs, sufficient flexibility must be maintained to make adjustments as progress is made toward implementation of the plan. Such adjustments could take the form of changing the staging or sequencing of planned facilities or substituting other actions to push recommended actions further into the future.

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APPENDIX A

**STATE SENATE BILL 346
AND RELATED ITEMS**

APPENDIX A CONTENTS

- A- 1 Senate Bill 346 as amended September 8, 1977.
- A- 9 Majority report of Committee on Conference.
- A-12 Senate Minority Report on SB 346 (Senator John A. Nejedly).
- A-13 Assembly Minority Report on SB 346 (Assemblyman Gordon Duffy).
- A-14 Correspondence with Legislature on SB 346.
- A-72 Principal objections to SB 346 and DWR responses.

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AMENDED IN ASSEMBLY SEPTEMBER 8, 1977
AMENDED IN ASSEMBLY SEPTEMBER 1, 1977
AMENDED IN ASSEMBLY AUGUST 26, 1977
AMENDED IN ASSEMBLY AUGUST 10, 1977
AMENDED IN SENATE JUNE 22, 1977
AMENDED IN SENATE MAY 23, 1977
AMENDED IN SENATE MAY 11, 1977
AMENDED IN SENATE APRIL 25, 1977

SENATE BILL

No. 346

Introduced by Senator Ayala

(Principal coauthor: Assemblyman Gualco)

Coauthors: Senators Cusanovich, Johnson, Nimmo, Presley, and Stull; Assemblymen Antonovich, Dannemeyer, Ellis, Kapiloff, McAlister, and Robinson

February 18, 1977

An act to amend Sections 5093.54 and 6217 of, and to add Section 5095 to, the Public Resources Code, to amend Sections 8457, 11460, and 11915 of, to add Sections 11108, 11109, 11456, 11457, and 11915.2 to, to add Article 9.4 (commencing with Section 11255) to Chapter 2 of Part 3 of, and to add Part 8.5 (commencing with Section 12974) to, Division 6 of, and to add Chapter 2 (commencing with Section 20200) to Division 10 of, the Water Code, to amend Section 8.1 of the Central Delta Water Agency Act (Chapter 1133 of the Statutes of 1973), to amend Section 8.1 of the North Delta Water Agency Act (Chapter 283 of the Statutes of 1973), and to amend Section 8.1 of the South Delta Water Agency Act (Chapter 1089 of the Statutes of 1973), relating to water, and making an appropriation therefor.

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with a majority of specified public agencies which represent at least $\frac{1}{2}$ of the land area in the specified agencies within the delta and Suisun Marsh, and for federal participation in the costs and benefits of the peripheral canal, and upon enactment of federal legislation that includes specified principles relating to the protection of the watershed in which water originates, and unless such actions are accomplished by December 31, 1980, the specified peripheral canal and Mid-Valley Canal authorizations would become inoperative.

The bill would provide that construction of the Los Vaqueros Unit, the Los Banos Grandes Reservoir, the Glenn Reservoir-River Diversion Unit, and the Colusa Reservoir-River Diversion Unit are conditioned upon completion of specified favorable feasibility reports.

The bill would provide for a study of ground water over-draft problems as specified, and proposed solutions in the San Joaquin Valley and would require a report, as specified, to the Governor and the Legislature on or before January 1, 1981.

The bill would also provide for a 5-year investigation of agricultural water uses, as specified, and require reports to the Legislature annually.

The bill would require the department to develop solutions for seepage and erosion problems along the Sacramento River and to report thereon to the Legislature not later than December 31, 1981.

The bill would provide a loan program for agricultural water conservation, as specified, and appropriate \$50,000,000 from the General Fund to the loan fund, established by the bill, for such purposes.

(2) Under existing federal law, before federal authorization of a project and if nonfederal public bodies indicate their intent in writing to administer project land and water areas for recreation and fish and wildlife enhancement, as specified, and to bear not less than one-half the separable costs of the project allocated to such purposes and all of the costs of operation, maintenance, and replacement, the federal project may take into account such benefits in determining the economic benefits of the project, allocate such costs as specified and provide that not over one-half of such separable costs and all joint costs of the project allocated to such enhancement pur-

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LEGISLATIVE COUNSEL'S DIGEST

SB 346, as amended, Ayala. Water facilities.

(1) Existing law provides for the design, construction, operation, and maintenance of specified water development facilities by the state. Such facilities include, among others, the facilities specified or authorized as additional facilities in the state Central Valley Project, and specified facilities in the Sacramento-San Joaquin Delta including facilities for transfer of water across the delta, flood and salinity control and related functions.

This bill would designate as additional facilities of the Central Valley Project, subject to specified conditions, a specified peripheral canal to be built in specified stages, the Los Vaqueros Unit as described, specified south delta water quality improvement facilities, Suisun Marsh interim and permanent protection facilities as specified, facilities to provide for transportation of water to termini to serve the Counties of San Francisco, San Mateo, and San Joaquin and specified facilities to provide for the transportation of a supplemental water supply to areas in Alameda and Contra Costa Counties, specified facilities for utilizing ground water storage space, the Glenn Reservoir-River Diversion Unit as specified, the Colusa Reservoir-River Diversion Unit as specified, the Los Banos Grandes Reservoir as specified, waste water reclamation facilities as specified, water conservation programs as specified, the Cottonwood Creek Project as specified, the Mid-Valley Canal as specified, and the Western Delta Overland Water Facilities, as specified.

The bill would declare the legislative intent of the provisions of the bill.

The bill would provide that construction of the peripheral canal or the Mid-Valley Canal are conditioned upon enactment of federal legislation and the Secretary of the Interior entering into a contract with the department pursuant to such legislation which requires operation of the Federal Central Valley Project in coordination with the State Water Resources Development System, as specified, and in conformity with a permanent agreement between the United States and the state for the protection and enhancement of fish and wildlife, and upon specified agreements having been entered

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poses shall be borne by the United States and be nonreimbursable.

The bill would authorize the Secretary of the Resources Agency to make such indication in writing for the project land and water areas of the proposed Mid-Valley Canal.

(3) Under existing law, certain revenues, moneys, and remittances received by the State Lands Commission and the Long Beach oil and dry gas revenues are allocated to various funds and agencies in accordance with an order of allocation of specified amounts, of which, the amount of \$5,000,000 is allocated to the Central Valley Water Project Construction Fund, and \$25,000,000 is allocated to the California Water Fund. The final depository of such revenues is the Capital Outlay Fund for Public Higher Education.

This bill would change the allocation of such funds by allocating to the Department of Water Resources a total of \$40,000,000 \$30,000,000 for allocation to the Central Valley Project Construction Fund, the California Water Fund, and to the department for specified study projects, in amounts as specified in the bill.

(4) Existing law prohibits the Department of Water Resources from depriving a watershed or area wherein water originates, as specified, the prior right to the water required therein, as specified.

This bill would require the department to make releases of stored water for beneficial uses downstream within the watershed in which the water originates and the delta, the Suisun Marsh, and the San Francisco Bay System westerly of the delta, to the extent that water quality control plans and the conditions in permits to appropriate water require such releases for specified purposes. The bill would declare that such provision is declaratory of and does not constitute a change in existing law.

The bill would also prohibit the export of water from the delta unless the remaining water is of sufficient quantity and quality reasonably required to satisfy the needs in the delta and Suisun Marsh as specified, and would declare that such provision is declaratory of and does not constitute a change in existing law.

(5) The bill would require the costs of benefits in the delta

as a result of a project operation, in excess of any detriments caused by the project, to be repaid, to the extent properly allocable, to the department by the beneficiaries and not by the contractors of the project.

(6) Existing law provides for the Central Delta Water Agency, the North Delta Water Agency, and the South Delta Water Agency of specified powers, including the authority to enter specified contracts with the United States and the State of California. Existing law also provides for the termination of such agencies unless such contracts are executed by specified dates.

The bill would extend such dates for execution of such contracts to December 31, 1980.

(7) The bill would require specified contracts with the Bureau of ~~Recreation~~ Reclamation involving water from the Federal Central Valley Project to be submitted to the State Treasurer, as specified, prior to execution.

(8) Existing law limits state expenditures for maintenance of vegetation on levees to \$200,000 per year.

This bill would increase such limit to \$400,000 per year.

(9) Existing law designates certain rivers or segments of rivers as part of the California Wild and Scenic Rivers System, and requires a specified report on the need for water supply and flood control projects on the Eel River and its tributaries after December 20, 1984.

This bill would change such report date to on or before January 1, 1980.

(10) The bill would also incorporate the definition of the Suisun Marsh as proposed by AB 1717, should that bill be chaptered.

Vote: $\frac{3}{2}$ Appropriation: yes. Fiscal committee: yes. State-mandated local program: no.

The people of the State of California do enact as follows:

1 SECTION 1. Section 5093.54 of the Public Resources
2 Code is amended to read:
3 5093.54. The following rivers are designated as
4 components of the system:
5 (a) Klamath River. The main stem from 100 yards

1 below Iron Gate Dam to the Pacific Ocean; the Scott
2 River from the mouth of Shackleford Creek west of Fort
3 Jones to the river mouth near Hamburg; the Salmon
4 River from Cecilville Bridge to the river mouth near
5 Somesbar; the North Fork of the Salmon River from the
6 intersection of the river with the south boundary of the
7 Marble Mountain Wilderness Area to the river mouth;
8 Wooley Creek, from the western boundary of the Marble
9 Mountain Wilderness Area to its confluence with the
10 Salmon River.
11 (b) Trinity River. The main stem from 100 yards
12 below Lewiston Dam to the river mouth at Weitchpec;
13 the North Fork of the Trinity from the intersection of the
14 river with the southern boundary of the Salmon-Trinity
15 Primitive Area downstream to the river mouth at Helena;
16 New River from the intersection of the river with the
17 southern boundary of the Salmon-Trinity Primitive Area
18 downstream to the river mouth near Burnt Ranch; South
19 Fork of the Trinity from the junction of the river with
20 State Highway 36 to the river mouth near Salver.
21 (c) Smith River and all its tributaries, from the
22 Oregon-California state boundary to the Pacific Ocean.
23 (d) Eel River. The main stem from 100 yards below
24 Van Arsdale Dam to the Pacific Ocean; the South Fork of
25 the Eel from the mouth of Section Four Creek near
26 Branscomb to the river mouth below Weott; Middle Fork
27 of the Eel from the intersection of the river with the
28 southern boundary of the Middle Eel-Yolla Bolly
29 Wilderness Area to the river mouth at Dos Rios; North
30 Fork of the Eel from the Old Gilman Ranch downstream
31 to the river mouth near Ramsey; Van Duzen River from
32 Dinsmores Bridge downstream to the river mouth near
33 Fortuna. It is the intent of the Legislature, with respect
34 to the Eel River and its tributaries, that on or before
35 January 1, 1980, the Department of Water Resources shall
36 report to the Legislature as to the need for water supply
37 and flood control projects on the Eel River and its
38 tributaries, and the Legislature shall hold public hearings
39 to determine whether legislation should be enacted to
40 delete all or any segment of the river from the system.

1 (e) American River. The North Fork from its source
2 to the Iowa Hill Bridge; the Lower American from
3 Nimbus Dam to its junction with the Sacramento River.
4 (f) Other river~~s~~ which qualify for inclusion in the
5 system may be recommended to the Legislature by the
6 secretary.

7 SEC. 1.5. Section 5095 is added to the Public
8 Resources Code, to read:
9 5095. The Secretary of the Resources Agency is
10 authorized to indicate in writing the state's intent to
11 agree to administer any federal multiple-purpose water
12 project land and water areas of the proposed Mid-Valley
13 Canal Unit of the federal Central Valley Project for
14 recreation and fish and wildlife enhancement as
15 provided in Public Law 89-72.

16 SEC. 2. Section 6217 of the Public Resources Code is
17 amended to read:

18 6217. With the exception of revenues derived from
19 state school lands and from sources described in Sections
20 6217.6, 6301.5, 6301.6, 6855, and 8551 to 8558, inclusive, and
21 Section 6406 (insofar as the proceeds are from property
22 which has been distributed or escheated to the state in
23 connection with unclaimed estates of deceased persons),
24 the commission shall deposit in the State Treasury all
25 revenues, moneys, and remittances received by it under
26 this division, and under Chapter 138 of the Statutes of
27 1964, First Extraordinary Session, and such sums shall be
28 applied to the following obligations in the following
29 order:

30 (a) To the General Fund such revenue as necessary to
31 provide in any fiscal year for the following:

32 (1) Payment of refunds, authorized by the commission
33 and approved by the State Board of Control, out of
34 appropriations made for that purpose by the Legislature.
35 (2) Payment of expenditures of the commission as
36 provided in the annual Budget Act approved by the
37 Legislature.

38 (3) Payments to cities and counties of the amounts
39 specified in Section 6817 for the purposes specified in that
40 section, and the revenues so deposited are appropriated

1 for such purpose.
2 (4) Payments to cities and counties of the amounts
3 agreed to pursuant to the provisions of Section 6875.
4 (b) To the Department of Water Resources each fiscal
5 year, commencing with the fiscal year 1977-78 and
6 ending with the fiscal year 1989-1990, inclusive; the
7 amount of forty million dollars (\$40,000,000); and
8 thereafter the amount of thirty million dollars
9 (\$30,000,000), to be allocated as follows:
10 (1) To the Central Valley Water Project Construction
11 Fund in such amount as is required to repay the
12 nonreimbursable costs of the State Water Resources
13 Development System as specified in Sections 11915 and
14 11915.2.
15 (2) To the Department of Water Resources the
16 amount of seven hundred fifty thousand dollars
17 (\$750,000) each fiscal year beginning with the fiscal year
18 1977-1978 and ending with the fiscal year 1982-1983,
19 inclusive, for the purpose of conducting the
20 comprehensive agricultural conservation and
21 management program pursuant to Section 11258.5 of the
22 Water Code.
23 (3) To the Department of Water Resources the
24 amount of two hundred thousand dollars (\$200,000) each
25 fiscal year for the purposes of Part 9 (commencing with
26 Section 12980) of Division 6 of the Water Code.
27 (4) To the California Water Fund the balance of such
28 amount.
29 The Department of Water Resources shall report to the
30 Legislature at the beginning of the 1989-1990 Regular
31 Session the details of the allocation of the funds to that
32 date and the need for funds during the next 10-year
33 period.
34 Funds allocated pursuant to this subdivision to the
35 California Water Fund after July 1, 1978, which are
36 subsequently loaned from, and reimbursable to, the
37 California Water Fund are conditional upon repayment
38 to the California Water Fund with interest thereon at a
39 rate which shall be the weighted average of the interest
40 rates paid by the state on bonds issued to construct

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1 facilities of the State Water Resources Development
2 System, except that the Department of Water Resources
3 shall utilize necessary interest collected to pay the state
4 portion of the principal and interest charges resulting
5 from Davis-Grunsky grants and loans as authorized in
6 Section 12938 of the Water Code.
7 (c) To the Resources Agency the amount of five
8 hundred thousand dollars (\$500,000) for each of the fiscal
9 years 1974-75, 1975-76, 1976-77, 1977-78, and 1978-79, for
10 distribution for public and private higher education for
11 use as up to two-thirds of the local matching share for
12 projects under the National Sea Grant College and
13 Program Act of 1966 (P.L. 89-688) approved, upon the
14 recommendation of the advisory panel appointed
15 pursuant to this subdivision, by the Secretary of the
16 Resources Agency or his designee. During the fiscal year
17 1978-79, the Legislature shall consider recommendations
18 from the Secretary of the Resources Agency and other
19 interested parties on the benefits to the people of
20 California derived from this program and shall determine
21 whether or not to continue similar appropriations for
22 subsequent fiscal years.
23 The Secretary of the Resources Agency shall appoint an
24 advisory panel, which shall do all of the following:
25 (1) Identify state needs which might be met through
26 sea grant research projects, including, but not limited to,
27 such fields as living marine resources, aquaculture, ocean
28 engineering, marine minerals, public recreation, coastal
29 physical processes and coastal and ocean resources
30 planning and management, and marine data acquisition
31 and dissemination.
32 (2) Review all applications for funding under this
33 subdivision and make recommendations based upon the
34 priorities it establishes.
35 (3) Periodically review progress on sea grant research
36 projects subsequent to their approval and funding under
37 this subdivision.
38 (4) Make recommendations to the Secretary of the
39 Resources Agency with respect to the implementation of
40 this subdivision.

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1 The members of such advisory panel shall serve at the
2 pleasure of the Secretary of the Resources Agency. The
3 advisory panel shall consist of 10 members composed of
4 the following persons:
5 (1) A representative of the Department of Navigation
6 and Ocean Development.
7 (2) A representative of the Department of
8 Conservation.
9 (3) A representative of the Department of Fish and
Game.
10 (4) The executive director of the California Coastal
Zone Conservation Commission or his designee.
11 (5) A representative of the fish industry.
12 (6) A representative of the ocean engineering
industry.
13 (7) A representative of the University of California.
14 (8) A representative of the California State University
and Colleges.
15 (9) A representative of a private California institution
of higher education which is participating in the National
Sea Grant Program.
16 (10) A representative of the State Lands Commission.
23 The Secretary of the Resources Agency shall designate
24 one member of the panel to serve as its chairman. Panel
25 members shall serve without compensation.
26 The sea grant research projects selected for state
27 support under this subdivision shall have a clearly
28 defined benefit to the people of the State of California.
29 Nothing in this subdivision shall be construed to preclude
30 the application for funding of any project which would be
31 eligible for funding under the terms of the National Sea
32 Grant College and Program Act of 1966.
33 (d) To the Capital Outlay Fund for public higher
34 education, the balance of all revenue in excess of that
35 distributed under subdivisions (a), (b), and (c) of this
36 section.
37 The commission may, with the approval of the State
38 Board of Control, authorize the refund of moneys
39 received or collected by it illegally or by mistake,
40 inadvertence, or error. Claims authorized by the

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1 commission and approved by the State Board of Control
2 shall be filed with the State Controller and the Controller
3 shall draw his warrant against the General Fund in
4 payment of such refund from any appropriation made for
5 that purpose.
6 All references in any law to Section 6616 shall be
7 deemed to refer to this section.
8 SEC. 21. Section 8457 of the Water Code is amended
9 to read:
10 8457. State expenditures for the purposes of this
11 chapter shall not exceed the amount of four hundred
12 thousand dollars (\$400,000) per year.
13 SEC. 22. Section 11108 is added to the Water Code,
14 to read:
15 11108. "Delta" means the Sacramento-San Joaquin
16 Delta as described in Section 12220.
17 SEC. 23. Section 11109 is added to the Water Code,
18 to read:
19 11109. "Suisun Marsh" means the area defined in
20 Section 1864 of the Fish and Game Code.
21 SEC. 24. Section 11109 is added to the Water Code,
22 to read:
23 11109. "Suisun Marsh" means the area defined in
24 Section 29101 of the Public Resources Code.
25 SEC. 3. Article 9.4 (commencing with Section 11255)
26 is added to Chapter 2 of Part 3 of Division 6 of the Water
27 Code, to read:
28 Article 9.4. Additional Facilities and Programs
29
30 11255. In enacting this article, it is the intent of the
31 Legislature to provide the following.
32 (a) To increase the water supply of the State Water
33 Resources Development System in order to assist in
34 meeting projected water demands under existing water
35 contracts.
36 (b) To establish the policy of partially meeting the
37 water needs of the State Water Resources Development
38 System through water conservation and waste water
39 reclamation. (The Department of Water Resources

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1 studies leading to this article are based upon a projection
2 of waste water reclamation and conservation potential in
3 urban areas of 700,000 acre-feet per year.)
4 (c) To establish the policy of partially meeting the
5 water needs of the State Water Resources Development
6 System by storing water underground during wet years
7 for withdrawal in dry years. (The Department of Water
8 Resources studies leading to this article include an annual
9 yield of 400,000 acre-feet from such an underground
10 storage program south of the delta.)
11 (d) To establish the policy of partially meeting the
12 water needs of the State Water Resources Development
13 System through the utilization of offstream reservoir sites
14 which would primarily be filled with water by diversion
15 from rivers rather than utilizing reservoir sites located on
16 rivers.
17 (e) To provide facilities to mitigate damages and, to
18 the extent feasible, to enhance the productivity of the
19 Suisun Marsh, California's largest brackish marsh, which
20 is utilized by a substantial percentage of waterfowl in the
21 Pacific Flyway.
22 (f) To provide for payment from tidelands and
23 submerged land revenues and state general funds for
24 environmental and recreation benefits in the delta and
25 the Suisun Marsh.
26 (g) To permit the state to enter into agreements with
27 the federal government for the joint construction and
28 operation of water facilities as and when needed by the
29 State Water Resources Development System and as
30 determined by Congress to be needed by the Federal
31 Central Valley Project, which facilities can best be
32 utilized as joint-use facilities because of the mutual
33 advantages of joint financing, coordinated operation, and
34 economies of scale.
35 11255.3. It is the further intent of the Legislature
36 (a) To request Congress to authorize the Secretary of
37 the Interior to enter into an agreement with the State of
38 California concerning the Federal Central Valley Project
39 and the State Water Resources Development System to
40 (1) Require coordinated operation of the two water

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1 projects.
2 (2) Require the projects to comply with identical
3 water quality standards in the Sacramento-San Joaquin
4 Delta, the Suisun Marsh and the San Francisco Bay
5 westerly of the delta, in order to protect existing water
6 rights, anadromous fish, environment, and to maintain
7 the biological environment of the bay.

8 (b) To request Congress to authorize an agreement
9 between the Secretary of the Interior and the state
10 regarding the construction and operation of the
11 Peripheral Canal, a facility which has been determined
12 after many years of studies to be the facility which will
13 best protect delta fisheries and the delta environment,
14 and which will best provide adequate water quality and
15 supply in the delta and at the export pumps of the
16 Federal Central Valley Project and the State Water
17 Resources Development System.

18 (c) To request the Congress to authorize the
19 construction of other water facilities needed in California
20 timely construction of water facilities, including Central
21 Valley Water Project facilities, needed to meet increasing
22 water demands in California for municipal, industrial,
23 agricultural, and environmental purposes,
24 including facilities which may be constructed and
25 operated as joint facilities with the state.

26 11256. The project includes the units authorized in
27 this section, subject to the conditions specified in Sections
28 11257, 11257.1, and 11257.2, and in compliance with the
29 California Environmental Quality Act (commencing
30 with Section 21000 of the Public Resources Code) and
31 which may be constructed, operated, and financed as
32 joint-use facilities with the United States:

33 (a) A peripheral canal, which shall be designed,
34 constructed, and operated to meet the provisions of this
35 part in the most effective manner, consisting of pumping
36 plants, intake structures, siphons, fish screens, relocation
37 of the intake of the Contra Costa Canal to divert water
38 from the state water facilities, and 43 miles of canal
39 around the eastern rim of the delta, which shall be
40 constructed in three stages, with the work on the first and

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1 second stages proceeding concurrently. Stage one shall
2 consist of construction of the facility from the town of
3 Hood to Shima Tract on the northeast outskirt of
4 Stockton; stage two, preconsolidation from the San
5 Joaquin River to Clifton Court Forebay of the California
6 Aqueduct and relocation of the intake of the Contra
7 Costa Canal; stage three, completion of the facility from
8 Shima Tract to Clifton Court Forebay. When stage one is
9 completed, it shall be operated for a period of two years
10 to establish adequate fish screen and operational release
11 criteria, and to evaluate other aspects of operation
12 Thereafter, stage three shall be constructed when the
13 Director of Water Resources and the Director of Fish and
14 Game both determine from the results of the trial period
15 that the fish screen and operational release criteria will
16 adequately protect fish populations pursuant to the
17 agreement referred to in subparagraph (B) of paragraph
18 (1) of subdivision (a) of Section 11257.

19 (b) The Los Vaqueros Unit to be located in eastern
20 Contra Costa County about eight miles west of Clifton
21 Court Forebay, consisting of Los Vaqueros Reservoir,
22 Kellogg Reservoir, and associated conveyance facilities,
23 and the necessary channel improvements, pumping
24 plant, pump generator plant, outlet structures, fish
25 screens, and other appurtenant facilities for the operation
26 of the unit. If this unit is feasible it shall be constructed
27 prior to the Los Banos Grandes Reservoir described in
28 subdivision (j) of this section.

29 (c) South delta water quality improvement facilities,
30 consisting of pumping plants, discharge canals, flow
31 control structures, and channelization of sloughs to
32 provide improved circulation, distribution, and quality of
33 water in the southeastern delta and to meet the needs of
34 the south delta area, to be completed no later than the
35 facility described in subdivision (a) of this section.

36 (d) As mitigation for the past, present, and future
37 adverse impacts of reduced delta outflows on the fish and
38 wildlife resources of the Suisun Marsh, the department
39 shall construct, maintain and operate or contract with an
40 appropriate local agency for the construction,

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1 maintenance or operation of the following facilities:
2 (1) Interim Suisun Marsh protection features, which
3 the department shall make every reasonable effort to
4 complete no later than July 1, 1979, consisting of the
5 following:

6 (A) Water control and management facilities required
7 for the following purposes:

8 (i) To deliver water from Montezuma Slough taken
9 from a point southeast of Meins Landing onto those
10 managed wetland areas, located on Grizzly, Simmons,
11 Wheeler, Dutton, Van Sickle, and Hammond Islands,
12 presently flooded with water from Honker, Suisun, and
13 Grizzly Bays.

14 (ii) To deliver water from Spoonbill Creek onto
15 Chippa Island.

16 (iii) To drain soil water from these areas into Honker,
17 Grizzly, or Suisun Bays or the Sacramento River.

18 (B) Water control facilities required to deliver water
19 from Goodyear Slough onto all adjacent managed
20 wetland areas and drain soil water from these areas into
21 Grizzly and Suisun Bays.

22 (2) Permanent Suisun Marsh protection facilities as
23 determined by a protection plan to be developed by the
24 department, in cooperation with the Suisun Resource
25 Conservation District, prior to January 15, 1979. The
26 department shall make every reasonable effort to
27 complete the facilities no later than July 1, 1982, but in
28 any event no later than stage one of the facility described
29 in subdivision (a) of this section.

30 (e) (1) Facilities to provide for the transportation of
31 water to termini to serve the Counties of San Joaquin, San
32 Francisco and San Mateo.

33 (2) Facilities to provide for the transportation of a
34 supplemental water supply to areas in Alameda and
35 Contra Costa Counties not served through the Contra
36 Costa Canal or the South Bay Aqueduct, provided that
37 the water to be delivered shall be water developed by
38 facilities of the Federal Central Valley Project.

39 (f) Facilities determined feasible by the department
40 for utilizing ground water storage space for the purpose

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1 of providing yield for the State Water Resources
2 Development System in conjunction with existing and
3 future surface water supplies, by the recharge and
4 extraction of ground water and including the capitalized
5 cost of delivering water for filling or refilling ground
6 water storage space, in one or more of the following
7 locations:

8 (1) The south San Francisco Bay area in the Counties
9 of Santa Clara and Alameda served by the South Bay
10 Aqueduct.

11 (2) San Joaquin Valley, served by the California
12 Aqueduct.

13 (3) Southern California, served by the California
14 Aqueduct, including enlargement of the Devil Canyon
15 Power Plant and the Lake Mojave Division (East
16 Branch) from the proposed Cottonwood Power Plant to
17 Silverwood Lake.

18 None of the facilities described in this subdivision shall
19 be constructed or operated within the boundaries of an
20 agency that has contracted for water from the State
21 Water Resources Development System without a
22 contract with such agency.

23 The department shall not extract water from ground
24 water basins in the Sacramento Valley for use in the State
25 Water Resources Development System as an alternative
26 to the construction of facilities authorized in this section.

27 (g) Glenn Reservoir River Diversion Unit on the west
28 side of the Sacramento Valley in the vicinity of Stony
29 Creek and Thomas Creek watersheds

30 (h) Colusa Reservoir-River Diversion Unit on the west
31 side of the Sacramento Valley in the western portion of
32 the Counties of Glenn and Colusa. This unit may be
33 constructed in stages. The Sites Reservoir portion of the
34 unit may be developed at any time hereafter by the
35 federal government as a facility of the Federal Central
36 Valley Project to serve the Tehama-Colusa Canal and any
37 extension thereof into Yolo and Solano Counties.

38 (i) Los Baños Grandes Reservoir, on the west side of
39 the San Joaquin Valley in the vicinity of Los Baños Creek.

40 (j) Waste water reclamation facilities that provide

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1 yield for the State Water Resources Development
2 System, provided such facilities are economically
3 competitive with alternative new water supply sources.

4 (k) Water conservation programs for use within the
5 boundaries of agencies that have contracted for water
6 from the State Water Resources Development System;
7 provided, that the implementation of such programs is
8 contingent upon contracts between such agencies and
9 the Department of Water Resources; and provided
10 further, that no expenditure shall be made for urban
11 retrofit water conservation programs unless the Director
12 of Water Resources determines that the result of the pilot
13 conservation projects authorized by Chapter 28 of the
14 Statutes of 1977 are favorable.

15 (l) The Cottonwood Creek Project to be located in
16 Tehama and Shasta Counties, consisting of Dutch Gulch
17 Reservoir, Tehama Reservoir, associated conveyance
18 facilities, and necessary channel improvements, pumping
19 plants, pump generator plants, outlet structures, fish
20 screens, and other appurtenant facilities.

21 (m) The Mid-Valley Canal Unit, which shall be
22 constructed primarily for the purpose of alleviating the
23 ground water overdraft in the canal service area;
24 provided, that the water delivered through its facilities
25 shall be developed by facilities of the federal
26 Central Valley Project.

27 (n) Western Delta Overland Water Facilities, to
28 supply water to agricultural areas on Sherman Island,
29 Jersey Island, Hotchkiss Tract, and adjacent areas.

30 11257. (a) Construction of the facilities described in
31 subdivision (a) or (m) of Section 11256 shall commence
32 only if the following events occur:

33 (1) The Congress of the United States enacts
34 legislation and the Secretary of the Interior enters into a
35 contract with the department pursuant to such
36 legislation for the life of the project which requires
37 operation of the Federal Central Valley Project:

38 (A) In full coordination with the State Water
39 Resources Development System. Such contract shall
40 require the operation of the Federal Central Valley

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1 Project and the State Water Resources Development
2 System in compliance with identical water quality
3 standards for the delta and the Suisun Marsh and the San
4 Francisco Bay System westerly of the delta and shall
5 assure that the two projects will be operated to optimize
6 the accomplishment of their purposes; provided, that the
7 department shall not enter into any such contract with
8 the United States which enables or requires the
9 department to operate the State Water Resources
10 Development System in violation of water quality
11 standards adopted by the State Water Resources Control
12 Board, and to the extent approval is required by federal
13 law, approved by the Administrator of the
14 Environmental Protection Agency

15 (B) In conformity with a permanent agreement
16 between the United States and the state for the
17 protection and enhancement of fish and wildlife which
18 shall have among its objectives:

19 (i) The restoration and maintenance of adult
20 populations of fish and wildlife at average historical levels
21 in the delta and the Suisun Marsh and the San Francisco
22 Bay system westerly of the delta, including defining the
23 manner in which exports shall be limited to achieve such
24 purposes and;

25 (ii) The realization of the potential of the project for
26 increasing these resources above the levels in (i), and
27 defining the manner in which exports shall be limited in
28 order to protect fish and wildlife, consistent with the
29 contracts for water delivery and with other purposes of
30 the project

31 (2) The Secretary of the Interior, in cooperation with
32 the state and with such congressional approval as may be
33 required, enters into agreements relating to water
34 quality and water supply with at least a majority of the
35 following agencies, which majority of such agencies shall
36 also represent at least two-thirds of the total acreage
37 within the delta and Suisun Marsh located within such
38 agencies:

39 (A) North Delta Water Agency.

40 (B) Central Delta Water Agency.

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1 (C) South Delta Water Agency.
2 (D) East Contra Costa Irrigation District.
3 (E) Byron-Bethany Irrigation District.
4 (F) Contra Costa County Water Agency.
5 (G) Contra Costa Water District.
6 (H) Suisun Resource Conservation District.
7 (3) The United States agrees to share in the costs and
8 benefits of the facilities described in subdivision (a) of
9 Section 11256.

10 (4) The Congress of the United States enacts
11 legislation that includes the following principles: The
12 Federal Central Valley Project shall be operated in such
13 a manner as not to deprive the watershed in which water
14 originates of water of adequate quality and quantity to
15 supply the beneficial uses of water in such watershed, or
16 any of its inhabitants or property owners. Water
17 requirements for all beneficial uses in the watershed
18 from which the water originates have a priority over
19 diversions for export from the watershed and the
20 secretary shall reduce or eliminate diversions for export
21 from the watershed to the extent necessary to supply
22 those uses, provided, however, that such priority shall not
23 apply to the use of water that would not exist in the
24 absence of the project, except as to such water for which
25 payment is made. The purpose of this paragraph is to
26 provide area of origin protection to those areas north of
27 the intakes to the California Aqueduct and the Delta-Mendota Canal at Clifton Court and at the Tracy
28 Pumping Plant.

29 (b) The department shall immediately proceed with
30 activities prerequisite to the construction of the facilities
31 provided for in subdivision (a) of Section 11256 and shall
32 complete the design by December 31, 1990.

33 (c) If all requirements of Section 11257 have not been
34 fulfilled by December 31, 1990, subdivisions (a) and (m)
35 of Section 11256 and subdivisions (a) and (b) of this
36 section shall be inoperative and of no force and effect on
37 and after that date.

38 (d) After December 31, 1990, or such earlier time as
39 the conditions of this section are satisfied, nothing in this

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1 section shall impair any authorization given to the
2 department under the California Water Resources
3 Development Bond Act (commencing with Section
4 12900).

5 11257.1. The authorizations of the Los Vaqueros Unit
6 and the Los Banos Grandes Reservoir are conditional
7 upon the completion of engineering, economic,
8 environmental, and financial feasibility reports found
9 favorable by the Director of Water Resources.

10 Each financial feasibility report shall contain:
11 (a) An initial allocation of project costs to project
12 purposes.

13 (b) The proposed method of financing.

14 (c) An estimate of the method of repayment.

15 (d) A designation of the water and power contractors
16 that are proposed to repay the allocated reimbursable
17 water development costs, including interest if any, on
18 upstream storage, conveyance, operations, maintenance,
19 and replacement.

20 (e) An estimate of the impact upon retail water prices
21 in the various service areas of the project.

22 Upon completion of the engineering, economic,
23 environmental, and financial reports on a facility, the
24 director shall submit the reports for that facility to the
25 Legislature for review at least six months prior to the
26 initiation of construction of the facility.

27 11257.2. The authorizations of the Glenn Reservoir
28 River Diversion Unit and the Colusa Reservoir-River
29 Diversion Unit are conditional upon the completion of
30 engineering, economic, environmental, and financial
31 feasibility reports on the facilities specified in
32 subdivisions (g) and (h) of Section 11256.

33 Should more feasible offstream storage facilities or
34 combinations thereof be determined by the department
35 to exist on the east side of the Coast Range, south of the
36 City of Redding, including combinations or modified
37 versions of the facilities provided for in subdivisions (g)
38 and (h) of Section 11256, it is the Legislature's intent that
39 they be constructed in lieu of constructing the facilities
40 provided for in subdivision (g) of Section 11256 to

1 maximum capacity.
 2 Upon completion of the engineering, economic,
 3 environmental, and financial reports on a facility, the
 4 director shall submit reports for that facility to the
 5 Legislature for review prior to the initiation of
 6 construction of the facility.
 7 The initiation of such studies, and the preparation of
 8 such reports shall not preclude the staged construction of
 9 the Sites Reservoir portion by the federal government as
 10 a feature of the federal Central Valley Project to serve
 11 the Tehama-Colusa Canal and any extension thereof into
 12 Yolo and Solano Counties. The department shall present
 13 findings and recommendations to the Legislature on or
 14 before January 1, 1980.
 15 11257.3. The Environmental Impact Report on the
 16 peripheral canal shall include a discussion of the sources
 17 of the mineral, nutrient, and biological components of the
 18 Sacramento River and shall evaluate the possible impacts
 19 to such components resulting from the operation of the
 20 proposed peripheral canal.
 21 If, the department determines that there will be
 22 significant adverse mineral, nutrient, or biological effects
 23 caused by the operation of the peripheral canal, the
 24 department shall:
 25 (a) Evaluate mitigation measures in the
 26 Environmental Impact Report.
 27 (b) Propose cost allocation principles for the
 28 mitigation.
 29 (c) Prepare trial cost allocation.
 30 To the extent practicable, the department shall
 31 mitigate adverse impacts upon mineral, nutrient, or
 32 biological effects caused by the operation of the canal.
 33 11257.4. The Environmental Impact Report on the
 34 peripheral canal shall consider potential seepage
 35 resulting from operation of the proposed peripheral
 36 canal. If the department determines there will be
 37 significant adverse seepage damage caused by the
 38 operation of the peripheral canal, the department shall:
 39 (a) Evaluate mitigation measures in the
 40 Environmental Impact Report.

1 The results of the study shall be submitted to the
 2 Legislature on or before January 1, 1981.
 3 11258.5. (a) The department shall investigate
 4 consumptive savings in agricultural water conveyance,
 5 use, and management. The department shall evaluate
 6 impacts upon salt balance, water quality, drainage, and
 7 energy conservation on both an on-farm and basinwide
 8 basis. The department shall allocate at least one hundred
 9 thousand dollars (\$100,000) each year of the amount
 10 allocated to the department pursuant to paragraph (2) of
 11 subdivision (b) of Section 6217 of the Public Resources
 12 Code for technical research on agriculture water
 13 conservation, including short- and long-term economic
 14 implications.
 15 The department shall submit progress reports of
 16 findings and recommendations annually to the
 17 Legislature and shall submit its final report on or before
 18 June 30, 1982.
 19 (b) The department shall contract with one or more
 20 water districts furnishing agricultural water in order to
 21 evaluate improvements in agricultural water
 22 conveyance, use, and management. Districts
 23 participating shall share in 40 percent of the cost of the
 24 evaluation. The 40 percent cost-sharing participation by
 25 water districts shall apply to all activities funded by
 26 paragraph (2) of subdivision (b) of Section 6217 of the
 27 Public Resources Code, with the exception of that
 28 amount to be allocated for technical research by the
 29 department pursuant to subdivision (a) of this section.
 30 (c) The department shall establish a policy committee
 31 for the purpose of developing cooperative efforts on the
 32 operations and research functions of the agricultural
 33 water conservation and management program provided
 34 in this section. Representatives on the policy committee
 35 shall be from local agencies such as soil and water
 36 conservation districts and county farm advisors, state
 37 agencies such as the department, the State Water
 38 Resources Control Board, the Department of Food and
 39 Agriculture, the State Energy Resources Conservation
 40 and Development Commission, and the University of

1 (b) Mitigate adverse impacts of seepage effects caused
 2 by operation of the peripheral canal.
 3 11258. The department is authorized to carry out a
 4 comprehensive study in cooperation with local agencies
 5 of existing and future San Joaquin Valley ground water
 6 overdraft problems and proposed solutions.
 7 The principal purpose of the study shall be to evaluate
 8 the most economical methods to reduce serious ground
 9 water overdrafts presently occurring within the San
 10 Joaquin Valley and to estimate optimal future ground
 11 water levels consistent with the economical use of water.
 12 The study shall investigate the historical and projected
 13 water situation in the various areas of the San Joaquin
 14 Valley, including water uses and amounts, water supplies
 15 and overdraft, ground water levels, water quality and
 16 drainage, energy requirements, costs of water
 17 developments, and net farm income.
 18 The study shall evaluate the economic, financial, and
 19 social implications of alternative projections of water uses
 20 and water supplies within the various areas of the valley,
 21 including, but not limited to, the alternatives whereby
 22 new imports only result from:
 23 (1) Fulfillment of the State Water Resources
 24 Development System contracts.
 25 (2) Fulfillment of the State Water Resources
 26 Development System contracts and completion of the
 27 Mid-Valley Canal.
 28 (3) Completion of facilities for water imports
 29 sufficient to eliminate the overdraft.
 30 (4) Economic water demands based on projected
 31 State Water Resources Development System and Central
 32 Valley Project water costs.
 33 The study shall also consider the effect of improved
 34 water use efficiency and management, and shall consider
 35 the alternative of planned reductions in the irrigation of
 36 lower quality agricultural land. The study shall
 37 coordinate with the San Joaquin Valley Interagency
 38 Drainage Program and shall consider possible impacts
 39 resulting from inadequate drainage and water quality
 40 degradation.

1 California and the State University and Colleges, and
 2 federal agencies such as the Bureau of Reclamation, the
 3 Soil Conservation Service, and the United States
 4 Department of Agriculture.
 5 11259. (a) The department shall report its progress
 6 in programs of water conservation, conjunctive use of
 7 ground water basins and surface water storage, and waste
 8 water reclamation in connection with the operation of
 9 the State Water Resources Development System to the
 10 Governor and the Legislature biennially, commencing
 11 December 1, 1978, and shall include in its report any
 12 recommendations for legislation to increase the
 13 efficiency of water use in the state.
 14 (b) The department shall continually evaluate
 15 mechanisms that will result in improved water quality in
 16 the Sacramento-San Joaquin Delta.
 17 11259.5. *The department shall increase the level of its*
18 studies of the causes of seepage and erosion along the
19 Sacramento River and its tributaries and shall develop
20 solutions for such seepage and erosion problems. The
21 department shall report its findings and
22 recommendations to the Legislature not later than
23 December 31, 1981.
 24 SEC. 4. Section 11456 is added to the Water Code, to
 25 read:
 26 11456. (a) The department shall make releases of
 27 stored water for beneficial uses downstream within the
 28 watershed in which the water originates and the delta,
 29 the Suisun Marsh, and the San Francisco Bay System
 30 westerly of the delta, to the extent that water quality
 31 control plans and conditions in permits to appropriate
 32 water adopted by the State Water Resources Control
 33 Board require such releases for: (1) the preservation and
 34 enhancement of fish and wildlife and to meet recreation
 35 needs; (2) the provision of water necessary to meet
 36 vested agricultural, municipal, and industrial water rights
 37 impaired by any project constructed and operated by the
 38 department; and (3) the provision of agricultural,
 39 municipal, and industrial water users with the water
 40 reasonably required, over and above the amounts

1 required to be released under (2) above, to adequately
 2 supply their beneficial needs.
 3 (b) Such plans and conditions in permits shall include
 4 dry and critical year relaxations.
 5 SEC. 5. Section 11457 is added to the Water Code, to
 6 read:
 7 11457. The costs of providing any benefits received by
 8 agricultural, municipal, and industrial water users in the
 9 delta as a result of project operations, in excess of any
 10 detriments caused thereby, shall, to the extent properly
 11 allocable, be repayable to the department by the
 12 beneficiaries. The costs of providing such benefits shall
 13 not be reimbursable by other contractors of the project.
 14 SEC. 6. Section 11460 of the Water Code is amended
 15 to read:
 16 11460. (a) In the construction and operation by the
 17 department of any project under the provisions of this
 18 part a watershed or area wherein water originates, or an
 19 area immediately adjacent thereto which can
 20 conveniently be supplied with water therefrom, shall not
 21 be deprived by the department directly or indirectly of
 22 the prior right to all of the water reasonably required to
 23 adequately supply the beneficial needs of the watershed,
 24 area, or any of the inhabitants or property owners
 25 therein.
 26 (b) In the operation by the department of any project
 27 under the provisions of this part, no water shall be
 28 exported from the delta unless the water remaining in
 29 the delta shall be water of sufficient quantity and
 30 adequate quality reasonably required to adequately
 31 supply the beneficial needs in the Sacramento-San
 32 Joaquin Delta and Suisun Marsh, including the needs of
 33 agriculture, municipal and industrial users, recreation,
 34 and fish and wildlife as established by the State Water
 35 Resources Control Board or by contract.
 36 SEC. 7. Section 11915 of the Water Code is amended
 37 to read:
 38 11915. All moneys deposited in the Central Valley
 39 Water Project Construction Fund pursuant to the
 40 provisions of Section 12.1 of Chapter 138, Statutes of 1964.

1 PART 8.5. AGRICULTURAL WATER
 2 CONSERVATION LOAN ACT OF 1978
 3
 4 12974. This part shall be known and may be cited as
 5 the Agricultural Water Conservation Loan Act of 1978.
 6 12975. The Legislature hereby finds and declares
 7 that, in order to provide sufficient water for the people
 8 of this state and to reduce the need for future surface
 9 reservoirs and to alleviate ground water overdraft, the
 10 maximum conservation of agricultural water is necessary.
 11 12975.1. The Legislature further finds and declares
 12 that it is the state policy to provide economic assistance
 13 to agriculture to encourage agriculture to develop water
 14 conservation measures so that conserved water may be
 15 available to help meet the growing water requirements
 16 of the state. It is also the intent of the Legislature to
 17 collect and evaluate data regarding the water
 18 conservation capability of alternative water conveyance,
 19 application, and tail water return systems. It is the
 20 purpose of this chapter to provide for low-interest loans
 21 to farmers in order to assist in the implementation of
 22 agriculture water conservation programs.
 23 12975.2. For the purposes of this chapter:
 24 (a) "Committee" means the Agricultural Water
 25 Conservation Loan Committee, created by Section
 26 12975.3.
 27 (b) "Fund" means the Agricultural Water
 28 Conservation Revolving Loan Fund created by Section
 29 12975.4.
 30 (c) "Eligible party" means any person, firm,
 31 corporation, partnership, association, business trust, or
 32 company.
 33 (d) "Eligible project" means any water conservation
 34 project. A water conservation project means any facility
 35 or land modification to improve the application,
 36 conveyance, or recycling of water in order to obtain a
 37 reduction in water use, which may include, but is not
 38 limited to, drip irrigation systems, sprinkler irrigation
 39 systems, channel lining, or tail water recovery.
 40 12975.3. The Agricultural Water Conservation

1 First Extraordinary Session and subdivision (b) of Section
 2 6217 of the Public Resources Code, and all accruals to
 3 such moneys so deposited, are hereby appropriated to the
 4 department for expenditure by the department without
 5 regard to fiscal years for the purposes of the construction
 6 fund, in amounts equal to allocations to recreation and
 7 fish and wildlife enhancement and to the costs of
 8 acquiring rights-of-way, easements and property for
 9 recreation development which have become effective
 10 pursuant to Section 11912.
 11 SEC. 7.5. Section 11915.2 is added to the Water Code,
 12 to read:
 13 11915.2. (a) Notwithstanding any provision of
 14 Section 11912, an amount not to exceed two hundred
 15 million dollars (\$200,000,000) of the funds allocated to the
 16 Central Valley Water Project Construction Fund
 17 pursuant to subdivision (b) of Section 6217 of the Public
 18 Resources Code shall be used, without further approval
 19 of the Legislature, for the following:
 20 (1) The reimbursement of the amount of the
 21 construction costs of the facilities of the State Water
 22 Resources Development System, as allocated by the
 23 department to provide water for water quality, fish,
 24 wildlife, and recreation in the delta and the Suisun Marsh,
 25 to compensate for historic upstream depletions and
 26 diversions which have reduced the amount of water
 27 naturally available in the delta and the Suisun Marsh.
 28 (2) Costs incurred pursuant to Section 5095 of the
 29 Public Resources Code.
 30 (b) The two hundred million dollars (\$200,000,000)
 31 authorized by this section shall represent the total state
 32 obligation from the General Fund for the purposes of
 33 subdivision (a) of this section except as otherwise
 34 provided in the California Water Resources
 35 Development Bond Act (Chapter 8 (commencing with
 36 Section 12930) of Part 6 of Division 6 of the Water Code).
 37 SEC. 8. Part 8.5 (commencing with Section 12974) is
 38 added to Division 6 of the Water Code, to read:

1 Committee is hereby created. The committee shall
 2 consist of the Director of Water Resources, the Chairman
 3 of the State Water Resources Control Board, the Director
 4 of Food and Agriculture, and the Director of Finance, or
 5 their designated representatives. The board shall elect
 6 annually a chairman. A majority of the committee may
 7 act for the committee.
 8 12975.4. There is in the State Treasury the
 9 Agricultural Water Conservation Revolving Loan Fund,
 10 which fund is hereby created. Moneys in such fund are
 11 continuously appropriated for the purposes provided in
 12 this part. The moneys in the fund may be used for
 13 defraying the costs of establishing and administering the
 14 loan program provided for herein in an amount not to
 15 exceed 1 percent of the total moneys loaned from the
 16 fund. All moneys received in any fiscal year in repayment
 17 of loans authorized by this part shall be deposited in this
 18 fund.
 19 12975.5. The committee may, pursuant to this part,
 20 establish a program of loans as hereafter provided.
 21 12975.6. No eligible party may receive more than fifty
 22 thousand dollars (\$50,000) in assistance provided by this
 23 part.
 24 12975.7. An eligible party may qualify for a loan
 25 pursuant to this part if all of the following are met:
 26 (a) The applicant has an annual average gross sales, for
 27 the immediately preceding three tax years, from
 28 agricultural production of at least five thousand dollars
 29 (\$5,000), but not more than five hundred thousand
 30 dollars (\$500,000).
 31 (b) The applicant has received at least 75 percent of
 32 his or her average total gross income, for the immediately
 33 preceding three tax years, from agricultural production.
 34 (c) The applicant's proposed project is on irrigated
 35 land with an agricultural production history predating
 36 June 1, 1975.
 37 (d) The applicant has the ability to repay the loan
 38 under the criteria established by this part and the rules
 39 and regulations promulgated by the committee.
 40 12975.8. (a) The moneys in the fund are hereby

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1 continuously appropriated to the committee and shall be
 2 used for the purposes set forth in this section.
 3 (b) The committee is authorized to enter into
 4 contracts with eligible parties for loans to such parties to
 5 aid in the implementation of eligible projects.
 6 (c) Any contract pursuant to this section may include
 7 such provision as may be agreed upon by the parties
 8 thereto, and any such contract shall include, in substance,
 9 the following provisions:
 10 (1) An estimate of the reasonable cost of the eligible
 11 project.
 12 (2) An agreement by the committee to loan to the
 13 eligible party, an amount which equals the cost found to
 14 be eligible for a loan, not to exceed fifty thousand dollars
 15 (\$50,000).
 16 (3) An agreement by the eligible party to repay the
 17 fund:
 18 (i) Over a period not to exceed 10 years.
 19 (ii) The amount of the loan.
 20 (iii) An administrative fee of 1 percent.
 21 (iv) Interest at a rate of 2½ percent per annum on the
 22 principal, which is the amount of the loan plus the
 23 administrative fee.
 24 (4) The pledge of a lien or other security in favor of
 25 the state acceptable to the committee which will secure
 26 repayment of the loan.
 27 (5) An agreement by the eligible party to proceed
 28 expeditiously with, and complete, the project.
 29 (6) An agreement by the eligible party to provide data
 30 regarding system operation and water savings as
 31 specified in regulations promulgated by the committee.
 32 12975.9. Repayment of all or part of the principal,
 33 which is the loan plus the administrative fee, may be
 34 deferred for the first repayment year when, in the
 35 judgment of the committee, substantial economic
 36 benefits will not accrue to the applicant during such
 37 period. Repayment of principal which is deferred may, at
 38 the option of the eligible party, be paid in annual
 39 installments during the remainder of the loan repayment
 40 period.

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1 Reclamation involving water from the federal Central
 2 Valley Project shall submit the contract to the State
 3 Treasurer and receive the financial analysis prepared by,
 4 or the notification by, the State Treasurer pursuant to
 5 Section 20201 prior to execution of the contract.
 6 20201. (a) Within 30 days of receipt of a contract
 7 submitted pursuant to Section 20200, the State Treasurer
 8 shall prepare a financial analysis to determine whether
 9 the contract essentially provides for the repayment to the
 10 federal government for the reimbursable costs for
 11 storage, conveyance, interest, operations, maintenance,
 12 and repair of the facilities supplying the water.
 13 (b) If the Treasurer determines that the contract
 14 essentially provides for repayment of reimbursable costs,
 15 the Treasurer shall notify the political subdivision and the
 16 political subdivision is then authorized to execute the
 17 contract, except as otherwise provided by law.
 18 (c) If the Treasurer determines that the contract does
 19 not essentially repay reimbursable costs, the Treasurer
 20 shall, within 90 days of receipt of the contract, estimate
 21 which and to what extent other specific public agencies
 22 in California will bear the reimbursable costs less
 23 payments by the political subdivision under the proposed
 24 contract. The Treasurer shall notify such affected public
 25 agencies and the political subdivision of his estimates and
 26 for comment. Thirty days following notification, the
 27 political subdivision is authorized to execute the contract,
 28 except as otherwise provided by law.
 29 (d) If the State Treasurer does not give notice to the
 30 political subdivision within 120 days of submittal of such
 31 contract to the State Treasurer, the contract may be
 32 executed by the political subdivision.
 33 SEC. 10. Section 8.1 of the Central Delta Water
 34 Agency Act (Chapter 1133 of the Statutes of 1973) is
 35 amended to read:
 36 Sec. 8.1. In the event that the agency fails to
 37 accomplish on or before December 31, 1980, the purposes
 38 of the agency of the character and nature described in
 39 Section 4.1 of this act, the agency is dissolved and its
 40 existence is automatically terminated, and all of its

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1 In the event a loan recipient suffers such economic
 2 hardship from drought, flood or other natural disaster
 3 that he is unable make loan payments, such payments
 4 may be deferred for a period not to exceed two years.
 5 There shall be no penalty for repayment for any
 6 portion or all of the loan in advance of its maturity date
 7 12975.10. Loans may be made only for eligible
 8 projects. In making loans, priorities shall be given in
 9 accordance with the relative extent of water savings of a
 10 proposed eligible project. The committee shall have final
 11 authority to make the determinations of the water
 12 savings potential of the proposed eligible project;
 13 provided, that the committee shall ensure that the loans
 14 are made to applicants in diverse areas of the state,
 15 producing a variety of agricultural products, and
 16 employing a variety of water conservation systems.
 17 12975.11. The committee shall establish a priority list
 18 for applications on or before March 30, 1978, and shall
 19 thereafter periodically update such list.
 20 12975.12. The committee may adopt rules and
 21 regulations and shall have such powers as are necessary
 22 to carry out the purposes of this part.
 23 12975.13. The committee shall publicize:
 24 (a) The existence and purposes of this part.
 25 (b) Any rules and regulations adopted by the
 26 committee.
 27 12975.14. The committee may contract with the
 28 department to administer the loan program provided in
 29 this part.
 30 SEC. 9. Chapter 2 (commencing with Section 20200)
 31 is added to Division 10 of the Water Code, to read:
 32
 33 CHAPTER 2. WATER SUPPLY CONTRACTS WITH THE
 34 FEDERAL CENTRAL VALLEY PROJECT
 35
 36 20200. In addition to any other requirement of law,
 37 and except as provided in subdivision (d) of Section
 38 20201, any political subdivision of the state proposing to
 39 enter into or renew a water supply contract for a term of
 40 performance exceeding one year with the Bureau of

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1 corporate powers shall cease, except for the purpose of
 2 winding up the affairs of the agency.
 3 SEC. 11. Section 8.1 of the North Delta Water
 4 Agency Act (Chapter 283 of the Statutes of 1973) is
 5 amended to read:
 6 Sec. 8.1. In the event that the agency fails to enter
 7 into and execute on or before December 31, 1980, a
 8 contract with the United States and the State of
 9 California of the character and nature described in
 10 Section 4.1 of this act, the agency is dissolved and its
 11 existence is automatically terminated, and all of its
 12 corporate powers shall cease, except for the purpose of
 13 winding up the affairs of the agency.
 14 SEC. 12. Section 8.1 of the South Delta Water Agency
 15 Act (Chapter 1089 of the Statutes of 1973) is amended to
 16 read:
 17 Sec. 8.1. In the event that the agency fails to enter
 18 into and execute on or before December 31, 1980, a
 19 contract with the United States and the State of
 20 California of the character and nature described in
 21 Section 4.1 of this act, the agency is dissolved and its
 22 existence is automatically terminated, and all of its
 23 corporate powers shall cease, except for the purpose of
 24 winding up the affairs of the agency.
 25 SEC. 13. The Legislature finds and declares that the
 26 provisions of subdivision (a) of Section 11456 of the Water
 27 Code, as enacted by Section 4 of this act, and the
 28 amendments to Section 11460 of the Water Code
 29 contained in Section 6 of this act are declaratory of and
 30 do not constitute a change in existing law.
 31 SEC. 14. There is hereby appropriated from the
 32 General Fund in the State Treasury to the Agricultural
 33 Water Conservation Revolving Loan Fund the sum of
 34 fifty million dollars (\$50,000,000) for the purposes of
 35 carrying out the provisions of the Agricultural Water
 36 Conservation Loan Act of 1978.
 37 SEC. 15. It is the intent of the Legislature that if this
 38 bill and Assembly Bill No. 1717 are both chaptered and
 39 become effective January 1, 1978, that Section 11109 of
 40 the Water Code, as enacted by Section 2.4 of this act shall

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1 be operative and that Section 11109 of the Water Code,
 2 as enacted by Section 2.3 of this act shall not become
 3 operative. Therefore, Section 2.4 of this act shall be
 4 operative only if this bill and Assembly Bill No. 1717 are
 5 both chaptered and become effective January 1, 1978, in
 6 which case Section 2.3 of this act shall not become
 7 operative.

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MAJORITY REPORT OF COMMITTEE ON CONFERENCE

Senate Chamber, January 20, 1978

The following report of Committee on Conference was presented by Senator Ayala

Mr President The Committee on Conference has met concerning

Senate Bill 346, as amended in Assembly on September 8, 1977—An act to amend Sections 5093.54 and 6217 of, and to add Section 5095 to, the Public Resources Code, to amend Sections 8457, 11460, and 11915 of, to add Sections 11108, 11109, 11456, 11457, and 11915.2 to, to add Article 94 (commencing with Section 11255) to Chapter 2 of Part 3 of, and to add Part 8.5 (commencing with Section 12974) to, Division 6, and to add Chapter 2 (commencing with Section 20200) to Division 10 of, the Water Code, to amend Section 81 of the Central Delta Water Agency Act (Chapter 1133 of the Statutes of 1973), to amend Section 8.1 of the North Delta Water Agency Act (Chapter 283 of the Statutes of 1973), and to amend Section 8.1 of the South Delta Water Agency Act (Chapter 1089 of the Statutes of 1973), relating to water, and making an appropriation therefor

The undersigned Members consenting to the report:

RUBEN S. AYALA LAWRENCE KAPILOFF

ALBERT RODDA EUGENE T. GUALCO

Senate Committee on Conference Assembly Committee on Conference

The undersigned Members dissenting to the report:

JOHN NEJEDLY GORDON DUFFY

Senate Committee on Conference Assembly Committee on Conference

And reports that it has agreed to recommend the following:

That the amendments of the Assembly be concurred in, and that the bill be further amended as follows:

Amendment 1

In line 3 of the title of the printed bill, as amended in Assembly September 8, 1977, strike out "11915", and insert "11912".

Amendment 2

In line 3 of the title, after "11109," insert "11110".

Amendment 3

In line 6 of the title, strike out "and".

Amendment 4

In line 7 of the title, after "of," insert "and to repeal Section 11915 of".

Amendment 5

In line 8 of the title, strike out "amend", and insert "repeal".

Amendment 6

In line 10 of the title, strike out "amend", and insert "repeal".

Amendment 7

In line 11 of the title, strike out "amend", and insert "repeal".

Amendment 8

In line 13 of the title, strike out "and".

Amendment 9

In line 14 of the title, after "therefor", insert ", and declaring the urgency thereof, to take effect immediately".

Amendment 10

On page 6, line 35, strike out "January 1", and insert "June 30".

Amendment 11

On page 8, strike out lines 10 to 14, inclusive; and in line 15, strike out "(2)", and insert "(1)".

Amendment 12

On page 8, line 18, strike out "1977-1978", and insert "1978-79".

Amendment 13

On page 8, line 20, after "agricultural", insert "water".

Amendment 14

On page 8, line 23, strike out "(3)", and insert "(2)".

Amendment 15

On page 8, line 27, strike out "(4)", and insert

"(3) To the Department of Water Resources, the amount of one million two hundred thousand dollars (\$1,200,000), for allocation to the Department of Fish and Game, for expenditure over the six fiscal years commencing with the 1977-78 fiscal year and ending with 1982-83 fiscal year, for the study provided for in Section 11257.7. It is the intent of the Legislature that a cooperative role and matching funds be sought from the federal government for such study.

(4) To the Department of Water Resources, for allocation to the Department of Parks and Recreation and the Department of Fish and Game, as appropriate, the amount required to pay costs incurred pursuant to Section 5096 of the Public Resources Code.

(5) To the Central Valley Water Project Construction Fund, an amount equal to the allocations which have become effective pursuant to Section 11912 of the Water Code, plus the allocations made under Section 11915.2 of the Water Code.

(6).

Amendment 16

On page 8, strike out lines 34 to 40, inclusive; and on page 9, strike out lines 1 to 6, inclusive, and insert

"Moneys expended from the California Water Fund after July 1, 1978, for the State Water Resources Development system shall be reimbursed to such fund together with interest at a rate which shall be the weighted average of the interest rates paid by the state on bonds issued to construct facilities of the State Water Resources Development System."

Amendment 17

On page 11, strike out lines 17 to 20, inclusive.

Amendment 18

On page 11, between lines 24 and 25, insert

"SEC. 25. Section 11110 is added to the Water Code, to read 11110. "Historical Level" means the average annual abundance from 1922 through 1967 of the adult populations of fish and wildlife estimated to have lived in or been dependent on any area, as determined by the Department of Fish and Game."

Amendment 19

On page 11, strike out lines 32 to 36, inclusive, and insert "Legislature that the state government shall undertake the following actions relative to water resources in California.

(a) To continue the commitment of the state to ultimately provide the 4,230,000 acre-feet of water, as specified in the existing State Water Resources Development System contracts, unless reductions are mutually agreed upon by the parties."

Amendment 20

On page 11, line 38, after "of", insert "users of water from".

Amendment 21

On page 11, line 39, after "through", insert "local waste water reclamation and reducing such needs through"

Amendment 22

On page 11, lines 39 and 40, strike out "and waste water reclamation".

Amendment 23

On page 12, line 3, after "of", insert "at least".

Amendment 24

On page 12, between lines 3 and 4, insert "(c) To enable the State Water Resources Development System to develop yield by waste water reclamation."

Amendment 25

On page 12, line 4, strike out "(c)", and insert "(d)".

Amendment 26

On page 12, line 11, strike out "(d)", and insert "(e)".

Amendment 27

On page 12, line 17, strike out "(e)", and insert "(f)".

Amendment 28

On page 12, line 22, strike out "(f)", and insert "(g) To provide for the State Water Resources Development System to be operated in coordination with the Federal Central Valley Project to restore and maintain fish and wildlife resources at average historical levels in the delta, Suisun Marsh (for which facilities are to be constructed), and the San Francisco Bay System westerly of the delta. Increases above these levels shall not have an adverse impact upon water supply contracts. Water provided by the State Water Resources Development System to compensate for upstream depletions, other than those depletions by the State Water Resources Development System and the Federal Central Valley Project, shall be a nonreimbursable cost of the State Water Resources Development System.

(h)".

Amendment 29

On page 12, line 26, strike out "(g)", and insert "(i)".

Amendment 30

On page 12, between lines 34 and 35, insert "(j) To recognize the important contribution of agriculture to the economy of the state and to the welfare of the people of the state and to provide for a major study of solutions to the groundwater overdraft problem of the San Joaquin Valley.

(k) To provide for agricultural water conservation research and field studies.

(l) To create a state fund for low interest loans to farmers to install water efficient irrigation equipment."

Amendment 31

On page 12, line 35, after "Legislature", insert "to request the federal government to undertake the following actions relative to the Federal Central Valley Project".

Amendment 32

On page 12, line 36, strike out "To request Congress to authorize", and insert "That".

Amendment 33

On page 12, line 37, after "Interior", insert "be authorized by an act of Congress".

Amendment 34

On page 13, line 4, after "Bay", insert "System".

Amendment 35

On page 13, line 6, after "fish," insert "and the".

Amendment 36

On page 13, line 7, strike out "of the bay.", and insert "and productivity of the Bay. The manner in which the projects are operated to achieve water quality standards shall be subject to mutual agreement."

Amendment 37

On page 13, strike out lines 8 and 9, and insert

"(b) That the Secretary of the Interior be authorized by an act of Congress to enter into an agreement with the state".

Amendment 38

On page 13, strike out lines 18 to 20, inclusive, and in line 21, strike out "Valley Water Project", and insert

"(c) That the Secretary of the Interior be authorized by an act of Congress to undertake programs and construct Federal Central Valley Project water".

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Amendment 39

On page 13, line 24, strike out "including facilities which", and insert "and needed to assist in alleviating the ground water overdraft in the San Joaquin Valley. Some of the facilities".

Amendment 40

On page 13, between lines 25 and 26, insert

"11255.7. The authorizations contained in Section 11256 are conditional upon the completion of engineering, economic, environmental, and financial feasibility reports found favorable by the Director of Water Resources.

Each financial feasibility report shall contain the following:

- (a) An initial allocation of costs to project purposes.
- (b) The proposed method of financing.
- (c) An estimate of the method of repayment.
- (d) A designation of the water and power contractors that are proposed to repay the allocated reimbursable water development costs, including interest if any, on upstream storage, conveyance, operations, maintenance, and replacement.

(e) An estimate of the impact upon retail water prices in the various service areas of the project.

Upon completion of the engineering, economic, environmental, and financial reports for any of the facilities described in subdivisions (b), (g), (h), (i), (l) and (m) of Section 11256, the director shall submit the reports to the Legislature for review at least six months prior to the initiation of construction of the facility."

Amendment 41

On page 13, line 28, strike out "11257, 11257.1," and insert "11255.7, 11257."

Amendment 42

On page 14, line 3, strike out "northeast", and insert "northwest".

Amendment 43

On page 14, line 26, strike out "feasible", and insert "determined to be feasible pursuant to the provisions of Section 11255.7".

Amendment 44

On page 14, line 28, strike out "(j)", and insert "(i)".

Amendment 45

On page 14, line 35, after "section", insert "; provided that no such facilities shall be constructed until the contract specified in subparagraph (C) of paragraph (2) of subdivision (a) of Section 11257 is executed in accordance with Section 11457."

Amendment 46

On page 14, line 36, strike out "past, present, and future".

Amendment 47

On page 15, line 4, strike out "July 1", and insert "December 31".

Amendment 48

On page 15, line 25, strike out ", prior to January 15, 1979.", and insert "and the San Francisco Bay Conservation and Development Commission, prior to July 15, 1979. Such plan shall be consistent with Division 19 (commencing with Section 29000) of the Public Resources Code."

Amendment 49

On page 15, line 29, after the period, insert "The department and the Suisun Resource Conservation District may agree that permanent facilities shall be constructed instead of any of the interim facilities authorized by paragraph (1) of this subdivision."

Amendment 50

On page 15, line 39, strike out "determined feasible by the department".

Amendment 51

On page 15, line 40, after "space", insert "determined to be feasible by the Director of Water Resources".

Amendment 52

On page 16, line 29, strike out "Thomas", and insert "Thomes".

Amendment 53

On page 17, line 2, after "are", insert "determined to be feasible by the Director of Water Resources and are".

Amendment 54

On page 17, line 25, strike out "federal", and insert "Federal".

Amendment 55

On page 18, line 18, strike out "have among its objectives", and insert "provide for".

Amendment 56

On page 18, line 22, strike out ", including defining the"; strike out lines 23 and 24, and insert ". The agreement shall include those limitations on exports and diversions to storage of presently unregulated flushing flows entering San Francisco Bay which are necessary to assist in restoring and maintaining fish and wildlife in the San Francisco Bay System westerly of the delta. To the extent practicable, fresh water needed to restore and maintain fish and wildlife in the San Francisco Bay System westerly of the delta shall be provided from such unregulated flows; and".

Amendment 57

On page 18, line 25, strike out "project", and insert "projects".

Amendment 58

On page 18, line 30, strike out "project", and insert "projects".

Amendment 59

On page 19, between line 6 and 7, insert

"The department shall submit reports to the Legislature by January 1, 1979, 1980, and 1981, regarding the progress of negotiations

with such agencies, with recommendations to the Legislature by January 1, 1981, if contracts have not been executed"

Amendment 60

On page 19, line 11, strike out "includes the following principles", and insert "shall include the following".

Amendment 61

On page 19, line 15, after "the", insert "reasonable".

Amendment 62

On page 19, line 17, after "all", insert "reasonable".

Amendment 63

On page 19, line 20, strike out "secretary", and insert "Secretary".

Amendment 64

On page 19, line 33, strike out "by December 31, 1980", and insert "of stages one and two by June 30, 1981."

Amendment 65

On page 19, strike out lines 34 to 40, inclusive; and on page 20, strike out lines 1 to 4, inclusive, and insert

"(c) The facilities described in subdivision (a) of Section 11256 shall be the facilities authorized by the California Water Resources Development Bond Act in paragraph (3) of subdivision (d) of Section 12934, to be constructed by the state as federal-state joint use facilities when the requirements described in subdivision (a) of this section are fulfilled."

Amendment 66

On page 20, strike out lines 5 to 32, inclusive; and in line 33, strike out "Should", and insert "11257.2. Should".

Amendment 67

On page 20, line 35, after "exist", insert "on the east side of the Coast Range".

Amendment 68

On page 21, strike out lines 2 to 7, inclusive; and in line 8, strike out "such reports", and insert "The provisions of Section 11255.7".

Amendment 69

On page 21, line 10, strike out "federal", and insert "Federal".

Amendment 70

On page 21, line 12, strike out "The department shall present"; and strike out lines 13 and 14.

Amendment 71

On page 22, line 1, strike out "adverse impacts", and insert "the adverse impact".

Amendment 72

On page 22, between lines 2 and 3, insert

"11257.5. The department shall immediately proceed with the engineering, economic, environmental, and financial feasibility reports in accordance with Section 11255.7, for the facilities specified in subdivisions (g) and (h) of Section 11256.

If the facility, or its alternative, is determined to be feasible, construction shall be initiated at the same time or prior to the initiation of construction of stage three of the peripheral canal as provided in subdivision (a) of Section 11256.

11257.7 (a) The Department of Fish and Game is authorized to administer a comprehensive study to determine the interrelationship between delta outflow, including flushing flows, and fish and wildlife resources in the San Francisco Bay System westerly of the delta. Such study and the work plan for it shall be reviewed by a committee composed of representatives of the San Francisco Bay Conservation and Development Commission, the State Water Resources Control Board, and the Department of Water Resources. The Department of Fish and Game shall report progress on such study annually to the Legislature. Such report shall include recommendations for coordination with any other ongoing related study and for adjustment in funding, and the report shall include independent statements of review from each agency on the review committee.

(b) The primary purpose of the study is to provide data to aid the State Water Resources Control Board in its consideration of the need to set standards to protect San Francisco Bay.

(c) The study need not be completed before the final environmental impact report on the peripheral canal is adopted.

(d) Nothing in this section shall affect the obligation of the department under the California Environmental Quality Act (Division 13 (commencing with Section 21000) of the Public Resources Code)."

Amendment 73

On page 22, line 31, after "and", insert "Federal".

Amendment 74

On page 22, line 36, after "land", insert "through leasing and other arrangements".

Amendment 75

On page 23, line 2, strike out "January 1", and insert "December 31".

Amendment 76

On page 23, line 4, strike out "consumptive", and insert "areawide net".

Amendment 77

On page 23, line 10, strike out "(2)", and insert "(1)".

Amendment 78

On page 23, strike out line 18, and insert "December 31, 1983."

Amendment 79

On page 23, line 26, strike out "(2)", and insert "(1)".

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Amendment 80

On page 23, line 34, strike out "Representatives", and insert "The department is authorized to appoint representatives".

Amendment 81

On page 23, line 35, strike out "shall be".

Amendment 82

On page 23, line 40, strike out the second "and".

Amendment 83

On page 24, line 1, strike out the third "and".

Amendment 84

On page 24, line 4, after "Agriculture", insert ", and other appropriate groups".

Amendment 85

On page 24, line 11, strike out "December 1, 1978", and insert "June 1, 1979".

Amendment 86

On page 24, line 16, after "Delta", insert "Estuary".

Amendment 87

On page 24, strike out line 23, and insert "June 30, 1982".

Amendment 88

On page 24, line 27, after "for", insert "reasonable".

Amendment 89

On page 25, strike out lines 36 to 40, inclusive; and on page 26, strike out lines 1 to 10, inclusive, and insert

"SEC. 6.5. Section 11912 of the Water Code is amended to read: 11912. The department, in fixing and establishing prices, rates, and charges for water and power, shall include as a reimbursable cost of any state water project an amount sufficient to repay all costs incurred by the department, directly or by contract with other agencies, for the preservation of fish and wildlife and determined to be allocable to the costs of the project works constructed for the development of such water and power, or either. Costs incurred for the enhancement of fish and wildlife or for the development of public recreation shall not be included in the prices, rates, and charges for water and power, and shall be nonreimbursable costs.

It shall be the duty of the department to report annually to the Legislature the costs, if any, which the department has allocated to recreation and fish and wildlife enhancement for each facility of any state water project. The department shall also report to the Legislature any revisions which the department makes in such allocation.

The department shall submit each such cost allocation to the Department of Navigation and Ocean Development, the Department of Parks and Recreation, and to the Department of Fish and Game. The Department of Navigation and Ocean Development, the Department of Parks and Recreation, and the Department of Fish and Game shall file with the Department of Water Resources their written comments with respect to each such cost allocation, which written comments shall be included in the report required by this section.

The allocations or revised allocations reported to the Legislature shall become effective for the purposes of Section 11915 upon approval by the Legislature.

It shall also be the duty of the department to report to the Legislature on any expenditure of funds for acquiring rights-of-way, easements and property pursuant of Section 346 for recreation development associated with such facilities. For the purposes of Section 11915 such expenditures shall become approved in the same manner as provided above with respect to cost allocation.

SEC. 7. Section 11915 of the Water Code is repealed.

11915. All money deposited in the Central Valley Water Project Construction Fund pursuant to the provisions of Section 124 of Chapter 128, Statutes of 1964, First Extraordinary Session and subdivision (e) of Section 6217 of the Public Resources Code, and all accruals to such money so deposited, are hereby appropriated to the department for expenditure by the department without regard to fiscal years for the purposes of the construction fund, in amounts equal to allocations to recreation and fish and wildlife enhancement and to the costs of acquiring rights-of-ways, easements and property for recreation development which have become effective pursuant to Section 11912."

Amendment 90

On page 26, line 13, strike out "(a)".

Amendment 91

On page 26, line 14, strike out "an amount not to exceed two hundred"; strike out lines 15 to 36, inclusive, and insert "for the purpose of determining the amount of money to be allocated to the Central Valley Water Project Construction Fund pursuant to subdivision (b) of Section 6217 of the Public Resources Code, the department shall allocate construction costs of the facilities of the State Water Resources Development System to the purposes of providing water for water quality, fish, wildlife, and recreation in the Delta, the Suisun Marsh, and San Francisco Bay, to compensate for depletions, other than those depletions by the State Water Resources Development System and the Federal Central Valley Project, which have reduced the amount of water naturally available in the delta, the Suisun Marsh, and San Francisco Bay. The total amount allocated pursuant to this section shall not exceed two hundred million dollars (\$200,000,000)."

Amendment 92

On page 27, line 20, strike out "chapter", and insert "part".

Amendment 93

On page 27, line 23, strike out "chapter", and insert "part".

Amendment 94

On page 27, line 34, after the first "project", insert "found to be eligible by the Agricultural Water Conservation Committee".

Amendment 95

On page 27, line 35, after "modification", insert "that is found by the committee".

Amendment 96

On page 28, line 5, strike out "board", and insert "committee".

Amendment 97

On page 28, line 6, strike out "chairman", and insert "chairperson".

Amendment 98

On page 28, between lines 39 and 40, insert

"(e) The applicant's proposed project is determined by the committee to provide sufficient water savings to carry out the purposes of this part."

Amendment 99

On page 29, line 20, strike out "1", and insert "2".

Amendment 100

On page 30, line 3, after "unable", insert "to".

Amendment 101

On page 30, line 7, strike out "eligible"; strike out lines 8 and 9; and in line 10, strike out "proposed eligible project", and insert "projects determined to be eligible by the committee, taking into account the extent of water savings offered by the proposed projects"

Amendment 102

On page 30, line 16, after the period, insert "Subject to the other requirements of this section, priority in accordance with the list established pursuant to Section 12975.11 shall be given to agricultural water users in water districts participating in studies as provided in subdivision (b) of Section 11258.5, provided nonparticipating districts are not excluded."

Amendment 103

On page 30, strike out lines 18 and 19, and insert "within nine months after the effective date of this part and shall thereafter review and update such list at least every nine months."

Amendment 104

On page 31, line 1, strike out "federal", and insert "Federal".

Amendment 105

On page 31, line 6, strike out "30", and insert "60".

Amendment 106

On page 31, strike out lines 33 to 40, inclusive; and on page 32, strike out lines 1 to 24, inclusive, and insert

"SEC. 10. Section 8.1 of the Central Delta Water Agency Act (Chapter 1133 of the Statutes of 1973) is repealed.

See 84. In the event that the agency fails to accomplish on or before December 31, 1968, the purposes of the agency of the character and nature described in Section 44 of this act, the agency dissolved and its existence is automatically terminated; and all of its corporate powers shall cease, except for the purpose of winding up the affairs of the agency.

SEC. 11. Section 8.1 of the North Delta Water Agency Act (Chapter 283 of the Statutes of 1973) is repealed.

See 84. In the event that the agency fails to enter into and execute on or before December 31, 1968, a contract with the United States and the State of California of the character and nature described in Section 44 of this act, the agency is dissolved and its existence is automatically terminated; and all of its corporate powers shall cease, except for the purpose of winding up the affairs of the agency.

SEC. 12. Section 8.1 of the South Delta Water Agency Act (Chapter 1089 of the Statutes of 1973) is repealed.

See 84. In the event that the agency fails to enter into and execute on or before December 31, 1968, a contract with the United States and the State of California of the character and nature described in Section 44 of this act, the agency is dissolved and its existence is automatically terminated; and all of its corporate powers shall cease, except for the purpose of winding up the affairs of the agency.

Amendment 107

On page 32, strike out lines 37 to 40, inclusive; and strike out page 33, and insert

"SEC. 15. This act is an urgency statute necessary for the immediate preservation of the public peace, health, or safety within the meaning of Article IV of the Constitution and shall go into immediate effect. The facts constituting such necessity are:

This act provides for a long range program to meet the water needs of California. In order, therefore, to permit timely construction of these vital facilities it is necessary that this act go into immediate effect to preserve the public peace, health, and safety."

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SENATE JOURNAL

SENATE MINORITY REPORT ON SB 346

January 30, 1978

Hon. Mervyn M. Dymally, President

and Members of the Senate

Hon. Leo T. McCarthy, Speaker

and Members of the Assembly

I dissent to the report of the Committee on Conference on Senate Bill 346.

Pursuant to Joint Rule 29, I am submitting the attached Minority Report for your use and consideration in responding to the recommendations of the Conference Committee's Majority Report.

Very truly yours,

JOHN A. NEJEDLY
Senator, Seventh District

Attachment

MINORITY REPORT OF SENATOR JOHN A. NEJEDLY ON THE

REPORT OF THE SENATE-ASSEMBLY CONFERENCE COMMITTEE ON SB 346 (AYALA)

I dissent to the report of the Committee on Conference on Senate Bill 346 (Ayala) which would authorize construction of additional water project facilities.

Californians are faced with making critical decisions, and soon, in the complex, controversial arena of water development. The oversimplified solution proposed in Senate Bill 346—build more dams and create more stored water—only poses more difficult problems to the state's already confused water management program.

Present operation of the state and federal water projects results in interference with the migration of salmon and other anadromous fish, loss of striped bass spawning areas in southern Delta channels, loss of large numbers of striped bass eggs and larvae which pass through louver fish screens into the pumps, decreases in aquatic fish food supply in Delta channels, great variation in the quantity of fish food available in the western Delta and adjoining bays, scouring of Delta channels, lowering of Delta water levels, and strains on Delta levees. These problems will worsen as exports increase.

Senate Bill 346, in authorizing construction of a Peripheral Canal and other facilities, fails to provide a guarantee that the adverse conditions now existing in the Delta will be corrected. It also fails to provide any assurance that existing conditions will not worsen as a result of the proposed program.

Rather, it is a thinly veiled attempt on the part of some to continue the chase for fresh water before its quality is degraded by ocean salinity or irrigation return flows. This continued extraction of good quality water from points farther and farther upstream results only in an expanded downstream area becoming more and more dependent on a degraded water supply.

The proponents of this bill, including some who have in the past been staunch opponents of a Peripheral Canal, would have us believe that now, for the first time, there are assurances for protection of northern California, protection of the Suisun Marsh, and protection of the Bay-Delta estuarine system. A "new direction for water development which is sensitive to environmental values" has been set out, they suggest. Such groups have now exposed themselves for what they really are: political mechanisms which play on the sensitivities of people in order to develop a political base. I, for one, refuse to acquiesce in this position.

This strictly political posture is particularly evident in the current support of the Planning and Conservation League and the Sierra Club. These organizations, which have so frequently and so critically spoken in the past of demographic concerns, particularly the need to avoid excessive concentrations of people in an environmentally sensitive air basin, now reveal their political motivation and hypocrisy by supporting water development projects that can only exacerbate the existing congestion.

These purportedly environmentally concerned organizations attempt to justify this patent inconsistency on the ground that fish habitat will be improved in the Delta. The fact remains, however, that presently no available fish screen facility exists that will provide the required degree of protection for resident or migratory fish at the Peripheral Canal intake site. Such protection has in fact never been provided at the existing Delta pumping plants near Tracy.

These organizations claim as well that protection of the Delta will be afforded by the staged construction of the Peripheral Canal. They claim that if Stages One and Two prove disastrous (and they almost certainly will), then protection would be provided by withholding approval for the construction of Stage Three. The sophistry of this argument is quite apparent. Withholding approval for the construction of Stage Three will in no way correct the damages provoked by the operation of Stages One and Two. Furthermore, the bill provides no mechanism for insuring that effective corrective measures will be taken, and it provides for no guarantees in any other form.

It has been noted that the authorization for the construction of a Peripheral Canal would proceed in three stages. The "go-ahead" for construction of the final stage rests on a determination by both the Director of Water Resources and the Director of Fish and Game that the fish screen and operational release criteria will adequately protect fish populations pursuant to a yet-to-be-executed four-party fish agreement. The capability and integrity of the present department directors and the Governor notwithstanding, I fail to see the guarantees provided when such a decision is left in the hands of political appointees, who must make their determination "pursuant to" an agreement, the contents of which have not been finalized. The highly touted four-agency fish agreement is, in its present draft form, a loosely worded document that provides little in the way of guaranteed protection.

The Department of Fish and Game has not adequately demonstrated that a Peripheral Canal can, in fact, protect the Delta

fishery. It is totally speculative. Are the projects willing to commit themselves to agreeing that if conditions do not materialize as they envision they will reverse the operation of the system and see that the previous circumstances are reconstituted? The bill is silent in this area.

The present problems in the Delta have been created by the federal government's refusal to honor the clear intent of the federal legislation authorizing the Central Valley Project to protect established beneficial uses in the Delta. The expectation that the Central Valley Project would be operated to protect these beneficial uses was shattered by the Spencer letter of 1957, however, in which the Bureau of Reclamation notified the state that it considered its obligation met when water quality was satisfactory at the Contra Costa and Tracy pumps. Accordingly, the root of the problem lies in the manner in which the Central Valley Project is operated and no effective solution can be developed until the Bureau of Reclamation reverses its position and recognizes its obligation to protect Delta water quality. It is the federal government that should act first on this matter, not the state.

The argument has been made in the Conference Committee hearings that the Peripheral Canal would save one million acre-feet of water annually. In reality the Canal would save no water at all since the water that is now being released to protect export water quality serves other valuable needs as well. Releases that are made to insure that high quality water arrives at the export pumps also insures that environmental, domestic, industrial and recreational users within the Delta and downstream from the Delta are protected. Certainly less water would be required to protect water quality at the Delta pumps, and almost just as certainly, releases that are now being made which protect these other beneficial uses would terminate as well.

The bill requires the Department of Water Resources to evaluate possible impacts of Peripheral Canal operation on the "mineral, nutrient, and biological" components of the Sacramento River. Such impacts on other channels of the Delta are not required to be evaluated. The Department is required to mitigate such adverse impacts (on the Sacramento River) "to the extent practicable." Does that offer any assurance that the operation of a canal will not adversely affect the Sacramento River, not to mention the rest of the estuary? It is also interesting to note that the bill requires absolute mitigation of adverse impacts caused by seepage but only conditional mitigation (i.e., to the extent practicable) of the adverse impacts on the mineral, nutrient, and biological components, and then only for the Sacramento River.

The time to plan for and develop water conservation and storage measures necessary to ameliorate the effects of inevitable dry years is indeed now. But, such planning should incorporate a much lengthier perspective of man and his environment and recognize the false dependencies created by the more traditional approaches to water resource management.

For example, dams and reservoirs have been constructed by using the unusual weather of this century to frame the extremes within which they have to operate. In California, the drought of the 1927-34 period serves as the guidepost. While the current, more severe drought may cause a reevaluation of those parameters, research has shown that the weather during this century is benign compared to the wide-ranging extremes of hot and cold, wet and dry, which prevailed from 1600 to 1850. If indeed our benign weather patterns are becoming more variable, as some suggest, then the need to bring our demands upon the resource into balance with its long-term availability becomes even more acute.

But, regardless of the chosen base period, because the operation of surface water storage facilities is governed by the amount of water needed during that critically dry base period (i.e., minimum project yield), and because senior water right holders may not yet be exercising the full extent of their preemptive rights, "surplus" water is available in most years. This "surplus" water is stored and utilized as if it were a permanent right, creating a false sense of security among its recipients and an unhealthy dependency on any impermanent supply. When severe droughts occur, as they always will, surface water deliveries are reduced to the preplanned minimum project yields and people are shocked that there isn't enough water to satisfy their insatiable demands. What they fail to realize, of course, is that that's just the way we planned it!

Indeed, our historical focus has been to rely on short-term statistics to develop what we erroneously have viewed as long-term solutions. We have given little emphasis to measures which would conserve our precious water resources. Our laws and institutions have encouraged users to consume excessive amounts in order to protect existing rights. And there has been little effort to manage and coordinate the use of surface and subsurface waters to provide the added flexibility that conjunctive use of these resources would allow. Senate Bill 346 proposes no substantive change in that policy.

Instead, we continue to hear the same proposals for a "permanent" solution to the ravages of drought: build more dams and create more stored water. There are some eleven such projects at various levels of the discussion stage in California. Some are proposed for authorization in Senate Bill 346. Together they would provide about 6 million acre-feet per year during the (outmoded) seven year dry cycle used to size California projects—16 percent of California's present needs. Such proposals only seek to perpetuate a river system that never was what it has been made out to be.

The total storage capacity of all groundwater basins in California, on the other hand, is some 1.3 billion acre-feet. The usable storage capacity is about 143 million acre-feet, 102 million acre-feet of which is in the agriculturally rich Sacramento and San Joaquin Valleys.

Why not utilize this enormous potential supply of groundwater to supplement the minimum project yields of surface supplies in years of drought? This alternative becomes even more attractive when it is realized that with groundwater recharge there need be no depletion of the underground reserves over time. (California's present groundwater pumping results in an overdraft of 2.2 million acre-feet per year.)

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Senate Journal

California has been hesitant to involve itself in groundwater management. The result is a fragmented, chaotic state of misuse, abuse, and nonuse of a very important resource. If the state would embark on a rational program of groundwater management, these resources could be used in conjunction with surface supplies and the existing transportation networks of the state and federal water projects to meet future demands for a long period of time.

SB 346 alludes to the potential for utilizing storage capacity of groundwater basins to meet the water needs of the state. But it envisions utilizing a mere 400,000 acre-feet per year!

A management philosophy should seek to minimize the impact of dry years, rather than attempting to contend with wet ones. At a time of crisis there is a tendency toward even more ambitious plans. But, the same crisis will occur again. Why not lay plans for muting that future event instead of planning expensive projects to reduce the risk by a small increment? The present drought is obviously serious. It is also unusual. But it is expectable on the basis of the past record. And it will occur again.

Consideration also ought to be given to the "requirements" of users in the state. Agriculture, for example, utilizes about 85 percent of the total available water supply in this state, and representatives of the industry comprise the most outspoken advocates of additional surface development, often citing as justification their "economic importance" to the state. As a business, agriculture contributes 6 percent to the state's gross annual product.

Are we convinced that agriculture ought to claim 85 percent of the total available water supply in this state and to demand it at prices that do not reflect the full cost of development?

The proper direction for our future efforts should be clear. Not only should we change our habits and lifestyles to make conservation an everyday occurrence, but we should change our laws and institutions to eliminate the disincents from a bygone era that undermine the effectiveness of our conservation programs. And we should recognize that the largest potential for improving water resource management lies in the development and the wise and efficient utilization of our groundwater reserves, where the vagaries of the weather can to a large extent be neutralized.

We ought to be willing to commit ourselves to develop the most efficient means of utilizing and reusing the resource. We ought to recognize the real costs and benefits associated with alternative usage patterns, insure that user groups pay their full fair share of the costs, and include a guarantee of environmental protection.

The fact that groundwater supplies that could now be used to irrigate crops are not available because they were squandered in the past ought to provide an incentive to develop the facilities and operational procedures necessary to insure that water will be available in the future—drought or no drought. And, the fact that trees and vines were planted that cannot now be sustained because the "surplus" surface water supplies upon which they depend for survival are not now available ought to convince us not to become dependent on that which is by definition (and reality) temporary.

It is clear that we have overdrawn our bounty.

Starkly before us is the history of a fresh water river system that extended to San Francisco Bay 150 years ago, with average annual fresh water flows of 33 million acre-feet. During years of average precipitation agricultural and other upstream development in the interior valleys and in the Delta not dependent on the State or Federal projects will have claimed 5.6 million acre-feet (17%) by 1990. The Federal Central Valley Project will take 10 million (30%), of which 4.2 million (13%) will be exported directly from the Delta. The State Water Project will export 3.3 million (10%). San Francisco and East Bay communities will lay claim to another 0.5 million (1.5%). An additional 1.1 million will have been imported into the Sacramento Valley from another watershed on California's north coast. Only 11.4 million acre-feet (34%) will flow through the Delta and Bay as outflow.

These are the estimates for 1990. As the export projects reach their planned limits and as upstream use continues to increase, the amount flowing through the Delta and Bay as outflow will continue to be reduced.

The estimates, too, are for an average year. But the average year is not a consistent year and we have seen what happens when the natural supply is diminished because of drought.

In the 1976-77 water year the river system provided only 7.9 million acre-feet. Agricultural and other upstream users in the interior valley took 21 percent (1.7 million acre-feet). Consumptive users in the Delta took 21 percent (1.7 million acre-feet). The Central Valley Project took 16 percent (1.3 million acre-feet) for export south of the Delta and the State Water Project exported another 10 percent (800,000 acre-feet). The Bay Area communities took 5 percent (1.7 million acre-feet). Delta outflow comprised only 25 percent (2 million acre-feet) of the total flow. Of that 2 million, 1 million consisted of carryover storage of previous year's precipitation. The "natural" outflow from precipitation that fell within the Sacramento and San Joaquin basins in 1977 was therefore only 1 million acre-feet.

The state and federal projects speak so blithely of having taken deficiencies in this year of drought. Yet they claimed 26 percent of the river for export from the Delta. Even in an average rainfall year in 1990 they seek to claim 23 percent.

From the "inexhaustible" Sacramento-San Joaquin River system and its flow of fresh water into San Francisco Bay we have come to a circumstance of temporarily closing channels through which fresh water historically flowed westward to the Bay in an attempt to prevent the salt water of the Bay from entering the Delta. The normal river flow of some 33 million acre-feet was reduced to a mere 3 percent of its former self.

To offset in part that excessive demand on a limited and obviously variable river system we have built over 1,200 dams and reservoirs which store about 39 million acre-feet of water. Of these, 141 have storage capacity between 10,000 and 100,000 acre-feet, 45 between 100,000 and 1,000,000 acre-feet, and 10 have a capacity greater than 1,000,000 acre-feet. Most of the larger projects are on streams in the Central Valley.

With two consecutive years of less than normal precipitation it should be clearly evident to all that no conceivable surface storage system can guarantee continuous water availability to meet the demands we have placed on the system and on the Delta.

The cry to build more dams and reservoirs (if all were built) would provide only about 6 million acre-feet per year, adding less than one-fifth of the historical normal year's flow.

What is to be the division of this scarce supply of water in future years of below normal precipitation and increasing demands? Will it be the river system (and those dependent upon it) that continues to bear the brunt of the burden? Or, do we have the courage in wet years to let a surplus water supply flow by to maintain the river, using it only as a true temporary supply which cannot be counted upon each year? And are we willing in dry years to respect commitments made to environmental needs—when the needs and threats of permanent damage to the ecosystems involved are greatest?

These are not hard questions. If we have learned anything during the past 150 years the answers ought to be clear. The present dry spell has only served to underscore parochial attitudes that are working against the orderly development of water for California. The Sacramento-San Joaquin River System never was what it was made out to be. Its supplies are limited. The in-basin needs and the out-of-basin export needs cannot all be satisfied by this one source. Isn't it time to recognize this reality?

The current years of low precipitation bring clearly into focus the circumstances of water availability in California and the demands that have been imposed upon that resource. It is a history of transition from incredible abundance to abject want. It is a mirror of a finite world for all resources that should give us the beginning, at least, of an understanding of the past, and enable us to better plan for the future.

It is incumbent on us all to fully understand the real plight of the water resources in this state, as well as the factors that have contributed to the unfortunate position in which we find ourselves—floundering uncertainly in the face of a crisis we knew would occur, and indeed probably caused.

Those who profit from the exploitation of water now find themselves without the resource to meet even present commitments. Even in normal years, the operation of the Delta pumping plants results in increasing saltwater intrusion. As this reverse flow condition causes a decline in interior Delta water quality, export water quality degrades as well. To prevent such degradation, the exporters now seek to go farther upstream to secure higher quality water for the pumping intake. The Peripheral Canal is a means to achieve this purpose. Once interior water quality is no longer a concern of those who are exporting water from the Delta, downstream users will no longer have this built-in insurance against seawater intrusion. Having first claim to river flows at the Peripheral Canal intake, downstream water quality would no longer be a concern to the water exporters.

Exclamations of concern over Delta water quality in the form of release requirements to meet water quality standards are hollow indeed when we recognize that shortages of water will inevitably occur. In those periods of crisis the insatiable demand for water by those who have grown dependent on an unreliable source will undoubtedly effect the removal of those legislative trappings that purport to give Delta water quality a higher priority.

It is obvious to me from the recommendations of the Conference Committee, that the proponents of Senate Bill 346 have failed to deliberate those facts or to learn these lessons.

JOHN A. NEJEDLY

January 27, 1978

ASSEMBLY MINORITY REPORT ON SB 346

January 27, 1978

Senator Ruben Ayala, Chairman

Joint Conference Committee on SB 346

Dear Senator Ayala: Contained herein are the principal reasons that I declined to support the Conference Committee Report on SB 346.

First, the Peripheral and the Mid-Valley Canals are desperately needed by San Joaquin Valley farmers. I believe that the conditions in the bill that must be met prior to the construction of these canals are too restrictive. For example, I do not believe that it is appropriate for a few Delta water agencies to have the ability to prevent construction of the Peripheral Canal by refusing to sign water supply contracts with the state and federal governments. I believe the effect of these restrictions in SB 346 may reduce the probability that the Peripheral and Mid-Valley Canals will be constructed.

Secondly, I believe that the provisions authorizing the release of water stored in reservoirs for fish and wildlife in San Francisco Bay should be clarified. I should note that I do not disagree with protecting major fish and wildlife species at historical levels in the Delta and Suisun Marsh. Unfortunately, the provisions in SB 346 simply specifies that water is to be released to protect in the Delta, the Suisun Marsh, and the San Francisco Bay. Thus, this very general section could result in substantial quantities of reservoir stored water being released for some relatively minor fish and wildlife enhancement in the San Francisco Bay when such waters would in fact be substantially more valuable in producing economically priced food.

I believe that the Conference Committee's amendments make substantial improvements in the bill.

I would also like to express my appreciation to you and to the other members of the Conference Committee who have been gracious enough to hold six long hearings in the different parts of the state in order to receive input from the water community and the public on this very important bill. You and the other members of the Committee who have supported SB 346 have sincerely tried to work out the controversial portions of the bill. I appreciate your great efforts and your willingness to work with those who opposed SB 346.

Sincerely,

GORDON DUFFY

CORRESPONDENCE WITH LEGISLATURE ON SB 346

SUMMARY OF SUBJECTS

From the Department of Water Resources

- A-17. *Gualco, August 4, 1977.* Subject: Answers to specific questions.
Question 1. Completion date and costs of SB 346 facilities.
2. Inflation rates used to determine costs.
3. Sharing costs, SWP and CVP.
4. Financing facilities.
5. Effect of SB 346 on cost of water.
6. Cost and availability of water to MWD service area.
- A-19. *Gualco, August 11, 1977.* Subject: Answers to specific questions.
Question 1. Demand through 2000, SWP.
2. Yield proposed plan through 2000, SWP.
3. Capital expenditures and sources of funds existing SWP.
4. Capital requirements (State share only) proposed facilities to 2000.
5. Financing by California Water Fund.
6. Interest costs of Cottonwood Project.
7. Inflation rates used in financial analysis.
8. Source of additional capital.
9. Why existing SWP cost more than \$1.75 billion.
10. Financing SWP from California Water Fund vs. revenue bond.
11. Project acre-foot cost of operation, maintenance, power and replacement.
12. Availability of water to Southern California.
13. Reimbursement of "enhancement" of Delta water quality, fish, wildlife, and recreation and historic upstream depletions.
14. Availability of Tidelands funds for SWP.
15. Cost of benefits to area of origin.
16. Cost of water from and other questions concerning the Mid-Valley Canal.
17. Revenue bonds for State-constructed Mid-Valley Canal.
18. Lands in Mid-Valley area administered by the Resources Secretary.
19. Additional SWP facilities after 2000.
20. Share of SB 346 facilities costs between property taxes and water charges.
21. Repayment of federal share of Peripheral Canal cost.
22. Federal construction of Sites Reservoir.
23. Ground water level in Mid-Valley Canal area.
24. Interim Suisun Marsh facilities.
25. Permanent Suisun Marsh facilities.
26. County of origin payment for water developed by SWP.
27. Water for Mid-Valley service area.
28. Development of yield for Mid-Valley Canal by State.
29. Yield remaining in Central Valley after SB 346 facilities are developed.
30. Contractors receiving SWP yield.
31. Delta outflow requirements in Kelley and Tippets report.
32. Meeting requirements from Question 31.
33. Unimpaired Delta outflows.
34. Actual Delta outflows.
35. CVP costs and power requirements, SB 346 facilities.
36. Application of 160-acre limitation to Delta.
- A-40. *Gualco, August 31, 1977.* Subject: Effect on financing of future facilities included in SB 346 if Tideland oil revenues are reduced.
- A-41. *Perino, August 31, 1977.* Subject: Peripheral Canal concerns.
Question 1. Possible seepage impacts.
2. Costs to San Joaquin County for policing recreation areas.

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- A-43. *Cline, September 1, 1977.* Subject: Conservation of Delta outflow with Peripheral Canal in operation vs. present operation.
- A-44. *Gualco, September 2, 1977.* Subject: Answers to a series of questions and general comments on the Department's efforts in studies leading to SB 346.
Question 1. Delta salinity intrusions under future export levels.
2. Water available to SWP by year to year 2000 with SB 346 and existing facilities.
3. SWP water available to Southern California by year to 2000.
4. Meeting water demands of SWP and risks of shortages in 1990 and 2000.
5. Cost of water per acre-foot to MWD each year through 2000.
6. Comparison of yields of Peripheral Canal and the two alternatives.
7. Mitigation of possible flood control problems from Peripheral Canal.
8. SWP-CVP additional yield required above the November 19th criteria to meet D-1379 or D-1379 plus Four-Agency Agreement.
9. Determination of nonreimbursable costs of improved Delta water quality.
- A-47. *Statham, September 23, 1977.* Subject: Answers to questions raised.
Question 1. Increased summer flow in Sacramento River with Glenn Reservoir in operation.
2. Protection of people of Elk Creek whose property will be required by the project.
- A-48. *Boatwright, October 26, 1977.* Subject: Possible water savings through agricultural water conservation.
- A-48. *Ayala, November 18, 1977.* Subject: Explanation of USBR "CVP Committed Water".
- A-50. *Gualco, November 25, 1977.* Subject: Cost of and additional yield from the Eel River development.
- A-51. *Statham, December 2, 1977.* Subject: Answers to specific questions.
Question 1. Contracts for storing water underground.
2. Description of Rand Study.
3. Compensation to property owners displaced by a water facility.
4. Increased summer flows on the Sacramento River with SB 346 facilities.
- A-52. *Ayala, December 8, 1977.* Subject: Answers to specific questions.
Question 1. Surplus water to San Joaquin County in 1980.
2. Amount of CVP-SWP export water from storage.
- A-52. *Nejedly, December 12, 1977.* Subject: Information requested for the Stockton meeting of the Joint Conference Committee.
Subject 1. Delta export pumping capacity of both the State and federal projects.
2. Capacity of SWP and CVP to export water before it reaches the Delta.
3. Projections of year 2000 deliveries of both projects under 1 and 2 above.
4. Basis for using the historic critical period (1927-34) for water project yield studies.
- A-54. *Ayala, December 13, 1977.* Subject: Supplemental information on Eel River development proposal made by the Sacramento Valley Landowners Association at the December 2, 1977 hearing in Redding.
- A-55. *Johnson, December 13, 1977.* Subject: Response to specific questions.
Question 1. Increase cost to CVP and SWP contractors of SB 346.
2. Increase cost to Delta beneficiaries of SB 346.
3. Comparison of sacrifices that could result from a drought.
4. Feasibility of Peripheral Canal with respect to Delta outflows and who pays for the canal.
5. Support of CVP and SWP Delta water quality criteria versus water contracts during dry periods.
6. Who, other than Delta interests, benefits from SB 346?
7. Meeting water quality in the Delta in 1976 if 1977 is a worse year.
- A-56. *Ayala, December 16, 1977.* Subject: Analysis of Kern County's suggested amendment No. 7 to SB 346 which would permit DWR to construct State-only Peripheral Canal.
- A-59. *Ayala, December 20, 1977.* Subject: Analysis of the report of the federal General Accounting Office on the California Drought of 1976-77.
- A-62. *Duffy, December 22, 1977.* Subject: Analysis of the Jim Provost statement on behalf of the Dudley Ridge Water District made at the Fresno, November 21, 1977, hearing of the Joint Conference Committee.
- A-66. *Ayala, January 3, 1978.* Subject: Transmittal of comments on the Kern County Water Agency statement on the effect of SB 346 on SWP financial integrity.
- A-68. *Ayala, January 4, 1978.* Subject: Rebuttal to statements made by Mr. H. C. Niesen of the Elk Creek Grange No. 441 at the December 2, 1977, hearing of the Joint Conference Committee on SB 346 held in Redding.

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- A-70. *Gualco, January 25, 1978.* Subject: Analysis of Mr. Jerry Dibble's letter of November 30, 1977, on the capability of the SWP.
- A-70. *Gualco, February 9, 1978.* Subject: Use of the Delta Mendota Canal and California Aqueduct to deliver Eel River water to the San Joaquin Valley.

From the Department of Fish and Game

- A-71. *Gualco, September 2, 1977.* Subject: Response to specific questions.

Fish Screens—

- Question 1. Effectiveness of fish screens developed to date.
2. Characteristics of a satisfactory fish screen.
3. Development of a proper fish screen in time for placement in the intake of the Peripheral Canal.

Delta Fishery—

- Question 1. Relative health of the Delta fishery as compared to historical Delta fishery.
2. Protection afforded by the Four-Agency Fish and Wildlife Agreement.

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STATE OF CALIFORNIA RESOURCES AGENCY

DEPARTMENT OF WATER RESOURCES

P.O. Box 300
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EDWARD G. BROWN, Jr., Governor



August 4, 1977

Honorable Eugene Gualco, Chairman
Assembly Committee on Water, Parks,
and Wildlife
State Capitol, Room 2016
Sacramento, CA 95814

Dear Gene:

Your letter of July 11, 1977, requested cost information on the facilities included in SB 346. We have previously provided Clyde MacDonald with a copy of the preliminary financial analysis which we performed for our Delta Alternatives package. While SB 346 changes the picture slightly, we are basing our answers on the previous analysis, with some adjustments. We plan to revise the financial analysis and make it a part of the final Delta report, but it would not be available to your Committee in time.

The following are our responses to your questions.

Question 1: "What are the tentative completion dates for these facilities and what are the expected costs in 1977 dollars?"

Response: The tentative completion dates for the features in SB 346 are shown in Table 1 (attached), along with the estimated costs in 1977 dollars.

Question 2: "What construction inflation rate is assumed? Assuming this inflation rate, what will be the actual dollar costs for each of these completed facilities?"

Response: The assumed inflation rate is 6 percent annually. The escalated costs are shown on Table 1.

Question 3: "What are the expected state shares of the costs of the various facilities in 1977 prices? What are the expected state shares of the actual dollar costs for each of these completed facilities?"



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Response: The facilities in SB 346 are considered to be additional conservation facilities (except the East Branch Enlargement and Mid-Valley Canal). As conservation facilities, the costs would be reimbursed through the SWP Delta Water Charge. Each contractor's charge is determined by using the Delta Water Rate which is the same for each contractor, without regard to the location of the service area. The costs of conservation facilities are included in the Delta Water Rate calculation in the year that construction of the facility commences. The present Delta Water Rate for 1977 is 19.40 per acre-foot, which includes the estimated costs of a Delta transfer facility (Peripheral Canal) because the water supply contracts define facilities which transfer water across the Delta as "initial" conservation facilities rather than "additional" conservation facilities. The estimated cost of the Canal accounts for approximately \$3.60 per acre-foot of the present Delta Water Rate.

The following table summarizes the increase in Delta Water Rate for each additional facility and the year it would affect the rate. These increases are a measure of the cost of the additional facilities but do not necessarily provide the added cost to the user over what would be paid if no further facilities were constructed.

EFFECT OF SB 346 FACILITIES ON COSTS OF WATER

Facility	Year in which : Delta Water Rate*			
	Facility Costs: Capital	: Minimum	: are Included	: Component: OMPSR
	: In Rate	: \$/AF	: Component: \$/AF	: \$/AF
Existing facilities and Peripheral Canal	1977	7.86	1.54	9.40
Relocate Contra Costa Canal and Suisun Marsh Protection	1979	8.19	1.55	9.74
So. Calif. Ground Water and San Joaquin Ground Water	1981	10.72	2.85	13.57
Los Vaqueros Reservoir	1984	12.20	2.93	15.13
Glenn Reservoir	1986	16.26	3.47	19.73
Cottonwood Reservoir	1987	16.95	3.77	22.72

*Values are discounted to 1976 at the present project interest rate of 4.46%.

In 1976 the average total cost of SWP water, based on entitlement water scheduled to be delivered and payments made to the State, was as follows:

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Response: The expected state share of these costs is shown on Table 1.

Question 4: "From what sources and in what amounts will come the state financing expenditures listed in Question 3 above?"

Response: The financial analysis is based on approximately \$3,420 million of capital expenditure as shown in Table 1. We assumed that the Cottonwood Creek Reservoir would be constructed and financed by the U. S. Corps of Engineers and the State would repay its share under the Water Supply Act of 1958. The payments, with interest, would be made over a 50-year period, beginning when the project is complete. In determining how the project might be financed, a total interest cost of \$800 million for the Cottonwood Creek Reservoir was also assumed as a capital expenditure for a total of \$4,220 million.

In order to include the repayments to the Federal Government for Cottonwood, the financial analysis for the facilities covered the period from 1977 through 2035. These capital expenditures were assumed to be financed as follows:

	(in millions)
California Water Fund	3,100
Supplemental Revenue Bonds	700
Miscellaneous Receipts	250
"General Obligation Bonds	167
	4,217

*The portion of General Obligation Bonds reserved (offset) for construction of additional facilities in Northern California watersheds as provided in Section 12938 of the California Water Code.

The financial analysis did not include the \$10 million annual appropriation that is included in SB 346. This appropriation should reduce the amount of supplemental revenue bonds needed; the exact amount would depend upon how many years the SWP received the annual appropriation.

Question 5: "How much will these facilities add to the cost of water in the six major service areas of the project: Feather River, North Bay, South Bay, San Joaquin, Central Coast, Southern California? Please specify the present cost per acre-foot and the added cost due to the SB 346 facilities and the OMPR of the water developed by these SB 346 facilities."

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South Bay Area	\$38/AP
San Joaquin Valley Area	\$26/AP
Southern California Area	\$120/AP

These rates represent the current Delta Water Charge and all transportation costs.

Question 6: "What is the average cost per household of water delivered in the Metropolitan Water District service area and how much will the average cost increase as a result of the capital and OMPR of the SB 346 facilities? How much water will SB 346 make available for the MWD service area and what percentage increase does this represent?"

Response: The Metropolitan Water District of Southern California (MWD) includes 27 different water agencies. Many of these agencies have several other sources of supply and the charge for water delivered to the various consumers is based on a melded cost.

Following are typical present costs of water to consumers located in the MWD service area.

City of San Diego	\$177/AP
City of Fullerton	\$158/AP
City of Anaheim	\$124/AP

Since the transportation facilities for the SWP (California Aqueduct) have been essentially completed and the present costs are based on today's power costs, the increase in charges to MWD resulting from SB 346 facilities is approximately equal to the increase in Delta Water Rate (\$22.72 - \$9.40 = \$13.32/acre-foot). This represents an 8 to 11 percent increase.

The following table indicates the estimated increase in water available to the MWD service area between 1980 and 2000, resulting from the completion of facilities included in SB 346.

	(1,000 acre-feet/year)
1980	2000
Requests for entitlement water	882
Less Net Conservation and Waste Water Reclamation Oosel	- 62
TOTAL	820
Increase in supply 1980-2000	472
1 Increase in supply 1980-2000	581

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If your Committee needs further information related to SB 346 facilities, we will be pleased to provide it. I will also be pleased to discuss our responses with you or Mr. MacDonald.

Sincerely,

/s/

Ronald B. Robie
Director

Attachment

TABLE 1
Program Costs
\$ Millions

Facility	Assumed Completion Date	SB 346 FACILITIES		
		SWP & CWP Costs 1977 Values	Escalated/ Calculated Values	Assumed State Share Values
Cottonwood Creek Reservoir	1989	320	492	224
Glenn Reservoir-River Diversion Peripheral Canal	1993	1,160	3,588	580
Stage 1 and 2	1984	315	415	158
Stage 3	1988	200	352	100
Relocate Contra Costa Canal	1984	16	23	8
Suisun Marsh Protection Facilities	1984	42	58	12
S. Delta Water Quality Improvement Worka	1984	25	42	21
Enlarge E. Branch Calif. Aqueduct	1987	120	186	120
So. Calif. Ground Water	1987	120	202	120
San Joaquin Valley Ground Water	1987	120	181	120
Los Vaqueiros Reservoir	1986	549	1,034	135
Mid-Valley Canal	1986	394	598	0
TOTALS		3,375	7,161	1,599
				3,412

✓ Escalated through construction period at 6 percent per year.

2/ Based on new estimate dated 7/22/77.

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ROBERT G. BROWN, Jr., Chairman

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August 11, 1977

Honorable Eugene Gualco, Chairman
Assembly Committee on Water, Parks,
and Wildlife
State Capitol, Room 2016
Sacramento, CA 95814

Dear Gene:

Your August 8, 1977, letter asked a number of questions regarding the provisions of SB 346. While I responded to some of these at your Committee hearing on August 9, 1977, here are our written responses which I promised to provide by the continuation of the Committee hearing on Friday, August 12, 1977.

We are basing answers to financial questions on the preliminary financial analysis which we performed for our Delta Alternatives package. As stated in our August 4, 1977, letter to you, SB 346 changes the picture slightly and we will, of course, revise the financial analysis for the final Delta report.

The following are our responses to your questions.

Question 1: What is the projected demand of the State Water Project for each year through the year 2000?

Response: The following tabulation shows the projected demand of the State Water Project through the year 2000 in thousands of acre-feet.

Year	Contractor Requests for Entitlement Water/ ¹	DWR Goal for Water Conservation and Waste Water Reclamation ² /	Projected Demand
1978	1,831	36	1,795
1979	1,900	60	1,840
1980	2,005	86	1,919
1981	2,155	112	2,046
1982	2,260	136	2,144
1983	2,377	160	2,217
1984	2,458	188	2,270
1985	2,539	214	2,325
1986	2,690	238	2,452
1987	2,826	260	2,566
1988	3,053	290	2,763
1989	3,264	320	2,944
1990	3,479	342	3,137
1991	3,528	370	3,158
1992	3,570	394	3,182
1993	3,623	421	3,202
1994	3,670	443	3,227
1995	3,714	470	3,244
1996	3,783	498	3,245
1997	3,772	522	3,250
1998	3,801	549	3,252
1999	3,830	572	3,258
2000	3,859	600	3,259

¹/ Includes minimal allowance for waste water reclamation and water conservation. Does not include transportation losses.

²/ DWR target goal for waste water reclamation and water conservation is 700,000 acre-feet in year 2000. This column represents the net reduction after allowing for amounts already included in contractor requests.

Question 2: What is the projected yield of the State Water Project through the year 2000 under the proposed plan?

Response: The projected firm Delta export yield of the SWP would depend on the Delta water quality criteria and the sharing of Delta outflow requirements with the CVP. In the proposed Delta alternatives plan, assuming the draft Pour-Agency Fish Agreement and Basin Plan agricultural Delta water quality requirements and sharing based on the annual CVP-SWP Coordinated Operation Agreement,



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the yield of the SWP would be about 4 to 4.1 million AF per year in year 2000. This estimate was derived as follows, in MAF:

Present system with Peripheral Canal and planned additional pumps at the Delta P. P.	2.9 to 3.0
Ground water storage south of the Delta	0.4
Cottonwood Creek Project	0.15 to 0.20
Los Vaqueros, 25% & 0.16	.04
Glenn Reservoir, 50% & 1.0	0.5
Total, approximately	4.0 to 4.1

These estimates are based on capability during the 1928-34 historic critical dry period. We usually allow about 0.2 MAF/year for SWP squadcast conveyance losses and recreation, so the delivery potential for SWP contractors would be 3.8 to 3.9 MAF per year.

Question 3: How much money has been invested in capital features of the State Water Project to date? From what sources has the financing been obtained and in what amounts?

Response: As of January 1, 1977, capital expenditures and sources of financing for the SWP are as follows: (in thousands of dollars)

Capital Expenditures (including Davis-Grunsky Act Program)	\$2,443,762
Financed by:	
General Obligation Water Bonds (Burns-Porter Act)	\$1,552,584
California Water Fund	280,786
Oroville Revenue Bonds	244,995
Devil-Canyon Coastal Revenue Bonds	72,438
Miscellaneous Receipts*	267,039
	\$2,443,762

*Miscellaneous receipts are derived from payments and appropriations as authorized by a variety of special contracts, cost sharing agreements, and legislative actions concerning the SWP. These were primarily comprised of:

- a) Federal flood control contributions;
- b) Appropriations for Capital Costs allocated to recreation from tideland oil and gas revenues;
- c) Appropriations prior to the Burns-Porter Act;
- d) Investment earnings on unexpended miscellaneous receipts; and
- e) City of Los Angeles payments for Coastal Power Development.

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Question 4: Describe the capital requirements of each of the proposed facilities (states share only) in each year through the year 2000. Describe the capital sources and amounts necessary to finance the state share for each year through the year 2000.

Response: The estimated annual financial requirements for each of the facilities and the total annual requirements are shown on Attachment 1. Also shown is the assumed financial sources for the total annual capital requirements.

Question 5: Your letter of August 4, 1977, shows a capital cost of \$3.412 billion as the assumed escalated state share through the year 2000. Your response to question 4 of the letter states that the interest cost of Cottonwood would be capitalized at \$800 million, bringing the total to \$4,217 (\$4,212) billion from the period 1977 through 1935 (2035). While the capital requirements rely very substantially upon the California Water Fund, it is not clear how such substantial amounts would be available from the California Water Fund in order to construct facilities that are to be completed by the year 2000. Please describe how this can be accomplished.

Response: A basic assumption of the financial analysis is that the appropriations to the California Water Fund (CWF) will be available to the Department indefinitely in the full annual amounts now provided for by the law. Also, the Department expects that transfers to the CWF to be derived from project revenues in excess of operating costs and Water Bond service, would be available for financing future capital expenditures. The use of CWF monies includes both the annual \$25 million appropriation and the expected transfers of project revenues for capital expenditures.

It is true the SB 346 facilities are assumed to be constructed before 2000, but as was stated in the letter of August 4, 1977, the payments for Cottonwood Creek Project would extend for 50 years. Therefore, the source of financing (i.e., CWF) to meet these payments extends until 2035.

Question 6: Please describe the justification for including the interest cost of Cottonwood as a capital expenditure.

Response: In general terms, the expenditures of the State Water Project can be categorized into the following:

1. Capital Expenditures
2. Operation, Maintenance, Power and Replacement (OMP&R)
3. Bond Service

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Expenditures 2 and 3 are paid with revenue derived from the State Water Resources Development System (primarily payments from SWP water contractors), and this revenue is only for the uses described in California Water Code 12937(b), which does not include capital expenditures. The only interest expense that can be paid from this revenue is for the Water Resources Development Bonds. Since the Cottonwood interest expense is not included in this category, it was assumed as a capital expenditure and financed as such. Payment to the Federal Government under the Water Supply Act of 1958 includes both capital and interest costs allocated to water supply by the Federal Government.

Question 7: Your financial analysis assumed an interest (inflation) cost of 6% per year. On what basis do you believe that this is appropriate? How sensitive are your estimates of needed capital costs to the assumed interest rate? In other words, how much more capital would you need if the assumed interest rate were some specified amount higher?

Response: The Department evaluates the possible effect of future inflation each year in its planning process. The latest guideline concerning escalation rates is included as Attachment 2 to this response. For simplification, the preliminary Delta Alternative financial analysis assumed a flat 6 percent rate as opposed to breaking the costs into categories as shown on the attached sheet.

In response to the second part of the question, it would be impossible to determine a sensitivity factor for inflation without actually performing several financial analyses at various escalation rates. This has not been done by the Department. In general, if inflation is higher than assumed, capital costs will increase and the need for financing will increase, primarily the need for supplemental revenue bonds will be higher.

Question 8: If additional capital amounts are required, how do you propose to raise such additional capital?

Response: The Department assumes that any financing needed for capital expenditures above and beyond all presently authorized sources would be met with supplemental revenue bonds to be issued under the authority granted to the Department under the State Central Valley Project Act. These bonds are assumed to be supported by contractor revenue and would require supplemental contracts with the SWP contractors, similar to the Devil Canyon-Castaic contracts.

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Question 9: Why has the capital cost of the State Water Project been so much more than the \$1.75 billion authorized by the voters?

Response: It was not intended that the \$1.75 billion authorized by the Burns-Porter Act would be sufficient to cover the entire cost of the State Water Project. Water Code Section 12931 states that "The object ... is to provide funds to assist in the construction The original cost estimates did not anticipate the huge escalation of costs due to inflation since 1959. Also, the \$1.75 billion did not include estimated costs of additional facilities to augment the yield of the project. Most of the facilities in the Delta Alternatives Program fall into this category. The Burns-Porter Act provided that \$130 million be used for Davis-Crunkin loans and grants. This further reduced the amount available for construction of the project.

Question 10: Why should the project be financed from the California Water Fund as opposed to revenue bonds?

Response: Ever since 1956, it has been the policy of the State for a portion of tidelands oil revenues to be used for water development. Part of the philosophy was that one natural resource was to be used to develop another natural resource. The Burns-Porter Act, which was approved by the people, appropriated the then existing California Water Fund for construction of the State Water Project. Although revenue bonds have been issued for power facilities and are expected to be used for certain additional facilities, this method of financing is complex and expensive. The bond issuance expenses are high and the interest rate is higher than General Obligation Bond financing. If the California Water Fund were not used, it is questionable as to whether the Department could market sufficient revenue bonds to cover all of the State Water Project construction costs to the year 2000.

Question 11: Question 5 of the letter requested the present cost per acre-foot and the added cost due to the SB 346 facilities and the OMP&R of the water developed by these SB 346 facilities. Your letter did not include the cost of the OMP&R. Please provide this information.

Response: As stated in my letter of August 5, the rates represented included the current Delta Water Rate and all transportation costs. The Delta Water Rate includes operation, maintenance, power, and replacement (OMP&R) costs for conservation facilities. Transportation costs also include OMP&R for transportation facilities.

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Question 12: Question 6 requested a percentage increase of water which will be made available for the MWD service area. Your answer provided the increase in water supply to MWD and not to the MWD service area. Please provide this information.

Response: We assume that you are referring to the entire Southern California area. The following table indicates the estimated increase in water available from the SWP in the Southern California area to MWD and other contractors between 1980 and 2000, resulting from the completion of facilities included in SB 346.

	(1,000 acre-feet/yr)	1980	2000
Requests for entitlement water from SWP for Southern California area	1098	2161	
Less Net Conservation and Waste Water Reclamation Goal	<u>-77</u>	<u>-527</u>	
Totals	1021	1634	
Increase in Supply 1980-2000	613		
% Increase in Supply 1980-2000	60%		

Question 13: The bill transfers money away from the COPHE Fund in order to reimburse the project for the construction costs of the added facilities as allocated by the Department to provide for water quality, fish, wildlife, and recreation in the Delta and to compensate for historic upstream depletions. The problem in this area has always been how to define "enhancement". Please provide the detailed description of how you intend to make the necessary calculations.

Response: In lieu of making a determination of the "enhancement" aspects of the proposed facilities, the Department has estimated the benefit to the Delta as being measured by the additional yield required above a basic requirement of 1,000 acre-feet/acre-mile at Emerton. Based on this criteria the State's share of the yield of the Delta facilities was estimated to be about 900,000 acre-feet. On today's anticipated criteria, the State's share is about 500,000 acre-feet. The difference of 400,000 acre-feet is the amount of yield (or benefit) being utilized for Delta purposes. By estimating the costs of a facility that would meet both Delta needs (.4 MAF) and project needs (.4 MAF) and allocating by proportionate use (400,000 acre-feet of a 1.3 MAF facility), it is estimated that the 1.3 present worth value of the Delta's share of such a facility is about \$230 million.

Honorable Eugene Gualco
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Question 14: What are your estimates of the availability of funds for the State Water Project from State Lands Commission revenue (tidelands oil monies) through time? What would be done to raise the necessary capital for the project if state lands revenues were not adequate?

Response: The State Lands Commission has provided an estimate of tidelands oil revenues for the next five years to 1981 (see schedule in Attachment 3). We have not been provided estimates beyond that time.

Our financial analyses also show that substantial amounts of project revenues will flow to the California Water Fund after about 1985 and will be available for construction of the project. One hundred sixty-seven (167) million dollars of General Obligation Bonds are reserved for certain additional facilities and we expect to receive significant amounts of federal participation in certain facilities, such as the Peripheral Canal. To the extent that these sources of funds are not adequate, we plan to issue (State) Central Valley Project revenue bonds.

Question 15: Decision 1379 appears to have established the principle that project operators would be required to provide certain benefits to the areas of origin as a condition of exporting water from those areas. The Board's decisions 1400 and 1422 have appeared to support establishment of this principle. In essence, it appears that these decisions have required the "payment" of a "transfer tax" from the water developer to the area of origin. The provision of the additional \$10 million of nonreimbursable moneys for Delta benefit appears to reestablish the principle that the cost of water is the cost to take it and there will be no transfer tax from the developers to the area of origin. Do you believe that water developers should provide benefits to the area of origin?

Response: We do not believe the provision of Delta outflow can be described as a "transfer tax" for exporting water. The consideration of non-reimbursable project costs in SB 346 is based on the fact that many prior appropriations of water above the Delta (such as the City of San Francisco, East Bay Municipal Utility District, Placer County Water Agency, etc.) have depleted Delta inflows which, at times, must be replaced with water from SWP storage to meet water quality standards, and that the cost of providing such replacement water should be generally based.

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Question 17: If the Mid-Valley Canal is constructed by the state with water provided by the Central Valley Project, please provide the following on a per acre-foot basis:

- a. What is the cost of upstream water developments per acre-foot from CVP?
- b. What would be the allocated cost per acre-foot of the Peripheral Canal, assuming state financing?
- c. What is your estimate of the allocated capital costs for charge for conveyance from Clifton Court to the Mid-Valley Canal intake?
- d. What is your estimate of the capital costs of the Mid-Valley Canal per acre-foot?
- e. What is your estimate of the OMP&R of the upstream water developments?
- f. What is the OMP&R of the Peripheral Canal?
- g. What is the OMP&R of the transfer of water from Clifton Court to the Mid-Valley Intake?
- h. What is the expected OMP&R of the Mid-Valley Canal itself?
- i. What is the total expected cost per acre-foot for Mid-Valley Canal water?

Response: The Mid-Valley Canal is a proposed federal project and it is not the Department's intent to take over the project. DWR has, however, been working with the Bureau of Reclamation on project formulation and environmental considerations and on ways of assuring that the water from the project is used to offset present ground water overdraft.

The possibility of the State building the project and wheeling CVP water to this area was put in SB 346 at the request of potential service area representatives to provide for timely completion should federal authorization or funding not be forthcoming. Consequently, all of the specific information you requested has not been developed by DWR. However, construction by the State would be contingent upon execution of appropriate contracts with project beneficiaries and USBR such that the State would recover all costs, with interest. Because this water would be used to offset present ground water overdraft rather than initiating new uses, unit costs of water would likely be balanced with local costs of continuing overdrafting the ground water or

Honorable Eugene Gualco
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the local agencies would not enter into contracts. Financing would probably be obtained through issuance of revenue bonds on these repayment contracts. Specific information currently available is listed below.

- a. In planning the Mid-Valley Canal, we understand USBR is using \$5.00/AF (\$1.50 capital and \$4.00 OMP&R) for the cost of water at the Delta from CVP.
- b. Costs would not be directly chargeable to the Peripheral Canal as the federal share would be handled as discussed under operation 21.
- c. The approximate cost to convey water from Clifton Court to the Mid-Valley Canal intake is estimated to be \$2.50/AF.
- d. Unit capital cost of water for the Mid-Valley Canal depends on a cost allocation which we understand from USBR is not yet available.
- e. OMP&R costs of CVP upstream development is included in the \$5.50/AF as noted in (a) above.
- f. OMP&R of the Peripheral Canal would probably be part of the CVP cost of water at the Delta as noted in (a) and (d) above.
- g. The estimated OMP&R cost of transporting water from Clifton Court to the Mid-Valley Canal intake is about \$1.00/AF.
- h. OMP&R costs for the Mid-Valley Canal were estimated to be about \$3.7 million per year by USBR in 1975.

- i. We understand that USBR is estimating that the cost of water to the Mid-Valley service area will be between \$20 and \$30 per acre-foot. Costs would probably be higher with State construction because irrigation water users would be required to pay interest costs.

Question 17: Could the State Water Project sign contracts with the Central Valley Project for water supply and with the Mid-Valley Canal water users and then sell revenue bonds in order to construct the needed facilities for the Mid-Valley service area?

Response: Yes. The project would have to be authorized as a unit of the Central Valley Project by State legislation, the Mid-Valley Canal users would have to agree to pay the full costs of operation and bond service, and this pledge would have to be backed by the taxing power of these agencies. The water would be supplied by separate contract between the Bureau of Reclamation and the Mid-Valley Canal users.

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Question 18: What lands are proposed to be administered by the Resources Secretary in the Mid-Valley area? Are there capital costs involved? What are the expected annual costs? Have these lands and facilities been reviewed by the State Department of Parks and Recreation and has the Department determined that these lands and facilities are most appropriate as state operated as opposed to locally operated?

Response: The lands proposed for administration by the Resources Secretary relative to the Mid-Valley Canal are riparian lands along the San Joaquin River and Kings River where minimum flows for fish enhancement would be provided. Federal non-reimbursable costs would be 75 percent and non-federal (State) costs would be 25 percent as shown below.

	Approximate State Costs	
	Capital Cost	Annual Equivalent Cost 1/
San Joaquin River Enhancement	\$2,128,000	\$324,000
Kings River Enhancement	<u>347,000</u>	<u>114,000</u>
Total	\$2,475,000	\$438,000

1/ Includes capital and annual cost components.

The plan for these lands and facilities have been reviewed by the Departments of Parks and Recreation and Fish and Game and these are considered very high priority streams. No formal determination has been made as to the appropriateness of state or local operation, but the Resources Agency has indicated to the USBR that legislation was pending and that if it passed the state would provide the letter of intent necessary for the Bureau to include this aspect in the Mid-Valley Plan.

Question 19: SB 346 proposes to construct the Peripheral Canal, Cottonwood, Glenn, and Los Vaqueros. When additional facilities are required for water needs in California, what sequence of facilities might be expected? Please describe the facilities, the capital costs, the yield, and the per acre-foot cost. We recognize that some projects are alternatives for others, so we would appreciate that this sequential list of facilities select the best facilities and exclude alternative projects utilizing essentially the same water.

Honorable Eugene Gualco
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Response: Full SWP contract entitlements exceed our estimate of reduced year 2000 demands by about one million acre-feet. Assuming the Delta criteria in the current draft of the Four-Agency Fish and Wildlife Agreement are adopted, the cited facilities and consecutive use of ground water south of the Delta would yield about one-half million acre-feet more than the estimated year 2000 demands. Therefore, an additional one-half million acre-feet would have to be developed to meet full contract entitlements. This could come from additional storage in the Central Valley or waste water reclamation or possible other sources. We are not attempting to make that judgment now as it is premature to describe the facilities, their sequencing, or unit costs.

Question 20: In the various areas where water will be delivered, how will the cost of the facilities in SB 346 be shared between property taxes and water charges?

Response: DWR contracts with the 31 water agencies throughout the State include provisions for repayment of all costs of project facilities including all capital and OMP&R based on the maximum amount of water to be delivered annually in accordance with a scheduled build up. These costs would include the State's share of the cost of facilities that would be authorized by SB 346. These costs could then be passed on to the various water users. Information on how these various water districts distribute these costs between property taxes and water charges is not readily available. It would require an extensive survey of water agencies to determine the actual methods of repayment as it relates to property tax and water charge. The USBR contracting procedures are also based on payment for water requested. The majority of the water furnished by the USBR is for agricultural purposes. The pricing policies of the USBR contracting agencies are also not readily available.

Question 21: A major benefit of the Peripheral Canal will be improved water quality at the export pumps and an improved water service reliability. Federal contractors receiving Delta water generally have long-term, fixed-rate contracts. If these contractors will not pay their share of the cost of the Peripheral Canal that must be repaid to the federal government, what public agencies in California will repay these costs?

Response: The Peripheral Canal is needed by the SWP and CVP to protect the Delta while meeting the present and future levels of export needs of both projects south of the Delta. SB 346 requires full federal participation before it can be built. The federal share of the costs would probably be considered part of the total

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cost of the CVP and should be evaluated in this light. While it is true that federal contractors generally have long-term, fixed-rate contracts, we understand that the CVP is moving toward a Delta pool pricing concept similar to that of SWP. Under this approach, costs could be recovered by a combination of extending the pay-out period for the project and increasing the price of continued water service as existing contracts are renewed or new contracts executed. We are unable to comment on the extent to which other public agencies would be required to repay the federal share of the Peripheral Canal costs.

Question 22: What is the probability that a small Sites Reservoir will be constructed by the federal government? When might it be expected that this small Sites Reservoir would be constructed? What are the physical and economic implications of constructing a small Sites Reservoir followed sometime later by an enlargement?

Response: According to USBR staff, there is a good probability that the Sites Reservoir will be constructed. The President has signed an appropriation bill authorizing \$400,000 for a four-year study of the West Sacramento Valley Canal Unit of the CVP which includes the Sites Reservoir. It is conceivable that construction could begin within six years. The Colusa Reservoir-River Diversion Unit (large Sitea Reservoir), included in SB 346, is considered an alternate to the Glenn Reservoir or as a source of additional supplies after the year 2000. The Colusa Reservoir project could be staged to incorporate a small Sites Reservoir as an early phase of the project.

Question 23: What is the optimal economic ground water level in the Mid-Valley service area considering the cost of Mid-Valley imports?

Response: The present average ground water level in the Mid-Valley service area is 100 feet; however, in some areas the level is much lower. By the year 2020 this level has been predicted to drop to an average value of 300 feet without the Mid-Valley Canal. With the Mid-Valley Canal, which would provide up to 650,000 acre-feet/year of ground water overdraft relief, the level is expected to drop to an average 240 feet. Some small farmers in the area are now experiencing economic difficulties due to heavy pumping costs which indicates that the optimal economic ground water level may have already been reached. Studies by USBR have shown that there will be an economic advantage in reducing the overdraft by 60 feet.

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Question 24: Precisely what facilities are proposed as interim Suisun Marsh facilities? What are the specific water quality and water quantity objectives, and how will these objectives be met? What operation studies have been done, and what are the results?

Response: Interim standards and facilities to protect the Suisun Marsh are outlined in the April 12, 1977, draft Four-Agency Fish and Wildlife Agreement (Attachment 4), Section III B1, as quoted below.

"a. The 28-day running average of daily mean electrical conductivities at O&A Ferry Landing on Chipp's Island shall not exceed 12.5 mhos from October through May, except that the comparable conductivity shall be 15.6 mhos during the same months in any calendar year when the Project's water users are taking a deficiency in Scheduled Water. Furthermore, from January 1 through February 15, the standard will be the same as in the previous December in all years.

"b. The minimum mean monthly Delta Outflow Index during the period January through May shall be 6,600 cfs whenever storage is at or above the minimum level in the flood control reservation envelope at any two of the following: Shasta Reservoir, Oroville Reservoir, and CVP storage on the American River. In addition, in Above Normal and Below Normal Years, the minimum Delta Outflow Index will be 12,000 cfs for 60 consecutive days in the period January through April. In Wet Years the minimum mean monthly Delta Outflow Index from February through May will be 10,000 cfs, except in Subnormal Snowmelt Years when the period shall be February through April.

"c. In addition, the Projects' managers shall prepare the necessary documentation required by the National Environmental Protection Act (NEPA), and the California Environmental Protection Act (CEPA), so that they can make a decision based on those documents whether to complete physical modifications described below. If the decision is to build the facilities, every reasonable effort shall be made to complete them by July 1979.

"i) Install all water control facilities required to (a) deliver water from Montezuma Slough taken from a point southeast of Meina Landing onto

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those managed wetland areas (located on Grizzly, Simmons, Wheeler, Dutton, Van Sickle, and Hammond Islands) presently flooded with water from Honker, Suisun, and Grizzly Bays; (b) deliver water from Spoonbill Creek onto Chipp's Island; and (c) drain soil water from all these areas directly or indirectly into Honker, Grizzly, or Suisun Bays or the Sacramento River.

- "ii) Optimize water management on the managed wetlands between Goodyear Slough and Suisun Bay by either installing water control facilities as necessary to flood these lands from Goodyear Slough and drain them to Suisun Bay or by providing sufficiently increased water exchange in Goodyear Slough by installing appropriate drainage facilities at the south end of the slough.
- "iii) The facilities designated above shall be constructed only if engineering studies show that they will be an overall benefit to the natural resources of the Marsh.
- "iv) Plans for the physical modifications to be made pursuant to this subsection must be approved by USFWS and CDF&G.
- "v) The Projects shall bear the cost of constructing, operating, and maintaining all water control facilities constructed pursuant to this subsection over and above the costs necessary to manage the affected lands with 1922-1967 Delta outflows.
- "d. Prior to January 1, 1982, a study shall be conducted as part of the Suisun Marsh portion of the Interagency Ecological Study Program to determine what quantity and quality of applied water, managed in what manner and for what period of time, is necessary to remove any accumulation of soil salts that result from the water qualities referred to in Section III.B.2.c.
- "e. During the period in which these interim standards apply, the Projects shall make releases of stored Lake Berryessa water in such quantities and at such times as may be recommended by CDF&G providing, however, that such releases shall not interfere with the Projects' obligation to provide water actually needed in a given year under their contracts."

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We have made a 1980 level operation study, employing the draft Four-Agency Fish and Wildlife Agreement interim Delta quality criteria. The results, in terms of estimated monthly average chloride concentrations in Suisun Bay and the West Delta, were presented in the SWRCB Delta hearings this spring, as a DWR exhibit. A copy is attached (Attachment 5) showing projected chloride concentrations at Benicia, Port Chicago, Chipp's Island, and Collinsville.

Question 25: Precisely what facilities are proposed as the permanent Suisun Marsh facilities? What are the specific water quality and water quantity objectives, and how will these objectives be met? What operation studies have been done, and what are the results?

Response: Permanent standards to protect the Suisun Marsh are also set forth in the draft Four-Agency Fish and Wildlife Agreement as shown below.

"a. A mutually satisfactory program including standards, monitoring systems, facilities, operating and management procedures and assurances to accomplish Objective 3 in Section II.B shall be developed by July 1, 1979.

"b. To implement the program the Projects shall provide all managed wetlands of the Suisun Marsh, except those on River, Roe, Snag, and Freeman Islands, with sufficient quantities of adequate quality water to attain a soil water salinity of 9 parts per thousand TDS in the first foot of soil during May, using the best practical water management practices. To attain the desired soil water TDS levels, the quality of the water available for application to all managed wetlands each year shall not exceed the electrical conductivities shown in Table I, except as provided in (c) of this Section.

TABLE I
MEAN MONTHLY ELECTRICAL CONDUCTIVITY (mhos)

Month	Alternative A	Alternative B
October	19.0	19.0
November	15.5	19.0
December	15.5	19.0
January	12.5	19.0
February	8.0	4.5
March	8.0	4.5
April	11.0	8.0
May	11.0	11.0

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The Projects may choose which set of alternative standards they prefer to meet in a given year, but it is expressly recognized that the facilities and costs necessary to effectively manage applied water meeting the standards under Alternative B may be greater than those required under Alternative A, and the Projects agree to provide these incremental facilities and bear their allocated share of any increased cost.

- "c. The marsh management program to be developed by July 1979 shall include mutually acceptable relaxations of the electrical conductivity in Table I for drier water supply conditions.
- "d. Water of the qualities specified in Table I shall be supplied in amounts sufficient to accomplish the marsh management programs provided for in Section III.B.2.e.
- "e. During the course of planning the program the standards and other provisions relating to land, water and wildlife in this subsection shall be subject to renegotiation if alternatives appear reasonable for achieving marsh management objectives.
- "f. The Projects shall bear the cost of constructing, operating and maintaining all water delivery and distribution facilities and, in addition, shall bear all costs allocated to the Projects necessary to meet marsh management objectives (Section II.B.3) over and above costs necessary to accomplish said objectives with 1922-1967 Delta outflows.
- "g. As mitigation for the adverse effect on wildlife habitat that will occur on Ryer, Roe, Snap, and Freeman Islands, the Projects shall bear the cost of providing comparable waterfowl benefits elsewhere in the Marsh.
- "h. Implementation of the program provided for in Section III.B.2.a shall be contingent upon at least 75 percent of the managed wetland in the marsh being managed according to plans approved by CDFAG."

As noted in (a) above, a plan for permanent facilities is to be completed by July 1, 1979. This plan is being prepared by the USBR with active participation by DWR, DP&G, USFWS, SCS, and Suisun Resources Conservation District. A final report will be completed April 1979.

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The purpose of the program is to establish long-range standards and procedures which will maintain the wildlife habitat in the Suisun Marsh. The plan will identify and evaluate various sources of water which could be made available to the Marsh, and the facilities and management practices required to maintain or improve the existing waterfowl habitat.

The water sources include:

West Sacramento Valley Canals,
Sewage Return Flows,
Solano Project Supplies, and
Sacramento-San Joaquin Delta Outflows.

The facilities include:

Delivery of water to northern extremities of Marsh Sloughs, individual distribution to each island, and tidal pumping through Montezuma and other sloughs.

Management practices include:

various flood and drain sequences, improved circulation and drainage, and alternative "on club" water control devices.

In June 1977, our staff made a year 2000 operation study of Central Valley Reservoirs to show how the proposed Delta Alternatives facilities could operate in conjunction with existing facilities. In a technical briefing on June 17, 1977, results of Delta water quality studies were handed out. The handout included projected monthly water quality for selected years at certain stations. Copies of those charts for the Port Chicago and Coltonville stations are attached (Attachments 6 and 7).

Question 26: How does the county of origin provision work if the county of origin needs the water that has been developed and is being exported by the project? In other words, what are the provisions for payment by the county of origin to the State Water Project for water developed by the project?

Response: Area of origin provisions in California law give such areas priority to waters reasonably required to meet their beneficial needs. If they develop the water themselves, they pay the direct costs of development and the resulting reduction in supplies available to the SWP in the Delta reduces the yield of the SWP. The SWP must then develop additional yield to compensate. This is the Delta pool concept in the Burns-Porter Act which provided the so-called offset bond provisions to help finance facilities to make up the loss in yield.

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On the other hand, if an area of origin contracts for developed water from the SWP, it would be required to repay the development costs of providing the water. All water supply development costs of the SWP are reflected in a single melded Delta pool price, which all water service contractors pay regardless of where they are located or what the water is used for. The SWP would still have to make up for the loss in project yield to, as in the first case, service all of its existing contracts. The Delta pool price increases with time as new projects are added to the system.

Question 27: How much water will the proposed facilities provide for the Mid-Valley service area? What are the assumptions regarding shortages for the Mid-Valley service area, and would these shortages be different than the shortages taken in other Central Valley Project areas?

Response: The proposed facilities would normally provide 650,000 AF/year for the Mid-Valley Canal. This amount would be reduced in critical and certain dry years. The reduction would be comprised of two steps: first, deletion of 150,000 AF of non-firm supply; second, a 35 percent curtailment in the remaining 500,000 AF, leaving 325,000 AF in a critical year. In our 50-year (1922-71) year 2000 operation study, the full 650,000 AF amount was assumed to be delivered in 42 years (84 percent), 500,000 AF in three years (6 percent), and 325,000 AF in five years (10 percent). There is still some uncertainty as to the amounts of deficiencies and the types of years in which these curtailments would be taken. Some USBR studies show only 250,000 AF in critical years. However, we believe the amounts used in our operation study present a reasonable estimate of the reliability of Mid-Valley Canal supplies if the proposed facilities are built.

These dry-year shortages are larger than in most existing CVP service areas in which we usually plan for 25 percent critical year curtailments. Since the purpose of Mid-Valley Canal is to alleviate existing ground water overdraft, we judge that a larger dry-year curtailment could be tolerated.

Question 28: Has there been any consideration of having the state develop the yield for the Mid-Valley Canal; and if not, why not?

Response: No. We have always considered the Mid-Valley Canal to be a USBR project proposed as an alternate to the East Side Canal. We have no intention of increasing the yield of the SWP beyond the present contractual commitment of 4.23 MAP/year.

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Question 29: How much additional yield do you think can be developed in the Central Valley after the SB 346 facilities are completed?

Response: Additional Central Valley water supplies could be developed by storing the remaining excess Delta outflows. These averaged about 5.4 million AF/year in our year 2000 operation study. However, the median year excess Delta outflow in the study was about 1.9 MAP/year, which represents a more realistic picture of the potential supply available for further development. Full operation of the proposed Glenn Reservoir Complex (which was only partly used in the year 2000 operation study) would reduce the median some more, probably to around 1.8 MAP/year.

Development of large additional supplies in the Central Valley would be quite expensive and may not be economically possible for agriculture. Other possible large reservoirs include Marysville on the Yuba River, Nashville on the Cosumnes River, and enlarging Shasta Reservoir.

Question 30: What State Water Project contractors will get the increase in the yield of the State Water Project?

Response: SB 346 is designed to provide additional yield within the 4.23 MAP contract amount. All SWP contractors will share in yield developed in accordance with the provisions of their contracts.

Question 31: A Kelley and Tippets report prepared for DEAC in April 1977, stated that one million acre-feet of outflow was required in two months in a row in order to affect the salinity stratification necessary to effect the physical and chemical conditions that are necessary in the estuary for phytoplankton, zooplankton, other invertebrates and fishes. Does the Department of Fish and Game agree with the Kelley conclusions; and if not, why not?

Response: The Department of Fish and Game accepts the general principle in the Kelley-Tippets report that freshwater outflow affects salinity stratification (more properly, vertical salinity gradients) which in turn affects biological resources. However, recent analyses for the 208 Planning Study being conducted by ABAG indicate that relationship between outflow and stratification is more complex than hypothesized by Kelley and Tippets, and Kelley has withdrawn the draft report. In the absence of either more complete evidence of physical relationships or evidence of definite harmful biological effects in San Francisco Bay, the best course of action is to provide export limits to place some limits on reductions in Delta outflow, as provided for in Section 11256

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of SB 346, and conduct studies to identify better effects of reduced outflows. The chief environmental risk in this approach is that present commitments will leave little uncontrolled outflow in dry and critical years.

Question 32: To what extent will the requirement that there be two months of one million acre-feet be met?

Response: We have analyzed our three operation studies for 1980, 1990, and 2000 levels of development to try to answer this question. Results were as follows, out of a 50-year hydrologic period:

	1980	1990	2000
Number of years with two months at 1 MAP or more	35	30	26
Number of years with two consecutive months at 1 MAP or more	34	30	25
Number of years with two consecutive months at 0.5 MAP or more	39	39	35
Number of years with one month greater than 2 MAP	32	32	25

Question 33: With regard to unimpaired Delta outflows:

- a. What is the long-term average Delta outflow?
- b. What would have been the three lowest years of unimpaired Delta outflow, and what would the flows have been in those years?

Response: a. Water Resources Board Bulletin No. 1, Water Resources of California, published in 1951, gives an 1895-1947 average inflow to the Delta of 30.3 MAP/year (excluding Tulare Basin). Assuming the Delta lowlands consumption was about the same as it is today, about 0.6 MAP of this inflow would be used, leaving 29.7 MAP/year of average Delta outflow.

Some of my staff think that the Bulletin No. 1 hydrologic base period was a little wetter than typical. Eventually, we plan to develop an updated estimate of unimpaired Central Valley runoff. For the 1922-1971 base period used in our operation studies, the natural runoff, computed via Bulletin No. 1 methodology, seems to be about two MAP/year less than the older 1895-1947 period. If this computation proves out, comparable unimpaired Delta outflow would have been around 27.5 MAP/year.

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b. Until the current drought, the lowest three years were 1924, 1931, and 1939. The estimated amounts for those years, as well as a preliminary estimate for water year 1976 and 1977 are as follows:

Water Year	Estimated Unimpaired Delta Outflow, MAP
1924	7.2
1931	7.9
1939	11.8
1976	10.7
1977	5.6

Question 34: With regard to actual Delta outflows:

- a. What would Delta outflows be under normal conditions in 1980, 1990, and 2000?
- b. What will Delta outflows be by 1980, 1990, and 2000 for dry years and for critically dry years?
- c. Up to the 1990 level of development, what would have been the three lowest years of Delta outflow, and what would these flows have been?
- d. What will be the environmental effects of the changes in Delta outflow upon the Delta and upon the San Francisco Bay?
- e. What is the assumed increase in yield to the State Water Project and to the Central Valley Project for the SB 346 facilities?

Response: a. We estimate that the average Delta outflow would be or was as follows, based on the 1922-1971 hydrologic base period.

Level of Development	Outflow in MAP
Historic	21.4
1980	13.5
1990	11.5
2000	10.5

b. Each year is different, depending on the weather pattern for that year. The following information is provided as an estimate of Delta outflow for several types of years.

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Level of Development	Outflow, in MAP		
	1931 (Critical)	1929-34 Avg. (Critical Dry Period)	1961 (Dry)
Historic	4.8	10.3	9.3
1980	2.8	3.9	5.1
1990	2.3	2.9	4.3
2000	2.4	2.8	3.4

These estimates for future conditions are based on studies which assume that the draft Four-Agency Fish Agreement criteria would govern Delta quality requirements. The increase in 1931 outflow from 1990 to 2000 is due to minor changes between the January and current April draft agreement and some Delta internal routing constraints added with full Peripheral Canal operation. (The 1990 results are from an operation study based on the January draft of the Four-Agency Fish Agreement and with North and South Delta transfer facilities--in essence a Peripheral Canal without the middle link.)

c. According to our recent operation studies, the four lowest years of Delta outflow would be:

1980 Level		1990 Level	
Water Year	Amount in MAP	Water Year	Amount in MAP
1931	2.8	1931	2.3
1933	3.0	1924	2.4
1934	3.3	1933	2.4
1924	3.4	1934	2.5

d. Reductions in Delta outflow will cause virtually all aquatic plants and animals to shift their distribution upstream, as the location of most species is correlated with salinity. Such shifts in distribution are not necessarily bad. For example, the diversity of varied sport fishes will undoubtedly increase in San Francisco Bay. The principal harmful effects which have been identified are reductions in striped bass survival and degradation of waterfowl habitat in Suisun Marsh. The agreement specified in Section 11256(l)(b) and the facilities in 11255(d) and (e) are expected to alleviate these effects. Other adverse effects may well be identified. These are expected to be alleviated pursuant to the principles of Section 11460 through the contracts provided for in Section 11256.

e. The estimated new Delta yield of the SB 346 facilities as well as a tentative split of these yields between the SWP and the CVP is as follows, in million acre-feet:

	Total	SWP	CVP
Peripheral Canal, with additional Delta pumps and assuming Pour-Agency Fish Agreement	1.1	0.6	0.5
Ground water storage south of Delta	0.4	0.4	-
Los Vaqueros Reservoir	0.16	0.04	0.12
Cottonwood Creek Project	0.15 to 0.20	0.15 to 0.20	-
Glenn Reservoir	1.0	0.5	0.5
Totals, (approximate)	2.8	1.7	1.1

Question 35; Your letter of August 4, 1977, indicates that the Central Valley Project escalated capital costs will be \$3.749 billion (\$7.161 billion minus \$3.412 billion). How much of these CVP capital costs do you anticipate will be reimbursable? How much net power, in kWh per year will be developed by the CVP portions of the SB 346 facilities? What public agencies will pay the costs of the CVP share of the SB 346 facilities?

Response: Allocation of CVP capital costs has not been completed and the information is not available. The following table indicates the net power generation and use by the CVP portion of the SB 346 facilities.

Facility	% CVP Share	Average Yearly Generation or Use* (10 ⁶ kWh/year)
Mid-Valley Canal	100	-280
Los Vaqueros Reservoir	75	-60
Glenn Reservoir	50	-90
Peripheral Canal	50	-60
Total		-350

*Minus sign designates net pumping energy.

Public agencies contracting for water from the CVP will pay for the reimbursable costs of the CVP share of the SB 346 facilities.

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Question 36: If salinity control is authorized for the Delta, the 160-acreage limitation might be applied to the Delta. If the limitation was applied to the Delta, what would be the impact on what farms?

Response: The gross area of the Delta is about 738,000 acres, many of which lie below sea level. About 550,000 acres of this land is in irrigated agriculture. The bottom of the channels which surround the levee-protected islands of the Delta lowlands (365,000) and which are the source of water for the uplands (273,000 acre), are all below mean sea level. An abundance of water is always available in the channels, but the water quality varies seasonally with the quantities of fresh water flowing through the channels and daily under tidal influences.

Water is supplied to the Delta lands for agriculture in three ways: (1) from precipitation, which averages about 15 inches annually, mostly during the winter months, (2) from ground water and seepage inflow, and (3) by direct diversion from the channels.

In 1968, the USBR reported that about one-half of the agricultural land in the Delta was held in ownership of such size that project water may be delivered to them under acreage limitations of reclamation law. We are not aware of more current estimates. Under existing law these provisions might apply in any contracts with the Delta water users for the delivery of Central Valley Project water.

The physical situation of the Delta, however, is unique and the problems in administering excess land laws in the Delta are complex and difficult. The presence in the Delta of Central Valley Project water will not increase the absolute quantity of water available to the Delta water users for irrigation, but will protect the quality so that users may continue their present irrigation operations.

The lands in the Delta, both excess and nonexcess, have entitlements to water in the Delta. Of the inflow to the Delta required to protect the quality of the water so that these entitlements can be utilized, most is natural flow and only a comparatively small amount is project water. For a particular year the amounts of each depend upon the hydrological conditions of the year. For a particular piece of land the amount of each depends upon the location of the land within the Delta and the peculiarities of flow in the Delta channels at its location. The amounts of each can be only roughly estimated. In view of these circumstances it is impossible to identify precisely the specific tracts of lands that receive project benefits and the annual variation in those benefits.

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The primary advantage which the Delta water users will receive from the proposed contract will be contractual assurance of suitable quality of water in the Delta channels during the irrigation season to continue their present irrigation operations. Releases from the Peripheral Canal required to maintain suitable water quality for fish and to meet Delta water quality standards, however, would provide suitable water under all normal conditions to the irrigators who propose to contract for such protection. Approximately 300,000 acres of land in the Delta are nonexcess and are presently eligible for the benefits that would be provided by the proposed contract.

The Delta is unique. Some of the Delta lands are irrigated by subirrigation. Water naturally seeps into these lands from the Delta channels and the landowners' drainage operation is to pump excess water out of their lands back into the channels.

In addition, the situation in the Delta is quite different from the usual reclamation project where water is delivered through canals. In the usual situation an excess landowner who has a source of water other than project water can forego benefits to his excess land by not contracting for water for the excess land and need not sign a recordable contract providing for disposal of his excess land.

In the Delta, a water user cannot forego the benefits created by the project. Once project water is in the channels the quality of the only water available has been improved and one can no longer divert water of the quality that would have been available in the absence of the project. If no project water is put into the channels to protect and maintain quality, then the 300,000 acres of eligible land would be adversely affected as would be the fish and wildlife. Thus, withholding water from excess landowners would create a dilemma because it would not only injure eligible landowners, but it would also adversely affect quality of water for recreation, fish and wildlife, and other Delta water uses.

If your committee has further questions related to SB 346, I will be pleased to respond to them at the hearing on Friday.

Sincerely,

/s/
Ronald B. Robie
Director

Attachment 4

MEMORANDUM OF AGREEMENT

Whereas, the Central Valley Project and the State Water Project are authorized to accomplish a variety of purposes, including among others the delivery of water for municipal, industrial, and agricultural uses, flood control, recreation, and fish and wildlife protection and enhancement, all for the welfare and benefit of the people; and

Whereas, the protection and enhancement of fish and wildlife are related to other functions of the Projects; and

Whereas, the maintenance of fish and wildlife resources that utilize the Sacramento-San Joaquin Estuary depends partially on judicious planning, construction, and operation of the Projects;

Now, therefore, the U.S. Bureau of Reclamation (USBR), the U.S. Fish and Wildlife Service (USFWS), the California Department of Water Resources (CDWR) and the California Department of Fish and Game (CDF&G) agree that:

I. Definitions

- A. "Above Normal Year" shall be determined as described in Appendix A.
- B. "Adult Populations" shall be the number of organisms of a given species or group of species that are longer than the minimum legal length in the case of a species having a minimum legal length or, in all other cases, sexually mature.
- C. "Average Abundance" shall be the arithmetic mean of the number of organisms estimated to have been present annually during a specified period.
- D. "Below Normal Year" shall be determined as described in Appendix A.
- E. "Critical Year" shall be determined as described in Appendix A.
- F. "Delta Outflow Index" shall be determined as described in Appendix B.
- G. "Delta Water Facility" shall mean any permanent modification of the present physical configuration of the Delta for the purpose of transferring water more efficiently from the Sacramento River to the Tracy and/or Delta Pumping Plants. For the purposes of this definition, permanent shall mean in existence continuously for more than one year. (Upon completion of mutually acceptable planning studies, a specific project shall be substituted for this general definition.)
- H. "Dry Year" shall be determined as described in Appendix A.
- I. "Estuary" shall mean the Sacramento-San Joaquin Delta as defined in Section 12220 of the California Water Code and the bays and adjacent tidal waters westerly of the Delta to the Golden Gate.
- J. "Firm Supplies" shall be any water USBR delivers under any contract of 10 or more years duration, subject only to Dry and Critical Year deficiencies, and any water CDWR delivers under Table A of contracts with various water users.
- K. "Historical levels" shall mean the Average Abundance of Adult Populations estimated to have existed between 1922 and 1967. Historical level shall include the entire Adult Population living in or depending on the Estuary.
- L. "Incremental Outflow" shall mean the Delta outflow to be provided under Section III, or subsequent modifications thereof, exclusively for the benefit of fish and wildlife.
- M. "Nonproject Levels" shall mean the Average Abundance of the fish and wildlife resources that would exist in the Estuary in the absence of the Projects at the relevant point in time.
- N. "Projects" shall mean the State Water Project and the Federal Central Valley Project.
- O. "Regulatory Agency" shall mean any federal or state agency other than the parties to this Agreement having jurisdiction or authority to establish water rights, water quality standards, or other criteria governing operation of the Projects.
- P. "Scheduled Water" shall be Firm Supplies for USBR and CDWR plus such additional water ordered from CDWR by a contractor the previous September, and which does not exceed maximum annual entitlement for said contractor.
- Q. "Subnormal Snowmelt Year" shall be determined as described in Appendix A.
- R. "Wet Year" shall be determined as described in Appendix A.

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II. Goals, Objectives, and General Provisions

A. Goals

To the extent that the Projects affect fish and wildlife resources in the Estuary, the Projects shall be operated to achieve the following goals:

1. Restore and maintain Adult Populations of fish and wildlife on the average at the Historical level.
2. Realize the Projects' potential for increasing these resources above Historical Levels consistent with other purposes of the Projects.

All parties recognize that Historical Levels cannot be achieved with existing Delta facilities and water exports. Until appropriate facilities are constructed which will permit attaining the goals fully, the Projects shall utilize the Incremental Outflow to provide the best conditions possible for fish and wildlife. Compliance with the goals is expected after the Delta Water Facilities of the Projects are completed.

B. Objectives

Attainment of the following objectives is designed to achieve the goals in Section II.A:

1. Provide suitable environmental conditions for young fish and their food supply.
2. Provide suitable water conditions for the upstream and downstream migration and survival of anadromous fish.
3. Permit management of Suisun Marsh as a brackish water marsh capable of producing high-quality feed and habitat conditions for waterfowl and other marsh-related wildlife using the best practical management practices.
4. Control the diversions of young fish and fish food from the Delta by facilities of the Projects.
5. Manage any new lands of the Projects in the Delta to develop fish and wildlife resources and to provide for recreational use of these resources by the general public, both compatible with other objectives of the Projects, provided that fish and wildlife resources are maintained at least at Nonproject Levels.
6. Promote selected riparian vegetation consistent with levee safety by preserving and planting trees and shrubs having high value for wildlife on or adjacent to any existing Delta levees that are modified in the future by the Projects.

C. General Provisions

1. As additional information becomes available, the objectives shall be modified as may be appropriate to attain the goals.
2. The obligations under these goals and objectives shall be limited to the effects of the Projects on fish and wildlife resources and habitat in the Estuary. The Projects shall have no responsibility for acts of entities or natural conditions beyond the control of USBR and CDWR, but the Projects shall have responsibility for mitigating effects on fish and wildlife of water depletions upstream from the Delta.
3. Any action, independent of the Projects' facilities, operations or funding taken by USFWS or CDF&G to increase fish and wildlife resources in the Estuary, shall not relieve the Projects of any obligation to mitigate fully for effects of the Projects. Any such proposed action will be reviewed with USBR and CDWR prior to implementation to determine their interest in cooperating in the implementation.
4. All fish and wildlife species, habitat, and management measures, including measures in addition to providing water flow, shall be considered in attaining the above goals and objectives.
5. Some changes in the abundance of individual species in relation to Historical levels are inevitable, but substantial reduction of any species is not acceptable unless the species is causing adverse environmental effects. Decisions regarding the acceptability of such changes are a responsibility of USFWS and CDF&G.
6. Determinations of whether resources are being maintained on the average at the Historical level shall be based on mutually satisfactory 50-year operations studies.
7. Appendix C is provided as an aid in interpretation of this Memorandum of Agreement, but shall not modify its terms.

III. Standards

To accomplish the goals and objectives specified in Section II, the Projects shall be operated to meet fish and wildlife needs as follows:

- A. The following standards shall be met until such time as evaluations may show some other standards to be more appropriate for accomplishing the goals and objectives in Section II, and appropriate changes in the standards are agreed to as provided for in Sections IV.C and VI.

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1. Protection of Striped Bass Spawning in the San Joaquin River

In all years, the average of mean daily salinities for the period April 1 through May 5 in the San Joaquin River at Prisoners Point shall not exceed 550 micromhos.

In addition, the average of the mean daily salinities for the period April 15 through May 5 in the San Joaquin River at the Antioch Water Works Intake shall not exceed 1,500 micromhos. For the period April 1 through April 14, the minimum mean Delta Outflow Index will be 6,700 cfs.

However, in any year when the Projects' water users are taking a deficiency in Firm Supplies, the salinity requirement at the Antioch Water Works Intake shall be replaced by a minimum total flow of 470,000 acre-feet minus an amount equal to 10 percent of the annual deficiencies in deliveries of Firm Supplies by the Projects, excluding any deficiencies in the Friant Division of the CVP. The above total flow shall be computed from the Delta Outflow Index for the period April 1 through May 5.

Deficiencies are to be the difference between planned deliveries of Firm Supplies in the most recent year in which no deficiency was taken, adjusted as may be appropriate for normal buildup in deliveries of the Projects.

2. Spring and Summer Flows for Striped Bass Survival and Neomysis Protection

The minimum mean Delta Outflow Index (cfs) for the following period will be:

Year	May 6-31	June	July
Wet	14,000	14,000	10,000
Above Normal	14,000	10,700	7,700
Below Normal	11,400	9,500	6,500
Subnormal Snowmelt	6,500	5,400	3,600
Dry ¹	4,300	3,600	3,200
Dry ² and Critical	3,300	3,100	2,900

¹ Dry year following an Above Normal, Below Normal, or Wet Year.

² Dry year following a Dry or Critical Year.

After completion of a Delta Water Facility and Historical Levels are restored, if flows exceed the standards in any year, USBR and CDWR can reduce flows below the specified level in a subsequent year at their discretion by an amount equivalent to the increase in striped bass survival computed by mutually acceptable procedures.

3. Flows to Facilitate Upstream and Downstream Migrations of Salmon

The minimum mean monthly computed net flows (cfs) in the Sacramento River at Rio Vista are to be as follows:

Year	Feb 1- Mar 15	Mar 16- Jun 30	July	Aug	Sept- Dec 31
Wet	3,000	5,000	3,000	1,000	5,000
Above Normal	2,000	3,000	2,000	1,000	2,500
Below Normal	2,000	3,000	2,000	1,000	2,500
Dry and Critical	1,000	2,000	1,000	1,000	1,500

In a January following a dry or Critical Year, the minimum net flow at Rio Vista will be 1,500 cfs. In all other Januaries, the comparable minimum net flow will be 2,500 cfs.

B. Suisun Marsh

1. Interim Standards: It is specifically recognized and agreed that the interim standards in (a), (b) and (c) below will not guarantee provision of water of a quality adequate to accomplish Objective 3 in Section II.B.

- a. The 28-day running average of daily mean electrical conductivities at O & A Ferry Landing on Chipp's Island shall not exceed 12.5 mmhos from October through May, except that the comparable conductivity shall be 15.6 mmhos during the same months in any calendar year when the Projects' water users are taking a deficiency in Scheduled Water. Furthermore, from January 1 through February 15, the standard will be the same as in the previous December in all years.
- b. The minimum mean monthly Delta Outflow Index during the period January through May shall be 6,600 cfs whenever storage is at or above the minimum level in the flood control reservation envelope at any two of the following: Shasta Reservoir, Oroville Reservoir, and CVP storage on the American River. In addition, in Above Normal and Below Normal Years, the minimum Delta Outflow Index will be 12,000 cfs for 60 consecutive days in the period January through April. In Wet Years the minimum mean monthly Delta Outflow Index from February through May will be 10,000 cfs, except in Subnormal Snowmelt Years when the period shall be February through April.

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- c. In addition, the Projects' managers shall prepare the necessary documentation required by the National Environmental Protection Act (NEPA), and the California Environmental Protection Act (CEQA), so that they can make a decision based on those documents whether to complete physical modifications described below. If the decision is to build the facilities, every reasonable effort shall be made to complete them by July 1979.
- i) Install all water control facilities required to (a) deliver water from Montezuma Slough taken from a point southeast of Meins Landing onto those managed wetland areas (located on Grizzly, Simmons, Wheeler, Dutton, Van Sickle, and Hammond Islands) presently flooded with water from Honker, Suisun, and Grizzly Bays; (b) deliver water from Spoonbill Creek onto Chipps Island; and (c) drain soil water from all these areas directly or indirectly into Honker, Grizzly, or Suisun Bays or the Sacramento River.
 - ii) Optimize water management on the managed wetlands between Goodyear Slough and Suisun Bay by either installing water control facilities as necessary to flood these lands from Goodyear Slough and drain them to Suisun Bay or by providing sufficiently increased water exchange in Goodyear Slough by installing appropriate drainage facilities at the south end of the slough.
 - iii) The facilities designated above shall be constructed only if engineering studies show that they will be an overall benefit to the natural resources of the Marsh.
 - iv) Plans for the physical modifications to be made pursuant to this subsection must be approved by USFWS and CDF&G.
 - v) The Projects shall bear the cost of constructing, operating, and maintaining all water control facilities constructed pursuant to this subsection over and above the costs necessary to manage the affected lands with 1922-1967 Delta outflows.
- d. Prior to January 1, 1982, a study shall be conducted as part of the Suisun Marsh portion of the Interagency Ecological Study Program to determine what quantity and quality of applied water, managed in what manner and for what period of time, is necessary to remove any accumulation of soil salts that result from the water qualities referred to in Section III.B.2.c.
- e. During the period in which these interim standards apply, the Projects shall make releases of stored Lake Berryessa water in such quantities and at such times as may be recommended by CDF&G providing, however, that such releases shall not interfere with the Projects' obligation to provide water actually needed in a given year under their contracts.
2. Permanent Standards:
- a. A mutually satisfactory program including standards, monitoring systems, facilities, operating and management procedures and assurances to accomplish Objective 3 in Section II.B shall be developed by July 1, 1979.
 - b. To implement the program the Projects shall provide all managed wetlands of the Suisun Marsh, except those on Ryer, Roe, Snag, and Freeman Islands, with sufficient quantities of adequate quality water to attain a soil water salinity of 9 parts per thousand TDS in the first foot of soil during May, using the best practical water management practices. To attain the desired soil water TDS levels, the quality of the water available for application to all managed wetlands each year shall not exceed the electrical conductivities shown in Table I, except as provided in (c) of this Section.

Table I

MEAN MONTHLY ELECTRICAL CONDUCTIVITY (mmhos)

Month	Alternative A	Alternative B
October	19.0	19.0
November	15.5	19.0
December	15.5	19.0
January.....	12.5	19.0
February.....	8.0	4.5
March	8.0	4.5
April	11.0	8.0
May	11.0	11.0

The Projects may choose which set of alternative standards they prefer to meet in a given year, but it is expressly recognized that the facilities and costs necessary to effectively manage applied water meeting the standards under Alternative B may be greater than those required under Alternative A, and the Projects agree to provide these incremental facilities and bear their allocated share of any increased cost.

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- c. The marsh management program to be developed by July 1979 shall include mutually acceptable relaxations of the electrical conductivity in Table I for drier water supply conditions.
 - d. Water of the qualities specified in Table I shall be supplied in amounts sufficient to accomplish the marsh management programs provided for in Section III.B.2.a.
 - e. During the course of planning the program the standards and other provisions relating to land, water and wildlife in this subsection shall be subject to renegotiation if alternatives appear reasonable for achieving marsh management objectives.
 - f. The Projects shall bear the cost of constructing, operating and maintaining all water delivery and distribution facilities and, in addition, shall bear all costs allocated to the Projects necessary to meet marsh management objectives (Section II.B.3) over and above costs necessary to accomplish said objectives with 1922-1967 Delta Outflows.
 - g. As mitigation for the adverse effect on wildlife habitat that will occur on Ryer, Roe, Snag and Freeman Islands, the Projects shall bear the cost of providing comparable waterfowl benefits elsewhere in the Marsh.
 - h. Implementation of the program provided for in Section III.B.2.a. shall be contingent upon at least 75 percent of the managed wetland in the marsh being managed according to plans approved by CDF&G.
- C. The following standards shall be met until a Delta Water Facility is completed.
1. *Minimize Cross Delta Movement of Salmon*
The Delta Cross channel gates are to be closed from January 1 to April 15 of each year when the Delta Outflow Index is greater than 12,000 cfs, provided that such closure will not cause violation of any other water quality objective or standard governing the Projects.
 2. *Minimize Diversion of Young Striped Bass*
From April 16 to May 31 the Delta Cross Channel gates are to be closed for up to 20 days, but no more than 2 out of any 4 consecutive days, each year, at the discretion of CDF&G. The gates will be closed upon 12 hours' notice by CDF&G. The gates will not be closed when the Delta Outflow Index is less than 12,000 cfs or if closure would result in violation of any water quality objectives or standard governing the Projects.
 3. *Minimize the Diversion of Fish across the Delta*
No modifications of Delta channels will be made without compliance with NEPA and CEQA.
 4. *Maintenance of Salmon Stocks in San Joaquin River Tributaries*
 - a) CDF&G will, at no cost to the Projects, annually release 200,000 yearling salmon through trapping and artificial propagation of fall run king salmon from San Joaquin River tributaries.
 - b) CDWR and USBR will be equally responsible for, and share equally the cost of installing a control structure at the head of Old River, subject to obtaining necessary governmental approval, as may be necessary to distribute the then-existing flow so a minimum net downstream flow of 500 cfs occurs in the San Joaquin River past Stockton in October and November of Above and Below Normal and Wet Years and in November of Dry and Critical Years. If the flow at Vernalis is less than 1,000 cfs, not more than 50 percent of the flow will be diverted toward Stockton.
 5. *Curtailment of Exports to Protect Striped Bass*
Whenever the Delta Outflow Index is below 10,000 cfs, CDWR will not export more than 3,000 cfs during May and June, and 4,600 cfs during July of any year. USBR will not export more than 3,000 cfs during May and June of any year. Whenever the USBR is curtailing exports for the protection of striped bass, CDWR will pump at the Delta Pumping Plant during July and August an amount of USBR water equal to the USBR curtailment, but not to exceed 200,000 acre-feet. No more than one-half of the water will be transported off-peak. USBR will furnish the power for pumping the water at the Delta plant.
- D. Fish Facility Objectives for Existing Facilities
1. *General Objectives*
Mutually satisfactory records shall be maintained of the numbers, sizes, and kinds of fish salvaged and of water export rates and fish facility operations.
 2. *State Fish Protective Facility Objectives*
The facility is to be operated to meet the following objectives to the extent that they are compatible with water export rates:
 - a) King salmon—from November through May 14, criteria shall be as follows:
 - (1) Approach Velocity—3.0 to 3.5 feet per second.
 - (2) Bypass Ratio—maintain 1.2:1.0 to 1.6:1.0 ratios in both primary and secondary channels.

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- (3) Primary Bay—not critical but use Bay B as first choice.
- (4) Screened Water System—the velocity of water exiting from the screened water system is not to exceed the secondary channel approach velocity. The system may be turned off at the discretion of the operators.
- b) Striped Bass and White Catfish—from May 15 through October, criteria shall be as follows:
 - (1) Approach Velocity—in both the primary and secondary channels, maintain a velocity as close to 1.0 feet per second as is possible.
 - (2) Bypass Ratio
 - (a) When only Bay A (with center wall) is in operation maintain a 1.2:1.0 ratio.
 - (b) When both primary bays are in operation and the approach velocity is less than 2.5 feet per second, the bypass ratio should be 1.5:1.0.
 - (c) When only Bay B is operating the bypass ratio should be 1.2:1.0.
 - (d) Secondary channel bypass ratio should be 1.2:1.0 for all approach velocities.
 - (3) Primary Channel—use Bay A (with center wall) in preference to Bay B.
 - (4) Screened Water Ratio—if the use of screened water is necessary, the velocity of water exiting the screened water system is not to exceed the secondary channel approach velocity.
 - (5) Clifton Court Forebay Water Level—maintain at the highest practical level.
- 3. *Tracy Fish Protective Facility*
The secondary system is to be operated to meet the following objectives, to the extent that they are compatible with water export rates:
 - a) The secondary velocity should be maintained at 3.0 to 3.5 feet per second whenever possible from February through May while salmon are present.
 - b) To the extent possible, the secondary velocity should not exceed 2.5 feet per second and preferably 1.5 feet per second between June 1 and August 31, to increase the efficiency for striped bass, catfish, shad, and other fish. (Secondary velocities should be reduced even at the expense of bypass ratio in the primary, but the ratio should not be reduced below 1:1.0.)
 - c) The screened water discharge should be kept at the lowest possible level consistent with its purpose of minimizing debris in the holding tanks.
 - d) The bypass ratio in the secondary should be operated to prevent excessive velocities in the holding tanks, but in no case should the bypass velocity be less than the secondary approach velocity.

E. Additional Operational Measures

Whenever Project operations can be modified to benefit fish and wildlife, without impairing the normal functions of the Projects, the Projects will make such modifications. These modifications will be coordinated by the USFWS, USBR, CDWR and CDF&G.

IV. Operating Principles

The Projects shall be managed in accordance with the following principles related to fish and wildlife.

A. Enforcement of Standards

- 1. If the Projects fail to meet any standard in effect at a given time, except in the event of a sudden occurrence beyond the reasonable control of the Projects, the Projects' operators will immediately make every reasonable effort to achieve compliance by modifying the Projects' facilities or operations, including reduction of Projects' exports and/or increased releases from storage.
- 2. In the event of a failure to meet a standard due to a sudden occurrence beyond the control of the Projects, the Projects' operators will confer with the USFWS and CDFG as soon as possible in the process of selecting and implementing the most practical and expedient measures for alleviating adverse effects, including those on fish and wildlife.

B. Evaluation of Standards

- 1. Monitoring and studies necessary to determine whether Nonproject Levels are being achieved and, if not, how this may be accomplished, shall be conducted at the Projects' expense.
- 2. To facilitate monitoring and studies, operations of the Projects shall be modified in accordance with mutually acceptable plans. Such evaluations are to include the full range of proposed operations of the Projects. Modifications of operations of the Projects for evaluation purposes are to be consistent with other purposes of the Projects. For the purpose of evaluating a standard through a specific study, any standard provided for in this Agreement may be suspended or modified by mutual consent, subject to approval as necessary from appropriate Regulatory Agencies.

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C. Revision of Standards

1. The fish and wildlife standards will be modified by mutual agreement as necessary to attain Historical Levels subject to Regulatory Agency approval required by law. If additional water is necessary to meet such modified standards and would impair the ability of the Projects to meet contracts for delivery of Firm Supplies, the Projects will provide 60 percent of the additional water necessary to meet the standards until such time as sufficient supplies are available to deliver firm Supplies and meet the standards fully, whereupon 100 percent of the additional water necessary to meet the standards will be provided by the Projects.
2. In order to reserve uncontrolled Delta outflow for use in meeting changes in standards found necessary to accomplish the goals in Section II.A., the Projects will not export more water from the Delta during any water year than the sum of (a) releases of water stored in previous years by the Projects, (b) 37, 35, and 33 percent of the estimated unimpaired inflow to the Delta in any Critical, Dry, and Below Normal Year, respectively, and 31 percent in any other year, and (c) imports from the Trinity River. The estimated unimpaired inflow to the Delta shall be determined from the May issue of CDWR Bulletin No. 120. The export limitations provided in this section shall remain in effect until the standards in Section III are evaluated and they, or appropriate modifications, are found to achieve Historical Levels of fish and wildlife.

D. Basis for Allocation

Any standard or facility specified as being necessary to maintain a Nonproject Level shall be implemented at the Projects' expense. If the Historical Level is higher than the Nonproject Level, the portion of any standard or facility specified as being necessary to exceed the Nonproject Level to maintain the Historical Level shall be implemented, but shall be a nonreimbursable cost of the Projects. The portion of any standard specified as being for the purpose of exceeding the Historical Level shall be nonreimbursable and shall be implemented only after funding is provided.

V. Any Delta Water Facility shall have a fish screen system capable of meeting reasonable standards specified by USFWS and CDF&G at any diversion point from the Delta. The objective of the specified standards shall be to maintain Adult Populations at Historical Levels. Any such fish screen system shall be designed and constructed following specifications approved by USFWS and CDF&G, and be in operation at the time the Delta Water Facility is placed in operation. The operation of each fish screen system is to be evaluated and modified at the expense of the Projects as may be necessary to accomplish the goals and objectives in Section II.¹ -

VI. This Agreement may be amended by agreement of all of the parties, but changes in standards shall not be effective until approved by all Regulatory Agencies. In the event the parties disagree on changes in standards, the standards may be changed by the Regulatory Agencies.

VII. The Secretary of the Interior and the State of California should enter into a fish, wildlife, and water operations agreement to establish the specific provisions necessary to implement the goals, objectives, principles, and terms stated in Sections I through VI of this Memorandum.

VIII. In order to accomplish the intent of this Memorandum of Agreement:

- A. CDWR shall submit this Memorandum to the State Water Resources Control Board (SWRCB) and shall operate the SWP to conform to this Memorandum of Agreement, subject to the following limitations:
 1. CDWR will provide only its share, as determined by the agreement with USBR in force at any given time, of the water necessary to meet any standard.
 2. CDWR will meet standards that do not cause violation of any water quality objective or water rights provision established by the SWRCB.
- B. USBR shall operate the CVP to conform to this Memorandum of Agreement to the extent that such conformance is or may become consistent with federal law.
- C. The Department of the Interior, CDWR, and CDF&G shall seek and actively support federal and state legislation to modify the Projects to accomplish fully the goals and terms of this Memorandum of Agreement.
- D. This Memorandum of Agreement shall be amended prior to adoption of a final EIS/EIR for a Delta Water Facility to incorporate in Section III, initial operating standards for this Facility.

¹ This section will be modified to conform with decisions made during the Delta Alternatives Study

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- E. USBR and CDWR shall make every reasonable effort to accomplish by January 1985 all actions necessary to operate the Projects to maintain fish and wildlife resources in or dependent on the Estuary at least at Historical Levels.
- F. USBR and CDWR shall not start construction of a Delta Water Facility until the fish, wildlife and water operations agreement specified in Section VII is executed between the United States and the State of California.
- G. USBR and CDWR shall seek authorization of such facilities as may be necessary to comply with Section III.B.2. concurrently with or prior to seeking authorization of a Delta Water Facility. Furthermore, USBR and CDWR shall make every reasonable effort to comply fully with Section III.B.2 by July 1982, and in any event, full compliance with Section III.B.2 shall be achieved prior to commencing operation of a Delta Water Facility.

Appendix A CLASSIFICATION OF YEARS

Year classification shall be based on forecasted unimpaired runoff for the current water year (October 1 of the preceding calendar year through September 30 of the current calendar year), as appearing in CDWR Bulletin 120. Year classifications shall be based on the sum of forecasted unimpaired runoff for the following locations: Sacramento River above Bend Bridge, near Red Bluff; Feather River, total inflow to Oroville Reservoir; Yuba River at Smartville; and American River, total inflow to Folsom Reservoir.

Year classifications shall be based on forecasted total unimpaired runoff for the water year at the above locations as follows:

Wet year = \geq 19.6 MAF or \geq 22.5 MAF when preceding year is critical
Above Normal year = $>$ 15.7 MAF
Below Normal Year = \leq 15.7 MAF
Dry Year = \leq 12.5 MAF or \leq 15.7 MAF when preceding year is critical
Critical Year = \leq 10.2 MAF or \leq 12.5 MAF when preceding year is critical

Year classification for the period May through December of each calendar year shall be determined from the forecasted total unimpaired runoff for the water year as reported in the May issue of Bulletin 120. Year classification for the period February through April shall be determined monthly based on the most current forecasts in Bulletin 120.

In addition to the year classifications enumerated above, a Subnormal Snowmelt Year classification will be established based on forecasted April through July unimpaired runoff at the same four Sacramento Valley locations listed above. Any otherwise Wet, Above Normal, or Below Normal Year will be designated as a Subnormal Snowmelt Year whenever the forecasted April through July unimpaired runoff reported in the May issue of Bulletin No. 120 is less than 5.9 MAF.

Appendix B DELTA OUTFLOW

Delta outflow shall be defined as the Delta Outflow Index computed daily by USBR and CDWR for their normal operating procedures. It shall be computed as follows:

Delta Outflow Index = DI—DU—SE—FE where:

DI = Delta inflow which is equal to the sum of the estimated 7 AM flows in the Sacramento River at "I" Street and the San Joaquin River at Vernalis.
DU = Delta use per Table A-1.
SE = State export which is equal to the daily inflow to Clifton Court Forebay minus the amount diverted to Byron-Bethany Irrigation District.
FE = Federal export which is the sum of diversions through the Tracy Pumping Plant and Contra Costa Canal Pumping Plant No. 1.

Experience during 1976 indicates that the above procedures need to be adjusted, particularly for deviations from the Delta use listed in Table A-1. USBR and CDWR will recommend procedural changes for estimating Delta use which will be incorporated in this appendix, upon concurrence by USFWS and CDF&G.

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Appendix C

EXPLANATION OF AGREEMENT

Definitions

The year classification definitions are based on a system described in Appendix A, rather than the previously used approach based on inflow to Shasta Reservoir. The new classification is intended to reflect better the total water supply to the Delta. Applying this new system to standards for fish and wildlife in the Estuary is compatible with the use of other systems defined in water delivery contracts. The classification "Subnormal Snowmelt Year" is necessary to describe years having a relatively large total supply but with an unusually small proportion of the supply remaining in the snowpack in the spring. Such a situation makes maintenance of large river flows in the spring and early summer difficult.

The 1922-1967 base for Historical Levels is a negotiated period. The year 1922 was selected as it is the start of reasonably comprehensive water flow records and is the standard starting point for operations studies for the Projects. The year 1967 limits the base period to conditions existing prior to the substantial increase in water exports from the Delta for the State Water Project and the San Luis Project. Limiting the base period to pre-project conditions (i.e., 1922-1944) would be inequitable due to the unusually frequent dry and critical years in that period. Including 1945-67 in the base incorporates benefits due to summer and early fall flow maintenance by the Projects, detriments due to Project-caused flow reductions at other times and to exports by the Projects and detriments due to flow reductions from upstream development.

The parties recognize that Historical Levels of fish and wildlife populations cannot be defined from measurements made throughout the base period. The parties expect to define Historical Levels through negotiations based on measurements which are available, on historical, hydrologic, and hydraulic conditions in the Estuary, and on relationships between the abundance of a fish or wildlife resource and hydraulic conditions in the Estuary. The primary approach expected is first to identify the relationships between the abundance of a resource and hydraulic conditions, and then to use those relationships to estimate the Historical Level based on historical hydraulic conditions. Relationships between fish and wildlife resources and hydraulic conditions may well be identified or modified as new information becomes available, and estimates of Historical Levels may change based on this new information. In general, the parties expect to define Historical Levels only for selected species and only when evidence indicates such a determination is necessary to establish a standard which would control operations of the Projects. Application of the principles involved is illustrated by the derivation of standards for striped bass which is described later in these recitals.

Nonproject levels are expected to change in the future as upstream depletions increase due to development other than that supported by the Projects. Such upstream depletions will cause Nonproject Levels to be lower than Historical Levels for some fish and wildlife resources.

Enhancement has not been defined, but it implicitly is any increase over Nonproject Levels rather than as an increase over Historical Levels, which is the traditional approach used by fish and wildlife agencies. The parties believe that relating enhancement to Nonproject Levels provides a more equitable basis for allocating costs.

Goals, Objectives, and General Provisions

The goals are intended to result in the maintenance of fish and wildlife resources at least at Historical Levels after completion of a Delta Water Facility. Before completion of that facility, the parties see no reasonable means to accomplish the goals.

Maintenance at Historical Levels rather than at Non-project Levels was selected as the goal primarily because it is impossible to know what decisions would have been made concerning later phases of the Projects if the earlier phases were not mitigating some effects of other upstream depletions.

The goals also anticipate maintaining Historical Levels only as an average; i.e., some standards to implement the goals will be designed to provide larger populations in wetter years and smaller populations in drier years, with a long-term average at the Historical Level. Similar fluctuations obviously occur in response to natural variations in water supply. This averaging approach is intended to provide an equitable level of fish and wildlife protection with minimal cost and impact on water use.

The agreement limits obligations of the Projects to water development effects within the Estuary. For some resources, conditions outside the Estuary limit abundance. Two examples of such resources are salmon and waterfowl. In these cases, the maintenance of Historical Levels is expected to involve maintenance of habitat conditions in the Estuary, as may be necessary in relation to historical conditions, so estuarine conditions do not become limiting to the resource.

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The goals, and the agreement in general, do not consider benefits of fisheries in the Projects' export system, which are partially dependent on fish produced in the Estuary. All parties recognize that such benefits are substantial and that decisions made pursuant to this agreement should consider impacts on such benefits. The purpose of such considerations should be to implement measures which would increase the benefits, consistent with the goals of this agreement.

The listed objectives, which are secondary to the goals, are those which appear necessary now for accomplishing the goals. Changes may prove desirable if additional effects of the Projects become evident or new facilities are proposed.

Standards

Standard A.1. is based on evidence that salinities influence the suitability of the lower San Joaquin River for striped bass spawning. Salts from both land runoff and the ocean are of concern. The time period was selected to bring salinities to the minimum acceptable level when substantial spawning starts approximately in mid-April, and to maintain suitable salinities during the first several weeks of spawning. Salinities during the latter part of the spawning period are influenced by Standard A.2.

Standard A.2. is based on evidence that the survival of young striped bass increases as the rate of flow increases in May, June, and July. The standard also benefits the opossum shrimp, *Neomysis*, and is a partial replacement for a standard developed in 1968 specifically for *Neomysis* protection.

The standard is based on statistical relationships between striped bass abundance, Delta outflow, and water diversions from the Delta for both local use and export. Historical striped bass abundance was estimated from the following equations:

$$\text{Abundance in Delta} = -696.7 - 0.00617D + 404.3F - 51.5F^2$$

$$\text{Abundance downstream from Delta} = -256.9 + 77.46F$$

where: D = mean water diversions from the Delta during June and July in cfs

F = logarithm of the mean Delta outflow during June and July in cfs.

(The derivation of these equations is explained in CDF&G Exhibit 3 presented at the November 1976 Delta hearings of the State Water Resources Control Board.) The estimated Average Abundance for 1922-1967 is 106 index units. (Abundance is measured as an index of relative abundance rather than attempting to estimate the actual number present.)

To derive the standard, mean June-July flows for the six categories of year types were selected to produce an historic mean abundance of 106, assuming the historical frequency of year types and export curtailment sufficient to eliminate export detriments. Many flow combinations would produce the desired mean. The general criteria used in making the selection were to have flows near the minimum required for other purposes in dry and critical years and to not have flows so large in the wetter years as to pose serious demands on storage. The resulting mean flows were divided between June and July to reflect the historical pattern of decreasing flows during those months. Finally, May flows were fixed at 1.2 to 1.5 times June flows based on evidence that May flows become limiting as they approach the magnitude of June flows at lower flow rates.

The provisions in the qualifying paragraph for this standard avoid the inequity which would result from establishing averages as the minimum. The paragraph does not apply to the interim before a Delta Water Facility is in operation as curtailments during this period will be insufficient to accomplish the goal of maintaining Historical Levels.

While Standard A.2. is directed toward the survival of young bass, substantial evidence indicates variations in the survival of young from May through July largely determine the abundance of adult bass.

Standard A.3. is based on judgments made by CDF&G biologists as to minimum satisfactory flows for salmon. These judgments were based largely on information from the San Joaquin River, and information to refine the standard will be gathered by studies just getting under way.

The standards were established based on studies of selected fish and wildlife resources. The standards are expected to benefit species other than the target species. This is particularly true for Standards A.1. and A.2. which provide for flow maintenance during spring and early summer. That is the spawning and migration period of many species which presumably are adapted to the natural high flows occurring then.

Interim standards for Suisun Marsh were not designed to assure full protection, as full protection cannot be assured without allocating most of the Projects' storage to that purpose in the drier years. The interim standards will guarantee that degradation does not exceed certain limits and will cause some modification of the Projects' operations to benefit the Marsh. Uncontrolled outflows will provide the primary protection for the Marsh in the interim.

The permanent standards for the Marsh are expected to provide full protection but will require upgrading management to leach with water more saline than the water which was available historically. The permanent

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standards cannot be made more explicit as to geographical locations until the program specified in Section II.B.2.a. for implementation of them is completed.

The standards in Section III.C. will provide some protection prior to completion of a Delta Water Facility. The most important one is the export curtailment to protect striped bass. It, in combination with Standard III.A.2., is expected to prevent further depletion of striped bass.

The fish facility standards formalize existing operational procedures designed to optimize salvage of fish at the present facilities.

Operating Principles

Section B and C, providing for evaluation and modification of standards, are necessary as all parties recognize that certain inadequacies exist in the information upon which standards are based. Hence, to achieve the goals of this Memorandum, substantial evaluations of the Projects' effects will be necessary and flexibility must exist for changing the standards as may prove necessary. This flexibility is provided for by stipulation that future deficiencies impairing Firm Supplies be shared, and by the export limits. The export limits are intended to maintain the remaining uncontrolled Delta outflows for the benefit of instream uses, unless studies demonstrate that such outflows are unnecessary for accomplishing the goals of this agreement. USFWS and CDF&G believe it is highly probable that uncontrolled flows, particularly in the winter and spring, provide benefits which are as yet unrecognized. Specifying minimum outflows rather than maximum exports would be a more direct means of protecting these benefits. Maximum exports were specified, however, due to the practical difficulty inherent in operating the Projects to maintain specified annual amounts of uncontrolled outflow.

The parties expected evaluations during the interim before a Delta Water Facility to aid in establishing better initial standards for operation of the facility and to provide baseline data for evaluating subsequent operations. Evaluations will be necessary for some substantial period after the Delta Water Facility is in operation to evaluate the effectiveness and efficiency of all standards.

Section D provides a basis for allocating costs, but the studies have not been conducted yet to identify any differences between Nonproject and Historical Levels. When this is done, the parties expect to recommend what portion of the costs of the Projects should be nonreimbursable for water user repayment.

Sections V through VIII

Section VII provides for the more detailed agreement which the parties believe is necessary to implement this Memorandum effectively.

Section VIII modifies the remainder of the Memorandum in light of existing authorities, particularly those of USBR. The various commitments in this section are intended to implement the Memorandum now as fully as existing authorities permit, and to provide for effective full implementation as soon as is practical.

Appendix B

For practical operational reasons, Delta outflows have been specified in terms of the Delta Outflow Index in the standards. This appendix describes the present standard procedures for defining this index. The parties recognize the limitations in the index, particularly those caused by use of the standard estimates of Delta use. Hence, the parties are committed to revising the index, as specified in this appendix.

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Delta Water Quality Standards +
Four Agency Fishery Criteria
No Delta Facility

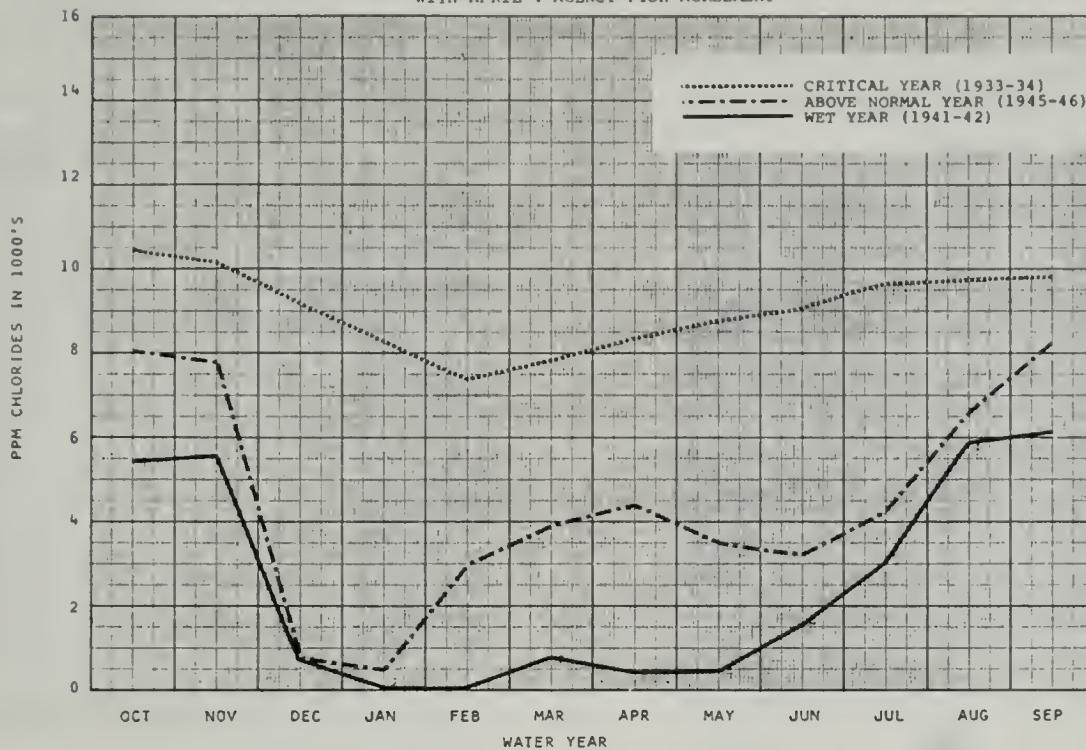
Attachment 5

M O N T H L Y M E A N T I D E C H L O R I D E S (PPM)											
M A Y - 1980		J U N E - 1980		J U L Y - 1980		A U G - 1980		S E P - 1980		O C T - 1980	
MoY	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT
2122	654	940	1087	719	303	217	652	653	612	540	2122
2223	999	1048	1049	1049	314	729	955	703	614	4103	9192
2324	1030	1203	1203	1049	8215	1046	1152	1072	773	773	773
2425	1152	1152	1152	1152	8165	8165	8165	8165	8165	8165	8165
2526	1153	1153	1153	1153	8165	8165	8165	8165	8165	8165	8165
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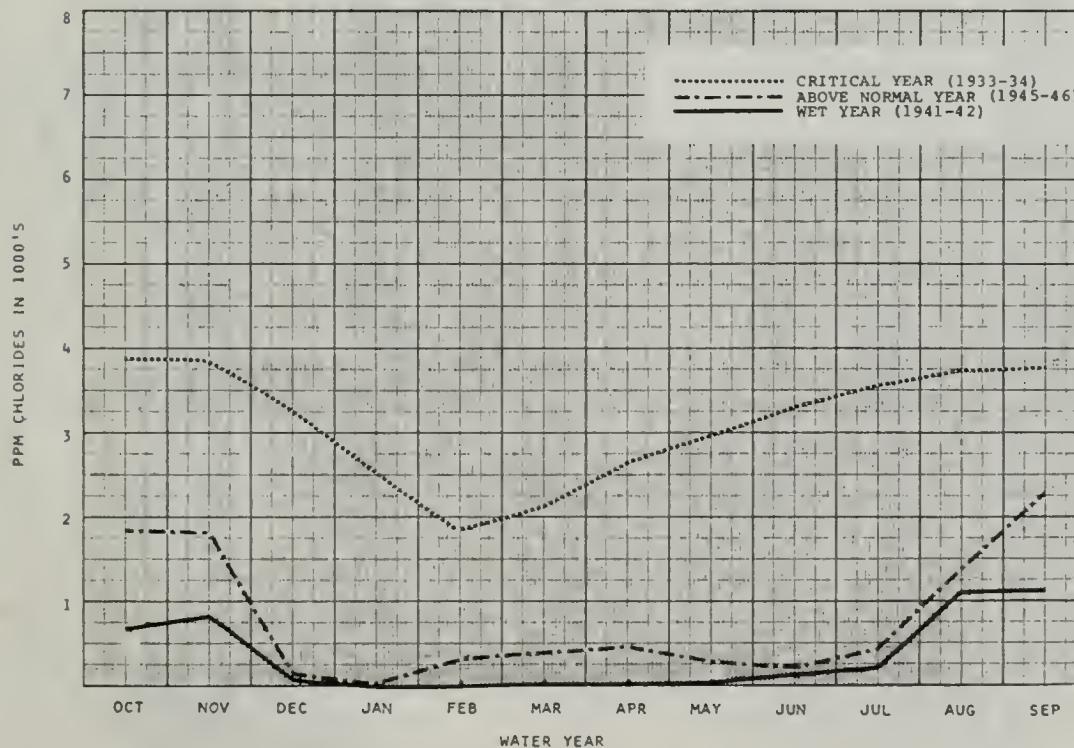
Attachment 6

PORT CHICAGO
DA 2000 2.0-77 BASIN PLAN AGR. STANDARDS
WITH APRIL 4-AGENCY FISH AGREEMENT



Attachment 7

COLLINSVILLE
DA 2000 2.0-77 BASIN PLAN AGR. STANDARDS
WITH APRIL 4-AGENCY FISH AGREEMENT



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STATE OF CALIFORNIA RESOURCES AGENCY

DEPARTMENT OF WATER RESOURCES

P.O. 601-116
SACRAMENTO
95807

(916) 445-9248

EDWARD G. BROWN JR. Governor

- COPY -



August 31, 1977

Honorable Eugene T. Gualco, Chairman
Assembly Committee on Water, Parks,
and Wildlife
State Capitol, Room 2016
Sacramento, CA 95814

Dear Gene:

This is a response to a question that was raised at the Committee hearing on August 12, 1977. The question was, "What effect would there be on the financing of the future facilities in SB 316 if the revenues from Tidelands Oil would be reduced as projected by the State Lands Commission?". The material presented by the State Lands Commission at the hearing showed that there may be no significant revenue after year 2000 and Tidelands revenues probably would be declining between now and year 2000. Two scenarios were used by my staff in preparing the answer to your question. The analysis for these two scenarios is shown on Attachment #1. Also attached (Attachment #2) is the original financing study that was in my letter to you dated August 11, 1977.

For the first scenario we used the Commission's most pessimistic estimate which assumes continuation of current oil and gas prices. The financing is mainly affected during the late 1980's and the 1990's. To compensate for the loss of Tidelands Oil revenue there would be more use of SWP revenues which are transferred to the California Water Fund and the need for supplemental revenue bonds increases by \$250 million.

For the second scenario we used the Commission's projection of revenue resulting from additional State Tidelands' development and potential geothermal revenue. The primary effect would be during the years 2000 and 2001. Again, oil revenue losses were compensated for by increased use of SWP revenue transfers and requires \$52 million more supplemental revenue bonds.

For both scenarios about \$2.6 billion of the California Water Fund financing would come from SWP revenues which would be transferred to the California Water Fund pursuant to Water Code Section 12937(b).

Attachment 1

Year		1978		1979		1980		1981		1982		1983		1984		1985		1986		1987		1988		1989		1990		1991		1992		1993		1994		1995		1996		1997		1998		1999		2000		2001		2002		2003		2004		2005		2006		2007		2008		2009		2010		2011		2012		2013		2014		2015		2016		2017		2018		2019		2020		2021		2022		2023		2024		2025		2026		2027		2028		2029		2030		2031		2032		2033		2034		2035		2036		2037		2038		2039		2040		2041		2042		2043		2044		2045		2046		2047		2048		2049		2050		2051		2052		2053		2054		2055		2056		2057		2058		2059		2060		2061		2062		2063		2064		2065		2066		2067		2068		2069		2070		2071		2072		2073		2074		2075		2076		2077		2078		2079		2080		2081		2082		2083		2084		2085		2086		2087		2088		2089		2090		2091		2092		2093		2094		2095		2096		2097		2098		2099		2000		2001		2002		2003		2004		2005		2006		2007		2008		2009		2010		2011		2012		2013		2014		2015		2016		2017		2018		2019		2020		2021		2022		2023		2024		2025		2026		2027		2028		2029		2030		2031		2032		2033		2034		2035		2036		2037		2038		2039		2040		2041		2042		2043		2044		2045		2046		2047		2048		2049		2050		2051		2052		2053		2054		2055		2056		2057		2058		2059		2060		2061		2062		2063		2064		2065		2066		2067		2068		2069		2070		2071		2072		2073		2074		2075		2076		2077		2078		2079		2080		2081		2082		2083		2084		2085		2086		2087		2088		2089		2090		2091		2092		2093		2094		2095		2096		2097		2098		2099		2000		2001		2002		2003		2004		2005		2006		2007		2008		2009		2010		2011		2012		2013		2014		2015		2016		2017		2018		2019		2020		2021		2022		2023		2024		2025		2026		2027		2028		2029		2030		2031		2032		2033		2034		2035		2036		2037		2038		2039		2040		2041		2042		2043		2044		2045		2046		2047		2048		2049		2050		2051		2052		2053		2054		2055		2056		2057		2058		2059		2060		2061		2062		2063		2064		2065		2066		2067		2068		2069		2070		2071		2072		2073		2074		2075		2076		2077		2078		2079		2080		2081		2082		2083		2084		2085		2086		2087		2088		2089		2090		2091		2092		2093		2094		2095		2096		2097		2098		2099		2000		2001		2002		2003		2004		2005		2006		2007		2008		2009		2010		2011		2012		2013		2014		2015		2016		2017		2018		2019		2020		2021		2022		2023		2024		2025		2026		2027		2028		2029		2030		2031		2032		2033		2034		2035		2036		2037		2038		2039		2040		2041		2042		2043		2044		2045		2046		2047		2048		2049		2050		2051		2052		2053		2054		2055		2056		2057		2058		2059		2060		2061		2062		2063		2064		2065		2066		2067		2068		2069		2070		2071		2072		2073		2074		2075		2076		2077		2078		2079		2080		2081		2082		2083		2084		2085		2086		2087		2088		2089		2090		2091		2092		2093		2094		2095		2096		2097		2098		2099		2000		2001		2002		2003		2004		2005		2006		2007		2008		2009		2010		2011		2012		2013		2014		2015		2016		2017		2018		2019		2020		2021		2022		2023		2024		2025		2026		2027		2028		2029		2030		2031		2032		2033		2034		2035		2036		2037		2038		2039		2040		2041		2042		2043		2044		2045		2046		2047		2048		2049		2050		2051		2052		2053		2054		2055		2056		2057		2058		2059		2060		2061		2062		2063		2064		2065		2066		2067		2068		2069		2070		2071		2072		2073		2074		2075		2076		2077		2078		2079		2080		2081		2082		2083		2084		2085		2086		2087		2088		2089		2090		2091		2092		2093		2094		2095		2096		2097		2098		2099		2000		2001		2002		2003		2004		2005		2006		2007		2008		2009		2010		2011		2012		2013		2014		2015		2016		2017		2018		2019		2020		2021		2022		2023		2024		2025		2026		2027		2028		2029		2030		2031		2032		2033		2034		2035		2036		2037		2038		2039		2040		2041		2042		2043		2044		2045		2046		2047		2048		2049		2050		2051		2052		2053		2054		2055		2056		2057		2058		2059		2060		2061		2062		2063		2064		2065		2066		2067		2068		2069		2070		2071		2072		2073		2074		2075		2076		2077		2078		2079		2080		2081		2082		2083		2084		2085		2086		2087		2088		2089		2090		2091		2092		2093		2094		2095		2096		2097		2098		2099		2000		2001		2002		2003		2004		2005		2006		2007		2008		2009		2010		2011		2012		2013		2014		2015		2016		2017		2018		2019		2020		2021		2022		2023		2024		2025		2026		2027		2028		2029		2030		2031		2032		2033		2034		2035		2036		2037		2038		2039		2040		2041		2042		2043		2044		2045		2046		2047		2048		2049		2050		2051		2052		2053		2054		2055		2056		2057		2058		2059		2060		2061		2062		2063		2064		2065		2066		2067		2068		2069		2070		2071		2072		2073		2074		2075		2076		2077		2078		2079		2080		2081		2082		2083		2084		2085		2086		2087		2088		2089		2090		2091		2092		2093		2094		2095		2096		2097		2098		2099		2000		2001		2002		2003		2004		2005		2006		2007		2008		2009		2010		2011		2012		2013		2014		2015		2016		2017		2018		2019		2020		2021		2022		2023		2024		2025		2026		2027		2028		2029		2030		2031		2032		2033		2034		2035		2036		2037		2038		2039		2040		2041		2042		2043		2044		2045		2046		2047		2048		2049		2050		2051		2052		2053		2054		2055		2056		2057		2058		2059		2060		2061		2062		2063		2064		2065		2066		2067		2068		2069		2070		2071		2072		2073		2074		2075		2076		2077		2078		2079		2080		2081		2082		2083		2084		2085		2086		2087		2088		2089		2090		2091		2092		2093		2094		2095		2096		2097		2098		2099		2000		2001		2002		2003		2004		2005		2006		2007		2008		2009		20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Antioch-212

STATE OF CALIFORNIA RESOURCES AGENCY

DEPARTMENT OF WATER RESOURCES

P.O. Box 300
Sacramento,
CA 95814

(916) 445-9248

August 31, 1977

Honorable Carmen Perino
Member of the Assembly
State Capitol
Sacramento, CA 95814

Dear Mr. Perino:

In discussions on SB 346 you expressed concern regarding possible seepage impacts of the Peripheral Canal, why the Canal is planned to be unlined, and what we plan to do about seepage from the Canal if it should occur. You also expressed concern that San Joaquin County might be required to pay the costs of policing State recreation areas along the Canal. This letter is provided in response to those concerns.

Seepage

The Peripheral Canal will not be lined because differential settlement of the Delta foundation materials could result in cracking of the lining with consequent major problems. These problems with a lined canal include possible undetected erosion of the Canal levee with subsequent flooding of Delta islands.

It is expected that there will be some seepage from the Canal. However, the Canal levees will be very wide. These levees will be approximately 180 feet to 200 feet wide at ground surface, whereas many Delta levees are only about 60 feet wide at ground level. The very wide levees should minimize through-the-levee seepage. Additionally, as stated in SB 346, the upper half of the Canal (where water surface would ultimately be highest) can only be operated at a maximum of one-quarter capacity during the early years of operation. This will (1) minimize seepage problems; (2) allow any seepage problems to be resolved prior to full operation; and (3) allow the levees to "seal" through the process of straining out and depositing in the levees small earth particles carried with the Canal flows. In much of the lower portion of the Canal, seepage would be intercepted by Trapper Slough and Victoria Canal.

In some areas drainage ditches paralleling the Canal and constructed as part of the project, such as between Beaver and Sycamore Sloughs in San Joaquin County, will act as drains and collect seepage. In most other areas, any seepage which might

(Donald G. Bachtel, Director)

- COPY -



Honorable Carmen Perino
Page 2
August 31, 1977

occur will drain into existing or relocated drainage ditches operated by local agencies. Both the added costs of relocating the existing local drainage ditches interrupted by the Canal and the added costs of pumping seepage will be reimbursed by the project.

The costs of solving seepage problems must be borne by the project in accordance with California Law (Section 12627.3 of the California Water Code). Furthermore, Section 12627.4 of the Water Code requires the Department to anticipate seepage problems which may arise from water projects and to include plans for the solution of seepage problems as part of the project development. This will be done.

Because of the extreme variation in Delta soils along the Canal alignment, the Department has not made estimates of seepage per linear foot of Canal. However, the Department, for the past 11 years, has been monitoring ground water levels and seepage conditions along the alignment of the Canal. These studies will be continued during the planning, design, construction and operating phases of the Canal. In summary, any seepage caused by the project is a project responsibility and in accordance with State Law will be remedied by the project.

Recreation

San Joaquin County, unless it does so as a willing participant, does not have to pay any operation or maintenance costs nor the costs of policing at any Peripheral Canal recreation facility. The State has no power to require a local agency, such as San Joaquin County, to become involved or pay the operating and maintenance costs of recreation facilities at any unit of the State Water Project. The Department is aware that San Joaquin County is concerned about potential recreation costs and recently sent a letter to Mr. Richard Dickenson of San Joaquin County fully explaining how recreation costs of the Peripheral Canal will be met. A copy of that letter is attached.

I hope this provides you with the information you need. If you have additional questions, I will be happy to respond.

Sincerely,

/s/
Ronald B. Robie
Director
Attachment



Antioch-212

STATE OF CALIFORNIA - RESOURCES AGENCY
DEPARTMENT OF WATER RESOURCES
P.O. BOX 388
SACRAMENTO
95802

EDMUND G. BROWN JR. Governor



C O P Y

July 19, 1977

Mr. Richard W. Dickenson
400 First Federal Plaza
6 South El Dorado
Stockton, CA 95202

Dear Mr. Dickenson:

We understand that San Joaquin County is concerned about some of the recreation costs that will be associated with the Peripheral Canal and would like a better understanding of how those costs are to be met. The purpose of this letter is to provide information concerning recreation funding at State Water Project units.

The majority of the terms and conditions under which recreation is developed at State water projects are contained in the Davis-Dolwig Act, Water Code Sections 11900-11925. The federal law dealing with recreation at water projects is contained in Public Law 89-72, "The Federal Water Project Recreation Act". Assuming that the Peripheral Canal is to be a joint undertaking of the State and Federal Governments, these are the primary laws involved.

Before considering the funding of recreation activities it is important to understand how responsibilities for State Water Project programs have been assigned by the Legislature. The Davis-Dolwig Act makes the Department of Water Resources responsible for planning and acquiring lands for recreation at State water projects. The Department of Parks and Recreation is responsible for the design, construction, operation, and maintenance of recreation facilities at State water projects. The Department of Navigation and Ocean Development is responsible for the design and construction of the portion of the total recreation program that relates specifically to boating. The Department of Fish and Game is responsible for the management of fish and wildlife resources at State water projects.



C O P Y

Mr. Richard W. Dickenson
Page 3
July 19, 1977

will continue to be attractive when compared with the alternative of General Fund financing.

Recreation Operation

Operation and maintenance costs of recreation facilities at existing State Water Project units have been met by the recreation operating agency. This has usually been the State Department of Parks and Recreation, although as indicated above, federal and local agencies are operating recreation facilities at some State Water Project units. In one instance, a recreation operating agency - Los Angeles County - used its own funds to develop recreation facilities at Castaic Lake and Lagoon beyond the level of development that had been funded by the State. The agency doing the operation is allowed to retain user fees, charges, concession revenues, etc. to defray its costs, but these are rarely adequate to meet the full costs of operation. It should be mentioned here that when an agency other than the Department of Parks and Recreation operates recreation facilities at a State Water Project unit it does so only as a willing participant. The State has no power to require a local agency to become involved in a project of this nature.

Assuming that the Peripheral Canal is developed and operated as a joint federal-state project and that the Federal Government participates in the recreation program under Public Law 89-72, we see no complications which would upset the basic funding patterns described above. Also, we do not see any provision in federal law that would in any way obligate a local agency to participate if it was not willing to do so. The Department and the Bureau of Reclamation have developed the San Luis Project in western Merced County as a joint federal-state water project, and the recreation program, which is operated by the Department of Parks and Recreation, has become an important feature of the project. Although initiation of the project predated Public Law 89-72, we have divided recreation funding responsibilities between the Federal and State Governments in a manner comparable to that provided in PL 89-72, and there have been no problems of any consequence. We would expect that a joint federal-state undertaking with the Peripheral Canal would likewise produce no particular funding or operation problem for recreation. The Bureau would pay its share of the costs of recreation planning, design, and construction based on whatever formula is decided upon for sharing of Peripheral Canal costs. Recreation operation costs would be paid by the recreation operators.

C O P Y

Mr. Richard W. Dickenson
Page 2
July 19, 1977

In addition to assigning the responsibilities mentioned above to these four State agencies, the Davis-Dolwig Act encourages participation by federal or local agencies or other entities in the design, construction, operation, and maintenance of recreation facilities at State water projects. Such participation is only encouraged, not required, but we do see at existing units of the State Water Project participation in the recreation program by federal agencies, county agencies, and park districts.

The following sources of funds have been used for recreation at existing units of the State Water Project. We assume that these same sources would be used for comparable actions in the State's share of the Peripheral Canal.

Recreation Planning

Recreation planning costs incurred by the Department of Water Resources are met with either General Funds or Project Funds, depending upon the stage of planning involved.

Recreation Land Acquisition and Joint Cost Allocations

Recreation lands have been acquired by the Department of Water Resources using Project Funds as authorized by the Davis-Dolwig Act, as well as by Water Code Section 346. These expenditures are reimbursed by an annual allotment to the Department of tideland oil revenues. Joint water project construction costs allocated to recreation are repaid in the same manner. Joint operation costs allocated to recreation are funded by annual General Fund appropriations.

Recreation Development

Initially, State Water Project recreation facilities were developed with annual General Fund appropriations as provided in the Davis-Dolwig Act. The Legislature, recognizing that the funding program provided in that manner was inadequate, later decided upon the use of general obligation bonds for this purpose. There have been two successful general obligation bond issues for State Water Project recreation facility construction. One was a \$60 million issue in 1970 (Proposition 20), and the other provided \$26 million for State Water Project recreation costs as part of a larger bond issue in 1976 (Proposition 2).

It is, of course, not possible to forecast how future recreation development costs will be met, but we believe that bond funds

C O P Y

Mr. Richard W. Dickenson
Page 4
July 19, 1977

I hope that this information will provide San Joaquin County with a better understanding of the way that recreation costs have been met in the State Water Project and are likely to be met in the Peripheral Canal. Please let me know if I can provide further information.

Sincerely,

/s/
Ronald B. Robis
Director

Antioch-212

STATE OF CALIFORNIA RESOURCES AGENCY

DEPARTMENT OF WATER RESOURCES

P.O. BOX 348
SACRAMENTO
95814
(916) 445-9248

EDWARD O. BROWN Jr. Governor

- COPY -

September 1, 1977

Honorable Robert C. Cline
Member of the Assembly
State Capitol, Room 3104
Sacramento, CA 95814

Dear Mr. Cline:

You recently raised the question of how the same Delta water quality standards could be met with less water with the Peripheral Canal than is required under the present operation.

I asked my staff to prepare the enclosed information which briefly explains the hydraulic and water quality relationships that would allow the conservation of Delta outflow with the Peripheral Canal in operation.

If you should desire more details on these complex relationships, I would be glad to arrange a briefing by a member of my technical staff.

Sincerely,

/s/
Ronald B. Robie

Director
Enclosures

DETA EXPLAINING WATER QUALITY RELATIONSHIPS

Most of the water available for export in the Delta enters from the north via the Sacramento River. The main export pumps of the State Water Project (SWP) and Central Valley Project (CVP) are located at the southwest edge of the Delta, far removed from the normal route of the Sacramento River. Since the average water level throughout the Bay-Delta estuary is relatively flat, the water from the Sacramento River can be drawn to the export pumps.

Existing channel capacities limit the amount of water that can be transferred from the Sacramento River through the central Delta to the main SWP and CVP export pumps. This limitation causes a portion of the water to flow into the western Delta and then back upstream (reverse flow) where it blends with the cross-Delta flows on the way to the pumps (see Figure 1). The route of the export water is important because the water becomes more saline due to seawater intrusion as it approaches the western edge of the Delta. The salinity of the water in the western Delta depends on the amount of water flowing out of the Delta to repel the sea water.

Under controlled flow conditions, the rates of Delta inflow, outflow, and export must be carefully balanced to avoid exceeding water quality criteria in the Delta and at project diversion facilities for the Contra Costa Canal, the Delta Mendota Canal, and the California and South Bay Aqueducts. As export rates are increased, more water is drawn from the western Delta, and to maintain the salinity balance, the sea water must be recycled further by additional Delta outflow. During periods of low natural flow, most of this additional Delta outflow must be released from upstream storage reservoirs of the SWP and CVP. This present relationship is illustrated by the curved line on Figure 2.

With the Peripheral Canal in operation, the point of diversion for the exports would be moved to the Sacramento River in the northern Delta. This change in diversion point, coupled with releases from the Canal, would restore positive downstream flow in the main channels of the Delta and eliminate the drawing of saline water from the western Delta (see Figure 3).

With water no longer drawn from the western Delta, the Delta outflow would not have to be increased to maintain water quality as exports are increased. Water quality standards could then be met by generally constant rates of Delta outflow as shown by the horizontal line on Figure 2.

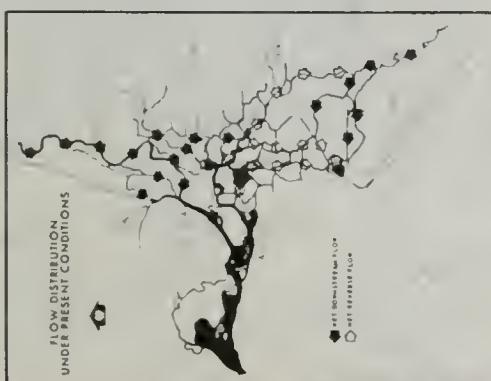
The distance between the curved and horizontal lines on Figure 2 represents the potential conservation of Delta outflow that could be realized with the Peripheral Canal, while meeting the same Delta water quality standards. The exact savings would depend on the quality standards adopted by the State Water Resources Control Board.



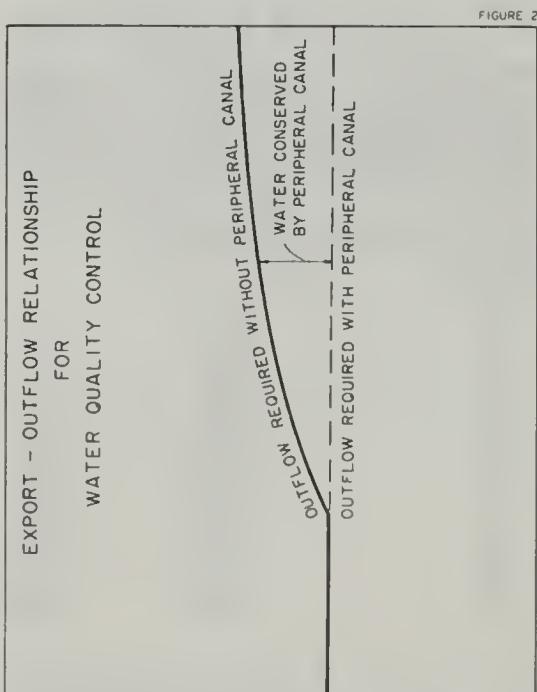
FIGURE 3



FIGURE 1



EXPORT - OUTFLOW RELATIONSHIP
FOR
WATER QUALITY CONTROL



INCREASING DELTA OUTFLOW REQUIREMENTS

Antioch-212

STATE OF CALIFORNIA—RESOURCES AGENCY
DEPARTMENT OF WATER RESOURCES
P.O. BOX 388
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95803
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EDWARD G. BROWN JR. Governor

C-O-P-Y

September 2, 1977

Honorable Eugene T. Ouslco, Chairman
Assembly Committee on Water, Parks,
and Wildlife
State Capitol, Room 2016
Sacramento, CA 95814

Dear Gene:

Your letter of September 1 requested answers to a series of nine questions related to Senate Bill 346 (Ayala). You asked for our response by 2:00 p.m. September 2, 1977, for a proposed hearing of your Committee on the bill. Before I answer your specific questions I would like to respond to some of the other issues which were raised in the previous hearings on this bill held in your Committee.

During the testimony by a number of witnesses the impression was given that the elements of SB 346 have been arrived at hastily and without in-depth study. Several witnesses requested that the bill be held over to January to allow time for interim hearings which might produce answers to some of the questions which they had. Most of these questions were directed at the adequacy of the water supply produced by the SB 346 facilities, and questions concerning the Peripheral Canal as the selected Delta facility. In my view, neither of these issues needs further study as far as support or opposition to SB 346. The bill provides for feasibility level studies of the water supply reservoirs and includes further environmental and engineering studies of the Peripheral Canal, which also will be staged, specifically for the purpose of answering remaining questions concerning the operation of that facility.

I believe that the bill contains provisions which will insure that questions concerning feasibility, economic, environmental, and financial matters must be satisfactorily answered before the facility can be constructed. I would point out that since 1952 the Department has spent in excess of \$39 million in its planning efforts related to the Delta and the State Water Project. In just the last 2½ years, our staff has examined a number of alternative courses of action for the State Water Project and the Central Valley Project as part of our Delta

Honorable Eugene T. Ouslco
Page 2
September 2, 1977

Alternatives Study. Nearly \$2 million was expended by the Department on this study effort, and additional funds were spent by other study participants. Many public hearings in all areas of the State were held as part of this review. I personally attended many of these meetings.

On the matter of water supply, the State of California began serious study of this issue in the mid-1920's. In particular, Bulletin No. 26 issued in 1931 addressed the water supply of the Sacramento River basin, and this study has been expanded upon in the intervening years by the Department and by the Federal Government. Our recent studies confirm that the unused portion of the Sacramento Valley water supply can be utilized by the facilities specified in SB 346, and will be adequate to meet the needs of the two projects through the year 2000. We have discussed this issue in some detail in our response to your August 8 letter and in the answers to the specific questions which we are responding to in this letter.

In summary, I am convinced that adequate studies have been performed to demonstrate that the facilities contained in SB 346 will in fact meet the needs of the two projects through the year 2000 and that they can be financed in a sound manner. I further believe that any unanswered questions related to the facilities in SB 346 will be answered as required by the bill prior to construction of any of the facilities.

I am attaching our responses to your Committee's specific questions. If you desire additional information on these matters, I would be pleased to provide it to the Committee.

Sincerely,

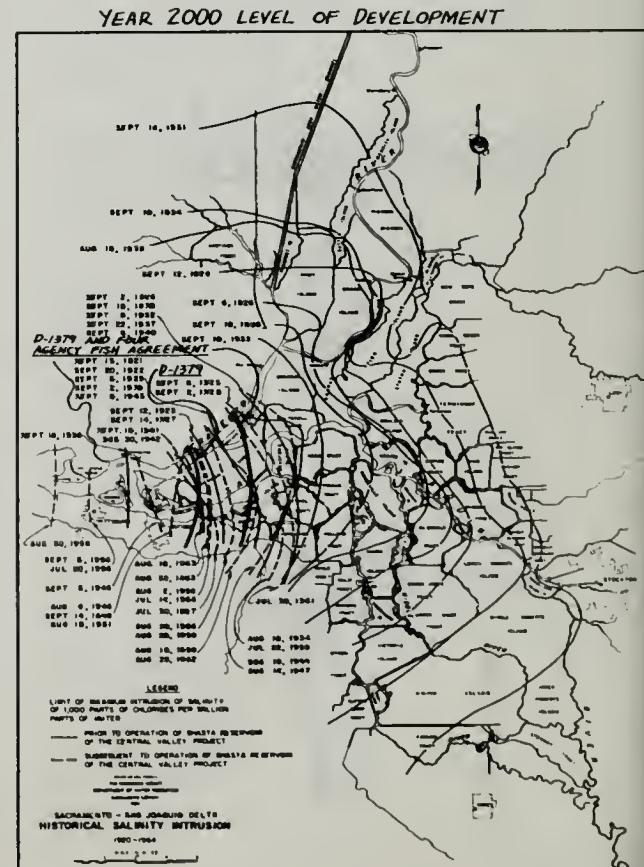
/s/
Ronald B. Robie
Director

Attachments



Question 1: "Under future export levels, what are the worst salinity intrusions expected in the Delta under: (a) D-1379; and (b) D-1379 agricultural standards and the Four Agency Fish Agreement?"

Response: The attached map illustrates the historical maximum intrusion of 1,000 parts per million (ppm) chloride ocean salinity for the period 1920-1964. Lines have been added to the map to indicate the estimated future maximum intrusion in the year 2000 with the facilities defined in SB 346 (Ayala). These lines represent the worst conditions observed in an operation study that considered 50 years (1922-1971) of historical hydrologic conditions. Maximum intrusion occurs at high tide and salinities are at that concentration for a brief time. Water quality standards are usually set on the basis of 14-day averages to compensate for these varying effects. The maximum intrusion lines indicate 1,000 ppm chloride, whereas the 14-day mean would probably be from 200 to 300 ppm chloride at the same locations.



Antioch-212

Question 2: "How much water will be available to the State Water Project on a year-by-year basis to the year 2000 with the combination of existing and SB 346 facilities?"

Response: The estimated firm yield^{1/} delivery capability of the SWP, based on the 1926-34 drought, and assuming the CVP would share in meeting Delta requirements, would be:

Year	Added Facilities	SWP Firm Supply in Million AP	Projected Demand
1980	None	2.3	1.9
1985	Additional Delta Pumps North Partion Peripheral Canal	2.4 to 2.5	2.3
1990	Finish Peripheral Canal, Ground Water South of Delta, and Los Vaqueros	3.2	3.1
1995	Cottonwood	3.3 to 3.4	3.2
2000	Olema Reservoir Complex (at half potential)	3.6*	3.3

Initial filling of the large reservoirs on Cottonwood Creek and especially the Olema Complex would take many years. In partial recognition of this filling factor, we have assumed only half the long-term potential of Olema to be available in year 2000.

^{1/} See response to question 4 for explanation of firm yield and indication of risk of deficiency.

Question 3: "How much SWP water will be available to Southern California on a year-by-year basis to the year 2000?"

Response: The attached table shows the DWR projected demand year-by-year for all SWP contractors, those in Southern California, and for the Metropolitan Water District.

Since the estimated SWP supply exceeds the projected demand at the five-year points designated (see response to question 2), we would anticipate merging the projected demands in the table in all but the driest years as indicated in our response to question 4.

PROJECTED DELIVERIES OF SWP ENTITLEMENT WATER^{1/} (1,000 acre-feet)

Year	All SWP Contractors	Southern California Contractors	Metropolitan Water District
1978	1,795	972	824
1979	1,840	988	817
1980	1,919	1,021	821
1981	2,046	1,086	862
1982	2,144	1,114	863
1983	2,217	1,117	859
1984	2,270	1,112	840
1985	2,325	1,108	825
1986	2,452	1,137	841
1987	2,566	1,170	861
1988	2,763	1,297	973
1989	2,944	1,412	1,076
1990	3,137	1,529	1,177
1991	3,158	1,548	1,196
1992	3,182	1,564	1,213
1993	3,202	1,581	1,231
1994	3,227	1,599	1,250
1995	3,244	1,618	1,270
1996	3,285	1,619	1,273
1997	3,250	1,625	1,279
1998	3,252	1,626	1,282
1999	3,258	1,631	1,288
2000	3,259	1,634	1,292

^{1/} Projections reflect DWR goal for waste water reclamation and water conservation.

Question 4: "Do the facilities in SB 346 meet the expected water demands of the State Water Project? Will the risk of shortage in 1990 and 2000 compare to present risks?"

Response: In our answer to questions 2 and 3, we indicated that the anticipated firm yield capability of the SWP would be enough to meet the projected demands of the SWP contractors. By definition, firm yield includes curtailments (deficiencies) in water deliveries to agricultural contractors in critically dry years. So there are built-in risks of shortage, particularly to agricultural users in critically dry years. Also, there are three situations aside from project facility breakdown, which could result in curtailments to M&I users. The first is a condition worse than the drought on which project yield was based (1926-1934); the second is if a prolonged dry period should occur at the completion of new storage reservoirs, thereby preventing initial filling and the expected yield; and the third situation is that Delta standards to be adopted by the State Water Resources Control Board may require more water than those assumed in project yield studies (draft Four-Agency Fish Agreement and Basin Plan agricultural criteria). This latter matter could be accommodated by modifying project construction schedule, however.

We have not statistically evaluated the relative risks on the SWP between now and year 2000, but our 1980, 1990, and year 2000 operation studies indicate that the frequency and severity of risk is diminished in 1990 and 2000, even though the combined target demand is 1 to 1.2 million AP/year more.

Question 5: "How much will water cost per acre-foot to the Metropolitan Water District each year through the year 2000?"

Response: The following unit costs of water per acre-foot are based upon water delivered at "canal side" from State Water Project facilities. The rates do not include costs for the Metropolitan Water District's distribution system. The projected rates are based upon current day prices and do not include allowances for future inflation of construction prices nor increases in future salaries and wages for operating personnel. The rates do reflect estimates of increased costs of power and energy in future years. If inflation continues at a rate of about 6 percent per year, the unit cost of water by year 2000 could be as much as \$225 per acre-foot rather than the \$150 per acre-foot shown.

Calendar Year	Projected Water Deliveries to Metropolitan Including Allowances for Water Conservation and Waste Water Reclamation (AP)	Estimated Annual Unit Cost of Water ^{1/} (\$/AP)
1978	824,000	102
1979	817,000	102
1980	821,000	106
1981	826,000	108
1982	863,000	110
1983	859,000	165 ^{2/}
1984	840,000	169
1985	825,000	172
1986	841,000	178
1987	861,000	176 ^{3/}
1988	973,000	167
1989	1,076,000	164
1990	1,177,000	155
1991	1,196,000	156
1992	1,213,000	156
1993	1,231,000	153
1994	1,250,000	152
1995	1,270,000	150
1996	1,273,000	150
1997	1,279,000	150
1998	1,282,000	150
1999	1,288,000	152
2000	1,292,000	150

^{1/} MWD also makes annual estimates. Their estimates are commensurate with those shown.

^{2/} Jump in cost due to increased cost of power.

^{3/} Decreasing values of unit costs occur because repayment of capital and operating costs become essentially level while water deliveries continue to increase.

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Question 6: "Please compare the yields of the Peripheral Canal, the New Hope Cross Channel, the upper portion of the Peripheral Canal with an enlarged Clifton Court Forebay, and the upper and lower portions of the Peripheral Canal with an open middle, under:

- (a) D-1379
- (b) D-1379 agricultural standards and the Four-Agency Fish Agreement"

Response: We estimate the combined new CVP and SWP yield of the Peripheral Canal with additional Delta pumps to be about 0.6 MAF/year with D-1379 criteria and about 1.1 MAF/year with D-1379 agricultural standards and the Four-Agency Fish Agreement.

For the New Hope Cross Channel, we estimate the yield would be approximately 0.2 MAF/year under D-1379 criteria and about 0.35 MAF/year with D-1379 agricultural criteria and the Four-Agency Fish Agreement.

The yields of the other two alternatives, the upper portion of the Peripheral Canal with either enlarged Clifton Court Forebay or the southern portion of the Peripheral Canal, are about the same as that of the full Peripheral Canal.

Statements have been made that the Delta alternatives that are open in the middle would provide more yield than the Peripheral Canal. This would be true only under very specific assumptions. First, it must be assumed that there will be different and more stringent agricultural water quality standards set for the interior Delta. Second, and more importantly, it must be further assumed that the fishery criteria would remain the same with all alternatives. The Department of Fish and Game has indicated that the open systems would require more Delta outflow to protect striped bass; making the second assumption inappropriate. At best, any water saved by an open system to meet more stringent agricultural standards would be offset by the additional requirements for the fishery.

Question 7: "What provisions have been made to mitigate possible flood control problems caused by the construction of the Peripheral Canal?"

Response: The construction of the Peripheral Canal will not cause additional flood control problems. The sizing of all cross-drainage facilities will be large enough, in relation to previously existing channels, to assure that potential overland flooding conditions after completion of the Peripheral Canal will be no more severe than such exposure prior to its construction.

Stone Lake flood flows as well as Middle River flood flows will be accepted into the Peripheral Canal. At the Mokelumne River, Disappointment Slough, San Joaquin River, and Old River, the Peripheral Canal will be siphoned under the existing channels. Therefore no additional flood control problems will be caused by the construction. Beaver Slough, Hog Slough, and Sycamore Slough flood flows will be combined and conveyed in a siphon under the Peripheral Canal. White Slough and Telephone Cut flood flows will be intercepted in a drainage canal adjacent to the Peripheral Canal and will be conveyed to Disappointment Slough. At Fourteen Mile Slough a substitute drainage channel, larger in size than the existing channel, will be constructed to handle flood flow and to provide navigational access.

Question 8: "How much combined (CVP + SWP) yield would be required above the November 19th criteria in order to meet:

- (a) D-1379
- (b) D-1379 agricultural standards and the Four-Agency Fish Agreement"

Response: (a) About 1.8 million AF/year. This estimate is for the long-range condition assuming that a Peripheral Canal and overland water supply facilities in the western Delta are in operation. It is based on estimated Delta outflow requirements of 4,500 cfs to meet the D-1379 Chippis Island fishery requirement of 4,000 ppm chloride and 6,700 cfs to meet the Antioch striped bass 5-week requirement of 1,000 ppm TDS (mg/l). This compares to 2,500 cfs to meet the November 19 criteria Emmaton agricultural standard of 1,000 ppm chloride.

(b) About 0.8 million AF/year. (D-1379 also has M&I TDS standards at Antioch, which will be terminated when existing M&I uses are fully supplied by overland facilities. DWR considers the present Contra Costa Canal to be the overland supply. SB 346 provides for the relocation of the intake to this canal to Clifton Court Forebay, which would improve the quality of water delivered.)

When comparing criteria it should be remembered that the November 19, 1965 criteria were negotiated between DWR, USBR, and representatives of some Delta agricultural water users as a basis for further negotiations in a water right settlement. Fish and Game interests did not participate in the negotiations and the November 19 criteria do not adequately protect fish and wildlife.

Question 9: "How will the nonreimbursable costs of improved water quality in the Delta be determined?"

Response: The final method of allocation has not been determined. In the response to Question 13 in our letter dated August 11, 1977, we provided the basis for determining the State's share of the proposed nonreimbursable costs. In essence, the method develops the percentage by comparing the yield being utilized for Delta purposes to the yield and cost of a facility which would provide both the yield required for the SWP and that utilized by the Delta. For your convenient reference, we have restated our response to question 13 below. I presume there would be a similar determination for the Federal share of the yield.

Response to Question 13 of our August 11, 1977 letter:

"In lieu of making a determination of the "enhancement" aspects of the proposed facilities, the Department has estimated the benefit to the Delta as being measured by the additional yield required above a basic requirement of 1,000 ppm chloride at Emmaton. Based on this criteria the State's share of the yield of the Delta facilities was estimated to be about 900,000 acre-feet. On today's anticipated criteria, the State's share is about 500,000 acre-feet. The difference of 400,000 acre-feet is amount of yield (or benefit) being utilized for Delta purposes. By estimating the costs of a facility that would meet both Delta needs (.4 MAF) and project needs (.9 MAF) and allocating by proportionate use (.4 x cost of a 1.3 MAF facility) it is estimated that 1.3 the present worth value of the Delta's share of such a facility is about \$230 million."

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STATE OF CALIFORNIA - BUREAU OF WATER RESOURCES

DEPARTMENT OF WATER RESOURCES

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(916) 445-9248

REBUND D. BROWN JR. Director



- COPY -

September 23, 1977

Honorable Stan Statham
Member of the Assembly
State Capitol
Sacramento, CA 95314

Dear Mr. Statham:

During hearings by the Assembly Committee on Water, Parks, and Wildlife on SB 346, you asked questions regarding summer flows in the Sacramento River with Glenn Reservoir in operation and land owner protection provisions in our property acquisition procedures. This letter is in reply to those questions.

Question: What is the approximate increase in flow of the Sacramento River in summer with Glenn Reservoir in operation?

Response: Examination of our year 2000 operation study shows Glenn Reservoir would increase the summer (June, July, August) flows of the Sacramento River by the amounts shown below. To provide perspective, the projected flow of the Sacramento River in the vicinity of Colusa and at Sacramento (including the release from Glenn Reservoir) are also shown.

Summer Averages	Approximate Flows, cfs		
	Glenn Releases	Vicinity of Colusa	at Sacramento
50 years	400	8,000	17,000
7-year critical period	1,400	7,800	13,000
Maximum month	1,700	14,000	24,000

At the year 2000 we anticipate that Glenn Reservoir would only be operated at partial capacity. Consequently, under full operation sometime past the turn of the century, the foregoing summer releases from Glenn would be larger, perhaps double the amounts shown. Under this condition, however, the flow in the river would increase only 10 percent or less.



Honorable Stan Statham
Page 3
September 23, 1977

I hope the foregoing information meets your needs.

Sincerely,

/s/
Ronald B. Robie
Director

Honorable Stan Statham
Page 2
September 23, 1977

In August 1967, after several years of detailed study, the Department of Water Resources published Bulletin No. 125, "Sacramento Valley Seepage Investigation". One of the conclusions in that bulletin reads as follows:

"The approximate maximum flows that can be maintained in the Sacramento River for long duration without causing seepage in the top 4 feet of soil are as follows:

Colusa Weir to Fremont Weir	9,000 cfs
Fremont Weir to American River	15,000 cfs
American River to Hood	19,000 cfs*

(emphasis added)

Comparing projected river flows with the approximate limiting flows indicates that summer seepage should not be a chronic problem. However, with passage of SB 346 we shall restudy the Sacramento River seepage and erosion problems and solutions thereto in accordance with Section 11259.5 of the bill. Furthermore, State law already provides that the costs of solving project-caused seepage problems shall be borne by the project.

Question: What protection is provided the people of Els Creek whose property will be acquired by the project?

Response: Water Code Sections 253 and 11575 are the basic statutory sources of authority for Department of Water Resources to acquire land and other property needed for State water projects, including multipurpose projects.

Section 14, Article 1, of the California Constitution provides that all property owners will be paid just compensation for their property, generally interpreted by California courts to mean fair market value.

The Relocation Assistance Act of 1972 (Government Code Sections 7260-7274) which became effective July 1, 1972, provides for both payments and relocation assistance to help defray moving costs and possible increased buying or renting costs. For farms or businesses, the payments will help defray moving costs and certain costs incurred in searching for a replacement business or farm. Relocation services are provided to assist in finding a replacement house, business, or farm.

It is the intent of this Department that all assistance within the law will be provided.

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STATE OF CALIFORNIA—RESOURCES AGENCY

DEPARTMENT OF WATER RESOURCES

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EDMUND G. BROWN JR. Governor



- COPY -

October 26, 1977

Honorable Daniel E. Boatwright
Member of the Assembly
State Capitol, Room 3091
Sacramento, CA 95814

Dear Mr. Boatwright:

This is in response to your request during the hearings on SB 346 for an analysis of possible water savings through agricultural water conservation measures.

There is substantial potential for agricultural water conservation along the coast and in the Colorado Desert region, but this letter will deal with the Central Valley. Bulletin No. 198, "Water Conservation in California", a copy of which is enclosed, outlines conservation potential in these other regions.

In the Central Valley, much of the excess applied water is reused directly on downstream farms, reused indirectly through ground water recharge, or contributes to required Delta outflow. However, water savings amounting to 410,000 acre-feet per year under dry year conditions would be possible with an expenditure of \$2,340,000,000. These are the maximum savings possible, regardless of expenditures.

This would be accomplished by:

1. Lining major canals, ditches, and drains and substituting closed pipe, where practical, for open laterals, farm head ditches and drains to eliminate deep percolation losses, evaporation losses and use by native vegetation.
2. Installing drip irrigation in all young orchards and vineyards to reduce some of the evaporation losses compared to other irrigation methods.
3. Installing drip or sprinkler irrigation systems where appropriate, land leveling, and improving water system operation in association with irrigation management services to reduce deep percolation.



Honorable Daniel E. Boatwright
Page 3
October 26, 1977

While I strongly support agricultural water conservation, I do not believe that all the water developed through facilities authorized in SB 346 can be developed by implementing increased irrigation efficiency. I believe that water conservation and water development must proceed together to meet the very substantial water needs of California in the coming years.

Sincerely,

/s/

Ronald B. Robie
Director

Enclosure

Honorable Daniel E. Boatwright
Page 2
October 26, 1977

The efforts would reduce to a minimum all nonessential consumptive water losses and eliminate deep percolation of surface water supplies, except that required for leaching accumulated salts from the soil profile.

The lining of all canals, laterals, and drains and use of closed pipe systems would greatly reduce ground water recharge that normally occurs. Although reductions in ground water recharge are acceptable during dry years and are consistent with good conjunctive use practices, the conservation measures would require substantial effort and, in addition, special facilities to replace the lost capability for recharging ground water during wet years.

During dry years, farmers use available supplies very carefully. Water saved is used by the farmer or within the local area to overcome water shortages. If this practice continued in the operation of the program shown here, much of the water saved would likely be reused in the immediate area. Only about 100,000 acre-feet of the 410,000 acre-feet saved water would reach the Delta.

In addition to the savings outlined above, irrigation management services may lead to additional savings in some parts of the Valley. The extent of these savings is still unknown, since the commercialization of this service is just beginning. SB 346 as currently drafted would involve the Department in the development of this type of service through contracts with irrigation districts.

As you know, SB 346 would provide for a fifty million dollar loan fund which would quicken the pace of installation of water saving irrigation equipment. This fund should substantially assist small farmers in purchasing necessary water saving equipment.

Senator Vuich has sponsored a bill (SB 1034) to provide for tax advantages to those installing water saving irrigation equipment. The Governor has signed this bill. I believe that this will also help implement agricultural water conservation in the Valley.

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- COPY -

EDMUND G. BROWN JR. Governor



November 18, 1977

Honorable Ruben S. Ayala
Chairman
Senate Committee on Agriculture
and Water Resources
State Capitol, Room 2048
Sacramento, CA 95814

Dear Ruben:

At the Los Angeles hearing of the Joint Conference Committee on SB 346, Assemblyman Duffy asked what was meant by "Commitment".

I explained that the Department of Water Resources meant provisions in our State Water Project water supply contracts when speaking of water exports, and the State's area of origin and Delta protection acts when speaking of water for Delta commitments. I did not attempt to explain what the U. S. Bureau of Reclamation meant by Commitment, so I'm sending the attached explanation of "CVP Committed Water" as it appeared in the "Review Draft, Special Task Force Report on San Luis Unit, Central Valley Project, California, October 1977". This may be of help to the committee when evaluating testimony of various water interests.

Sincerely,

/s/

Ronald B. Robie
Director

Attachment



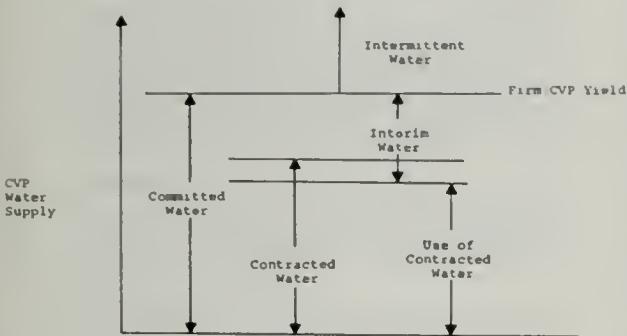
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Excerpt from Draft Special Task Force Report
on San Luis Unit, CVP

B. Central Valley Project

More CVP water is available for use than is needed to meet current contractual demands. The water in excess of long-term contracted demands at any time is classified in several ways.

The following diagram describes the different classifications:



"Committed water" is that water committed to predetermined areas of need to serve anticipated demands for CVP water. It corresponds to the firm, dependable yield of the project. The legal commitments are in the form of water supply contracts, and are accounted for in "contracted water." The remainder of the committed water is

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CVP yield, which is defined as the maximum amount of water available each year to meet CVP demands and obligations, given allowable deficits in critical years.^{26/}

The potential uses of Interim and intermittent water vary, since Interim water is available on a diminishing schedule, and intermittent water is available only in wet years. The Bureau has conducted studies to project the future availability of both these classifications of water. The amount of Interim and intermittent water available depends on the potential uses. The Bureau assumes that return flows from upstream users can be utilized by downstream users, and includes an allowance for reuse in the CVP yield estimate. Roughly 3,000,000 acre-feet is presently uncontracted of the total 11,400,000 acre-feet future projected annual firm yield of all CVP facilities. The Bureau has estimated the rate of buildup in demand for CVP contract water as well as the Interim water available to be about as shown on Figure X-6. Table X-2 indicates the availability over time of Interim water for in-basin uses.^{27/} If this water is not diverted upstream, and is committed solely for Delta uses or export, the amount of Interim water available is somewhat less, as indicated in the column "Delta Equivalent." This column indicates that in 1975, for example, 1,805,000 acre-feet released from CVP storage could be used and reused to supply a total demand of 3,760,000 acre-feet, or go straight through to the Delta and supply a 1,805,000 acre-feet demand. Consequently, the amount of Interim water available depends on reuse assumptions. The same is true for

^{26/} The Bureau (personal communication, B. Everett, October, 1977) suggests that intermittent water be defined as follows:

"Water deliveries above the firm CVP yield can be made available only to the extent that seasonal and carryover storage in CVP reservoirs is projected to be in excess of that required to provide the firm yield in ensuing year assuming a drought will follow the given operational year."

^{27/} BuRec, Working Document No. 9

called "interim water", and is committed on the basis of authorizing legislation or project plans, or is available from those water users who are using less than their full contractual entitlements. The Bureau expects to contract for sale of all "committed water", but has not yet done so due to distribution system financing constraints of potential contractors, problems associated with unconstructed and unauthorized projects, and other planning considerations.

"Contracted water" includes that necessary to meet all current project constraints, after allowing for Delta outflow. The Bureau uses a 2,500 cfs net Delta outflow constraint to determine availability of interim water.^{24/} If this or other constraints change, the amount of interim water available will change proportionally. Since interim water is the amount of supply available after meeting current contracted demands, the availability of interim water should decrease over time until the full CVP yield is under contract and being delivered.

"Intermittent water" is water available only in wet years, and can be controlled by CVP facilities for delivery during the same year.^{25/} It is the water available in some years above the firm

^{24/}United States Bureau of Reclamation. 1976. Total Water Management Study for the Central Valley Basin, California: Interim Water Supply. Working Document No. 9. 11 p. This figure was derived to estimate the amount of outflow to meet the criteria established on Nov. 19, 1965. The Bureau has subsequently revised this estimate to 3,600 cfs until and unless a Peripheral Canal is in operation.

^{25/} United States Bureau of Reclamation. 1975. Total Water Management Study for the Central Valley Basin, California: Intermittent Surface Water Supply, Working Document No. 6.

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intermittent water.

Present and potential uses of CVP Interim water can be maintained only until project demands catch up with supply. The Bureau is presently using Interim water for power production, temporary supply to the Westlands Water District, reservoir recreation, American River fish and recreation flows, Trinity River fish releases, and for Delta water quality purposes. The Bureau has indicated that potential additional uses of Interim water include irrigation in the San Joaquin Valley, supplemental supplies to meet SWP demands, and temporary use of New Melones yield outside the Stanislaus River Basin until local demand approaches supply.^{28/}

Availability of Interim water depends on the year-to-year variations in precipitation. In a wet year, much Interim water is available for use. In a dry year, Interim water is non-existent.

Intermittent water is used extensively in the Friant Division service area. Most of the San Joaquin River flow is diverted for irrigation, but the demands exceed the firm yield. In dry years, this difference is made up by conjunctive use of local groundwater. During wet periods, Interim water is used directly to meet irrigation demands. If the available Interim supply exceeds irrigation demands, the excess is used to recharge the groundwater basin.

The Bureau has studied a similar conjunctive use program in the Tehama-Colusa service area. Other potential uses of Interim CVP yield include enhancement of fish, wildlife, recreation, and water quality.

^{28/} BuRec, Working Document No. 9

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EDWARD G. BROWN Jr., Governor



- COPY -

November 25, 1977

Honorable Eugene Gualco, Chairman
Assembly Committee on Water, Parks,
and Wildlife
State Capitol, Room 2016
Sacramento, CA 95814

Dear Gene:

This is in response to your request at the hearing by the Joint Conference Committee on SB 346 (Ayala) in Los Angeles on November 3, 1977, relative to how much it would cost to develop the Eel River and convey the additional yield to the San Joaquin Valley. Based on updating studies made prior to the State's Wild and Scenic Rivers Act of 1972, my staff made a very rough appraisal of what would be involved in such a project and prepared the enclosed summary for your information.

As you are aware, the Wild and Scenic Rivers Act not only prohibits the State from building dams and reservoirs on rivers named in the Act, it also prohibits the Department from studying dams and reservoirs on those rivers. The Act does, however, place the Eel River in a special status in that it requires a report by DWR to the Legislature by December 20, 1984, on the need for water supply and flood control projects on the Eel River and its tributaries. Since 1972, in compliance with the Act, the Department's planning studies for developing additional supplies for the State Water Project (SWP) have concentrated on developing physical and environmental data needed for the December 1974 report. These studies included alternative sources in the Sacramento Valley since the Burns-Porter Act includes those potential sources in addition to North Coast streams for additional yield for the SWP.



11/23/77

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Rough Appraisal of Eel River-Delta Diversion Project to Deliver Additional Water to San Joaquin Valley

The Corps of Engineers' Dos Rios Project (with minor modifications made during subsequent DWR planning)

Dos Rios Dam: 730 feet high; crest elevation 1,650 feet
Dos Rios Reservoir: 7,600,000 acre-feet; 40,000 acres
Grindstone Tunnel to Glenn County: 23.4 miles long;
diameter 17 feet
Mean Inflow: 1,015,000 acre-feet per year
Annual Fish Release: 217,000 acre-feet per year
Dry-Period Yield: 930,000 acre-feet per year
Average Diversion to Sacramento Valley: 540,000 acre-feet
per year

Aqueduct System from Delta to San Joaquin Valley

Canals to Bakersfield: Length 330 miles; capacity 165 miles @ 5,000 second-feet and then reducing to 500 second-feet at terminus
Ten Pumping Plants: 7 @ 5,000 cfs and 3 @ 2,500 cfs; total pump lift 550 feet
Offstream Storage, surface and underground: 1,000,000 acre-feet
Average Diversion of Surplus Sacramento River Flows: 390,000 acre-feet per year

Costs (1977 price levels)	Project First Cost, Dollars	Approximate Unit Cost of New Yield Dollars/ac-ft
Dos Rios	1,000,000,000	
Aqueduct System	1,600,000,000	
Total	2,600,000,000	250
Year 2000 price level*	9,900,000,000	960

*Assuming 6 percent annual inflation rate (compounded)

Principal Unresolved Issues

Round Valley

A large Dos Rios Reservoir would flood the 18,000-acre Round Valley, displacing approximately 1,400 people (including many of the 350 Indians of the Round Valley Reservation). Alternative plans that would not flood the valley encounter problems with sediment, landslides, and water quality that make their feasibility questionable. From an engineering viewpoint, the large Dos Rios Reservoir would clearly be superior.

Honorable Eugene Gualco
Page 2
November 25, 1977

I hope this information is sufficient for your needs and, of course, I will be pleased to discuss it with you if you wish.

Sincerely,

/s/
Ronald B. Robie
Director
Enclosure

Diversion Routes

In the North Bay counties and Lake County, substantial latent opposition exists to an eastward diversion from the Middle Fork Eel. The 1972 district report shows that southerly routing through Clear Lake would not be much more costly than the eastward route, but the environmental impacts would be much greater. If Glenn Reservoir were to be built, the economic and environmental comparisons would shift considerably in favor of the eastern route.

Fishery Impacts

About one-sixth of Eel River salmon and steelhead spawning takes place above Dos Rios Dam site. No definite plans have been made for fish preservation and significant problems remain unresolved. The most recent studies (1972) were based on a hatchery at the dam and controlled releases of 17,000 acre-feet per year. Department of Fish and Game personnel have indicated that greater flow releases might be necessary or that periodic high releases might be needed to scour out sediment deposited in the river channel downstream. Either of these changes would decrease project yield and increase unit costs of water.

Wildlife Impacts

Dos Rios Reservoir would inundate an area with substantial wildlife value. The Department of Fish and Game does not feel that improvements on adjacent lands could provide satisfactory compensation for inundated habitat. Consequently, some offsite mitigation would be needed, but no such plan has yet been developed.

Sediment

Dos Rios Reservoir would reduce peak flows in the Eel River and diminish the river's ability to move sediments. Because of the high sediment production and prevalent landsliding in the Eel River, channel aggradation (infilling) is possible. This appears to be a particular threat in the 20-mile reach between the Middle Fork and the North Fork. Additional studies of this hazard were in progress when studies terminated in 1977.

Reservoir Landslides

Dos Rios Reservoir would inundate many unstable areas and accelerate or trigger landsliding into the reservoir. A large reservoir would have sufficient storage to absorb the landslide material without serious effect; the main hazard would be waves from rapid earth movements. Smaller Dos Rios Reservoirs would be much more vulnerable to landslides.

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Sacramento River Seepage

At high flows, water levels in the Sacramento River are often higher than adjacent land surfaces; under this condition, seepage under the levees can damage crops or hinder agricultural operations. Present summer flows are not high enough to cause seepage, but they approach the seepage threshold at times. Importation of Eel River water could cause or aggravate seepage problems (especially if Glenn Reservoir were built first for offstream storage of Sacramento River water). The 1972 Eel River studies allowed a modest cost for on-farm drainage systems to offset seepage problems. There is some current discussion of the possibility of a separate system to convey releases from new projects to the Delta. This would involve around 100 miles of canals and channel improvements, adding 10 to 20 percent to the cost of a Dos Rios Project. The need for a separate conveyance system would tip the scales back toward a southerly diversion routing from the Eel.

Sacramento River Erosion

Many claims are being made recently about erosion damages caused by sustained high summer flows in the Sacramento River. Such problems would be aggravated by additional releases from an Eel River Project. No solution has been identified for potential erosion problems; a separate conveyance would work, but the cost would be very high in comparison to some other alternatives. Needed additional studies will be carried out in conjunction with the Glenn Project, which presents a similar problem.

San Joaquin Valley Drainage

The question of disposal of poor quality irrigation return flows is still pending. Consequently, San Joaquin Valley water users still face additional costs constructing a drainage facility such as the San Joaquin Valley Master Drain.

Assumptions on Aqueduct System

An aqueduct alignment along the east side of the San Joaquin Valley was assumed for the following reasons.

Neither the California Aqueduct nor the Delta-Mendota Canal will have capacity available for transporting Dos Rios water for ground water replenishment in the San Joaquin Valley after full contract commitments and the Mid-Valley Canal project are completed.

Constructing a new aqueduct on the west side of the San Joaquin Valley would be impractical for the following reasons:

1. The North San Joaquin Division was located at the edge of foothills along the west side of the valley leaving no room for another parallel canal to the west.
2. The Delta-Mendota Canal lies quite close to the North San Joaquin Division since its water surface is only 50 feet lower. The proximity of the two alignments plus the fact that about 15 miles of Interstate 5 is located between the two canals would make an intermediate major canal alignment very costly.
3. Major canal crossings might be required in the vicinity of San Luis Reservoir.
4. More room is available to the south but all the alignment would be located in lands now serviced by the San Luis and South San Joaquin Divisions.

Finally, most of the ground water overdraft occurs on the east side of the San Joaquin Valley from Merced County to Kern County.

STATE OF CALIFORNIA—RESOURCES AGENCY

EDWARD G. BROWN, M. GOVERNOR

DEPARTMENT OF WATER RESOURCES

P.O. BOX 380

SACRAMENTO

PHONE

(916) 445-9248

- COPY -

December 2, 1977

Honorable Stan Statham
Member of the Assembly
State Capitol, Room 6007
Sacramento, CA 95814

Dear Stan:

Your letter of September 22 asks several questions concerning water in general and SB 346 in particular. I am very sorry about the lateness of my response, but the legislative activities on SB 346 and some recent staff changes caused the delay. I assure you that your future requests will be handled more promptly.

Specifically, you asked the following questions:

1. "Prior to storing underground water, are contracts still required between State and local agencies?"

Response

Last year the courts established an important ground water ownership principle in the so-called "San Fernando Decision" involving a dispute between the City of Los Angeles and other adjacent cities over the rights to water in that basin. Briefly, the court found that the City of Los Angeles retained ownership of the water which it had imported into the basin and stored underground, and was entitled to withdraw that water when it needed it. We are proposing approximately 3 million acre-feet of ground water storage to produce an annual yield of 500,000 acre-feet in SB 346. Even though we legally might not need to enter into contracts with overlying State and/or local agencies, we propose to do so. We have already begun discussions with the agencies involved in both the Southern California basin and those in the Kern County area. Section 11255(g) describes the ground water program and requires contracts between State project contractors and the Department providing for repayment of the costs of such facilities.

Honorable Stan Statham
Page 2
December 2, 1977

2. "What is the Rand Water Study?"

Response

The Rand Water Study is a study commissioned by the Assembly Water, Parks, and Wildlife Committee with the Rand Corporation. The study report is due to the Committee in January 1978. The study involves a very broad look at California water problems and will make specific recommendations about future water development within the State.

3. "When private property owners are displaced by the construction of a water facility, do they receive any 'extra compensation' above Fair Market Value?"

Response

Property owners generally receive fair market value for their property, and not any extra compensation above that value. The final sums are generally achieved either by negotiation with the property owner leading to an agreement over price, or by condemnation. In the latter case, a sum equal to the appraised valuation of the property is placed in escrow by the State until the matter has been resolved under the condemnation procedures.

4. "Have hydrological flows been estimated along the Sacramento River as a result of the increased summer flows if SB 346 facilities are completed (how many feet higher for how many days)?"

Response

Only very cursory estimates have been prepared by the Department based on our Delta Alternatives Operations Studies. The specific figures vary depending on whether Glenn Reservoir, Cottonwood Reservoir, or Colusa are assumed to be operable and how they are operated. In all cases, these preliminary studies show that the increased flows would be in the range of 5 to 15 percent of the present flow. More detailed studies, as required in Section 11259.5 of SB 346, are needed before final flows can be determined.

I apologize again for the lateness of this response.

Sincerely,

/s/

Ronald B. Robie
Director



Antioch-212

STATE OF CALIFORNIA—RESOURCES AGENCY

DEPARTMENT OF WATER RESOURCES

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EDMUND G. BROWN JR. Governor



- COPY -

December 8, 1977

Honorable Ruben S. Ayala, Chairman
Joint Conference Committee on SB 346
State Capitol, Room 3048
Sacramento, CA 95814

Dear Ruben:

During the testimony of Tom Graff of the Environmental Defense Fund at the November 21, 1977 hearing in Fresno, the Committee asked the following questions relative to the Department's gray brochure "Key Elements - SB 346".

1. How much of the surplus water deliveries for a normal year under 1980 conditions as shown on the chart on page 30 would go to the San Joaquin Valley?
2. How much of the CVP-SWP export water shown on the six charts on page 29 would come from storage?

Response to Question No. 1: Of the 0.85 MAF/year of surplus water demands included in our 1980 level operation studies in normal and wetter years, about 0.76 MAF/year was for the San Joaquin Valley. The balance, 0.07 MAF/year, was for the San Francisco Bay Area and Southern California.

Response to Question No. 2: The approximate portion of CVP and SWP Delta exports derived from stored water north of the Delta in 1980 and 2000 are, in million acre-feet per year:

	1980	2000
50 Year Average	2.9	3.3
Typical Dry Year (Average 16 driest years)	2.7	3.1
Typical Wet Year (Average 16 wettest years)	3.1	3.5



Honorable Ruben S. Ayala
Page 2
December 8, 1977

The total exports in year 2000 include water diverted for storage in San Luis (1980 level too) and Los Vaqueros Reservoirs and in ground water basins south of the Delta. Thus, before delivery to project water contractors, a substantial portion of the remaining direct diversion of unstored flow in the Delta would be subsequently transformed to stored water from storage south of the Delta.

On these charts, it is assumed State Water Resources Control Board (SWRCB) Basin Plan Delta quality standards, plus carriage water to protect the quality at project pumps in the south Delta, would be the Delta criteria governing 1980 project operation in the Delta. For year 2000, it is assumed that the Peripheral Canal would be in operation and that the SWRCB Basin Plan Delta quality standards for agriculture, plus (Draft) 4-Agency Agreement criteria for fish and wildlife, would govern project operation in the Delta. Carriage water to protect the quality at project export pumps would no longer be required with the Peripheral Canal and the re-location of the Contra Costa Canal Intake.

I hope this information is sufficient explanation for the needs of the Committee

Sincerely,

/s/
Ronald B. Robie
Director

STATE OF CALIFORNIA—RESOURCES AGENCY

DEPARTMENT OF WATER RESOURCES

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95802

(916) 445-9248

- COPY -

December 12, 1977

Honorable John A. Nejedly, Member
Joint Conference Committee on SB 346
State Capitol, Room 3048
Sacramento, CA 95814

Dear Senator Nejedly:

This is in response to your letter of December 5, 1977, in which you request we provide certain information for the Stockton hearing of the Joint Conference Committee on Senate Bill 346. The attached statement contains our responses to the four subjects you mention in your request.

I hope this statement provides the information you require. I would be pleased to discuss it further if you wish.

Sincerely,

/s/
Ronald B. Robie
Director
Attachment



Antioch-212

INFORMATION FOR SENATOR NEJEDLY

December 9, 1977

This was prepared in response to Senator Nejedly's letter of December 5, 1977, in which he asked for information on four subjects as follows:

Subject: "1. The total export pumping capacity of both the state and federal projects from the Delta."

Response: The total export pumping capacity of the SWP and CVP presently totals about 11,200 cubic feet per second (cfs), and the capacity upon completion of the SWP and with SB 346 will be 18,200 cfs as shown in the following tabulations:

Pumping Plant	Approximate Pumping Capacity, cfs Present	Planned
SWP, Delta Pumping Plant	6,300	10,300
SWP, Calhoun Pumping Plant (North Bay Aqueduct)	---	120
CVP, Tracy Pumping Plant	4,600	4,600
CVP, Contra Costa Canal Pumping Plant	300	300
Subtotals	11,200	15,320
New Pumping Plant for Los Vaqueros Reservoir as planned for in SB 346	---	3,000
TOTALS	11,200	18,320

*Current deliveries to Napa County are purchased from USBR through the Putah South Canal and are not exported from the Delta now.

The Burns-Porter Act requires that the capacity of the aqueduct from the Delta to San Luis Reservoir be not less than 10,000 cfs. The California Aqueduct and the South Bay Aqueduct (100 cfs) of the SWP have been designed and constructed to a combined capacity of 10,300 cfs. The Delta Pumping Plant which supplies water to these two aqueducts has, of course, been designed and constructed to the same total capacity, but the individual pump units are staged according to buildup in demand. We currently estimate that the remaining four pump units will be completed in 1983, bringing

-1-

Deliveries from basin export above the Delta to EBMUD via the proposed American River Aqueduct are projected to be about 0.12 million acre-feet in year 2000.

These estimates assume that the area of origin tributary to the Delta increases its use from 8.5 million acre-feet per year at present to about 10 million acre-feet per year in year 2000. Some of this area of origin use is direct diversions under local water rights, ground water, and from local storage projects; and some is from CVP and SWP developed supplies, both Central Valley and import sources. In addition to the uses in the areas of origin, direct diversions to the San Francisco Bay area from the Sierra watersheds, such as by City of San Francisco and East Bay Municipal Utility District, are expected to increase from about 0.5 million acre-feet per year to about 0.7 million acre-feet per year by year 2000.

Subject: "4. A discussion of the basis for using the historic critical period (i.e. 1928-34) for water project yield studies, including your comments on the advisability of increasing yields by expanding the degree of risk in meeting delivery commitments."

Response: In general, for northern California, the 1928-34 critical period was selected for yield studies of large water projects since it was the driest prolonged period in recorded California history, at least until the current drought. The water projects are generally planned to meet contractual demands during the critical dry period, with scheduled deficiencies in agricultural deliveries. We still do not know whether the current drought will have a greater impact on the projects' abilities to deliver water than the earlier dry period, although current indications are that with existing facilities the impact may be more severe. However, if the facilities authorized in SB 346 were constructed, the impact of the current drought would be much less, due to the large long-term carryover storage facilities authorized by the bill. I especially refer here to Glenn Reservoir and the ground water storage program in Southern California and San Joaquin Valley.

So far as the advisability of increasing yields by expanding the degree of risk in meeting water delivery commitments, this may well be the inevitable result of the current drought, especially if it extends into a third year. While the expected yields of the projects would remain the same under a repeat of the 1928-34 drought, the yields would be reduced under a more severe drought. A drought more severe than 1928-34 would mean that the risk of shortage was greater than we previously thought. In some areas, such as the Delta for example, water shortages are accompanied by poorer quality water.

the installed capacity up to the full 10,300 cfs. A new pumping plant for Los Vaqueros is provided for in SB 346 and would be designed to divert flood flows for temporary off-stream storage and later release to the State and federal aqueducts.

Subject: "2. The total capacity of both projects to augment direct diversions from the Delta by exporting water from the basin prior to its reaching the Delta."

Response: The SWP does not export any water from the basin before reaching the Delta. The principal CVP export from the basin before reaching the Delta will be East Bay Municipal Utility District's (EBMUD) proposed American River Aqueduct from the Folsom South Canal. This aqueduct is planned to supply 0.15 million acre-feet per year (EBMUD's contract amount). A small part of the proposed CVP West Sacramento Canal Unit supply would go into the North Bay area to Napa and Solano Counties, but we estimate this would be after the year 2000.

Subject: "3. Your projections of year 2000 deliveries of both projects under (1) and (2) above."

Response: Project deliveries to SWP and CVP service areas not only depend on direct diversions and releases from upstream storage reservoirs, they also depend on releases from off-stream storage—surface and underground—south of the Delta. Total SWP and CVP off-stream storage capacity south of the Delta presently is about 2.9 million acre-feet and would increase to about 7 million acre-feet with full implementation of SB 346.

Estimated project deliveries from Delta by both projects in the year 2000, assuming DWR estimates of demand with 700,000 acre-feet per year water conservation and waste water reclamation and completion of facilities contemplated in SB 346, are shown in summary form on the pie charts on pages 29 and 31 of the enclosed gray brochure "Key Elements - SB 346". They are summarized below for convenient reference.

Estimated Water Deliveries* from Delta Export
(Million Acre-feet Per Year)

Project	Normal Deliveries— All Years Except Dry and Critical	Approximate 50-year Average Deliveries	Typical Critical Year Deliveries
CVP	4.3	4.2	2.9
SWP	3.4	3.37	3.1
TOTALS	7.7	7.6	6.0

*Includes unavoidable losses.

-2-

You must understand that the Department's analysis of the effects of the current drought, which is not yet over, is only in preliminary stages. We will have to really know the drought is over before making a final analysis of its effects.

I firmly believe that the programs and projects authorized in SB 346 are vitally needed to mitigate the effect of any future drought, and also to provide complete protection to the Bay-Delta estuarine system.

-3-

-4-

Antioch-212

STATE OF CALIFORNIA - RESOURCES AGENCY

DEPARTMENT OF WATER RESOURCES

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(916) 445-9248

EDMUND G. BROWN JR., Governor



- COPY -

December 13, 1977

Honorable Ruben Ayala, Chairman
Senate Committee on Agriculture
and Water Resources
State Capitol, Room 2048
Sacramento, CA 95814

Dear Senator Ayala:

On November 25, 1977, I furnished information to Assemblyman Guilco on the cost of developing and conveying Eel River water to the San Joaquin Valley. Here is some supplemental information on a proposal made by the Sacramento Valley Landowners Association (SVLA) at the SB 346 hearing in Redding on December 2, 1977.

The SVLA proposed amending SB 346 to include a conveyance system along the west side of the Sacramento Valley from Shasta Reservoir to the Delta, just east of Antioch. Their objective is reduction of river flow levels to minimize erosion and seepage. The proposed conveyance would link up with storage reservoirs along the edge of the valley. My staff has made a rough appraisal of this proposal, based on 20-year-old studies of similar systems once considered for conveyance of imports from the Klamath and Trinity Rivers.

To avoid unfavorable terrain and to maintain production of Shasta Power Plant, the conveyance would best begin at Keswick Reservoir, 10 miles downstream from Shasta Dam. An 85-mile system of canals, reservoirs, and tunnels would connect to the existing Black Butte Reservoir, from which water could be pumped to Glenn Reservoir. The conveyance system would cross Cottonwood Creek downstream from the proposed Cottonwood Creek Project reservoirs. From Black Butte Reservoir, a 142-mile canal would connect to Montezuma Reservoir in Solano County. In conformance with the SVLA proposal, we assumed a 33-mile siphon/canal crossing of the western Delta near Antioch, patterned after the plan shown in the Department's

Honorable Ruben Ayala
Page 2
December 13, 1977

Bulletin No. 3, "The California Water Plan", 1957. (Actually, subsequent studies have cast very serious doubt on the engineering feasibility of such facilities in the western Delta; it would probably be necessary to terminate the conveyance facility north of the Peripheral Canal intake at Hood, which would involve difficult and costly crossings of the Yolo Bypass and the Sacramento River Deep Water Ship Channel.)

The first cost of the entire 260-mile conveyance system is estimated as a minimum of \$2,500,000,000 at 1977 price levels. Assuming a uniform inflation rate of 6 percent, the first cost in 2000 would be about \$9,500,000,000. This is based on a conveyance capacity of approximately 15,000 cubic feet per second, which would be sufficient to control river flows to the desired levels under all but flood conditions. On previous occasions, SVLA has suggested a conveyance system large enough to handle major flood releases from Shasta Reservoir; such a system would be substantially more costly than indicated above.

I hope this information meets your needs.

Sincerely,

/s/
Ronald B. Robie
Director



Antioch-212

STATE OF CALIFORNIA RESOURCES AGENCY

DEPARTMENT OF WATER RESOURCES

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CALIFORNIA
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EDWARD G. BROWN, JR., Governor

- COPY -



December 13, 1977

Honorable Ray Johnson
Member of the Senate
State Capitol, Room 5095
Sacramento, CA 95814

Dear Ray

Your letter of September 9, 1977, requested that we provide you with answers to some questions proposed to you by the Glenn-Colusa Water Users Association. I apologize for the extreme lateness of this answer, but the legislative activities on SB 346 and some staff changes delayed our response. I assure you that your future requests will be handled promptly.

Before I respond to the specific questions attached to your letter I would comment that in my opinion some of the questions appear to be "loaded". I won't respond to the question of morality since that is pretty much an individual judgment. Our response to these questions is as follows:

1. "How much will the Ayala bill increase costs to present Central Valley Project and State Water Project contractors?"

Response

Specific cost allocations to CVP and SWP contractors would depend on which of the facilities in SB 346 are finally built, and when they are built. Such allocations obviously have not yet been made. Estimates have been made, however, with regard to the State Water Project and were included in our responses to the Assembly Water, Parks, and Wildlife Committee questions dated August 11, 1977, which I am attaching. I am also attaching "Key Elements - SB 346" which was prepared by the Department for the Conference Committee hearings. Allocations to CVP contractors would be according to current Bureau of Reclamation policies.



Honorable Ray Johnson
Page 3
December 13, 1977

ultimately have to be removed from the San Joaquin Valley. The Peripheral Canal provides the only means to prevent further depletion of the Delta fishery and to restore the capacity of the Delta to support fish and wildlife to pre-project levels (see the attached "Key Elements - SB 346", page 27). Payment for the Canal and other features in SB 346 would be shared by the State and Federal Governments depending on their relative shares in the program. This is also described in the attached brochure.

5. "Since the present Central Valley Project and State Water Project water supply cannot support both the Delta water quality criteria and the water contractors in dry periods, which is preferable?"

Response

Our operation studies made during the Delta Alternatives Study clearly show that with the construction of facilities included in SB 346 and the adoption by the SWRCB of basin plan agricultural and Four-Agency Fish and Wildlife Agreement fishery water quality criteria, the water supply for both the SWP and CVP is sufficient through the year 2000 to meet Delta water quality standards and water supply contracts. These studies included the assumption that dry year deficiencies will be taken by project contractors according to existing contract terms.

6. "Who, other than Delta interests, benefits from the Ayala bill?"

Response

The CVP and SWP contractors will benefit from the facilities included in the Ayala bill. Without SB 346, the State Water Project will have only one-half of its contracted yield, and the Central Valley Project will lack the transportation facilities needed to meet its commitments. In addition, in my opinion, the State of California as a whole will benefit greatly from resolution of this long-standing conflict.

7. "Is it morally or technically supportable to meet water quality criteria in the Delta, as was done in 1976, if a much worse condition follows in 1977 than would have occurred if the total shortage had been distributed over the years of the drought? Is this conservation?"

Response

In my opinion both projects would be unable to estimate when in fact a drought has started. In 1976, contrary to the

Honorable Ray Johnson
Page 2
December 13, 1977

2. "How much will the Ayala bill increase costs to Delta beneficiaries?"

Response

Here again, specific estimates have not yet been made. The Senate Bill 346 provides that the Delta beneficiaries repay the cost of benefits which they receive above their vested water rights. In addition, the fish and wildlife enhancement costs would be properly nonreimbursable charges, and as such would not be paid by either CVP or SWP contractors.

3. "In time of drought, is it better to sacrifice crops, power production, stream flows, and recreation than it is to reduce Delta water quality criteria?"

Response

We have maintained that the Department is required to meet water quality standards set by the State Water Resources Control Board (SWRCB). The Board presumably takes all of these tradeoffs into account when it determines the appropriate level of a water quality standard in the Delta. The Board, of course, did adopt emergency standards for the Delta as a result of its recognition of the consequences of the current drought.

4. "Doesn't the feasibility of the Peripheral Canal depend on reducing Delta outflow requirements? Does anyone want to build this canal if it saves no water? Who would pay for such a canal?"

Response

The feasibility of the Peripheral Canal does not depend on reducing Delta outflow requirements. The Canal "conserves or saves" water by providing a more efficient means of transport across the Delta to the pumping plants. Under the present (except for emergency modifications due to the 1976-77 drought) basin plan Delta water quality criteria established by the SWRCB, the Peripheral Canal would increase the water delivery capability of the project by 500,000 acre-feet per year. If the Delta fishery criteria as proposed in the draft Four-Agency Fish Agreement (see attached letter of August 11, 1977) is adopted by the Board, this capability would be increased to 1,000,000 acre-feet per year. In addition to providing additional water the Peripheral Canal would also allow the delivery of better quality water, thereby reducing the quantity of salt that would

Honorable Ray Johnson
Page 4
December 13, 1977

suggestion of apportioning the shortage over the years of the drought, agricultural interests requested that the State Water Project continue to make full deliveries including surplus water on the presumption that 1977 would be a wet year. It is very difficult to determine what level of deficiency ought to be applied in any given year, but I feel that the projects must err on the conservative side. As you are undoubtedly aware, we have been struggling with this problem in terms of establishing the level of deliveries which the SWP will make in 1978. We have received a lot of valuable information during a number of public hearings on this subject.

Again I apologize for the lateness of this response, and I hope that these answers meet your needs.

Sincerely,

/s/

Ronald B. Robie
Director

Attachments

Antioch-212

STATE OF CALIFORNIA RESOURCES AGENCY
 DEPARTMENT OF WATER RESOURCES
 P.O. BOX 318
 SACRAMENTO
 95814
 (916) 445-9248

- COPY -

EDMUND G. BROWN JR. Governor



December 16, 1977

Honorable Ruben Ayala, Chairman
 Joint Conference Committee on SB 346
 State Capitol, Room 3048
 Sacramento, CA 95814

Dear Senator Ayala:

Following the joint committee hearing in Fresno, I asked my staff, and Pete Chadwick of Fish and Game, to make a technical analysis of the effect of Kern County's suggested Amendment No. 7 to SB 346. This proposed amendment would (1) permit the Department to construct the Peripheral Canal in 1981 if the agreements (called for in Section 11257) had not then been reached with the United States and the Delta interests, and (2) prohibit transfer of CVP water via the Peripheral Canal until the United States agrees to the operation of the Canal in accordance with water quality standards and conditions in water right permits adopted by the State Water Resources Control Board.

They have completed their analysis, and I am attaching their report to me for your information and use in your deliberations on refinements to SB 346.

Sincerely,

/s/
 Ronald B. Robie
 Director

Attachment

cc: (See attached list)

Honorable Ruben Ayala
 Page 2
 December 16, 1977

cc: Honorable Peter Behr, Member
 Joint Conference Committee on SB 346
 State Capitol, Room 5053
 Sacramento, CA 95814

Honorable John A. Nejedly, Member
 Joint Conference Committee on SB 346
 State Capitol, Room 3048
 Sacramento, CA 95814

Honorable Gordon Duffy, Member
 Joint Conference Committee on SB 346
 State Capitol, Room 4005
 Sacramento, CA 95814

Honorable Eugene Gualco, Member
 Joint Conference Committee on SB 346
 State Capitol, Room 2016
 Sacramento, CA 95814

Honorable Lawrence Kapiloff, Member
 Joint Conference Committee on SB 346
 State Capitol, Room 4116
 Sacramento, CA 95814

Mr. Pete Chadwick
 Department of Fish and Game
 Resources Building, 12th Floor
 Sacramento, CA 95814

State of California

The Resources Agency

Memorandum

To: Ronald B. Robie

Date: December 7, 1977

File No.

From: John D. McClurg, Coordinator
 Delta Alternatives
 Department of Water Resources

Subject: Kern County Proposed
 Amendment to SB 346

Attached is a preliminary staff analysis of the Kern County proposed Amendment No. 7 of SB 346. This amendment would permit the Department to construct a "state-only" Peripheral Canal in 1981 if agreements have not been reached with the federal government and Delta interests. The Canal would be operated to meet SWRCB standards and would exclude federal water.

The analysis was prepared by the Central District in coordination with the Department of Fish and Game (Pete Chadwick). The Division of Planning (Maury Roos) was consulted regarding the effect on SWP yield.

Before conducting the analysis, it was necessary to make assumptions as to associated Delta facilities and operation. The major assumptions are listed below and are discussed in more detail in the attachment.

1. The CVP would share in Delta outflow only to the extent of meeting November 19, 1965, water quality criteria or to protect quality at the Tracy pumps. Since the CVP recognizes no present commitment, this assumption could be in error in either direction.
2. The SWP would provide all additional outflow required to meet the Basin Plan agricultural standards and Four-Agency Fish Agreement.
3. The CVP southern Delta diversion capacity would be expanded by some undefined means to meet increased future demands.
4. The CVP would continue to divert Contra Costa Canal demands from Rock Slough.
5. The permanent Suisun Marsh facilities would be constructed.
6. Southeastern Delta distribution facilities would be constructed (possibly different facilities than presently envisioned).

Ronald B. Robie
 Page 2
 December 7, 1977

The analysis was based on hand-adjustments of the 1990 operation study presented in the SWRCB Delta Hearing. Preliminary estimates of the effects of a "state-only" Canal were made by comparison to present conditions and to 1990 conditions with a joint-use Peripheral Canal. The preliminary findings are summarized below.

1. Delta flow patterns would be similar to present conditions but of less magnitude in the lower Sacramento River and Western Delta (outflow).
2. Delta water quality would be similar to present conditions with some improvement in the southeastern Delta and some degradation in the western Delta.
3. Fish and wildlife values would be reduced about 8 percent compared to present conditions (1968-74), and reduced about 30 percent compared to the joint-use Peripheral Canal.
4. The SWP yield may be increased slightly (0.1 MAF) over present conditions, but would be reduced by 0.4 to 0.5 MAF compared to a joint-use facility with the CVP sharing equitably in Delta outflow requirements.
5. Even without a Delta facility, the adverse effect on SWP yield would be similar if the CVP does not share equitably in meeting Delta water quality standards.

Attachments

SB 346

KERN COUNTY AMENDMENT NO. 7

In essence, Amendment No. 7 would permit the Department of Water Resources to proceed with a "state-only" Peripheral Canal in 1981 if agreements have not been reached with Delta interests and the federal government. The Canal could be constructed as described in subdivision (a) of Section 11255 and operated to meet applicable SWRCB water quality standards, and the "wheeling" of federal water through the facility would be prohibited until the U. S. agrees to meet water quality standards.

Assumptions

In order to analyze the effects of this proposed amendment on the Delta environment and the SWP water supply, it is necessary to make certain additional assumptions as to Delta facilities and operation.

Contra Costa Canal Intake - The proposed amendment's prohibition of "wheeling" federal water through the Peripheral Canal would appear to eliminate the need for relocation of the Contra Costa Canal intake from Rock Slough to Clifton Court Forebay. Conversely, two other clauses of the amendment support the relocation. First, it calls for construction of the Canal as described in subdivision (a) of Section 11255 which includes relocation of the Cootta Costa Canal intake. Second, the amendment calls for operation of the Canal in conformance with SWRCB water quality standards which would include a standard at the Contra Costa Canal intake. With the USBR continuing to transfer water through the Delta channels for export at Tracy, water quality at the existing Rock Slough intake would be beyond the control of State operations, and, based on past experience, the standards could be occasionally exceeded.

One possible solution to this conflict in the proposed amendment would be construction of the new intake with its use limited to those infrequent occasions when standards cannot be met at Rock Slough. However, for the flow routing estimates required for this analysis, it is assumed that the Contra Costa Canal would continue to divert from Rock Slough at all times.

Suisun Marsh - Subdivision (e) of Section 11255 calls for construction of Suisun Marsh permanent protection facilities by the time the Canal is completed. Compliance with this subdivision is assumed for this analysis with appropriate effects on the need for Delta outflow to meet Suisun Marsh water quality standards.

Southeast Delta - Subdivision (c) of Section 11255 calls for construction of south Delta water quality improvement facilities by the time the Peripheral Canal is completed. Compliance with this subdivision is assumed for this analysis. The required facilities and their operation would probably differ from those presently being considered because the Delta flow patterns would be significantly different under the proposed amendment. Therefore, it is assumed that water quality requirements in the southeastern Delta would be met, but the effects of meeting these standards on flow and project water supplies are unknown (judged to be minimal).

Water Quality Standards - The proposed amendment calls for operation of the "state-only" Canal in conformance with water quality standards and conditions in permits to appropriate water adopted by the SWRCB applicable to the Department. For the purpose of this analysis, it was assumed that the CVP would share in only November 19, 1965, criteria and that the SWP would provide all additional water necessary to meet Four-Agency Fish Agreement and Basin Plan agricultural standards. Technically, the SWP may not be responsible for making up the total amount not provided by the CVP. However, present support of SB 346 by environmental groups such as the Sierra Club, Planning and Conservation League, and Suisun Marsh interests is based on the Delta protection afforded by these standards, and their support probably would be withdrawn if this protection was not assured by the SWP.

Delta Conditions

With the "state-only" Canal of the proposed amendment and the above assumptions, only export supplies for the State Water Project would be diverted into the Peripheral Canal. Export supplies for the Central Valley Project and flows for Delta use and outflow would continue to be transferred through the existing channels of the Delta. Since there still would be a large transfer of water across the Delta, Peripheral Canal releases were not considered in the analysis although minimal releases to dead-end sloughs and the southeastern Delta might be required for quality control under actual operation. The CVP does not have enough existing capacity at Tracy to pump its planned exports (Mild Valley, Cross Valley, and San Felipe deonds were to be "wheeled" through State facilities), so the further assumption was made that the federal export capacity at the Delta would be increased to meet demands.

Operation of the SWP and CVP with the facilities and assumptions described above would result in the general flow patterns and

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water qualities discussed in the following sections for a 1990 level of development."

Flow Patterns - In 1974 the combined export of the SWP and CVP from the southern Delta was about 4.1 MAF. At the 1990 level of development with a "state-only" Peripheral Canal, the CVP export demand from the southern Delta also would be about 4.0 MAF. Therefore, the general flow patterns in the interior Delta with a "state-only" Canal should be similar to recent historical patterns except as modified by: (1) a reduction in total annual outflow due to the increase in combined SWP-CVP export; and (2) a higher regulated San Joaquin River inflow due to greater return flows and operation of the New Melones Reservoir.

Flows below the Peripheral Canal intake and through the Delta Cross Channel into the Mokelumne River system would continue to be substantial and considerably greater than would occur with a joint-use Canal. Flows in the lower Sacramento River would be lower than present and frequently lower than with a joint-use Canal. The flow standard in the proposed 4-Agency Fish Agreement for salmon at Rio Vista often would not be met in the fall (no regulation of the Delta Cross Channel).

Net flow reversals of the San Joaquin River at Antioch would be less frequent than present, but still would occur in the summer of most years. All San Joaquin River inflow (except flood flows) would be drawn to the southern Delta export pumps as occurs now. Net reversal of the San Joaquin upstream of Stockton would be essentially eliminated due to the maintenance of high regulated San Joaquin River inflow. However, low to reverse flow could occur in the San Joaquin River between the Mokelumne River and Stockton without redistribution of flows in the southeastern Delta (facilities undefined). With a joint-use Canal, positive downstream flow would be maintained throughout the San Joaquin River.

The Old and Middle Rivers, from their mouths upstream to the Tracy Pumping Plant, would continue to have strong reverse flows at all times (except during extreme high flow periods). With a joint-use Canal, these channels would have lower but positive flows at all times.

*Based on a hand-adjustment of the 1990 operation study presented in the 1977 SWRCB Delta Hearing (DA 90 1.2-77); assumed Auburn and New Melones in operation and 4-Agency Fish and Basin Plan agricultural standards.

Water Quality - In general, the water quality in the Delta with a "state-only" Canal would be similar to present quality assuming the same standards applied to both conditions. The exceptions would be that water quality improvement would be expected in the southeastern Delta with New Melones Reservoir in operation, and that some degradation would be expected in the lower Sacramento River and western Delta due to reduced flows.

Compared to the joint-use Peripheral Canal, the "state-only" Canal would provide better water quality in the main water transfer channels of the Mokelumne, Old, and Middle River systems. The joint-use Canal would provide slightly better quality in the lower Sacramento River during the fall. Generally, the quality in western Delta would be similar under both conditions with some variations due to the distribution of outflow between the Sacramento and San Joaquin Rivers. Differential quality effects in the southeastern Delta, the San Joaquin River near Stockton, and dead-end sloughs would depend on final decisions on the operation of Canal releases and southeastern Delta distribution facilities. The SWRCB water quality standards would have to be met, if possible, in all cases.

Effects on Fish and Wildlife

As discussed above, flow patterns with a "state-only" Peripheral Canal would be similar to present conditions with some reduction in total flow in the western Delta and lower Sacramento River. Thus, the fish and wildlife impacts of CVP exports at the 1990 level of development would be similar to present impacts. Superimposed on these impacts would be the effects of the SWP diversions through the Peripheral Canal and the overall reduction in Delta outflow.

Compared to present conditions (1968-1974 levels = 100), the "state-only" Canal would have the following impacts on major fish and wildlife values in the Delta.

Striped Bass - The mean June-July exports would be about the same, but outflows would be reduced somewhat. The Canal diversion would have no impact with operations curtailed during the spawning season. The estimated impact is a 5 percent reduction in striped bass values (Rating = .95).

Sacramento River Salmon - Approximately the same number of young would be drawn to the south Delta diversions by CVP

exports. The estimated impact of screening operations at the Canal intake and the reduced fall flows in the lower Sacramento River would be a 5 percent reduction in values (Rating = 95).

San Joaquin River Salmon - All San Joaquin River water would continue to be drawn to the CVP export pumps. The operation of New Melones Reservoir may slightly decrease spring flows in the upper river causing an estimated 5 percent reduction in the value of this fishery (Rating = 95).

American Shad - Approximately the same number of young would be drawn to the south Delta diversions. In addition, the reduced flows in the lower Sacramento River during the out-migration of young would result in an estimated 10 percent reduction in value (Rating = 90).

Resident Fish - With similar flow patterns, the population of resident fish would be expected to remain about the same as present (Rating = 100).

Wildlife - With the Suisun Marsh protected, the only other change in wildlife values would result from the new habitat established along the Canal right of way. The estimate impact is a 25 percent increase in wildlife values in the Delta (excludes Suisun Marsh) (Rating = 125).

To arrive at an overall impact of the "state-only" Peripheral Canal, it was necessary to weight each of the fish and wildlife values as follows.

	Rating	Weight
Striped Bass	95	100
Sacramento Salmon	95	100
San Joaquin Salmon	95	20
American Shad	90	50
Resident Fish	100	50
Wildlife	125	5

This resulted in an overall rating of about 95, compared to present conditions. Based on prior estimates prepared for the Delta Alternatives Study, the overall rating of the joint-use Peripheral Canal was 135, compared to present conditions. This

means the "state-only" Canal would reduce fish and wildlife values about 5 percent from present and about 30 percent from those attainable with a joint facility.

Effects on SWP Yield

The yield effects of a "state-only" Peripheral Canal as described in the proposed amendment are difficult to estimate without a detailed operation study of the entire water development system of the State. Construction of the Canal would tend to increase the yield of the combined SWP-CVP system over present conditions. However, the requirement that the State would operate to meet Delta water quality standards even without the full cooperation of the federal government could have severe adverse effects on SWP yield. The net results could be that the CVP yield would be considerably greater than otherwise assumed while the SWP yield would be considerably less than required to meet contract commitments.

The largest unknown is the extent to which the federal project would share in the Delta outflow requirements. A possible minimum would be the federal share of the outflow required to meet the November 19 criteria as determined by the coordinated operation agreement (about 60 percent of 2,500 cfs). A more realistic minimum would be that quantity of outflow required to protect quality at the Tracy pumps, but not less than the federal share of the November 19th criteria. This amount* would vary depending on export rates at Tracy and other hydrologic factors.

Assuming this latter estimate of the federal share of outflow, the SWP would have to provide disproportionately high volumes of flow to meet the outflow required for water quality standards such as called for in the Four-Agency Fish Agreement. One of the most adverse operating situations would be a below normal water year followed by a critical water year. The outflow requirements in a below normal year are relatively high; the average April through July requirement is in excess of 8,500 cfs. In this case, the SWP supplies would be depleted in the below normal year with compounding effects on yield in the following critical year. This hydrologic condition occurred historically in 1922-23 and 1923-24. The effects of this hydrology on SWP yield at the 1990 level of development with the proposed "state-only" Canal have been estimated. The estimate indicates that SWP storage would be depleted by 0.3 MAF in 1922-23, and that there would be an additional 0.5 MAF reduction in SWP yield in 1923-24.

*The hand-adjusted Delta routing study indicates that the outflow required to protect quality at Tracy with a "state-only" Canal could occasionally exceed the outflow required for Delta quality control with a joint-use Canal. In these cases, the CVP export had to be reduced to maintain quality.

Another way to estimate the possible effects of a "state-only" Canal on SWP yield is to compare two previous analyses of critical period yield conducted in connection with SB 346.* One analysis estimated the increased combined SWP-CVP yield of the joint-use Peripheral Canal to be 1.1 MAF per year. With the "state-only" Canal, this yield would be somewhat less due to the additional outflow occasionally required to protect CVP export quality; say 1.0 MAF per year. The SWP share of this yield increase would be about 0.5 MAF per year. This estimate was based on meeting D-1379 agricultural standards and the Four-Agency Fish Agreement.

The second analysis estimated that the D-1379 agricultural standards and Four-Agency Fish Agreement would require 0.8 MAF per year more of the combined SWP-CVP yield than the November 19 criteria. This requirement was assumed to be shared approximately 50-50 between the SWP and CVP. If the CVP did not share in these added requirements, the SWP yield would be reduced an additional 0.4 MAF per year.

Combining the two analyses as modified, the proposed operation of a "state-only" Canal might increase SWP yield by 0.1 MAF per year over present conditions, but the SWP yield would be about 0.45 MAF per year less than with a joint-use Peripheral Canal where the CVP more equitably shares in meeting Delta water quality standards. It should be noted that similar effects on SWP yield will occur without any canal if the CVP does not share in higher water quality standards.

EXCERPT FROM KERN COUNTY'S PROPOSED AMENDMENTS (10/31/77) TO SENATE BILL 346 (AS AMENDED IN THE ASSEMBLY, SEPTEMBER 8, 1977)

AMENDMENT NO. 7

On page 19, delete lines 34 through 40, and on page 20, delete lines 1 through 4, and insert:

(c) If all of the requirements of Section 11257 have not been fulfilled by December 31, 1980, the department may proceed to construct the facilities described in subdivision (a) of Section 11256 in three stages as provided for therein. The department shall: (1) operate the facilities in conformance with water quality standards and conditions in permits to appropriate water adopted by the State Water Resources Control Board applicable to the department; and (2) prohibit the transfer of any water developed by facilities of the Federal Central Valley Project through the peripheral canal unless and until the United States agrees to the operation of the peripheral canal under the conditions as provided for in part (1) of this sentence.

Explanation: Section 11257(a) provides that construction of the peripheral canal will not commence until certain prerequisites have been obtained and that if these requirements have not been fulfilled by December 31, 1980, they become inoperative and of no force and effect after that date. The peripheral canal must be built for the protection of fish and wildlife in the delta and the maintenance of water quality at the export pumps. If the requirements in Section 11257(a) are not met by December 31, 1980, it will be because of inaction on the part of either the federal government or the delta entities mentioned in that section. Such inaction will not diminish the need for the peripheral canal and the Department of Water Resources should be permitted to proceed after 1980 with the construction of the canal, provided that it operates the canal in a manner to provide the delta protections intended by the provisions in Section 11256(a). The state cannot be put in a position where its water development is stymied by federal inaction, and this amendment is intended to prevent that from happening.

*Results of these analyses were reported to Eugene T. Gualco, Chairman, Assembly Committee on Water, Parks, and Wildlife, in a letter of September 2, 1977.

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STATE OF CALIFORNIA RESOURCES AGENCY

DEPARTMENT OF WATER RESOURCES

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BURGESS BROWN N GOMBER



December 20, 1977

Honorable Ruben S. Ayala, Chairman
Joint Conference Committee on
Senate Bill No. 346
State Capitol, Room 2048
Sacramento, CA 95814

Dear Senator Ayala:

On October 20, 1977, Congressman Leo J. Ryan, Chairman of the Environment, Energy, and Natural Resources Subcommittee of the Committee on Government Operations, released a report prepared at his request by the Comptroller General of the United States on "California Drought of 1976 And 1977--Extent, Damage, And Governmental Response".

While the report primarily examines current drought problems, the assessment of future water needs and problems discussed in Chapter 5, "Water Planning and Development", is of critical concern. It is here that I would like to concentrate my comments. This section highlights some of the water issues facing California, including Delta water quality, ground water overdraft, future water needs and supplies, and water development and management. However, there are several erroneous conclusions which if corrected, I believe would alter interpretations of the General Accounting Office (GAO).

The report questions California's ability to meet water needs at or beyond the year 2000 and states that continued reliance on ground water overdraft will be necessary. This conclusion is apparently based upon water needs and supplies interpreted from the periodic update of the California Water Plan (Bulletin No. 100-74, "The California Water Plan--Outlook in 1978").



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The report recommends establishment of a federal-state task force to reexamine the State plan. We do not need such a task force now. The State can and should manage its water resources, and our current planning efforts (Department of Water Resources and State Water Resources Control Board) are miles ahead of the U.S. Bureau of Reclamation which does not plan for the entire State and has given little attention to planning for State needs. The 11 questions in the GAO report suggested for consideration by a federal-state task force are precisely the kinds of questions the State water planning program addresses and which are embodied in SB No. 346. Detailed responses to those questions are attached.

There are a number of federal-state water issues which need resolution, including recognition, as defined in SB No. 346, of federal responsibility in meeting water quality requirements in the Delta. The Federal Government has continuing opportunity to provide Federal input to the State program, and assuming SB No. 346 passed, Congress will be asked to determine the federal interest in participating in the SB No. 346 plan.

Sincerely,

/s/
Ronald B. Robie
Director

Attachment

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continuing State water planning, and the facilities and measures embodied in California Senate Bill No. 346, the Delta Alternatives Program as the specific construction proposals to meet statewide water needs. I am particularly concerned that this erroneous questioning of the State's water planning has been interpreted to be criticism of the Delta Alternatives Program.

As you know, the Delta Alternatives Program concentrates on areas receiving water exports from the Delta, protection of the Bay-Delta estuary and Suisun Marsh, and specific proposals to meet water needs of the Federal Central Valley Project (CVP) and the State Water Project (SWP). It is designed to fulfill existing and contemplated contracts and obligations of the SWP and the CVP. While it is a comprehensive program including water conservation, Delta protection, off-stream storage, reclamation, alleviation of some ground water overdraft, and studies of the remaining San Joaquin Valley ground water overdraft, the Delta Alternatives Program does not address the statewide water balance as the report implies. The GAO report however, does not question the SB No. 346 program.

The report further erroneously describes State alternatives under study to meet year 2000 water needs as (1) surplus water, (2) construction of small reservoirs--Sacramento Basin, and (3) Fei River development and implies that these are not adequate to meet year 2000 needs. The statewide planning studies underway for meeting year 2000 water needs encompass a wide variety of alternatives at the local, State, and federal levels. These prominently include conjunctive surface and ground water management, extensive water conservation, waste water reclamation, and off-stream storage, in addition to capture of surplus flows now reaching the Delta. The studies also include facilities needed to utilize reserve supplies which are developed supplies available but presently unusable because of lack of facilities or institutional arrangements. As required by law, the program specifically does not include development of the Fei River system now included in the State Wild and Scenic Rivers System. Our studies convince us that we can have sufficient water to meet reasonable California needs to the year 2000 without Fei River development.

I believe adequate consideration of these facts would have substantially altered the GAO report conclusions that California will not meet essential year 2000 water needs and that reduction of irrigated acreage in the San Joaquin Valley through continuation of present ground water overdraft is imminent.

DEPARTMENT OF WATER RESOURCES REVIEW OF GAO REPORT CALIFORNIA DROUGHT OF 1976 AND 1977 -- EXTENT, DAMAGE, AND GOVERNMENTAL RESPONSE

On October 19, 1977, the Comptroller General of the United States issued a report by the General Accounting Office entitled "California Drought of 1976 and 1977 -- Extent, Damage, and Governmental Response". The bulk of the report deals with a description of the California water picture; its geographic characteristics, water characteristics, and agencies and organizations supplying water; the extent and impact of the drought with causes and damage; and the governmental response and drought emergency planning. In this regard the authors conclude "generally, governmental response to the drought has been adequate, reducing the effect of the drought in the State".

The portion of the report that has received attention by the media, however, relates to one 15-page chapter entitled "Water Planning and Development". This chapter has been interpreted by the press (L.A. Times, 10/21/77) as "GAO Raises Questions on Brown's Water Plan". We have reviewed the subject report and have answers for the questions. We find that many of the questions and concerns raised stem from combining information from several sources and from a general misunderstanding of the Department of Water Resources Delta Alternatives Plan as embodied in Senate Bill 346. For example, the report uses much information from the Department's Bulletin 160-74 and preliminary information for Bulletin 160-78 which cover the 11 hydrologic basins of the entire State. It also uses information from Bulletin No. 113, "California's Ground Water, 1975", another statewide bulletin. In contrast, the Department's plan developed under the Delta Alternatives Program concentrates on areas receiving water exports from the Delta, protection of the Bay-Delta estuary and Suisun Marsh, and specific proposals to develop the water supply for the Federal Central Valley Project (CVP) and the State Water Project (SWP) to support those uses. The effects of future upstream depletions in the area of origin are considered in the yield studies for the projects at the Delta but were not reported in such a way as to show the total supplies and demand of each upstream area in detail. The GAO report is riddled with errors and reflects both the inability of the office to give careful treatment to an immensely complex problem in a few pages and based on a limited amount of information and a lack of the knowledge of the California water situation. There is little back-up to support most of the broad-brush conclusions, particularly the questions raised on page 71-73.

The GAO report recommended that the Secretary of Interior request the State and other agencies to establish a federal-state task force to reexamine the State plan and determine the best ways to meet future water needs. The Federal Government will

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have an opportunity to provide federal input to the State program and, assuming SB 346 passes, Congress will get a chance to determine the federal interest in participating in the SB 346 plan. We do not need another task force now. We consider the GAO conclusion that the Secretary of Interior request the State "to reexamine the State plan" to be ridiculous. The State has just spent \$2 million and two years on the plan now before the Legislature. The Federal Government, through the U. S. Bureau of Reclamation, was offered an opportunity to participate fully in the plan development and refused. The arrogance of this suggestion typifies the response of federal officials to State activities in water management.

The remaining portions of this paper will examine each of the 11 specific recommendations and offer comments in an effort to clarify the differences between the Delta Alternatives Plan and the total statewide water needs.

1. "Is the projected 1 million acre increase in irrigated agricultural lands consistent with estimated future demands for California food and fiber products? Will the increased agricultural land produce sufficient benefit to warrant the cost of additional irrigation water resources development, or are there less costly alternative ways to increase the yield from existing agricultural lands?"

Response:

This question represents one of the major misunderstandings of the California water situation. The "projected 1 million acre increase" referred to apparently is a statewide total and is not related to the SB 346 program. The Delta Alternatives Plan is designed to fulfill existing and contemplated contracts of the SWP and the CVP. For the most part these will not result in increased irrigated acreages in the export service areas, and in the case of the SWP, irrigation demands are based on present contractor requests for water up to the limit of the contracts. Current SWP contract deliveries for agriculture are approximately at the contract limit. In the case of the CVP, increased demands for irrigation supplies from the Delta are based on USBR estimates¹ and are primarily to partially offset existing ground water overdrafts. In the case of agriculture, the State's program is to protect the existing economy rather than expand it.

2. "If, as indicated by the State planner, continued overdrafting of ground water will lead to the loss of substantial agricultural land, is it realistic for the State to rely on over-drafting to meet future water demands?"

Response:

This question neither adequately reflects the problem or the answer prepared in SB 346. First, the effects of continued overdraft are not yet known. Second, the SB 346 plan does not

¹/ USBR Working Document No. 9, "Interim Water Supply, Total Water Management Study for the Central Valley Basin, California, March 1976.

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conjunction with local ground water to even out a supply in that area. Again, the attempt here is to maximize the utilization of existing facilities and available storage capacity to keep the cost affordable by the water users. Since this area of the State is served by the federal Central Valley Project, attention to greater conjunctive use should come from the Federal Government.

Fuller protection of the ground water resources may require law changes as our basins are managed more fully. This is one of the issues currently being studied in depth by the Governor's Commission to Review California Water Rights Law.

4. "Because of considerable success of the conservation measures during the drought emergency and their potential for permanent water savings, should planning for additional water development rely on more efficient water use and conservation measures during low water periods rather than basing the size of developments on the most severe drought period of record?"

Response:

The Department of Water Resources believes water conservation should be part of any plan and SB 346 provides for this. In this regard we have estimated that the combined effect of waste water reclamation and water conservation by M&I water users in SWP and CVP service areas that would amount to about 700,000 acre-feet per year by the year 2000, lessening the demands on the Delta. This reduction in demand is equal to the yield of more than two dams the size of Auburn Dam and represents a potential savings of nearly \$1.2 billion (estimated cost of two dams). Because of reuse of return flows from irrigation supplies in the Central Valley basin, we do not foresee a large amount of net savings in export from the Delta due to agricultural conservation. However, SB 346 specifically provides for the Department to investigate consumptive savings in agricultural water conveyance, use, and management as part of the package to the extent that such savings are made. While it may not reduce the net amount of water diverted to meet existing contracts, it could lessen the ground water overdraft in the service areas. SB 346 also provides for a statewide agricultural low interest lending program and would establish a \$50 million fund for that purpose.

5. "To promote water use economies as well as to minimize the size of water developments, should the water users of planned projects be required to have effective conservation programs as a prerequisite to construction of water supply projects or delivery of water to them?"

Response:

The California Constitution requires that water resources of the State be put to beneficial use and that waste or unreasonable use be prevented. Therefore, use of water from any California

rely on overdraft to meet future demands. Ground water overdraft is not something that is new. It has been going on for a number of years and before the current drought averaged about 1½ million acre-feet per year in the San Joaquin Valley. Rather than planning to rely on substantial ground water overdrafts, the SB 346 plan will reduce that reliance by approximately one-third between now and the year 2000. Furthermore, Section 1125 of SB 346 specifically directs the Department of Water Resources in cooperation with other agencies to undertake a comprehensive study of San Joaquin Valley ground water overdraft problems and proposed solution. It will address the subjects of economics, drainage, water quality, ground water levels, energy requirements, costs, net farm income, improved water efficiency and management, etc. The results of the study shall be submitted to the Legislature on or before January 1, 1981. With this approach we can proceed with plans already on the drawing boards for fulfilling existing commitments and reducing ground water overdrafts in the Mid-Valley service area, and at the same time develop a program for the additional part of the problem which, if feasible, could be implemented concurrently. Also, water conservation resulting from the low interest agricultural water conservation loan program in SB 346 should help reduce ground water overdrafts. This is not recognized in the GAO report since its data was gathered earlier in the summer.

3. "In view of the potential significant adverse affects of continued overdrafting of ground water, are adequate actions being taken to protect ground water resources as well as to maximize the benefits of conjunctive management and use of surface and ground water?"

Response:

The first portion of this question was addressed in the response to item 2 above. In regard to conjunctive management of surface and ground water, the State's Delta Alternatives Plan embodied in SB 346 envisions use of ground water in Southern California, San Joaquin Valley, and South Bay area in conjunction with the California and South Bay Aqueducts. Available capacity of these aqueducts would be used for transporting winter and spring surplus flows and storing them underground for later use in dry and critical periods. This will maximize the use of existing surface facilities and presently dewatered ground water storage capacity available near the aqueducts, and produce an annual yield of about 400,000 acre-feet in partial fulfillment of the contracts of the State Water Project. Development of this annual yield requires replacement or "banking" of about 3 million acre-feet underground which will have the beneficial effect of raising ground water levels.

In regard to the Mid-Valley service area of the CVP, 500,000 acre-feet of the 650,000 acre-feet proposed delivery for that area would be on a firm surface supply basis. The 150,000 acre-feet would be available in the wetter years and could be used in

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project should be subject to prudent use without waste and conservation is already implied in California law. This requirement should apply to federal projects as well since water in California is a limited resource that is becoming more scarce.

6. "One alternative being considered to make up the expected water supply deficit is the development of water storage from projected surplus water flows. If the current drought persists, it could materially affect the future water runoff and snowmelt projections. Therefore, is it realistic to consider the use of such a projected surplus flow as a viable alternative for meeting future demands?"

Response:

Storage of surplus water flows during wet periods is a basic premise of water development throughout the West. If the drought persists, it simply means that it could become more critical (than the seven-year historic drought in the 1930's) for carry-over water and that larger storage projects would be needed and that it would take longer to fill storage reservoirs. The State's long-range plan in SB 346 covers 20 years. History shows that past 20-year periods have both high and low flows. Short-range problems, should the current drought continue, are being handled by separate planning apart from the Delta Alternatives Study.

7. "If further water data analysis support the reasonableness of planning to capture surplus water flows, how long, even with good water years, will it be before the storage reservoirs are operational and what action will be taken to meet the interim demand?"

Response:

The SB 346 plan takes this into account. Assuming passage of SB 346 in early 1978 and passage of congressional legislation, we estimate that the first facilities could be operational as early as 1984 and the last facility currently thought to be Oliven Reservoir could be operational by 1993, with the other features of the plan coming on line in between those two dates. In this way the estimated firm export yield would be matched against the demand for export water according to the following tabulation:

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Year	Added Facilities, SB 346	SWP & CVP Firm Export Supply in Million AF	Projected Export Requirement in MAF
1980	None	5.6	5.5
1990	Additional Delta Pumps, Peripheral Canal, 4-Agency P&W Agreement, Ground Water South of Delta, Los Vaqueros, and Interim New Melones Water	7.5	7.5
2000	Cottonwood Project and Glenn Reservoir Complex (at half potential)	7.9±	7.7

Initial filling of the large reservoirs on Cottonwood Creek and especially the Glenn Complex would take many years. In partial recognition of this filling factor, we have assumed only half the long-term potential of Glenn to be available in year 2000.

Also, to the extent possible, it is DWR's intention to accelerate replenishment of the underground basins to be used as part of the conjunctive surface and ground water programs as a hedge against future droughts.

P. "In view of the public concern and the responding governmental actions for protecting our water resources, should reliance be placed on the Eel River, which is to be preserved under the Wild Rivers and Scenic Rivers Act, as a realistic alternative for planning development of future water supply sources?"

Response:

No. And no reliance is being placed on the Eel River. This is an example of the GAO completely misunderstanding the Delta Alternatives Plan. The GAO has the situation backwards. California's Wild and Scenic Rivers Act not only prohibits the building of dams and reservoirs for export purposes, but also prohibits the study of dams and reservoirs on those rivers. It does place the Eel River in a special status in that it requires a report to the Legislature by December 20, 1984 on the need for water supply and flood control projects on the Eel River and its tributaries. Consequently, the Eel River is currently off limits to State planning for additional water supplies. However, SB 346 would change the date for the Eel River report to "on or before January 1, 1980" -- almost five years earlier than existing law. This will

give the Legislature an opportunity at that time to make a decision based on updated information. Our recent studies have, however, convinced us that we can develop sufficient water to meet the needs of the CVP and SWP to the year 2000 with Sacramento Valley supplies, and development of the Eel River is not included in SB 346.

9. "If, as proposed by the State, the Central Valley Project is reauthorized to divert water for maintaining higher water quality in the Sacramento-San Joaquin Delta, will additional federal water development be required to offset such diversions so that the project can meet existing water delivery commitments? If such development is necessary, what are the trade-offs between the economic costs and the environmental effects involved to achieve various levels of water quality so the decision-makers can consider the merits of each level of development?"

Response:

If CVP is required to provide its share of water to meet Delta quality standards, development of additional federal water would be required. But a point often overlooked is that irrespective of Delta standards, the USBR knows that it needs the Peripheral Canal to meet the so-called "export commitments" south of the Delta (page 63 of GAO report); and with the present environmental awareness and political realities, the Peripheral Canal will not be constructed without a firm commitment to protect the Delta environment.

California has a long-standing commitment to the Delta and Northern California that only water surplus to their needs would be exported. This was basic to the State's original Central Valley Project later built by the Bureau of Reclamation, as well as to the more recent California Water Project. These commitments are embodied in California law in the Areas of Origin Act, the County of Origin Act, and the Delta Protection Act.

Many of the water right permits the Bureau holds for the CVP are State filings which we believe are subject to areas of origin priority. Under these priorities, the area of origin cannot be deprived of their right to the water required to supply the beneficial needs of the area. The State Water Resources Control Board is the agency established by the legislature to administer water rights and water quality law and to make the determination of what is required to protect prior water rights and the reasonable beneficial needs in the areas of origin. In the Delta the Board has established water quality criteria which have been approved by EPA in fulfillment of federal water quality control laws.

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The Department of the Interior takes the legal position that the CVP operations in the Delta are not subject to State law or the standards approved by EPA. This position is in line with a federal decision now on appeal to the U. S. Supreme Court (United States v. Calif., 558 Fed. 2D1347, 9th Cir. 1977), which deals with the Board's decision to condition the permits for New Melones Project in order to protect Delta water quality.

We understand that the Bureau of Reclamation computes the yield of the CVP on two basic premises pertinent to this discussion: (1) the CVP is operated to control salinity intrusion only to the extent necessary to protect the quality of water at CVP diversion points, and (2) that the Peripheral Canal is completed. With these assumptions the Bureau would have sufficient yield to meet its present and future contract commitments from CVP's authorized units, plus water planned for the Mid-Valley Canal unit, should Congress authorize it. However, with the CVP and the SWP both diverting out of the Delta and without the Peripheral Canal, a substantially greater quantity of water is needed for salinity control than the Bureau allowed in its studies and therefore, the actual yield that CVP can deliver south of the Delta is much less than computed. Therefore, even without specifically meeting State Water Resources Control Board and EPA water quality criteria, CVP needs additional water to meet the Bureau's so-called existing water delivery commitments (not all contracted for). Further, if CVP meets its share of Delta water quality criteria, the Bureau would also need additional storage projects to meet both Delta requirements and export commitments.

As to the second question, it is the prerogative of Congress, the policy maker for the Federal Government, to decide where, when, and how to make "tradeoffs". We believe that it is to the economic and environmental benefit of California and the nation to protect the water quality of the Delta, Suisun Marsh, and the San Francisco Bay.

10. "In view of continuing delays in completing projects under construction, is it reasonable for the State plan to assume that projects will be operational in time to meet projected demands? What alternatives are available to meet such demands until such projects are completed?"

Response:

Yes, the schedule is conservative but flexible. With a cooperative effort, we hope that delays can be minimized and projects completed in time to meet projected demands. If not, the only alternative seems to be continuing to overdraft the ground water basins, accelerating the ground water recharge program, buying some reclaimed water, and a continuation of our extraordinary water conservation efforts. This, however, could not meet all the needs.

11. "If the water developments in the State plan are not constructed as planned and overdrafting of the ground water continues, what would be the impact of the drought on the magnitude being experienced when the projected water demands for the year 2000 is reached?"

Response:

This is a silly question. If California does nothing to provide for future water supplies, we will be short by the year 2000. It seems obvious that without constructing any new facilities, State plan or otherwise, continued overdrafting of the ground water basin could only worsen the impacts under a demand of a higher level than today. This is not, however, a deficiency in the State plan, since with the State plan we can meet the needs to the year 2000 with less reliance on ground water overdraft, even though the combined Delta export of the CVP and the SWP is approximately 2.2 million acre-feet more than present.

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STATE OF CALIFORNIA - RESOURCES AGENCY

DEPARTMENT OF WATER RESOURCES

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- COPY -

EDMUND G. BROWN JR. Governor



STATEMENT OF
DUDLEY RIDGE WATER DISTRICT *
OH SB 346

December 22, 1977

Honorable Gordon W. Duffy, Member
Joint Conference Committee on SB 346
State Capitol, Room 4005
Sacramento, CA 95814

Dear Mr. Duffy:

At the November 21, 1977, hearing on SB 346 in Fresno, you asked for our analysis and comment on the statement (copy attached) presented by Jim Provost on behalf of Dudley Ridge Water District. Our comments and analysis are attached.

I hope this response adds to the Committee's understanding of this complex subject, and I would be pleased to discuss it further if you wish.

Sincerely,

/s/

Ronald B. Robie
Director

Attachments



costs as given to you and by use of this blue covered report titled "Central Valley System Operation Study for the Year 2000", I have learned something about these two subjects which I will relate to you. This study assumes that the facilities proposed in this Bill are installed and that export demands are fixed at the year 2000 level for each of the 50-years from 1921 thru 1971. It is also assumed that the April 12, 1977, draft of the four agency fish agreement is in force. One key operating criteria is that the Glenn Complex is operated to provide 300,000 acre feet per year during dry and critical years.

I went thru this operation plan, year by year, and found that for the 50-year period, the Glenn Complex increased the Sacramento River yield by 73,500 acre feet per year. Information by the Department indicates that the repayment cost of the Glenn Complex is \$74 million per year for a water cost of approximately \$1000 per acre foot in the Sacramento River. Yet the Departments publication on the "Key Elements-SB 346" indicates that Glenn provides one million acre feet for the same project yield. The Department has also indicated that the Delta water rate will increase \$.60 per acre foot in 1986 when the Glenn construction starts. I believe it would be more informative to know what the Delta water rate would be in the year 2000 when substantially all the construction is complete. I am thankful that this Bill requires a feasibility study before any construction can begin. Since Glenn appears to be very costly, I am concerned that the Department will be required to report to the legislature by 1980,

Dudley Ridge Water District is located in Western Kings County and contains 30,000 acres. The District is one of the 31 State Water Project Contractors and is unique in that it has no alternate water supply.

The ability of the State to supply us water is critical to our economic survival. If the Peripheral Canal is not constructed by the early 80's, the State will not be able to deliver our scheduled entitlement water. With no groundwater, nor alternate surface supply, the situation we find ourselves in reviewing SB 346, is frustrating.

The Bill provides us with the Peripheral Canal, only under conditions which make it mandatory for the Federal Government to comply with State mandated Delta Water Quality Standards. In our opinion, this will be impossible to accomplish. It is even made more difficult to accomplish because all the compromise projects provided for are permanently authorized, except for the Peripheral and Mid-Valley Canals, which will leave just a portion of the State to work for Federal Legislation.

The legislature has given us time to find out how much water is made available by the implementation of this Bill and also learn how much it might cost. By use of the project capital

*Given by Jim Provost, Consulting Engineer, Fresno, before the Senate and Assembly Conference Committee Hearing on SB 346 held in Fresno on November 21, 1977.

on what they recommend for the wild river status of the Eel River. In my opinion, the feasibility study for all the proposed construction and the proposed report on the Central Valley's groundwater must be completed before any recommendations are made about the Eel.

Another important operation caught my eye in reviewing the 50-year operation plan. This was that Los Vaqueros Reservoir only released water during May, and no other month during the entire 50-years. It supplied an average of 247,000 acre feet each year. The cost of this water is approximately \$167 per acre foot. Trying to understand this May only use, I found on Page 117, a table titled, "Probable Long Range Controlling Delta Outflow Requirements". It is indicated there that exports from the Delta are limited to 4,500 cfs in May and that in a below normal water year or wetter, the four agency fish agreement controls what the Delta outflow must be during April, May, June and July. From this table, it appears that the minimum Delta outflow to maintain agricultural water quality for Delta farmers is approximately 3,900 cfs. During May for a below normal water year, the additional fish requirement is 7,500 cfs or 446,000 acre feet, while in an above normal water year, the additional fish requirement is 10,100 cfs or 600,000 acre feet. Additionally, if one were to look at May, June and July operations in a below normal water year, they will find that the fish flow amounts to 930,000 acre feet. It is going to cost someone \$41 million per year to provide 247,000 acre feet of water from

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Los Véqueros during the month of May while at the same time, 446,000 acre feet flows to the ocean for the benefit of fish. To put this fishery benefit in prospective for you, the required fish outflow in May during a below normal water year is a one year's water supply for a city with a population of over one million. It is too bad that the Peripheral Canal could not be operated more efficiently than now is proposed in the four agency fish agreement.

The following areas covered in the Bill must have amendments before we can consider support of the Bill:

(a) The provisions indicating that the Federal Government must comply with water quality standards as set by the State Water Quality Control Board is not practical. The needed standards should be negotiated between the project operators.

(b) The so called self destruct provisions must be changed. They should either include the proposed Delta projects or it should be mandated that the Peripheral Canal be built by the State alone with provisions for the Federal Government to join after 1980.

(c) Section 11456, dealing with the release of stored water, should have the reference to San Francisco Bay deleted and also should clarify what is meant by beneficial use. Additionally, the release of stored water should be as contained in the operation agreement and not the basin plans.

(d) We have no objection to water being used for fish enhancement but a definition of water needs for mitigation

should be included to establish a base line that can be used to determine who pays for what.

(e) The comprehensive groundwater study needs to be expanded to recognize the potential of expanding agriculture. Even more important, the study completion date needs to be the same as the reporting date for reporting on the Eel River. As written, the study on the need for water is to be submitted to the legislature by January 1, 1981, yet the need for the Eel River water is to be submitted by January 1, 1980.

(f) The provisions expanding the authority of the State Treasurer should be eliminated as the intent could best be accomplished by changing Federal Law.

(g) The Bill states that certain provisions are included to clarify existing law. Some of these provisions are in both the State and Federal Courts now. An amendment is needed to protect the rights of all parties involved.

In conclusion, we support the specific amendments as offered by Senator Zenovich and Assemblyman Lehman.

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COMMENTS AND ANALYSIS BY THE
STATE DEPARTMENT OF WATER RESOURCES
OF THE
STATEMENT BY DUDLEY RIDGE WATER DISTRICT
AT THE
HEARING NOVEMBER 21, 1977
ON SB 346 IN FRESNO

In his statement, Mr. Provost raised questions and drew conclusions regarding the yield and cost of water from various facilities in SB 346. Mr. Provost's statement (copy attached) was based on information he obtained from our Department.

General Comment

There are a great many possible ways of operating the various facilities of the State Water Project (SWP) and the federal Central Valley Project (CVP) systems. Approximate values of yield for the various facilities in SB 346 are computed as incremental Delta export yield added to the combined SWP and CVP systems, after meeting estimated future upstream depletions in the areas of origin and after meeting water quality and fish and wildlife criteria in the Delta and Suisun Marsh. This yield is not necessarily the same as the average amounts of water released from each facility. Much of the project yield in most years comes from direct diversions of uncontrolled excess flows in the Delta. These direct diversions must be firmed up with releases from storage during dry periods. Excess flows are those flows not needed to meet consumptive use requirements and water quality and fish and wildlife criteria in the Delta and Suisun Marsh. The yields also include planned deficiencies in agricultural deliveries during critically dry periods

as provided for in State and federal water service contracts. Thus, average annual releases from a given reservoir are usually but not always less than the critical dry period releases from a reservoir or the incremental yield capability of the system. In other words, we are interested in the total system capability after the new facilities have been added compared to its capability without the new facilities.

Glenn Reservoir

On page 2 of his statement, Mr. Provost indicated that the DWR year 2000 operation study only showed an increase in yield of 73,500 acre-feet per year. We believe Mr. Provost has incorrectly interpreted the data in our study. The correct figure for the 50-year average release is 88,000 acre-feet per year, not counting some additional flood control releases in the fall. More importantly, he overlooked the fact that for year 2000 we did not operate Glenn to its full planned capability of 1,000,000 acre-feet per year of average critical dry period yield; we used only 300,000 acre-feet per year. This was done for two reasons: (1) The full system yield would not be needed to meet the estimated requirements in year 2000, and (2) under the contemplated construction schedule it would be doubtful if Glenn could be filled to capacity by year 2000. Under our "ultimate demand" study still in progress, the 50-year average release from Glenn storage will be about 400,000 acre-feet per year; and the critical dry period yield, or annual incremental export yield to the SWP and CVP systems, will be about 1,000,000 acre-feet.

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Los Vaqueros

Mr. Provost's computation of average releases from the Los Vaqueros Reservoir of 247,000 acre-feet per year is approximately correct, but his interpretation of its value to the project system is not complete. We have determined that Los Vaqueros Reservoir is better suited to an annual cycle of filling and withdrawal instead of carryover dry period storage; hence the 50-year average is greater than the 1928-34 dry period average, or system, yield which is about 160,000 acre-feet per year. In all cases, project additions should be evaluated against their total contribution and flexibility they add to project operation and Delta protection. (Present project operation is damaging the Delta fishery and additional protection is needed.) For example, Los Vaqueros would allow us to continue meeting project demands south of the Delta during the period of reduced exports to protect striped bass. It would give us the opportunity to capture and temporarily store winter flood flows and later move them down the aqueduct when aqueduct capacity is available for long-term storage in the ground water basins. Storage in Los Vaqueros could also provide a reserve emergency gravity supply to over 250,000 people in Contra Costa County Water District, which presently only has a 2- or 3-day supply should there be an outage in their present pumped supply. This small reserve supply is not satisfactory and is less than any other urban water system of comparable size that we are aware of in California.

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Fish and Wildlife Requirements

Mr. Provost's estimates of Delta outflow requirements are substantially correct for the months and types of years stated. However, he has overlooked some important aspects in drawing his conclusions as to the effects.

First, under existing State laws the SWP project only has the right to divert water that is surplus to Delta needs, including the maintenance of fish and wildlife resources. Most of the water required to meet these higher fish and wildlife flows will occur without releases from project storage reservoirs. On the average (50-year average) and with year 2000 level of development, only one-sixth of the water required to meet Delta water quality standards will come from storage. This figure is only one-fourth for average dry years. The remaining five-sixths or three-fourths of the water required to meet Delta needs would occur without any contribution from the projects, is not surplus to Delta needs, and is therefore not available for export. Therefore, the cost of providing these fish and wildlife flows is greatly overstated by Mr. Provost. This concept is generally illustrated on the year 2000 charts on page 29 of our gray brochure "Key Elements - SB 346".

Second, (nondrought emergency) State Water Resources Control Board (SWRCB) Basin Plan criteria for fish and wildlife in the Delta and Suisun Marsh do not contain relaxations in dry and critical years. The criteria included in the draft Four-Agency

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Fish and Wildlife Agreement do contain such relaxations. These are based on the premise, developed in conjunction with the Department of Fish and Game, that dry and critical year relaxations are permissible if they are offset by increased flows in the wetter years, so long as the long-term preproject historical average fish and wildlife populations are restored and maintained. This is an important concept because the exportable dry period yield of the Peripheral Canal, and hence the system yield of the projects, is about 500,000 acre-feet per year higher with the proposed Four-Agency Fish and Wildlife criteria than with the Basin Plan fish and wildlife criteria.

Cost of Water

Mr. Provost stated that the cost of Glenn Complex water would be \$1,000 per acre-foot by using an annual cost of \$74 million and an annual yield of 73,500 acre-feet. As explained previously, this is not a correct measure of incremental system yield from the Glenn Complex. In regard to his statement concerning Los Vaqueros, Mr. Provost used a construction cost of \$650 million which is an earlier estimate for a larger reservoir and pumping plant. The current estimated construction cost is \$540 million for Los Vaqueros. Following is a table that shows the unit costs of dry period yield from the proposed Glenn and Los Vaqueros Reservoirs, which is equivalent to incremental new yield to the system.

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UNIT COSTS OF DRY PERIOD DELTA YIELD

	Glenn	Los Vaqueros
Capitalized cost (1977) ^{1/} (million \$)	1,185	721
Estimated share allocated to water supply	99%	100%
Capitalized cost allocated to water supply (million \$)	1,173	721
Average annual cost to water supply ^{2/} (million \$)	74.4	45.7
Nominal yield (MAF/yr.)	0.990	0.160
Demand buildup period @ 75 TAF/yr. (years)	13.2	2.1
Average annual equivalent yield (MAF/yr.)	0.695	0.155
Unit cost of Yield (\$/AF)	\$107	\$295

^{1/} Represents all costs including operation, maintenance, power, and replacement costs.

^{2/} 6% interest, 50-year repayment.

This type of cost computation is used to compare alternatives and is not a measure of the repayment of cost by the SWP water contractors. The repayment of the costs by the SWP water contractors is accomplished within the Delta water charge which follows the Delta pool principle that all contractors will share total conservation costs in proportion to the amount of their annual water entitlements, regardless of the source of supply. The Delta water rate is increased to reflect the costs of conservation facilities as they are added to make additional water available

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at the Delta to match the buildup in demand or to maintain project yield due to increased depletions in the areas of origin. Thus all SWP water service contractors pay a melded Delta pool price. This was done so that SWP facilities could be staged according to need without giving water users with early needs a cost advantage over those whose needs developed later. (We understand that the CVP is moving toward a similar Delta pool pricing concept, but that full implementation will necessarily be slow because it can only be put into effect as new contracts are executed or existing contracts renewed.)

Under the State's Delta pooling concept, the cost of the SWP share (assumed at 50 percent) of Glenn Complex would be recovered through the Delta water rate applied to each acre-foot of entitlement water from the year construction begins through 2035. The calculation of the rate also considers the construction schedule and the time value of money. As Mr. Provost stated, the estimated increase in the Delta water rate for the assumed SWP share would be about \$4.60 per acre-foot (expressed in today's dollars). This increase would be applied to all of the entitlement water of each SWP contractor from the year construction begins until 2035 (end of the project repayment period). Repayment would not just be based on the incremental system yield added by the Glenn Complex. The estimated increase in the Delta water rate to SWP contractors for the assumed State share (assumed at 25 percent) of Los Vaqueros would be \$1.56 per acre-foot (expressed in today's dollars) and would apply to all entitlement water from the year construction of Los Vaqueros begins to 2035. As explained earlier, Los Vaqueros must be evaluated for its total contribution and flexibility it provides to the entire system.

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The Resources Agency

STATE OF CALIFORNIA - RESOURCES AGENCY

DEPARTMENT OF WATER RESOURCES

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- COPY -

EDMUND G. BROWN JR., Governor

Memorandum

To : Ronald S. Beebe

Date : December 20, 1977

File No.

Donald A. Sandison, Financial Adviser
Ralph Alpert, Attorney
John McClurg, Engineer for Delta
Alternatives Study

Subject : Comments on KCWA
Statement as to Effect
of SB 346 on SWP Financial
Integrity

From : Department of Water Resources

January 3, 1978

Honorable Ruben S. Ayala
Member of the Senate
State Capitol, Room 204B
Sacramento, CA 95814

Dear Senator Ayala:

Attached herewith are copies of the following documents:

1. Memorandum dated December 20, 1977 to Ronald B. Robie from Donald A. Sandison, Financial Adviser; Ralph Alpert, Attorney; and John McClurg, Engineer for Delta Alternatives Study, subject - Comments on KCWA Statement as to Effect of SB 346 on SWP Financial Integrity.
2. Letter dated December 19, 1977 to Ronald B. Robie from C. Richard Walker, Senior Partner, Orrick, Herrington, Rowley & Sutcliffe.
3. Letter dated December 20, 1977 to Ronald B. Robie from Ernest R. Tracy, Vice President, Dillon, Read & Co. Inc.

These documents are self-explanatory and represent the Department's response to the statement presented by the Kern County Water Agency at the December 12 hearing in Stockton of the Conference Committee on SB 346.

Sincerely,

/s/
Ronald B. Robie
Director

Attachments



Ronald B. Robie
Page 2
December 20, 1977

Valley SWP contractors, the Delta water users, environmentalists, the Federal Government water agencies, the San Francisco Bay protectionists, Southern California SWP contractors, and Federal CWC contractors. Unless some program and procedure is worked out which enjoys broad support among these interests and which provides for Federal participation in the Peripheral Canal and Federal agreement to share in the protection of the Delta-Bay estuary, it is the Department's judgment that the Peripheral Canal cannot be expeditiously built or that, even if built, that it may not significantly augment the yield of the SWP. This judgment is based on the long experience of several State administrations in trying to build a Delta facility. Through the negotiations on SB 346, there has been achieved, for the first time, a considerable amount of consensus among the concerned interests as to a Delta facility. Mr. Fowler and Dr. Eudey point to the requirements of SB 346 that federal agreements and Delta agency approvals be obtained before construction of the Peripheral Canal; they say this will delay construction of the facility. But they don't discuss the alternative; they appear to assume some pie-in-the-sky procedure whereby the Department would simply begin letting construction contracts without assurance of Federal participation and where no one would block construction or financing of the facility through lawsuits or legislative action. They also do not note that under the present form of SB 346, the Department is required to proceed with activities prerequisite to construction and to complete design by the end of 1983. (Proposed Section 11257(b).) The practical realities of building the Peripheral Canal have been recognized by the Metropolitan Water District of Southern California (MWD). MWD has contracted to take about one-half the water of the SWP and to pay substantially more than one-half the costs of the SWP. MWD has carefully reviewed all aspects of SB 346 and has independently concluded that this is the surest way to get this facility built. Also, during the recent conference committee hearings on SB 346, Assemblyman Cuslco stated several times his judgment that the California congressional delegation will not move to obtain Federal participation until the State has a unified position, as would be provided by the enactment of SB 346.

There is also a question whether Mr. Fowler and Dr. Eudey are basing their conclusion of adverse effects upon Kern County water bonds solely on concern that KCWA may not receive its entitlement water as scheduled, or whether they are also basing their conclusion on concern whether significant amounts of surplus water also will be available. Mr. Fowler writes of "the probable inability of the state to meet future foreseeable needs of its customers...." (Emphasis added.) Dr. Eudey writes that "the yield of present State Project facilities ... is not adequate to meet projected demands in 1978 or thereafter ..." and "it ... [is] likely that under present project capabilities ... [contractors] would not be able to obtain sufficient water supplies from the

SURNAME : *Robert S. Beebe* | DATE : *12-20-77* | FILE NUMBER : *Mr. Beebe*

Ronald B. Robie
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December 20, 1977

State Project to meet their requirements ..." (Emphasis added.) The State has not contracted with KCWA to supply "needs", "demands" or "requirements", but rather to supply specific amounts of entitlement water. (See Article 6 of the State-KCWA water supply contract.) The contract does also provide for the delivery to contractors of "surplus water", which is water made available by the Project which is in excess of entitlements. (See Articles 21 and 47(a).) However, surplus water is not guaranteed and the State has no obligation to build project facilities on a schedule which would provide surplus water. The State recognizes the importance of surplus water to agricultural water contractors and will continue to provide surplus water whenever it is available. However, we do not believe it is sound fiscal practice for San Joaquin Valley water agencies to predicate their financing needs and capability on optimistic assumptions as to the delivery of surplus water. Also, KCWA and other agricultural water contractors are required to take reductions in entitlement water deliveries in times of drought of up to 50 percent in any one year or a total of 100 percent in any series of seven consecutive years. (Article 18(a).) The State is not required to build facilities on a schedule that would provide for 100 percent of agricultural entitlements during times of drought. The State has always included reductions in agricultural supplies during drought as computing required project yield. This, too, must be considered by KCWA in its fiscal projections.

The third document presented by KCWA to demonstrate the adverse effect of SB 346 upon the financial status of the SWP is a letter from James Warren Beebe. Mr. Beebe discusses at some length the ramifications of a failure by the State to "complete" the SWP. He writes of an obligation to the electorate and State bondholders as well as SWP water contractors which he suggests may be enforced through litigation.

The answer to Mr. Beebe's comments is that the State intends to meet all its legal obligations to its water contractors and SB 346 does not impair the State's ability to do so. To the contrary, we believe that the SB 346 program provides a means whereby the SWP can meet its obligations consistent with the social, political, and economic conditions that exist today.

We have two additional comments on Mr. Beebe's letter. First, Mr. Beebe appears to misconstrue the State's obligation to provide project yield. On page eight of his letter he states:

"What seems to have happened is that the State Water Project which was designed and sold to the voters and the bondholders on a yield basis of approximately 4 million acre-feet by surface means in normal years appears to be only producing approximately 2 million acre feet. The schedule for completion of the Project is far behind the estimates made by the Department of Water Resources when most of the water supply contracts were executed."

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Ronald A. Robie
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December 20, 1977

The SW, obviously, was never planned to produce 4 billion acre-feet in 1977. Full project yield of 4.23 billion acre-feet was originally planned to be produced in 1980. As a result of reductions in water contractor requests (particularly that of MWD) for entitlement water, the full yield of 4.7 million acre-feet is now not expected to be required until sometime after 2010. The project yield is now sufficient to meet entitlement requests under conditions no worse than the historic dry cycle, with reductions in deliveries of agricultural water during drought, in accordance with the water supply contract provisions. Under the SB 3-6 program, the State plans to build facilities on a schedule which will provide yield sufficient to supply the buildup in entitlement requests in future years. (See the table set forth below on page 5).

Secondly, Mr. Beebe expressed concern that no opinion has been requested of the State's board counsel as to whether the Peripheral Canal can be financed with Central Valley Project revenue bonds. The Department has made preliminary legal and financial studies on the possibility of financing the Peripheral Canal with revenue bonds and has tentatively concluded that, under suitable circumstances, such financing may be possible. No opinion has been requested of outside counsel because it has been the Department's financial plan to finance the State's share of the Peripheral Canal with tidelands oil revenues appropriated to the California Water Fund under present law.

In conclusion, it is the Department's judgment that SB 346 provides the framework to:

1. Complete and operate an environmentally sound Peripheral Canal with associated facilities in the Delta and Suisun Marsh to protect local resources.
2. Provide additional storage capacity for the SWP. (The State has had no other comprehensive plan for such storage since the Wild and Scenic Rivers Act prohibited construction of the Tel River project.)
3. Broaden the authority of the SWP to use ground water storage capacity to increase project yield and to use waste water reclamation and water conservation to stretch out the buildup of project entitlement requests.
4. Cause the CVP to assume its share of the obligation to provide water to protect the Delta-Bay estuary.

Ronald A. Robie
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December 20, 1977

S. A graph showing the yield of the SW is shown below.*

Year	Added Facilities	SWP Share of First Supply in Million AF/Yr	DJR Projected Entitled Requests in MAF/Yr
1980	None	2.3	1.9
1985	Additional Delta Pumps and North Portion Peripheral Canal	2.6 to 2.8	2.3
1990	Floish Peripheral Canal, Ground Water South of Delta, and Los Vaqueros	3.7	3.1
1995	Cottonwood	3.3 to 3.4	3.2
2000	Gleno Reservoir Complex (at half potential) ??	3.6	3.3

Based on agricultural water users taking deflections in water deliveries to accordance with provisions in the contracts.

** Initial filling of the large reservoirs on Cottonwood Creek and especially the Gleno Complex would take many years. In partial recognition of this filling factor, the Department assumes that only half the long-term potential of Gleno to be available in year 2000. Complete filling of Gleno and additional facilities after the year 2000 would provide the full 6.23 million acre-feet per year of yield to satisfy full contractual entitlements.

We have discussed the KGA statement of December 17 and its supporting letters with Ernest Tracy, a vice-president of Dillon, Read & Co., Inc. and C. Richard Walker, a senior partner of Orrick, Herrington, Rowley & Sutcliffe. Separate letters will be sent to you from both of them explaining their respective positions.

* Based on letter to Eugene Gualco, Chairman, Assembly Committee on Water, Parks and Wildlife, from Ronald Robie, Director of Water Resources, September 2, 1977, Re: Hearings on SB 346.

ORRICK, HERRINGTON, ROWLEY & SUTCLIFFE
COUNSELORS AND ATTORNEYS AT LAW
ATTORNEY ROOM
600 MARKET STREET
SAN FRANCISCO, CALIFORNIA 94102
TELEPHONE 415 362-2222

December 19, 1977

ORRICK, HERRINGTON, ROWLEY & SUTCLIFFE

Mr. Ronald B. Robie
December 13, 1977
Page 2

the plans and intentions of the Department of Water Resources. Moreover, the statement expressly relates only to future "needs" of water contractors and not to any contractual rights of those contractors or any commitments of the State.

The final paragraph of Mr. Fowler's letter regrettably expresses views as to Senate Bill No. 346 which are matters of political judgment, economics, engineering and the like. As a law firm, these matters are simply not our business and we have no opinion to express with respect to them. The final statement in the letter to the effect that "we are of" a certain view as to the bill was inadvertent. My partner may personally be of the view described, as may some of our clients in Kern County, but that view is not the opinion of this firm.

Sincerely yours,
C. Richard Walker

CRW:lb

cc: Mr. Stuart T. Pyle
Mr. Donald A. Sandison
Mr. Verne L. Cline

Mr. Ronald B. Robie
Director of Water Resources
State of California
P. O. Box 388
Sacramento, California 95802

Re: Senate Bill No. 346

Dear Mr. Robie:

A letter from my partner, Carlo S. Fowler, to Mr. Stuart T. Pyle, dated December 8, 1977, concerning Senate Bill No. 346, has recently come to my attention. That letter was unfortunately grouped with letters or statements of others in a presentation to a legislative committee in such a manner that it may result in mistaken impressions as to the views of this firm.

Mr. Fowler's letter contains no statements whatsoever with respect to the financial integrity of the State Water Project or with respect to any bonds heretofore issued, or which may hereafter be issued, by the State of California or its Department of Water Resources. The letter relates only to the future issuance and sale of bonds of local agencies in Kern County.

I understand that the letter was primarily intended to deal with future bond sales by Kern County water districts and the disclosure problems which might arise from any limitations on the availability of water to meet future demands of those districts. In this connection, after mentioning the present drought in California and the fact that some projects for additional water supplies in the state have not yet been completed, the letter speaks of the "probable inability of the state to meet future foreseeable water needs of its customers." I understand that this phrase was intended to refer to a "probable inability" to meet future needs with presently existing facilities and unless additional facilities are completed, end not to any inability which can not be overcome by the further development of the State Water Project in accordance with

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Dillon Read & Co. Inc.

46 William Street

New York 10005

December 20, 1977

Mr. Ronald B. Robie
Director
Department of Water Resources
P. O. Box 388
Sacramento, California 95802

Dear Mr. Robie:

At your request we have reviewed Kern County Water Agency's statement before the Joint Conference Committee on Senate Bill 3-6 at Stockton on December 12, 1977. We have also reviewed the documents supporting the statement and have assisted in the preparation of a response by Donald Sandison, Ralph Alpert and John McClurg dated December 20, 1977, to certain questions raised in the statement.

As you know, Dillon Read has served the Department of Water Resources as its financial consultant since February, 1950. Our efforts were initially directed toward determining that the State Water Project would be feasible from a financial standpoint, meaning that it could be financed and paid for without impairing the State's high credit standing because the water contractors would have the capacity to pay for the water delivered to them by the Project. In reaching this conclusion we assumed that the annual entitlements of water under contract would be delivered by the Project, and our efforts since 1960 have been devoted to assisting the State in obtaining financing for authorized Project features which will result in meeting the annual contract entitlements at a cost which does not require calling upon the State's General Fund in a substantial amount to repay the debt. This is what we mean by maintaining the financial integrity of the Project.

You have assured us that the Department is committed to maintaining the financial integrity of the Project and that in the Department's judgment, the SB3-6 program provides the best possible means of maintaining this policy under present conditions. It is recognized that the Bill represents a consensus of many viewpoints and as such cannot completely satisfy the desires of all parties affected by it. However, without the Bill's enactment no determination of Federal participation can be made, and thus the alternative of the State proceeding alone to finance the authorized facilities should not be undertaken at this time.

Since you have assured us that the Department intends to meet Project entitlement requests for water and you believe that enactment of SB3-6 is the best possible means of meeting your commitment to the water contractors, no useful purpose would be served in making a study of the effect on the State's credit and the water contractors' credit of a failure through SB345 to meet this goal, as suggested by the Kern County Water Agency.

Very truly yours,

Ernest E. Tracy
Ernest E. Tracy,
Vice President

c.c.: Donald Sandison

STATE OF CALIFORNIA - RESOURCES AGENCY

DEPARTMENT OF WATER RESOURCES
P.O. BOX 388
SACRAMENTO
95802

(916) 445-9248

EDMUND G. BROWN JR. Governor



- CDPY -

January 4, 1978

Honorable Ruben S. Ayala,
Chairman
Joint Conference Committee on SB 346
State Capitol, Room 2048
Sacramento, CA 95814

Dear Senator Ayala:

At the December 2, 1977 hearing on SB 346 in Redding, Mr. Harold C. Niesen of the Elk Creek Grange No. 441 testified before your committee and presented a resolution opposing the selection of the Glenn Reservoir Project. A copy of the resolution with supporting references and notes is attached for easy reference.

I regret that the Grange has decided to oppose the Glenn Reservoir as one of the facilities included in SB 346. I believe the provision in the bill (Section 11257.2) requiring completion of engineering, economic, environmental, and financial feasibility reports before construction can begin provides adequate assurance that a safe and productive facility will be built. The following comments are addressed to some of the concerns expressed in the resolution.

The seismic activity at Glenn Reservoir is considered low and no serious problems are anticipated. There are mapped faults in the damsite and reservoir area, but these are considered to be inactive. We are just starting to conduct a preliminary fault study and seismic evaluation, including consideration of reservoir-induced seismicity. This study is scheduled to be completed in July 1978.

The stability of Rocky Ridge has been considered in the preliminary planning studies done by both the Department of Water Resources and the Bureau of Reclamation. These studies tentatively concluded that it would be safe to store up to about Elevation 980 feet. The maximum safe storage elevation will not be determined until considerably more planning and preliminary design are completed. Planning studies show that the yield is enhanced as the storage is increased and, therefore, it is desired to store as high as possible. At this time, storage above Elevation 980 feet without considerable remedial

Honorable Ruben S. Ayala
Page 2
January 4, 1978

work to the ridge does not seem likely. We are now preparing preliminary design and cost estimates for spillway crest elevations of 950 feet and 1,000 feet and expect to have these completed in July 1978.

Today, no studies have been done on the dynamic stability of the proposed embankments. However, the liquefaction potential of available embankment materials under seismic loading will be studied.

The factors discussed above are extremely important to safety and will be thoroughly covered in the feasibility study of Glenn Reservoir.

Sincerely,

/s/
Ronald B. Robie
Director
Attachments



Antioch-212

ELK CREEK ORANGE #441
Elk Creek, Ca.

December 2, 1977

The Honorable Ruben S. Ayala, Chairman
Joint Conference Committee on SB 346
Redding, Ca.

Dear Sir:

As an appointed spokesman for the Elk Creek Orange, I have made arrangements to testify before your committee.

Attached is a resolution opposing the selection of the Glenn Reservoir site which was adopted by the California State Grange at their convention in San Jose on 20 October 1977.

The resolution with supporting references and notes, also attached, represent the subjects upon which my testimony will be centered.

Very truly yours,

/s/

Harold C. Kissien
Elk Creek Grange #441
Elk Creek, Ca.

WHEREAS: The state engineers presented four alternative developments, cautioning that they were dependent upon the same surplus water, and

WHEREAS: The Department of Water Resources selected two and a significant part of a third development (Glenn, Colusa and Cottonwood) for legislative consideration, and

WHEREAS: The full capacity of the Glenn Reservoir Unit could not be realized from available surplus water resources, and

WHEREAS: The Glenn County Board of Supervisors on August 2, 1977 resolved to oppose the construction of the proposed Glenn Reservoir River Diversion Unit,

THEREFORE, BE IT RESOLVED, that the California State Grange oppose the selection of the Glenn Reservoir site and that the State Department of Water Resources be urged to select a site with less economical and social impact, geologically safe and more practical from an energy and cost standpoint,

BE IT FURTHER RESOLVED, that the Chairman of the current Senate-Assembly Conference Committee on the Peripheral Canal, the Senate Agriculture and Water Resources Committee, and the Assembly Water Committee be made aware of the basis for the opposition to the proposed Glenn Reservoir River Diversion Unit site.

Passed at California State Grange Convention, on floor vote, San Jose, Ca., on October 20, 1977

REFERENCES AND NOTES PERTINENT TO ELK CREEK GRANGE RESOLUTION

COST OF IMPounded WATER

"Irrigation water coming from the Glenn Complex - if it were built - would cost area farmers at least \$10 per acre foot" said Al Dolcini, Northern District DWR Engineer, at the Glenn County Chamber of Commerce meeting on July 27, 1977.

EARTHQUAKE POTENTIAL

See attached extract from Geologic Report

DISPLACEMENT OF LUMBER MILL

The lumber mill at Elk Creek is a stable industry, now entering its 27th year of continuous operation. The attached letter from Louisiana Pacific Corporation is in protest to the displacement of the mill.

INUNDATION OF AGRICULTURAL LAND

A total of 90,000 acres of land would be required for all features of the Glenn Reservoir including conveyance and expansion of Black Butte reservoir.

DISPLACEMENT OF PEOPLE

There are 50 separate households in the Elk Creek area with 3d, 4th, and 5th generation descendants of early settlers. Some are living on the original homesites.

INDIAN RESERVATION

Within the past 3 years, the Orindstone Indian Rancheria has constructed 14 new houses that cost \$565,000. A bridge project was recently completed which cost \$333,000. A Federal grant in the amount of \$164,000 has been received which will provide a medical/dental facility on the Rancheria.

The Indians have agreed through their Tribal Council that they do not want to move. For more information, see attached "History" and copy of Tribal resolution.

SUPERVISORS OPPOSE GLENN RESERVOIR

See attached resolution from the Glenn County Board of Supervisors

RECOMMENDATION

Further feasibility studies will not correct the many undesirable features of the Glenn Reservoir plan but would result in an irretrievable loss of time in selecting an alternate site with positive potential for meeting the State's water needs.

We strongly recommend the deletion of the Glenn Reservoir site from SB 346.

Because of knowledge of earthquakes in the vicinity of the proposed Glenn Reservoir and the obvious porous appearance of the eastern rim, the services of James Cooksley of Cooksley Geophysics were enlisted. His findings are:

1. The proposed Glenn Reservoir site is bounded to the west by the Coast Range thrust fault. This feature is likely to consist of sheared and fractured rock in which one fault or several parallel to sub-parallel faults are present in a north striking zone which might attain a width of several hundred feet in some places.
2. The Paskenta fault zone appears to pass through the northern portion of the Glenn Reservoir site. This structure is a 2000-foot wide, northwest striking zone of sheared and fractured rock.
3. The bedrock at the site is comprised mainly of competent, sedimentary units (of Cretaceous and, perhaps, Jurassic age) consisting of shale, mudstone and sandstone. According to the U.S. Sheet, there is not such alluvium cover at the site. However, it is generally known that the bedrock units are locally susceptible to deep weathering and slope failure.
4. Records of epicenters of earthquakes indicate that seismic activity has occurred along both the Coast Range thrust fault and the Paskenta Fault zone. Two epicenters of earthquakes have been recorded within or bordering the site since 1940. Over twenty earthquakes, three of which had magnitudes of over 4.0 but less than 4.9 were recorded within 25 miles of the site since 1940.

In the opinion of the writer, three sources of problems of a geologic nature exist at the site. These are:

1. The presence of faults and shear zones at the site constitute potential zones for water seepage, slope failures and epicenters for earthquakes.
2. The site is in an area which is moderately seismically active. The possible effect of accumulations of water up to 350 and 450 feet in depth, along with severe annual drawdowns, should be carefully considered. The soil derived from the shaly and sandy bedrock would appear to be subject to liquefaction under earthquake conditions. Seismic shocks might also trigger slope failures. Potential bedding plane failures such as that which took place at Vinton in Northern Italy should be investigated carefully.
3. Slope failure (landslide) conditions are common in the general area. Most of the slides result from a combination of conditions such as moisture or accumulation of ground water in the sub-surface, steepness of the slope and thick accumulation of soil and/or a development of a thick layer of intensely weathered rock. Landslides often are initiated by earthquakes as discussed under item 2.

References: Fault Map of California (C.D.M. 1975) U.S. Sheet of the Geologic Map of California (C.D.M. 1970), Great Valley Sequence, Sacramento Valley paper presented at the Cordilleran Section, Geological Society of America, Annual Meeting 1977; by Raymond V. Ingerson, Ernest I. Rich and William R. Dickinson, and Catalog of Earthquakes in Northern California and Adjoining Areas by Bruce A. Bolt and Roy O. Mitan, published in 1975.

*Extract from J. W. Cooksley letter, dated 4 August 1977.
J. W. Cooksley is a Registered Geologist, a Certified Engineering Geologist, Cooksley Geophysics, Inc., has offices in Redding, Ca., and Tucson, Ariz.

Antioch 212

STATE OF CALIFORNIA—RESOURCES AGENCY

DEPARTMENT OF WATER RESOURCES

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EDWARD O. BROWN JR., Governor

- COPY -



January 25, 1978

Honorable Eugene T. Gualco, Chairman
Assembly Committee on Water, Parks,
and Wildlife
State Capitol, Room 2016
Sacramento, CA 95814

Dear Gene:

This is in response to your request to analyze Mr. Jerry Dibble's November 30, 1977 letter, on the capability of the State Water Project (SWP).

Mr. Dibble's first point is that the SWP is not currently able to deliver the full amount of water requested (including surplus) during critically dry years. After 1982 he points out, the contractual entitlements for SWP deliveries would exceed the presently estimated project yield of 2.3 million AF/year. In 1976, except for some reduction in requests for surplus water, all demands were met. In 1977, the SWP allocated 1.15 million AF, but some contractors elected to defer delivery.

The SWP may be slightly deficient in the mid-1980s until the Peripheral Canal is built and further delays in construction of the Peripheral Canal and implementation of the other provisions of SB 346 could mean more frequent and severe shortfalls meeting the Water Service Contractors' demands.

Four additional pumps are planned for the Delta Pumping Plant and could provide some improvement in SWP yield prior to completion of the Peripheral Canal. The amount of improvement will depend on the findings of the Joint Federal-State Environmental Impact Report/Statement and the terms and conditions, if any, in the Corps of Engineers permit.

Mr. Dibble's comments on DWR's goals for water conservation and reclamation are similar to those made by others. We think the goal of 0.6 million AF/year by year 2000 and the projected total demand for water is reasonable. You will recall that we did not assume any reduction in San Joaquin Valley contractor demands in our goal because of current ground water overdrafts. I can understand local agency desires to control their own water supply and use, but I would like to be assured that future water needs are required before embarking on expensive new water projects.



STATE OF CALIFORNIA—RESOURCES AGENCY

DEPARTMENT OF WATER RESOURCES

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EDWARD O. BROWN JR., Governor



- COPY -

February 9, 1978

Honorable Eugene T. Gualco, Chairman
Assembly Committee on Water, Parks
and Wildlife
State Capitol, Room 2016
Sacramento, CA 95814

Dear Gene:

This is in response to your letter of December 20, 1977 asking us to look into the extent to which the Delta-Mendota Canal and the California Aqueduct could be used to deliver Eel River water to the San Joaquin Valley to provide additional water service over and above present State Water Project amounts. Our previous discussion on this subject, included with my November 25, 1977 letter, was based on the large Don Rios Dam proposal of the Corps of Engineers. The amounts of water to be conveyed under that proposal would be about 0.9 million acre-feet (MAF) per year, including surplus Sacramento River flows in wetter years.

The Delta-Mendota Canal has no capacity that would be available for the transportation of water from an Eel River development. It is not practical to plan to utilize the California Aqueduct to transport such water for a number of reasons.

It would be unsound to build an expensive water storage project with only assurance of temporary conveyance. To do so would understate the real cost of the project. It would be unrealistic to assume that an Eel River storage project could be on-line before 1995. Although there is some capacity in the California Aqueduct to convey additional water from the Delta to the San Joaquin Valley, it would diminish or disappear as the State Water Project demands approached the 4.23 million contractual amounts. This is especially true due to demands made on the Aqueduct by the groundwater storage program.

This situation should not be confused with a system where the Eel River would be developed to provide yield for the SWP. Under the latter condition, the 0.9 MAF/year yield could be developed with the California Aqueduct conveying the water to SWP customers as part of their 4.23 MAF/year contract entitlements.



Honorable Eugene T. Gualco
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February 25, 1978

In regard to our operation study, Mr. Dibble's discussion on scheduled deficiencies is overcritical. The graph does show 11 years of deficient supply. However, there are actually only eight years with system shortages. The other three, 1925, 1935, and 1940 are January through March reductions occurring as the tailends of previous year curtailments. For the SWP itself, page 115 of the operation study report shows five years of scheduled curtailments (1924, 1929, 1931, 1933, and 1934) at a 25 percent annual rate for agriculture.

I am not sure how Mr. Dibble goes from the 25 percent rate shown in the operation study to the 35 to 40 percent figures on the last page of his letter. He may be assuming that our water conservation goals will not be achieved or that the municipal and industrial growth in demand for SWP water is underestimated. If this is the case, the SWP yield could be deficient during a future critical dry period and agriculture could be allocated a greater deficiency than the 25 percent used in our operation studies.

As a closing comment, I would like to add that we all recognize that there is some uncertainty in our projections of water demand and water yield for year 2000. Estimates can be high or low, depending on future developments. The drought has shown that presently developed water supplies are not adequate in extremely dry years. Within financial and time constraints, the construction schedule for the facilities of SB 346 can be adjusted although I question whether the schedule can be shortened much more. The important thing is to begin the process of augmenting presently developed water supplies immediately. To us, SB 346 is the only viable balanced way to proceed at this time.

Sincerely,

/s/
Ronald B. Robie
Director

Honorable Eugene T. Gualco, Chairman
Page 2
February 9, 1978

Permitting the use of temporarily unmet capacity in the California Aqueduct would pose a risk to State Water Project contractors. It might be extremely difficult or impossible from a practical point of view to withdraw the use of capacity when it was needed for the requirements of state contractors if no conveyance for the North Coast water had been constructed.

If a new aqueduct system to deliver Eel River water from the Delta is not built, there would be other costs which would have to be met. Some additional water conveyance systems would probably have to be built from the west side aqueducts to the east side service areas, where most of the overdraft exists. Since any capacity in the California Aqueduct would not be available on an irrigation demand pattern, a portion of any of the water conveyed would have to be percolated into underground storage or stored in new off-stream storage reservoirs. Either of these systems would be costly. Because of the pattern of available aqueduct capacity, much of the aqueduct pumping would have to be done with expensive on-peak power.

With the many qualifications just discussed, capacity may be available to convey a portion of the 0.9 MAF/year yield of an assumed Eel River project. As you know, our studies project 0.7 MAF/year of reduced demand through urban conservation and waste water reclamation. Much of the California Aqueduct capacity which may be available in the year 2000 would eventually be needed for the full contractual requirements of the SWP. The details of just how much water might be conveyed and how this capacity might change with time (from year 2000 to full entitlement demand) would require considerable study.

In conclusion, I want to repeat that our studies have convinced us that, with implementation of the facilities provided for the SB 346, we will have sufficient water to meet the projected reasonable needs of the Delta, and State Water Project, and the Federal Central Valley Project to the year 2000 without additional diversions from the Eel River or other North Coast rivers. The

State, therefore, has no current plans to develop any North Coast River. Please also know that it is not our intention to permanently wheel any federal water supplies that might be developed from the North Coast via State Water Project facilities. As mentioned before, this is because of the short duration and many uncertainties as to the availability of capacity in the California Aqueduct.

Sincerely,
/s/
Ronald B. Robie
Director

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STATE OF CALIFORNIA, DEPARTMENT OF FISH AND GAME

DEPARTMENT OF FISH AND GAME

1001 K Street, Suite 100
Sacramento, California 95814
(415) 447-3731

- COPY -

September 2, 1977



Honorable Eugene T. Gualco
Member of the Assembly
State Capitol
Sacramento, CA 95814

Dear Gene:

In reply to your September 1, 1977 letter the answers to your questions are as follows:

Fish Screens

- (1) How effective are the fish screens that have been developed to date?

The effectiveness of fish screens depends not only upon their basic design, but also on how they are operated and the kinds and sizes of fish which are present. The screens which are most comparable to the situation at the Peripheral Canal intake are those at USBR's Tracy Pumping Plant, at the State's Delta Pumping Plant, at the Glenn Colusa Canal intake, and at PG&E's Pittsburg and Contra Costa Steam Plants. These screens range up to one-fourth the size of the Peripheral Canal screens.

Most tests at the Tracy and Delta plants indicate efficiencies exceeding 80% for salmon over two inches long for each exposure to a screen. Efficiencies for shad, the other fish of principal concern at the Peripheral Canal, have not been measured there.

The principal inherent deficiencies of the Tracy and Delta screens are their relative ineffectiveness for small fish and the fact that all fish must be handled and trucked. The latter is an inherent and major disadvantage of any screen in the south Delta and is a primary reason favoring the Peripheral Canal.

Limited evaluation of the Glenn Colusa screens indicate less than 5% of the salmon are lost through the screens.

The P.G. and E screens were redesigned in 1973 to eliminate design deficiencies. The efficiency of these screens has not been tested, but few dead fish are impeded on the screens indicating a high efficiency. These screens are designed to allow fish less than 2 inches long to pass through the screens into the power plants and back into the river.

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Delta Fishery

- (1) Please provide us with your estimate of the relative health of the Delta fishery as compared to the historical Delta fishery for the following:
- with current upstream facilities and with current exports
 - with current upstream facilities and proposed future exports levels
 - with the Peripheral Canal
 - with the New Hope Cross Channel
 - with the upper portion of the Peripheral Canal and an enlarged Clifton Forebay
 - with the upper portion of the Peripheral Canal an open middle, and the lower portion of the Peripheral Canal

Our staff's best judgment is overall fish and wildlife resources in the estuary averaged about 40% greater between 1922 and 1967 than they do now due to present facilities and exports.

Assuming the standards we envision having in effect with a Peripheral Canal and that present conditions equal 100, our best judgment is overall fish and wildlife values 20 years from now would approximate the following for various alternative conditions:

- with current Delta facilities and proposed future exports - 60
- with a Peripheral Canal - 135
- with the upper portion of the Peripheral Canal and an enlarged Clifton Forebay - 80
- with the upper portion of the Peripheral Canal, an open middle, and the lower portion of the Peripheral Canal - 90

Our staff has never evaluated the New Hope Cross Channel without any facilities in the south Delta, as we understand DWR does not consider it to be a viable alternative. We would probably conclude, however, that it would have an impact similar to combining the New Hope Channel with enlarging Clifton Court Forebay (i.e. a level of about 80).

- (2) With present knowledge, do you believe that the proposed Four Agency Fish Agreement adequately protects fish and wildlife resources in the Delta?

- (2) What are the necessary characteristics of a satisfactory fish screen?

For the kinds and sizes of fish which will be present at the Peripheral Canal intake, essential conditions for biological purposes are:

- an even approach velocity between 0.2 and 0.8 fpm, depending on the time fish have to swim in front of the screen
- holes small enough that the fish can't pass through (probably holes 5/32" in diameter)
- a facility designed so natural bypass flows eliminate the need to handle fish
- minimizing habitat for predators in the entire intake system.

From the engineering standpoint, the challenge is to design a screen which has these characteristics and can be constructed and operated efficiently and economically. A major consideration is keeping the screen clean.

- (3) Do you believe that a proper fish screen can be developed in time for placement on the intake to the Peripheral Canal?

Yes, I do. The development program has already provided much of the essential basic information. The remaining basic information will be gathered during the next two years. An important reason for extending the development program through the full time available is to find a solution as close to optimum as possible, both in terms of efficiency and economics. We believe this is the most prudent approach considering both the potential environmental consequences and the costs involved.

You should be aware of the fact that several years ago the directors of the four agencies involved concluded that it would not be feasible to screen striped bass eggs and larvae. Instead we are committed to the principle of curtailing diversions into the canal to the extent necessary to protect striped bass. Our Department believes that this should involve diverting not more than 15% of the flow in the Sacramento River during about 25 days each spring. We understand from DWR and USBR that such a curtailment will have only a small impact on operations, so we are confident that adequate protection can be provided this way.

-4-

Based on present knowledge, the current draft agreement provides adequate but not optimum protection. I believe the goals and operating principles are sound and equitable for all interests concerned. The standards in the present draft include certain compromises, which we identified during the State Water Resources Control Board's recent Delta hearings. In the interim before facilities are constructed in the Delta and Suisun Marsh, we do not believe it is possible to achieve the goals of the agreement without totally disrupting CVP and SWP operations. Accordingly, certain compromises seem inevitable and reasonable. The degree of compromise is still under discussion. The permanent standards provide for deficiencies in the striped bass spawning standard equal to deficiencies in firm supplies taken by export water users. The concept seems equitable, but we will have to review its consequences in light of this year's extraordinarily poor striped bass survival.

You should be aware of two uncompleted portions of the agreement. Considerable uncertainty exists as to the value of uncontrolled outflows. We need to protect some of the existing uncontrolled flows until their value in meeting the goals of the agreement is ascertained. Also Peripheral Canal operating criteria must be incorporated in the agreement. The agreement provides that this be done no later than completion of an EIR/EIS, but we expect to do it sooner.

- (3) If fish that spawned in the Sacramento watershed return to a Peripheral Canal outlet structure, how will they be returned to the Sacramento watershed?

We believe this is a potential problem primarily for fall run salmon. The optimum solution is to avoid the problem. For outlets north of the San Joaquin River, this can be done easily by closing the outlets and meeting agricultural needs by flows through the Delta Cross Channel. Our first priority for south Delta outlets is to close them in September, October and November and meet agricultural needs by releases from New Melones. Our second priority would be meeting agricultural needs in those months by releases from the Delta Mendota Canal. If neither of these solutions can be achieved, we would trap fish at the outlets and haul them to the Sacramento River. This is an issue which must be resolved during negotiations over Peripheral Canal operating criteria.

Pete Chadwick will represent the Department at your hearing and will answer any questions you may have.

Sincerely,
/s/
Director

Antioch-212

PRINCIPAL OBJECTIONS TO SB 346

AND DWR RESPONSES¹

Some interests have raised objections to SB 346. Most of these are from a special interest point of view. For example, some Delta interests oppose SB 346 because they believe it does not give enough protection to the Delta-Bay estuary, while some export water users oppose the bill because they believe it gives too much protection to the estuary! The Department believes that when the viewpoints of all the diverse interests are considered, SB 346 represents a fair compromise that will meet the reasonable requirements of the interests involved. With this in mind, the following responses to the most frequent objections voiced are included:

Objection

There are too many restrictions in SB 346 and the Peripheral Canal will never get built.

Response. Opponents that use this argument apparently assume that the Peripheral Canal could be more quickly constructed in the absence of a political consensus that would be derived from the enactment of SB 346. In this they are making a judgment which is not well supported in the history of events on the Peripheral Canal. The Peripheral Canal has been proposed under two prior governors and three prior Directors of Water Resources. None of these directors were able to construct this facility, mainly because of the great difficulty in resolving the conflicting interests among export water users, Delta water users, environmentalists, federal governmental agencies, Suisun Marsh interests, and San Francisco Bay protectionists. Based on past experience it would seem that some programs and procedures must be worked out which enjoy broad support among these interests and which provide for federal participation in the Peripheral Canal and federal agreement to share in the protection of the Delta-Bay estuary.

Through negotiations and hearings on SB 346, there has been achieved, for the first time, a considerable amount of consensus among the concerned interests that the Peripheral Canal is the best Delta water transfer facility and on the provisions necessary to assure the Bay-Delta estuary adequate protection. On their recent trip, Vice-President Mondale and Secretary of the Interior Andrus, according to news reports, assured the Governor that the Carter Administration would work with California in reaching agreement on a plan whereby the CVP would share in the protection of water quality and fish and wildlife in the Delta-Bay estuary and needed water facilities. Federal and State officials are in the process of negotiating resolution of these matters.

Objection

SB 346 does not guarantee that the water storage components, i.e., Glenn Reservoir, Los Vaqueros Reservoir, Los Banos Reservoir, or Colusa Reservoir would be built, and therefore the State Water Project will not be able to fulfill the project yield of 5.22 cubic kilometres (4.23 million acre-feet) as originally planned and provided for in the contracts with 31 contracting agencies.

Response. The SWP was never planned to produce 5.22 cubic kilometres (4.23 million acre-feet) in 1977. The full project yield was originally estimated to be needed and supplied in 1990. However, as a result of reductions in contractual requests for water, particularly from the Metropolitan Water District of Southern California, the full yield of 5.22 cubic kilometres (4.23 million acre-feet) is now not expected to be required until sometime after the year 2010. The present project yield, together with that contemplated from SB 346 facilities, will provide sufficient yield to meet the projected demands through the year 2000. In fact, SB 346 provides the first plan the State has had for providing additional storage capacity and project yield since 1972, when the Wild and Scenic Rivers Act prohibited construction on the Eel River project. The requirement for documenting the full feasibility of these storage facilities is something that would have to be done anyway, irrespective of provisions in SB 346.

Objection

SB 346 will not provide a supplemental supply for expanding irrigated agriculture in the San Joaquin Valley and will result in further lowering of the San Joaquin Valley ground water levels.

Response. SB 346 is designed to fulfill existing and contemplated agricultural contracts of the SWP and CVP in the San Joaquin Valley. For the most part these will not result in increased irrigated acreages in the export service areas.

¹ The form of the bill considered assumes the September 8, 1977, version with refinements adopted by the Joint Conference Committee in January 1978

Antioch-212

Current SWP contract deliveries for agriculture are approximately at the contract limit for entitlement water; however, approximately one-half of these deliveries are currently delivered under firm entitlement provisions and one-half are delivered as surplus water. By 1990 the entire SWP agricultural contract amounts will be delivered as firm entitlements. In the case of the CVP, increased demands are primarily to reduce existing ground water overdraft by approximately one-third as a result of the Mid-Valley project.

SB 346 would direct the DWR, in cooperation with other agencies, to undertake a comprehensive study of the ground water overdraft problem and proposed solutions. The results of this study would have to be submitted to the Legislature by December 31, 1981. With this approach the State and Federal Governments can proceed with the plan in SB 346 for fulfilling existing commitments and reducing ground water overdrafts, while protecting the Delta; and at the same time, develop a further program for dealing with the additional part of the overdraft problem. If the new study shows it to be feasible, plans for reducing the remaining ground water overdraft could be implemented either concurrently or later.

Objection

The estimated goal in SB 346 for reducing water demand by 860 cubic hectometres (700,000 acre-feet) per year by water conservation and waste water reclamation by the year 2000 is too high (or to low). At present there is no way to determine how much water might be saved due to water conservation and waste water reclamation.

Response. The Department of Water Resources, in Bulletin No. 198, has estimated that there is a potential for an annual savings by the year 2000 of about 1040 to 1730 cubic hectometres (840,000 to 1,400,000 acre-feet) from water conservation in three coastal areas served by the SWP from Delta exports. On October 13, 1977, the Governor created the Office of Water Recycling with the objective of reclaiming an additional 490 cubic hectometres (400,000 acre-feet) of waste water annually by 1982 and 990 cubic hectometres (800,000 acre-feet) by 2000. It is, therefore, our judgment that a goal of 860 cubic hectometers (700,000 acre-feet) per year of combined savings from municipal and industrial water conservation and waste water reclamation by the year 2000 is conservative.

Objection

SB 346 provides too much protection and enhancement for the Delta-Bay estuary at the expense of the export water users.

Response. From its inception, the SWP was formulated on the premise that protection of the areas of origin, including the Delta, was a responsibility and obligation to be borne by the project and paid for by the water users. By isolating the water transfer flows for SWP and CVP export, and providing the other guarantees in the bill, historic and further degradation of the Delta-Bay fishery resources would be eliminated and fishery resources would be restored to long-term historic levels. SB 346 specifically makes the realization of the potential for enhancement (increasing fishery resources above historic levels) consistent with meeting contracts for water delivery and other purposes of the project. Further, water quality control plans and water right permits are required to include dry year relaxations to reduce the amount of water required to protect the Delta and minimize impact on project yield.

Objection

SB 346 provides too little protection for the Delta-Bay estuary. In times of water shortages, political and economic pressure will be so great that too much water will be shipped south at the expense of the Delta-Bay environment.

Response. SB 346 provides a number of institutional and statutory measures and physical facilities which taken collectively provide reasonable guarantees that the Delta-Bay-Marsh environments will be protected from the threat of diverting excessive amounts of water from the Delta.

- (1) Section 11460 clarifies existing California law for protection of the areas of origin and the Delta and Suisun Marsh.
- (2) Section 11257 conditions construction of the Peripheral Canal and Mid-Valley Canal on federal legislation and agreements to provide for:
 - (a) coordinated operation of SWP and CVP to meet identical water quality standards for the Delta, Suisun Marsh, and San Francisco Bay;
 - (b) a state-federal operation of the CVP and SWP so as to restore and maintain fish and wildlife

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populations to average historical levels.

Provisions for restoring and maintaining fish and wildlife resources are to include limitations on exports and diversions to storage of unregulated fresh water flows (flushing flows) to San Francisco Bay;

- (c) execution of federal and state contracts for water quality and water supply with at least a majority of eight local Delta and Suisun Marsh agencies covering at least two-thirds of the Delta and the Marsh;
- (d) adoption of a federal area of origin law similar to existing California law.

Placing these requirements in federal statutes and regulations as well as State law eliminates the possibility of changes in law by a Southern California dominated State Legislature because Southern California lawmakers do not dominate the U.S. Congress.

- (3) Delta protection facilities include:

- (a) facilities to improve water circulation and water quality in the south Delta;
- (b) facilities for moving the Contra Costa Canal intake to Clifton Court Forebay to provide eastern Contra Costa County with improved water quality, identical to that exported to the San Joaquin Valley and Southern California;
- (c) overland water facilities to supply water of improved quality to agricultural areas in the western Delta;
- (d) facilities in the Suisun Marsh to improve water quality for Marsh management;
- (e) an isolated Delta water transfer facility (Peripheral Canal) which would reduce the impact of direct export diversions on Delta fish and fish foods organisms and correct virtually all reverse flow problems. The Department of Fish and Game and several environmental groups testified that with the strong statutory and institutional provisions, this was the best water transfer facility for restoring and maintaining the Delta-Bay fishery resources, while meeting the export requirements of the State and federal projects. Section 11256 of the bill provides for staged construction of the Peripheral Canal to allow for testing of the fish screen and other operational aspects to assure that the facilities will adequately protect fish before completing the full canal.

In the Department's judgment, all of these legislative, institutional, and physical facilities, when taken collectively, provide adequate guarantees for protection of the Delta-Bay estuary.

APPENDIX B

COMPARISON AND SELECTION OF ALTERNATIVES

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APPENDIX B

COMPARISON AND SELECTION OF ALTERNATIVES

Public hearings conducted on the 1974 Draft EIR for the Peripheral Canal produced a long list of suggested alternatives. During the subsequent studies leading to Bulletin 76, other alternatives were added to the list. Not all were alternatives in the sense of performing the same functions as a Delta transfer facility (some were outside the Delta). However, many could contribute to an overall solution.

The suggested alternatives were divided into five categories: (1) actions to reduce Delta export; (2) institutional, legal, and physical measures to provide Delta protection; (3) construction of Delta transfer facilities; (4) provisions for additional facilities south of the Delta; and (5) development of additional supplies north of the Delta. Table B-1, "Alternative Components", lists all the alternatives that were considered. Alternatives that were included as a part of the selected plan are noted. These are described in Chapter V of the bulletin. Alternatives that were either not included in the selected plan or those that are considered part of other programs are discussed at the end of this appendix.

The following section describes the process that was used to compare and evaluate the many alternatives listed in Table B-1 and to select the best of these alternatives for further consideration as components in formulating alternative plans.

Objectives

Objectives, established during review, provided the basis for evaluating the alternatives and developing the selected program. These objectives, which are discussed in detail in Chapter V, reflect relevant directives and constraints from legislation, constraints from administrative decisions, presently contracted and currently projected maximum and minimum export requirements, conditions in the Delta, and comments received at public hearings. The basic goal was to find the best way to protect the Delta environment while pumping water from the Delta for the SWP and CVP.

Initial Screening and Evaluation of Alternatives and Plan Components

In November 1975, the Department held a public hearing on the scope and purpose of the reexamination on the need and timing for a Delta water transfer facility and presented a list of the alternatives to be considered. The list included alternatives reducing export demands, increasing efficiency of Delta water transfer, and augmenting available supplies. The list

included most of those listed in Table B-1. Subsequent to the public hearing, initial screening and evaluation was undertaken to reduce the number of alternatives and components listed to the most viable. General summaries describing each component and its effects were prepared. These were based on a review of previous studies as well as on preliminary analysis of new proposals. The summaries, including physical configurations, were examined by a committee of engineers and biologists from DWR, DFG, and USBR. The general principles used for this initial screening and evaluation were: (1) elimination or deferment and (2) consolidation.

Elimination or Deferment

The following specific factors were considered in eliminating or deferring components from further consideration in this reevaluation.

Adverse Impact. Physical alternatives and components were eliminated or deferred if they obviously had unacceptable adverse impacts on fish, wildlife, recreation, water quality, or other environmental concerns. Components were also eliminated if they were not economically feasible, adversely affected water supply, or unduly contributed to the energy shortage. An impact was considered unacceptable if it was beyond reasonable mitigation.

Technological Feasibility. Physical alternatives and components were eliminated or deferred if the required technology had not sufficiently advanced to assure the viability of the proposals in the near future. Certain proposals with potential for meeting the growth in water needs beyond the time limits of this study (year 2000) were recommended for continued investigation.

Legal, Institutional, and Political Constraints. Alternatives and components were eliminated if they involved legal, institutional, or political constraints that either limit or prevent their effectiveness, and if there were no reasonable assurances that the constraints could be modified in the near future. An exception is the "No Project" alternative which would involve abandonment of water export, limit to present level of export, or limit to present capability of export. This alternative, which would constitute breach of contract by the SWP, is nevertheless required to be studied in response to CEQA and, therefore, was considered.

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TABLE B-1

ALTERNATIVE COMPONENTS

1. *Reduction of Delta Export*
 - Water Conservation
 - Waste Water Reclamation
 - Reduce Export During Dry Years and Critical Fish Periods
 - Desalting Sea Water
 - Desalting Geothermal Brines
 - Amend Water Service Contracts
 - Curtail Water to New Lands
 - Reduced Central Arizona Project
 - Icebergs

 2. *Delta Protection*
 - Institutional and Legal Measures
 - Environmental Monitoring
 - Four-Agency Fish and Wildlife Agreement
 - Limits on Delta Diversions
 - SWP-CVP Operation Agreement
 - Federal Participation in Delta Protection
 - Review and Revision of Delta Water Quality Standards
 - Delta Water Agency Contracts
 - Physical Measures
 - Western Delta Overland Water Facilities
 - South Delta Water Quality Improvement Facilities
 - Relocation of Contra Costa Canal Intake
 - Suisun Marsh Facilities
 - Delta-Woodbridge Canal
 - Fish Screens on In-Delta Diversions
 - Fish Hatcheries
 - Improved Delta Levee Maintenance

 3. *Delta Water Transfer Alternatives*
 - Existing Channel Conveyance
 - Continue Present Method ("No Project" Alternative)
 - Enlarge Clifton Court Forebay
 - Union Island Forebay
 - Enlarge South Delta Channels
 - Enlarge North Delta Channels
 - Modified Channel Conveyance
 - Waterway Control Plan
 - Cross Delta Transfer Plan
 - Central Delta Plan
 - Combination Waterway Control Plan and Central Delta Plan
 - North Stub Canal
 - South Stub Canal
 - Mathena Landing Cross Channel and South Stub Canal
 - New Hope Cross Channel and Enlarged Clifton Court Forebay
 - New Hope Cross Channel and South Delta Intake Channel
 - Isleton Cross Channel and Enlarged Clifton Court Forebay
 - Isleton Cross Channel and South Stub Canal
 - Isolated Channel Conveyance
 - Peripheral Canal
 - East Delta Canal
 - East Central Delta Canal
 - Central Delta Canal
 - West Delta Canal
 - Montezuma Hills Reservoir and Canal
 - Isleton Cross Channel Alignment
 - Mathena Landing Isolated Canal
-
4. *Facilities South of the Delta*
 - Off-stream Surface Storage
 - *Los Vaqueros Reservoir
 - Los Banos Grandes Reservoir (alternate)
 - Los Banos Grandes—Los Vaqueros Combination Reservoirs
 - Sunflower Reservoir
 - Ground Water Storage
 - *South San Francisco Bay Basin
 - San Joaquin Valley Basins
 - *Kern River Fan
 - *White Wolf Basin
 - Southern California Basins
 - *San Fernando Valley Ground Water Basin
 - *Chino Ground Water Basin
 - *Southern Mojave River Valley Ground Water Basin (alternate)
 - *Raymond Ground Water Basin (alternate)
 - *Santa Ana Ground Water Basin (alternate)
 - *Mid-Valley Canal

 5. *Additional Supply North of the Delta*
 - Revise Operation of SWP and CVP Reservoirs
 - Weather Modification
 - Long-range Weather Forecasting
 - Purchase Dry Year Supplies
 - Purchase Interim Water Supplies from CVP
 - Sacramento Valley Tributary Storage
 - *Cottonwood Creek Project
 - Millville Reservoir
 - Wing Reservoir
 - Schoenfield Reservoir
 - Gallatin Reservoir
 - Newville Reservoir
 - Rancheria Reservoir
 - Marysville Reservoir
 - Nashville Reservoir
 - Sacramento Valley Off-stream Storage
 - Tuscan Buttes Reservoir
 - *Glenn Reservoir—River Diversion
 - *Colusa Reservoir—River Diversion (alternate)
 - Enlarged Lake Berryessa
 - Sacramento Valley Mainstream Storage
 - Enlarged Shasta Reservoir
 - Sacramento Valley Ground Water
 - Stony Creek Fan Basin
 - Thermalito Basin
 - Importation from North Coast Rivers
 - Dos Rios Reservoir
 - English Ridge Reservoir

*Included in Selected Plan as discussed in Chapter V

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TABLE B-2

SUMMARY OF ALTERNATIVES AND PLAN COMPONENTS
ELIMINATED OR DEFERRED DURING INITIAL SCREENING

NAME OF ALTERNATIVE OR PLAN COMPONENT	BASIS FOR DECISION						
	ADVERSE IMPACT				OTHER REASONS		
	Economics	Energy	Water Supply	Fish, Wildlife, and/or Recreation	Water Quality	Other Environmental Concerns	Technology
REDUCTION OF DELTA EXPORT							
Desalting Sea Water	•	•				•	
Desalting geothermal brines	•				•	•	•
Amend water service contracts							
Curtail water to new lands.....							•
Reduced Central Arizona Project.....		•				•	
Icebergs.....							
DELTA PROTECTION							
Fish hatcheries						•	
DELTA WATER TRANSFER							
ALTERNATIVES							
Existing channel conveyance							•
Union Island Forebay.....							•
Enlarge South Delta channels							•
Enlarge North Delta channels							
Modified channel conveyance							•
Cross Delta Transfer Plan.....							
Isolated channel conveyance							•
Central Delta Canal							•
Montezuma Hills Resv & Canal (Resv only)	•						•
Modified and isolated channel conveyance							
Modified Folsom-South Canal	•	•	•				
Western Delta Diversion.....		•	•				
Physical barriers							
Chippis Island Barrier			•	•			
Dillon Point Barrier			•	•			
Point San Pablo Barrier			•	•			
Submerged Barrier, Carquinez Strait							•
FACILITIES SOUTH OF THE DELTA							
Sunflower Reservoir	•						•
Raymond Ground Water Basin							•
ADDITIONAL SUPPLY NORTH OF THE DELTA							
Revise operation of SWP and CVP reservoirs	•			•			
Weather modification						•	
Long-range weather forecasting						•	
Purchase dry year supplies							
Purchase interim water supplies from CVP.....							•
Sacramento Valley tributary storage							
Millville Reservoir							•
Wing Reservoir							•
Schoenfield Reservoir							•
Gallatin Reservoir							•
Newville Reservoir							•
Rancheria Reservoir							•
Nashville Reservoir			•				
Sacramento Valley offstream storage							
Tuscan Buttes Reservoir						•	•
Enlarged Lake Berryessa.....						•	•
Importation from north coast rivers							
English Ridge Reservoir						•	•

¹See discussion at end of this Appendix.

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Consolidation

The following specific factors were considered in reducing the number of proposals by consolidation.

Better Similar Proposals. If alternatives or components involved the same concept and resulted in essentially the same impacts and accomplishments, the one judged most advantageous was selected.

Part of Another Proposal. Physical alternatives or components that could be a part of another proposal being considered were eliminated from separate evaluations, but were retained for evaluation of staged implementation or inclusion in a more comprehensive proposal.

Results of Initial Screening

Many of the alternatives and plan components were evaluated and discussed in the Department's report "Phase II—Alternative Courses of Action to provide Delta protection and adequate water supplies for California", dated March 1975. Initial screen-

ing of additional alternatives and components continued after publication of the Phase II report. Table B-2 lists the alternatives and plan components eliminated or deferred as a result of the entire initial screening process. In a few cases, alternatives originally screened out were reconsidered.

Secondary Evaluation

Following the initial screening there still remained many alternative Delta water transfer facilities and plan components to be further evaluated. During Phase II, the Department's Delta Alternative Review staff determined that no single action would protect and enhance the Delta and meet the increasing export requirements. Actions and facilities to the north and south of the Delta, as well as improvements in the Delta, are required. Delta protection components in Table B-1 were not evaluated as alternatives because they would be common to any plan.

Evaluation of Components

The remaining alternatives and plan components were divided into four broad groups: (1) Delta water

TABLE B-3
PLAN COMPONENTS TO BE RATED

NORTH OF DELTA COMPONENTS	DELTA COMPONENTS (Continued)
Surface Reservoirs Cottonwood Creek Project Glenn Reservoir – River Diversion Enlarged Shasta Reservoir Das Rios Reservoir Marysville Reservoir	Combination Waterway Central-Central Delta Plan West Delta Canal Montezuma Hills Canal
Ground Water Basins Stony Creek Fan Thermalito	SOUTH OF DELTA COMPONENTS Offstream Surface Storage Los Vaqueros Reservoir – Los Banos Grandes Comb. Los Vaqueros Reservoir Los Banos Grandes Reservoir Southern California Groundwater Basins San Fernando Valley Chino Southern Mojave San Joaquin Valley Groundwater Basins Kern River Fan White Wolf South San Francisco Bay Groundwater Basin
DELTA COMPONENTS Peripheral Canal East Delta Canal East Central Delta Canal Isleton Cross Channel South Stub Canal North Stub Canal Mathena Landing Cross Channel – South Stub Canal Mathena Landing Isolated Canal Enlarged Clifton Court Forebay Isleton Cross Channel – South Stub Canal Isleton Cross Channel – Enlarged Forebay Waterway Control Plan Central Delta Plan	WATER MANAGEMENT COMPONENTS Waste water Reclamation South Bay Area Central Coastal Area Southern California Water Conservation

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supply components (north of Delta); (2) Delta components; (3) South-of-Delta components; and (4) Water management components. Table B-3 lists the alternatives and plan components that remained to be evaluated.

To select the best from this large number of remaining components, it was necessary to consider and evaluate all the significant environmental, economic, resource, socio-cultural, financial, legal, political, institutional, technological and performance requirements, impacts, and constraints of each alternative component and composite plans made up of various components. To accomplish this in a timely manner, the Department contracted with Socio-Economic Systems, Inc. (SES), which has a specific method and computer program for making this type of evaluation. The SES method involves group participation in the establishment of criteria for the evaluation and comparison of alternatives. Table B-4 lists and defines the evaluation criteria used.

An essential feature of the SES evaluation system is the quantification of the rating of criteria used in the process. The system is based on a criteria rating scale of +100 (best case) to -100 (worst case). The rating system also accounts for the fact that each criteria ("Category", "Subcategory", "Criterion", and "Subcriterion") is not necessarily of equal importance. In recognition of this, each "Category" and "Subcategory" was independently weighted as to its relative importance by a steering committee of DWR top management personnel. The assigned weighting factors for each "Category" and "Subcategory" were not known to the rating staff at the time individual ratings for each component were determined. Weighting factors for each "Criterion" and "Subcriterion" were assigned by the staff during the rating process. Table B-4 also lists the assigned weighting factors.

In summary, the process involved rating the 36 individual components or alternatives against the evaluation criteria by appropriate technical specialists from DWR and DFG in consultation with their counterparts within USBR. The SES proprietary computer program was used to process the large volume of rating data submitted and to apply the weighting factors and compute overall ratings for each component. The computer printouts generated were then used by the DWR staff to screen the remaining alternative Delta transfer facilities and other plan components and to aid in formulation of alternative plans. Table B-5 is the summary of the alternative component ratings.

Formulation and Evaluation of Alternative Plans

In addition to the management and functional objectives described at the beginning of Chapter V, planning precepts (constraints) were adopted to

provide for guidance in combining alternative components into plans for evaluation and rating (see Table B-6). Nine alternative plans were then formulated using the best of the components in various combinations. These plans generally included one of several alternative Delta transfer facilities, other Delta components, south-of-Delta components, supply components north of the Delta, water conveyance facilities, institutional requirements, and related actions as summarized in Table B-7. In addition, the "No Project" alternative (Plan 1) was evaluated. The "No Project" alternative assumes no further construction of SWP or CVP facilities by DWR or USBR to year 2000 except for those facilities now under construction. For the purpose of this study, the "No Project" alternative plan consisted of the existing and under-construction facilities of the SWP and CVP that supply water to, or transport water from, the Delta. The existing facilities of the SWP and CVP are listed and discussed in Chapter IV.

The present method of water transfer in the Delta would be continued. The SWP and CVP water systems would be operated up to their full capability to supply water to areas that receive a portion of their water supplies from the Delta, while meeting applicable water quality criteria in the Delta. It was further assumed that each project would make use of the other project's surplus supplies or transportation capacity when they could be made available, assuming purchase or exchange to balance respective surpluses and shortages.

Evaluation of Plans. The alternative plans were rated by the same technical specialists against the same criteria used to rate the individual components. The poorer plans—Plans 5, 6, 7, and 10—were easily identified by inspection of the unweighted ratings, making it necessary to process only six of these plans, including the "No Project" alternative, by the SES computer system.

In addition to receiving poor ratings, Plans 5, 6, and 7 were eliminated because they included a Delta transfer facility composed, in part, of the Mathena Landing Cross Channel. Subsurface exploration revealed that the foundation conditions for the intake and fish screen structure were poor, and a study of tidal flows showed the hydraulic conditions were not suitable for an efficient fish screen. Plan 10 was eliminated from further consideration because it included the proposed Dos Rios Reservoir on the Eel River, a designated wild and scenic river, and because no provision for water conservation and waste water reclamation was included in the plan.

Table B-8 summarizes the findings of the alternative plan rating process. Socio-Economic Systems, Inc. submitted their report ("Delta Alternatives Study Final Report") on the evaluation and rating of alternative components and plans in February 1977.

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TABLE B-4. PLAN COMPONENT EVALUATION CRITERIA

<p>CATEGORY: SYSTEM EFFECTIVENESS (75%) DEFINITION: The degree to which the proposal is implementable, flexible with time, and reliable.</p> <p>SUBCATEGORY: IMPLEMENTABILITY (100%) DEFINITION: The degree to which the proposal can be implemented, considering public acceptance, institutional constraints and financial implications.</p> <p>CRITERION PUBLIC ACCEPTANCE (100%) DEFINITION: The degree to which the proposal is acceptable to those with permit power, elected officials, water users, DWR, USBR, DFG, citizen and environmental groups.</p> <p>SUBCRITERION PUBLIC ENTITIES (100%) DEFINITION: The degree to which the proposal is acceptable to those Public Agencies with permit power, water users, DWR, USBR, DFG, and elected officials, legislative and executive, of various jurisdictions.</p> <p>SUBCRITERION CITIZENRY AND ENVIRONMENTAL GROUPS (100%) DEFINITION: The degree to which the proposal is acceptable to environmental groups and the citizen at large.</p> <p>CRITERION FINANCIAL IMPLEMENTABILITY (100%) DEFINITION: The degree to which the financial requirements of the proposal vary from those of the initially proposed alternative. The ease with which the financial requirements of the proposal can be met.</p> <p>CRITERION LEGAL-INSTITUTIONAL (100%) DEFINITION: The degree to which the proposal is possible within the constraints of existing federal and state law, authorization, contracts and agreements.</p> <p>SUBCATEGORY FLEXIBILITY WITH TIME (70%) DEFINITION: The degree to which the proposal can respond to change in technology, new standards and changing needs.</p> <p>CRITERION NEW TECHNOLOGY (100%) DEFINITION: The degree to which the proposal or its individual components can incorporate expected advances in technology.</p> <p>CRITERION NEW STANDARDS (97%) DEFINITION: The degree to which the proposed project can respond to foreseeable new environmental quality standards (water quality, air quality, conservation, etc.).</p> <p>CRITERION CHANGING NEEDS (100%) DEFINITION: The degree to which the proposed project can respond to changing population, industrial, and agricultural distribution.</p> <p>SUBCATEGORY RELIABILITY (90%) DEFINITION: The degree to which the proposal can operate reliably, when considering its vulnerability to natural disasters or sabotage and capability to mitigate failures.</p> <p>CATEGORY: ADEQUACY OF SUPPLY (75%) DEFINITION: The degree to which the proposal will satisfy the quantity and quality requirements of the Delta and the Service Area.</p> <p>SUBCATEGORY DELTA (100%) DEFINITION: The degree to which the proposal will satisfy the quantity and quality requirements of the Delta.</p> <p>CRITERION WATER QUALITY (100%) DEFINITION: The degree to which the proposal will satisfy water quality requirements in the Delta.</p> <p>CRITERION WATER QUANTITY (100%) DEFINITION: The degree to which the proposal satisfies Delta Water quantities requirements (water levels).</p> <p>SUBCATEGORY SERVICE AREAS (97%) DEFINITION: The degree to which the proposal will satisfy both water quality and quantity requirements in the Service Area.</p> <p>CRITERION WATER QUALITY (100%) DEFINITION: The degree to which the proposal will satisfy water quality requirements in the Service Area.</p>	<p>CATEGORY: ADEQUACY OF SUPPLY (75%) (continued)</p> <p>CRITERION WATER QUANTITY (100%) DEFINITION: The degree to which the proposal will satisfy the water quantity requirements in the Service Area.</p> <p>CATEGORY: PHYSICAL ENVIRONMENT (100%) DEFINITION: The degree to which the proposed project affects the physical environment including biota and landforms.</p> <p>SUBCATEGORY BIOTA (100%) DEFINITION: The degree to which the proposal affects the biota of the physical environment, including terrestrial and aquatic ecosystems, and areas of special biological significance.</p> <p>CRITERION TERRESTRIAL ECOSYSTEMS (100%) DEFINITION: The degree to which the proposal affects terrestrial ecosystems, including flora and fauna, with respect to species diversity, productivity, habitats, populations and trophic levels.</p> <p>CRITERION AQUATIC ECOSYSTEMS (100%) DEFINITION: The degree to which the proposal affects aquatic ecosystems, including flora and fauna, with respect to species diversity, productivity, habitats, populations, and trophic levels.</p> <p>CRITERION SUISUN MARCH ECOLOGY (100%) DEFINITION: The degree to which the proposal provides water of sufficient quality to maintain fish and wildlife resources of the marsh.</p> <p>SUBCATEGORY LANDFORM ALTERATION (50%) DEFINITION: The degree to which the proposal would result in changes in the topography of immediate and adjacent areas.</p> <p>CRITERION DRAINAGE AND FLOODING (100%) DEFINITION: The degree to which the proposal modifies existing drainage patterns (including flooding and siltation) in the affected areas.</p> <p>CRITERION STABILITY AND EROSION (100%) DEFINITION: The degree to which the proposal changes landforms which affect stability and erosion of existing lands and features.</p> <p>CATEGORY: SOCIO-CULTURAL FACTORS (55%) DEFINITION: The degree to which the proposal affects the human environment.</p> <p>SUBCATEGORY LAND USE AND DEMOGRAPHY (100%) DEFINITION: The degree to which the proposal affects land use, population patterns, and social inter-relationships in the affected areas.</p> <p>CRITERION COMPATIBILITY WITH PLANNED USE (100%) DEFINITION: The degree to which the proposal is compatible with planned land use in the local area as specified in the General Plan, in its absence by current zoning patterns, or in their absence, by existing land use.</p> <p>CRITERION COMPATIBILITY WITH RELATED PLANS (100%) DEFINITION: The degree to which the proposal is compatible with plans of federal, state and local agencies (other than land use), e.g. water basin studies, regional air quality plans, transportation, energy conservation, etc.</p> <p>CRITERION DEMOGRAPHY (100%) DEFINITION: The degree to which the proposal affects population patterns in the affected areas in terms of project-caused population displacement and relocation.</p> <p>SUBCATEGORY AMENITIES (15%) DEFINITION: The degree to which the proposal affects facilities of cultural and recreational value.</p> <p>CRITERION ARCHAEOLOGICAL, PALEONTOLOGICAL AND HISTORICAL SITES (100%) DEFINITION: The degree to which the proposal affects local sites of archaeological, or paleontological, and historical interest.</p>	<p>CATEGORY: SOCIO-CULTURAL FACTORS (55%) (continued)</p> <p>CRITERION RECREATIONAL ACTIVITIES (100%) DEFINITION: The degree to which the proposal affects the availability and quality of recreational opportunities, i.e. hunting, fishing and boating, etc.</p> <p>SUBCATEGORY AESTHETICS (55%) DEFINITION: The degree to which the appearance of the proposal tends to disrupt or enhance the aesthetic impression of the landscape (including waterways).</p> <p>CATEGORY: ECONOMIC FACTORS (30%) DEFINITION: The degree to which the proposal causes economic changes in the affected area, in terms of public revenue and costs, employment and business effects, including agriculture and the cost burden imposed by the project.</p> <p>SUBCATEGORY PUBLIC FISCAL EFFECTS (55%) DEFINITION: The degree to which the operation of the completed proposal causes changes in public revenues and costs, by virtue of changes in tax revenues and municipal service costs.</p> <p>SUBCATEGORY EMPLOYMENT AND BUSINESS EFFECTS (90%) DEFINITION: The degree to which the operation of the completed proposal creates or removes job and business revenues in the affected areas.</p> <p>SUBCATEGORY AVERAGE ANNUAL EQUIVALENT COST (100%) DEFINITION: The degree to which the financing and operation of the proposal will be a cost to the water user, as reflected by an amount equal to the annual payment necessary to amortize facilities' capital costs over 50 years at 6%, plus estimated annual O&M cost of the facilities.</p> <p>CATEGORY: CONSTRUCTION FACTORS (10%) DEFINITION: The degree to which construction activities affect local economy and transportation networks.</p> <p>SUBCATEGORY TRANSPORTATION (60%) DEFINITION: The degree to which the construction activities associated with the proposal affect ground and water-borne traffic.</p> <p>SUBCATEGORY ECONOMIC EFFECTS (100%) DEFINITION: The degree to which the construction activities affect the level of employment, business, and net public revenues.</p> <p>CRITERION PUBLIC FISCAL EFFECTS (100%) DEFINITION: The degree to which the direct and indirect costs to local government are offset by construction-generated revenues.</p> <p>CRITERION EMPLOYMENT AND BUSINESS (100%) DEFINITION: The degree to which the construction of the facility affects the level of employment and business in the local area.</p> <p>SUBCATEGORY LOCAL PUBLIC SERVICE SYSTEMS (80%) DEFINITION: The degree to which the proposal, during construction, will increase or decrease the actual burden of providing municipal services, in terms of man-power needs, consumption of excess capacities, equipment needs, etc.</p> <p>CATEGORY: RESOURCE SUPPLY AND DEMAND (60%) DEFINITION: The degree to which the proposal affects the availability of energy, water, forest, agricultural, or mineral resources in an affected area.</p> <p>SUBCATEGORY NET ENERGY USE (100%) DEFINITION: The degree to which the proposal is a net user or net producer of energy.</p> <p>SUBCATEGORY MATERIALS (50%) DEFINITION: The degree to which the proposal affects present availability and possible future scarcity of resources (land, construction materials).</p>
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NOTE NUMBERS IN PARENTHESIS (100%) ARE WEIGHTING FACTORS.

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TABLE B-5. SUMMARY OF ALTERNATIVE COMPONENT RATINGS.

RATED ITEMS		NORTH OF DELTA						SOUTH OF DELTA					
		SACRT VALLEY GROUND WATER BASINS			CITY STREAMS			CIRCULATING RIVER BASINS			WATER MGMT		
SYSTEM EFFECTIVENESS		SWAT CREEK	SWAT CREEK	SWAT CREEK	SWAT CREEK	SWAT CREEK	SWAT CREEK	SWAT CREEK	SWAT CREEK	SWAT CREEK	SWAT CREEK	SWAT CREEK	SWAT CREEK
WATER AVAILABILITY	Water Availability	9.7	1.6	-34.0	8.6	35.9	24.3	10.2	-3.4	13.0	9.4	2.4	-18.6
PUBLIC ACCEPTANCE	Public Acceptance	30.0	-30.0	-39.2	-40.3	11.7	14.2	10.0	-1.3	-13.2	-13.2	-1.3	-31.6
CITIZEN AND ENV. GROUPS	Citizen and Env. Groups	50	35	-15	-25	15	0	-40	-20	-2.5	-2.5	-2.5	-40.5
FINANCIAL IMPLEMENTABILITY	Financial Implementability	15	-10	-85	-45	20	25	25	-50	-50	-50	-50	-50
LEGAL - INSTITUTIONAL	Legal - Institutional	-3.3	-3.3	-6.9	-6.9	-6.8	-6.8	-41.3	21.0	12.7	2.9	14.4	-28.1
RELIABILITY	Reliability	-50	-50	-50	-50	-50	-50	-50	-50	-50	-50	-50	-50
ADROGACY OF SUPPLY	Adrogacy of Supply	-2.5	-10.0	-2.5	-2.5	-2.5	-2.5	-27.5	22.5	20.0	2.5	2.5	-7.5
DETA	DETA	0	-5	10	0	0	5	5	5	0	-15	0	0
WATER QUALITY	Water Quality	-5	-15	-15	-5	-5	-5	-50	-10	-10	-10	-10	-10
WATER STANDARDS	Water Standards	25	25	-80	-80	0	75	75	90	-10	-10	-10	-10
CHANGING NEEDS	Changing Needs	25	25	-80	-80	0	75	75	10	10	10	10	10
WATER QUALITY	Water Quality	25	10	50	50	65	35	10	-20	-10	-10	-10	-10
WATER QUALITY	Water Quality	-17.2	7.2	13.5	2.4	3.7	52.1	49.6	47.1	12.4	10.9	32.2	49.6
PHYSICAL ENVIRONMENT	Physical Environment	-38.3	-4.3	-13.1	-37.1	8	-6.6	-5.2	19.1	12.1	9.4	-24.1	-9.4
OCITA	Ocita	-30	-37	-37	-33	-3	-7	17	10	11.7	10.0	-33.7	-7.4
TERRESTRIAL ECOSYSTEMS	Terrestrial Ecosystems	-63	10	20	-93	-10	-7	45	47	40	-27	-13	-27
ACADEMIC ECOSYSTEMS	Academic Ecosystems	-3	10	7	15	-2	-25	-25	-18	-18	-18	-25	-25
SUBMARINE ECOLOGY	Submarine Ecology	25.0	-30.5	-32.5	-12.5	-5.0	-5.0	-29.5	0	5.0	-32.5	-35.0	-30.0
LAND FORM ALTERATION	Land Form Alteration	75	45	-15	50	0	0	10	10	10	10	-65	0
DRAINAGE AND FLOODING	Drainage and Flooding	-25	-30	-35	-35	-35	-35	-10	40	0	0	0	0
STABILITY AND EROSION	Stability and Erosion	1.7	1.3	-33.3	-3.3	-3.3	-3.3	-18.7	-6.7	-6.7	-6.7	-6.7	-6.7
RESOURCE SUPPLY AND DEMAND	Resource Supply and Demand	5	10	60	30	-10	-10	0	0	0	0	0	0
NET ENERGY USE	Net Energy Use	-5	-10	-20	-10	0	0	-6	-6	-6	-6	-6	-6
MATERIALS	Materials	-10	-20	-50	-75	10	10	-25	-25	-25	-25	-25	-25
SOCIOCULTURAL FACTORS	Sociocultural Factors	10.3	2.9	-18.5	-22.1	9.6	3.7	3.9	2.9	-16.9	-11.0	-6.4	-2.8
LANG USE AND GEOGRAPHY	Lang Use and Geography	-10.0	-25.0	-30.0	-30.0	6.7	15.0	13.3	-1.7	-3.3	-3.3	-11.7	-3.3
COMPATIBILITY • PLANNED LAND USE	Compatibility • Planned Land Use	-10	-25	-50	-75	10	10	-25	-25	-25	-25	-25	-25
DEMOGRAPHY	Demography	-10	-25	-50	-75	10	10	-25	-25	-25	-25	-25	-25
DEFINITES	Definites	0	-200	0	-100	-27.5	-2.5	0	0	0	0	0	0
ARCH PALEO AND HIST SITES	Arch Paleo and Hist Sites	-40	30	40	-5	0	0	0	0	0	0	0	0
RECREATION ACT VITNES	Recreation Act Vitnes	50	80	50	40	50	50	20	20	25	35	10	10
AESTHETICS	Aesthetics	8.0	3.0	-14.7	9.6	8.9	22.0	8.1	8.5	13.9	5.5	12.3	9.7
PUBLIC FINANCIAL EFFECTS	Public Financial Effects	-20	-51	-100	-44	-34	-10	-76	-26	-33	-16	-19	-20
EQUIPMENT AND BUSINESS EFFECTS	Equipment and Business Effects	34	55	100	53	45	25	30	33	44	20	33	31
AVERAGE ANNUAL EQUIVALENT CCST	Average Annual Equivalent CCst	0	-12	-71	0	37	0	0	-6	12	8	-9	18
CONSTRUCTION FACTORS	Construction Factors	-4.3	-21	-71	-50.8	-28.7	-32.5	0	3	-12.1	-15.3	-17.1	-17.1
TRANSPORTATION	Transportation	-20	-20	-70	-50	-50	-45	-30	-30	-30	-30	-30	-30
ECONOMIC EFFECTS	Economic Effects	0	4.0	0	0	0	0	0	0	0	0	0	0
PUBLIC FINANCIAL EFFECTS	Public Financial Effects	-20	-51	-100	-47	-30	0	-25	-25	-40	-10	-20	-20
EQUIPMENT AND BUSINESS EFFECTS	Equipment and Business Effects	10	59	100	47	30	5	25	25	40	20	30	30
LOCAL PUBLIC SERVICE SYSTEMS	Local Public Service Systems	-10	-55	-100	-47	-30	0	-25	-25	-40	-10	-20	-20
NUMERICAL AVERAGE OF RATINGS*	Numerical Average of Ratings*	3.6	-4.0	-70.0	-76.0	1.9	8.9	9.1	13.7	9.5	2.4	-1.7	-1.7
WEIGHTED AVERAGE OF RATINGS*	Weighted Average of Ratings*	1.95	1.01	-4.60	-78.03	6.35	7.38	6.87	18.76	12.09	6.01	4.96	-6.4
RATED ITEMS		NORTH OF DELTA						SOUTH OF DELTA					
WATER MGMT		GATEWA RECLAMATION						CITY STREAM					
GATEWA RECLAMATION		CIRCULATING RIVER BASINS						SURFACE STORAGE					
CIRCULATING RIVER BASINS		SC CALIFORNIA VALLEY						GATEWA RECLAMATION					
GATEWA RECLAMATION		CITY STREAM						SURFACE STORAGE					
SURFACE STORAGE		CIRCULATING RIVER BASINS						GATEWA RECLAMATION					
GATEWA RECLAMATION		CITY STREAM						CIRCULATING RIVER BASINS					
CIRCULATING RIVER BASINS		SC CALIFORNIA VALLEY						CITY STREAM					
CITY STREAM		GATEWA RECLAMATION						SURFACE STORAGE					
SURFACE STORAGE		CIRCULATING RIVER BASINS						GATEWA RECLAMATION					
GATEWA RECLAMATION		CITY STREAM						SC CALIFORNIA VALLEY					
SC CALIFORNIA VALLEY		CIRCULATING RIVER BASINS						GATEWA RECLAMATION					
GATEWA RECLAMATION		CITY STREAM						SC CALIFORNIA VALLEY					
SC CALIFORNIA VALLEY		CIRCULATING RIVER BASINS						GATEWA RECLAMATION					
GATEWA RECLAMATION		CITY STREAM						SC CALIFORNIA VALLEY					
SC CALIFORNIA VALLEY		CIRCULATING RIVER BASINS						GATEWA RECLAMATION					
GATEWA RECLAMATION		CITY STREAM						SC CALIFORNIA VALLEY					
SC CALIFORNIA VALLEY		CIRCULATING RIVER BASINS						GATEWA RECLAMATION					
GATEWA RECLAMATION		CITY STREAM						SC CALIFORNIA VALLEY					
SC CALIFORNIA VALLEY		CIRCULATING RIVER BASINS						GATEWA RECLAMATION					
GATEWA RECLAMATION		CITY STREAM						SC CALIFORNIA VALLEY					
SC CALIFORNIA VALLEY		CIRCULATING RIVER BASINS						GATEWA RECLAMATION					
GATEWA RECLAMATION		CITY STREAM						SC CALIFORNIA VALLEY					
SC CALIFORNIA VALLEY		CIRCULATING RIVER BASINS						GATEWA RECLAMATION					
GATEWA RECLAMATION		CITY STREAM						SC CALIFORNIA VALLEY					
SC CALIFORNIA VALLEY		CIRCULATING RIVER BASINS						GATEWA RECLAMATION					
GATEWA RECLAMATION		CITY STREAM						SC CALIFORNIA VALLEY					
SC CALIFORNIA VALLEY		CIRCULATING RIVER BASINS						GATEWA RECLAMATION					
GATEWA RECLAMATION		CITY STREAM						SC CALIFORNIA VALLEY					
SC CALIFORNIA VALLEY		CIRCULATING RIVER BASINS						GATEWA RECLAMATION					
GATEWA RECLAMATION		CITY STREAM						SC CALIFORNIA VALLEY					
SC CALIFORNIA VALLEY		CIRCULATING RIVER BASINS						GATEWA RECLAMATION					
GATEWA RECLAMATION		CITY STREAM						SC CALIFORNIA VALLEY					
SC CALIFORNIA VALLEY		CIRCULATING RIVER BASINS						GATEWA RECLAMATION					
GATEWA RECLAMATION		CITY STREAM						SC CALIFORNIA VALLEY					
SC CALIFORNIA VALLEY		CIRCULATING RIVER BASINS						GATEWA RECLAMATION					
GATEWA RECLAMATION		CITY STREAM						SC CALIFORNIA VALLEY					
SC CALIFORNIA VALLEY		CIRCULATING RIVER BASINS						GATEWA RECLAMATION					
GATEWA RECLAMATION		CITY STREAM						SC CALIFORNIA VALLEY					
SC CALIFORNIA VALLEY		CIRCULATING RIVER BASINS						GATEWA RECLAMATION					
GATEWA RECLAMATION		CITY STREAM						SC CALIFORNIA VALLEY					
SC CALIFORNIA VALLEY		CIRCULATING RIVER BASINS						GATEWA RECLAMATION					
GATEWA RECLAMATION		CITY STREAM						SC CALIFORNIA VALLEY					

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TABLE B-6.
PLANNING PRECEPTS

WATER DEMANDS AND TIMING	<p>Each eligible plan shall be capable of supplying sufficient water to meet the expected service area demands for water at all times up to the year 2000 (within dry-year deficiency limitations provided for in the SWP and CVP contracts or as they may be proposed for revision).</p> <p>Each plan shall also be capable of satisfying the probable maximum demands projected through the year 2000 by merely shifting the dates of construction of key components or programs.</p>
SYSTEM COMPATIBILITY	<p>Any component added to the existing SWP and CVP systems should be compatible with those systems and also be able to be incorporated into a complete plan for meeting the demands of the year 2000 without the necessity for abandonment of that component or any other component in the future.</p>
STATE OF THE ART	<p>Any plan proposed shall contain components which are within engineering technology now available, but be flexible enough to accept substitution with the advent of new engineering technology.</p>
WATER RIGHTS AND OTHER LEGAL ASPECTS	<p>Any plan, during its various stages of implementation, shall be compatible with existing water right permits for the SWP and CVP and with all other legal requirements.</p>
WATER QUALITY	<p>Each eligible alternative plan, during its various stages of implementation, shall be capable of complying with applicable State and Federal Delta water quality standards (as they may be from time to time modified) and with SWP and CVP export water quality criteria.</p>
FISH AND WILDLIFE	<p>No component added to the existing SWP and CVP systems shall preclude the eventual attainment of the fish and wildlife objectives.</p>
FLOOD CONTROL	<p>Any plan shall maintain or improve the flood-carrying capacity of Delta channels or include alternative means for conveying flood flows so as to reduce or prevent any material increase in the threat of flooding Delta lands. In this regard, any proposed changes to Delta channels or levees should be made compatible with recommendations in DWR Bulletin No. 192, "Plan of Improvement of the Delta Levees," May 1975.</p>
NAVIGATION	<p>Any plan shall maintain the use of Delta waterways for commercial, recreational, and military navigation. Any proposed change in present conditions will be governed by requirements of the Corps of Engineers and Coast Guard in their capacities of issuing permits for any project affecting navigable waters.</p>
SEEPAGE AND DRAINAGE	<p>Any alternative plans shall provide for control of any increase in seepage or drainage to Delta lands that may be caused by construction and operation of Delta facilities.</p>
GROUND WATER	<p>Ground water requirements imposed by any alternative plan shall be such that existing long-term overdrafts are not increased.</p>

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TABLE B-7
COMPONENTS COMPRISING THE ALTERNATIVE PLANS

COMPONENT	PLAN 1 "No Protect"	PLAN 2	PLAN 3	PLAN 4	PLAN 5	PLAN 6	PLAN 7	PLAN 8	PLAN 9	PLAN 10
EXISTING FACILITIES										
SWP & CVP Facilities	•	•	•	•	•	•	•	•	•	•
New Melones Reservoir (under construction)	•	•	•	•	•	•	•	•	•	•
Auburn Reservoir (under construction)	•	•	•	•	•	•	•	•	•	•
DELTA WATER TRANSFER ALTERNATIVES										
Peripheral Canal		•								•
North Stub Canal - South Stub Canal			•							
North Stub Canal - South Stub Canal/Future Connection				•						
Mathena Landing Isolated Canal					•					
Mathena Landing Cross-Channel - South Stub Canal						•				
Mathena Landing Cross-Channel - South Stub Canal/Future Connection							•			
North Stub Canal - Enlarged Clifton Court Forebay								•		
North Stub Canal - Enlarged CCF/Future Connection									•	
OTHER DELTA COMPONENTS										
Environmental Monitoring	•	•	•	•	•	•	•	•	•	•
Four-Agency F&W Agreement (limits on Delta Diversions)		•	•	•	•	•	•	•	•	•
SWP-CVP Operation Agreement		•	•	•	•	•	•	•	•	•
Federal Participation in Delta Protection		•	•	•	•	•	•	•	•	•
Delta Water Agency Contracts		•	•	•	•	•	•	•	•	•
Review and Revision of Delta Water Quality Standards		•	•	•	•	•	•	•	•	•
Install Four Pumps in Delta Pumping Plant (SWP)		•	•	•	•	•	•	•	•	•
Completion of Delta Fish Protective Facility (SWP)		•	•	•	•	•	•	•	•	•
South Delta Water Quality Improvement Facilities		•	•	•	•	•	•	•	•	•
Relocation of Contra Costa Canal Intake		•	•	•	•	•	•	•	•	•
Suisun Marsh Facilities		•	•	•	•	•	•	•	•	•
Western Delta Overland Water Facilities										•
SOUTH OF DELTA COMPONENTS										
Water Conservation	•	•	•	•	•	•	•	•	•	•
Waste Water Reclamation		•	•	•	•	•	•	•	•	•
Enlargement of East Branch California Aqueduct		•	•	•	•	•	•	•	•	•
Mid-Valley Canal		•	•	•	•	•	•	•	•	•
Los Vaqueros Reservoir		•	•	•	•	•	•	•	•	•
Storage in Southern California Ground Water Basins		•	•	•	•	•	•	•	•	•
Storage in San Joaquin Valley Ground Water Basins		•	•	•	•	•	•	•	•	•
NORTH OF DELTA COMPONENTS										
Marysville Reservoir	•	•	•	•	•	•	•	•	•	•
Cottonwood Creek Project		•	•	•	•	•	•	•	•	•
Sacramento Valley Ground Water		•	•	•	•	•	•	•	•	•
Glenn Reservoir - River Diversion		•	•	•	•	•	•	•	•	•
Dos Rios Reservoir										•
RELATED ACTIONS										
Improved Delta Levee Maintenance	•	•	•	•	•	•	•	•	•	•
Fish Screens on In-Delta Diversions		•	•	•	•	•	•	•	•	•
Deepening Baldwin and Stockton Ship Channels		•	•	•	•	•	•	•	•	•

TABLE B-8. SUMMATIVE Composite PLAN RATINGS.

RATED ITEMS	PLAN NO.					
	1 No Project	2 Peripheral Corridor	3 North Sub- South Sub	4 North Sub- South Sub Future Isolation	8 North Sub- Enlarged Clifton Court	9 North Sub- Enlarged CCF Future Isolation
SYSTEM EFFECTIVENESS	-11.4	-11.9	8.3	10.4	9.4	10.1
IMPLEMENTABILITY	10.0	-6.3	-2.5	-5.5	-8	-6.3
PUBLIC ACCEPTANCE	-20.0	10.0	12.5	12.5	22.5	15.0
PUBLIC ENTITIES	-25	40	30	35	25	35
CITIZEN AND ENVIRONMENTAL GROUPS	-15	-20	-5	-10	20	-5
FINANCIAL IMPLEMENTABILITY	100	-44	-30	-39	-35	-44
LEGAL - INSTITUTIONAL	-50	15	10	10	10	10
FLEXIBILITY WITH TIME	-56.6	8.4	-4.0	8.1	-2.7	8.1
NEW TECHNOLOGY	-50	-35	-35	-35	-35	-35
NEW STANDARDS	-60	38	-2	35	-3	33
CHANGING NEEDS	-60	23	25	25	30	27
RELIABILITY	0	35	30	30	30	30
ADEQUACY OF SUPPLY	-37.0	49.6	35.8	43.3	34.6	40.8
DELTA	-20.0	22.5	7.5	15.0	7.5	12.5
WATER QUALITY	-25	-5	-15	-10	-10	-10
WATER QUANTITY	-15	50	30	40	25	35
SERVICE AREA	-54.5	77.5	65.0	72.5	62.5	70.0
WATER QUALITY	-10	95	70	85	65	80
WATER QUANTITY	-99	60	60	60	60	60
PHYSICAL ENVIRONMENT	-8.5	13.5	-3.2	13.1	-10.8	11.3
BIOTA	-4.0	4.0	-21.0	3.3	-25.0	2.0
TERRESTRIAL ECOSYSTEMS	0	-6	-6	-6	-8	-8
AQUATIC ECOSYSTEMS	-10	20	-55	18	-65	16
SUISUN MARSH ECOLOGY	-2	-2	-2	-2	-2	-2
LAND FORM ALTERATION	-17.5	32.5	32.5	32.5	17.5	30.0
DRAINAGE AND FLOODING	-25	80	80	80	70	80
STABILITY AND EROSION	-10	-15	-15	-15	-35	-20
RESOURCE SUPPLY AND DEMAND	-20.0	-11.7	-11.7	-11.7	-11.7	-11.7
NET ENERGY USE	-25	-10	-10	-10	-10	-10
MATERIALS	-10	-15	-15	-15	-15	-15
SOCIO-CULTURAL FACTORS	-14.8	20.5	17.0	18.8	17.1	16.1
LAND USE AND DEMOGRAPHY	-15.0	-3.3	-6.0	-3.3	-8.0	-7.3
COMPATIBILITY WITH PLANNED LAND USE	-30	-15	-13	-14	-23	-27
COMPATIBILITY WITH RELOCATION PLANS	-10	18	8	17	12	18
DEMOGRAPHY	-5	-13	-13	-13	-13	-13
AMENITIES	-12.5	16.5	13.0	15.0	9.0	11.5
ARCH., PALEO, AND HIST. SITES	0	-50	-50	-50	-55	-55
RECREATION ACTIVITIES	-25	83	76	80	73	78
AESTHETICS	-15	65	60	60	65	60
ECONOMIC FACTORS	-41.8	17.4	21.4	19.4	19.4	17.4
PUBLIC FISCAL EFFECTS	-50	50	50	50	50	50
EMPLOYMENT AND BUSINESS EFFECTS	-50	50	50	50	50	50
AVERAGE ANNUAL EQUIVALENT COST	-30	-30	-20	-25	-25	-30
CONSTRUCTION FACTORS	-7.5	-6.5	-6.5	-6.5	-6.5	-6.5
TRANSPORTATION	0	-25	-25	-25	-25	-25
ECONOMIC EFFECTS	-10.0	7.5	7.5	7.5	7.5	7.5
PUBLIC FISCAL EFFECTS	-10	-10	-10	-10	-10	-10
EMPLOYMENT AND BUSINESS	-10	25	25	25	25	25
LOCAL PUBLIC SERVICE SYSTEMS	-10	-10	-10	-10	-10	-10
NUMERICAL AVERAGE OF RATINGS*	-19.9	13.8	8.5	12.8	7.2	11.5
WEIGHTED AVERAGE OF RATINGS**	-19.31	16.91	9.41	15.28	7.33	13.82

-19.9 WEIGHTED RATINGS FROM S.E.S. COMPUTER PROGRAM

-35 UNWEIGHTED RATINGS

* TOTAL OF ALL RATINGS DIVIDED BY THE NUMBER OF RATED ITEMS (32)

** CATEGORIES AND SUBCATEGORIES WEIGHTED TO REFLECT RELATIVE IMPORTANCE

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Discussion of Impacts of "No Project" Alternative

In addition to being evaluated as part of the SES process, an expanded study of the physical and economic impacts of the "No Project" alternative was made. Physical impacts were evaluated by DWR staff; and the economic impacts were evaluated by SES and discussed in their report "Economic Impact of the 'No-Project' Alternative Delta Alternatives Study", dated February 1977. The most significant direct physical impacts of the "No Project" alternative are the detrimental effects on the Delta fishery and the shortages in future water supply for the export water contractors.

The estimated shortages in firm yield available from the Delta by year 2000, if no new water is developed, are discussed in Chapter IV. These shortages would be in addition to the dry year deficiencies in agricultural supplies provided for in the SWP and CVP water service contracts. Thus, by the year 2000, the CVP and SWP agricultural customers would receive, in a critical dry year, actual water deliveries 50 to 80 percent less than normal year deliveries.

In addition to Delta water quality criteria (that are established by SWRCB independent of a particular alternative plan), the basic factors considered essential for migratory and resident fish of the estuary include: a long salinity gradient, adequate dissolved oxygen, adequate food supply, and positive downstream flow patterns. The "No Project" alternative would continue to maintain a long gradual salinity gradient, would assure good levels of dissolved oxygen in the main channels, but would not improve dissolved oxygen levels in the deadend sloughs or in the vicinity of Stockton. Continued diversion from the southern Delta would magnify the present reverse flow patterns (See Figure B-1) and continue to increase the already substantial losses of young striped bass (and other fish) and their food supply in project diversions.

There would be no new impact on upstream Sacramento River salmon migrants; but there would be continued detriments to downstream migrants, since water exports tend to transport salmon out of their normal path and to the export pumping plants. Impacts on upstream migrating San Joaquin River salmon would be detrimental since essentially no San Joaquin River water finds its way through the Delta and dissolved oxygen problems near Stockton would continue. The out-migrant would continue to be drawn to the pumps and reverse flows in the San Joaquin River and other Delta channels would increase. There would be a continued large detrimental impact on resident fish, since a large amount of water would continue to move through the main Delta channels and there would be no capability for improving conditions in the deadend sloughs.

In addition:

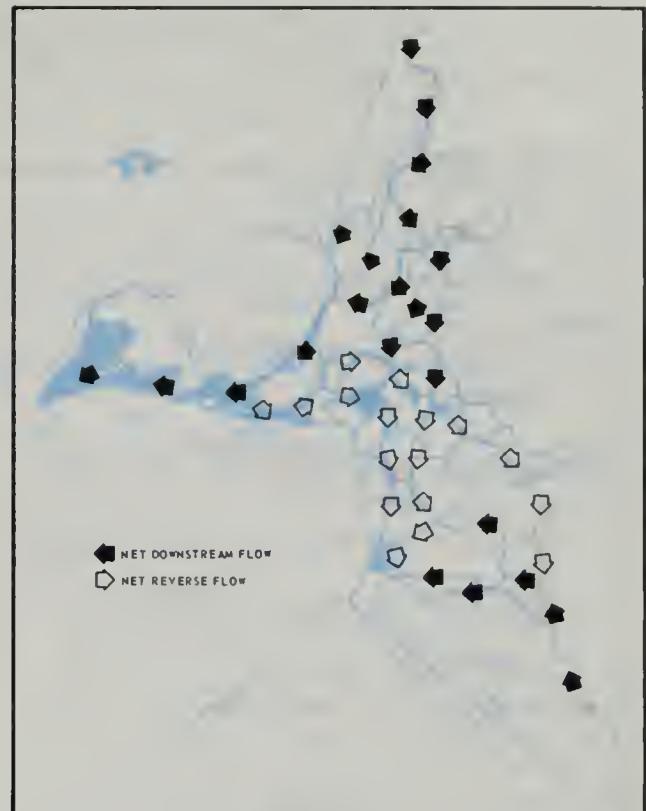


Figure B-1.
Flow distribution under present conditions.

1. Average quality of export water would continue to deteriorate.
2. Local water quality would be similar to present conditions in the central and eastern Delta, but would continue to deteriorate in the southern Delta.
3. Water levels at low tide in the south Delta would continue to be aggravated by project diversions.
4. Conditions conducive to scour in the south Delta channels would continue.

The SES report on economic impacts generally discussed the economic implications of the "No Project" alternative as compared to plans that would provide additional water. SES concluded that the total California portion of the projected gross national product would be lower if the "No Project" alternative were adopted. According to the SES report the largest economic impact of the "No Project" alternative would be felt by the agricultural sector, which depends heavily on delivered water from the SWP and CVP and which take the first deficiencies. Water shortages that would result could put many small family farmers out of business. SES estimated that adoption of the "No Project" alternative would reduce the anticipated agricultural production in the San Joaquin Valley significantly and that there would be an overall loss in employment.

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PROPOSED PROGRAM, DELTA ALTERNATIVES STUDY STATUS
OCTOBER 1976

COMPONENT	COMMENTS
DELTA PROTECTION PROGRAM	
ENVIRONMENTAL MONITORING	Monitor water quality and fish and wildlife resources.
FOUR-AGENCY FISH AND WILDLIFE AGREEMENT	(DWR, USBR, DFG, & USFWS) specifying needs and means of protecting fish and wildlife.
SWP/CVP OPERATION AGREEMENT	Spell out responsibility of the two projects in meeting Delta and project needs.
LIMITS ON DELTA DIVERSIONS	Low in dry years, intermediate in normal years, and high in wet years.
REVIEW AND REVISION OF DELTA WATER QUALITY STANDARDS	To assure criteria for protecting the Delta constitutes a reasonable, beneficial use of water.
FEDERAL PARTICIPATION IN DELTA PROTECTION	Provide for CVP to operate within the same rules for protecting Delta as SWP and federal participation in Delta Water Facilities and Suisun Marsh Protection.
SOUTH DELTA WATER QUALITY IMPROVEMENT FACILITIES	To distribute good quality water to areas that now have poor quality water.
SUISUN MARSH FACILITIES	To improve water quality for Marsh management.
FACILITIES SOUTH OF THE DELTA	
WATER CONSERVATION	Estimated that by year 2000, water conservation of 500 cubic hectometres (400,000 acre-feet) per year could be achieved.
WASTE WATER RECLAMATION	Estimated that by year 2000, 120 cubic hectometres (100,000 acre-feet) per year could be developed.
GROUND WATER STORAGE	To provide about 500 cubic hectometres (400,000 acre-feet) per year of firm project yield.
ENLARGE EAST BRANCH OF CALIFORNIA AQUEDUCT	To provide necessary aqueduct capacity to deliver water for storage in Chino Ground Water Basin.
LOS VAQUEROS RESERVOIR	To provide 200 cubic hectometres (160,000 acre-feet) per year of firm yield and other benefits.
MID-VALLEY CANAL	USBR Project to deliver water from California Aqueduct to east side of San Joaquin Valley to reduce existing ground water overdraft.
FACILITIES NORTH OF THE DELTA	
SACRAMENTO VALLEY GROUND WATER	To provide approximately 250 cubic hectometres (200,000 acre-feet) per year of firm yield.
COTTONWOOD CREEK PROJECT	USCE project to provide about 210 cubic hectometres (170,000 acre-feet) of firm yield for purchase by State.
MARYSVILLE RESERVOIR	USCE Project to provide about 200 cubic Hectometres (160,000 acre-feet) of water to offset loss from Ship Channel Projects.
GLENN RESERVOIR-RIVER DIVERSION	To provide 1.2 cubic kilometres (1 million acre-feet) of additional firm yield annually.
RELATED FACILITIES AND ACTIONS	
RELOCATE CONTRA COSTA CANAL INTAKE	To improve water quality and insure water supply for Contra Costa Canal; and to save water otherwise needed for water quality control at the present canal intake.
IMPROVE DELTA LEVEE MAINTENANCE	To protect Delta agriculture by reducing the threat of flooding and salt water intrusion from levee failure.
FISH SCREENS ON IN-DELTA DIVERSIONS	To help protect Delta fisheries by screening some of the 1.9 cubic kilometre (1.6 million acre-feet) in-Delta diversions.
DELTA WATER AGENCY CONTRACTS	To assure Delta Water Agencies of adequate quality water supply and provide repayment for project benefits.
SELECT ONE OF THREE ALTERNATIVE DELTA WATER TRANSFER FACILITIES	
NEW HOPE CROSS CHANNEL - SOUTH DELTA INTAKE CHANNEL	See Figure B-2
NEW HOPE CROSS CHANNEL - ENLARGED CLIFTON COURT FOREBAY	See Figure B-3
PERIPHERAL CANAL	See Figure B-4

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Recreation development planned in conjunction with SWP facilities is an important part of the project. SES concluded that the "No Project" alternative could result in a significant reduction in potential SWP recreation use by the year 2000 because existing reservoirs would be drawn down to lower levels much of the time.

Without further water development the SWP would not be able to meet contractual water commitments. If the "No Project" alternative is adopted, litigation against the State by water contractors is possible.

Some water districts have issued bonds to finance local distribution facilities under the assumption that they would be receiving increasing volumes of delivered SWP and CVP water as contracted. With less water available from the projects, as would be the case if the "No Project" alternative were adopted, less water would be delivered to their customers. With less water revenue and possible bond defaults, the adverse publicity could impair future California State bond issues.

In short, if additional water supplies are not developed (the "No Project" alternative) for the SWP and CVP, serious water shortages will develop and the fiscal repercussions would adversely affect the overall economy of the State of California.

Preliminary Proposal, October 1976

After reviewing public reaction to the Phase II report obtained through public workshops held at Stockton and Los Angeles in April 1976, and the findings of the SES study, the DWR staff prepared a preliminary draft of a program that set forth a number of possible actions for meeting study objectives. This proposal was included in the status report, "Delta Alternatives Study Status—October 1976", which was widely distributed. The proposed program included facilities and actions comprised of components and plans previously evaluated and is summarized in Table B-9.

The proposal recommended that a Delta water transfer facility be selected from one of three alternatives—(1) the New Hope Cross Channel-Enlarged Clifton Court Forebay (Figure B-2), (2) the New Hope Cross Channel-South Delta Intake Channel (Figure B-3), or (3) the Peripheral Canal (Figure B-4). During the period of continuing evaluation, the New Hope Cross Channel evolved as a more viable north Delta transfer facility than the North Stub Canal. The South Delta Intake Channel is essentially the same as the South Stub Canal, but included a new in-channel fish screen rather than relying on an enlargement of the existing louver fish screens at the Delta and Tracy Pumping Plants. Likewise the Enlarged Clifton Court Forebay would also have new fish screens at the intakes. Both New Hope Cross Channel plans would use interior Delta channels for

water transfer, while the Peripheral Canal would be a full isolated Delta water transfer facility as described in the August 1974 "Draft Environmental Impact Report—Peripheral Canal Project".

February 1977 Revisions After Public Hearings

During October and November 1976, the DWR staff held a series of public hearings in Stockton, Bakersfield (two), Sacramento, Los Angeles, Oakland, Antioch, and Chico to obtain public comment on the draft program outlined in the October 1976 status report. Separate meetings were also held with concerned individuals and organizations to get direct input.

Based on comments received during the various hearings and meetings, the Delta alternatives program proposed in the October 1976 report, and summarized in Table B-9, was revised in February 1977 as follows.

1. The Sacramento Valley ground water extraction program was eliminated from the proposed program as an element of water supply.
2. Marysville Reservoir was deleted from the program as an offset to increased salinity intrusions by the Baldwin-Stockton Ship Channel Project. The Corps of Engineers concluded that this was not a feasible use of water, and that salinity might be mitigated by a submerged barrier at Carquinez Strait.
3. The estimated minimum required Delta outflow for protecting the Delta fishery was modified to reflect that proposed in the draft of the Four-Agency Fish and Wildlife Agreement. This change resulted in improved protection for fish and wildlife and increased yield of the Delta water transfer facilities.
4. Estimated Delta export requirements were modified to reflect earlier staging of the Mid-Valley Canal to reduce ground water overdraft in the San Joaquin Valley. A modification was also made to reflect the difference between dependable and intermittent water deliveries.
5. Yield of Los Vaqueros Reservoir was revised downward to reflect a geologic storage limit for the site.
6. The Delta-Woodbridge Canal was added to effect more efficient management of water supplies for fish, recreation, and irrigation in the Folsom-South service area, American and Mokelumne Rivers, and the Delta.
7. Delta levee rehabilitation was removed as a component of the proposed Delta Alternatives Program, since it is sufficiently independent of other actions to be treated separately. However, any Delta construction would be made compatible with the Nejedly-Mobley Delta Levees Act (Water Code Sections 12225-12227, and Section 12987 as amended in 1976), which ap-

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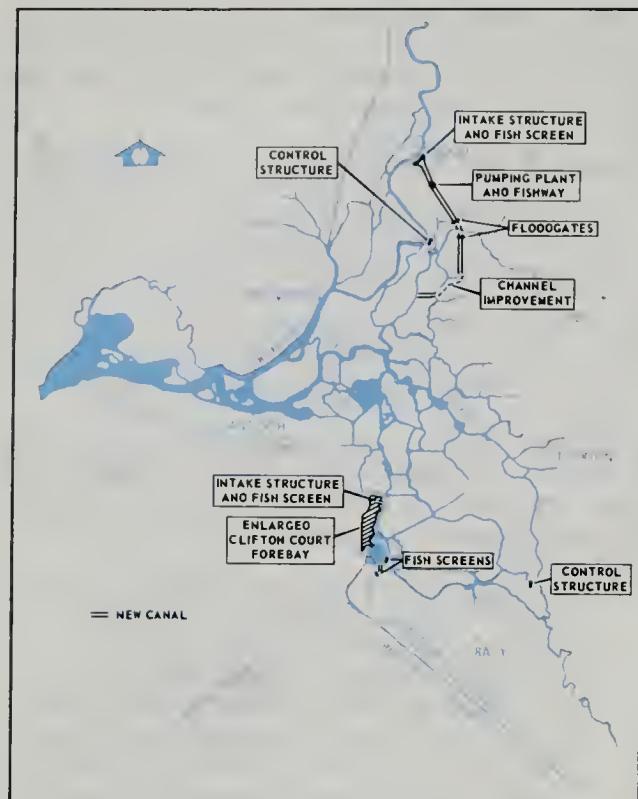


Figure B-2. New Hope Cross Channel – Enlarged Clifton Court Forebay Plan.

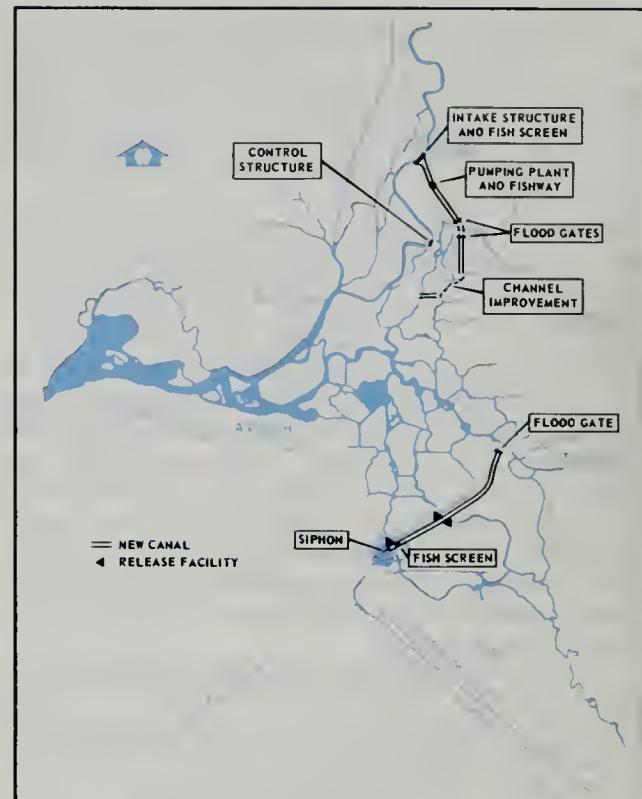


Figure B-3. New Hope Cross Channel – South Delta Intake Channel Plan.

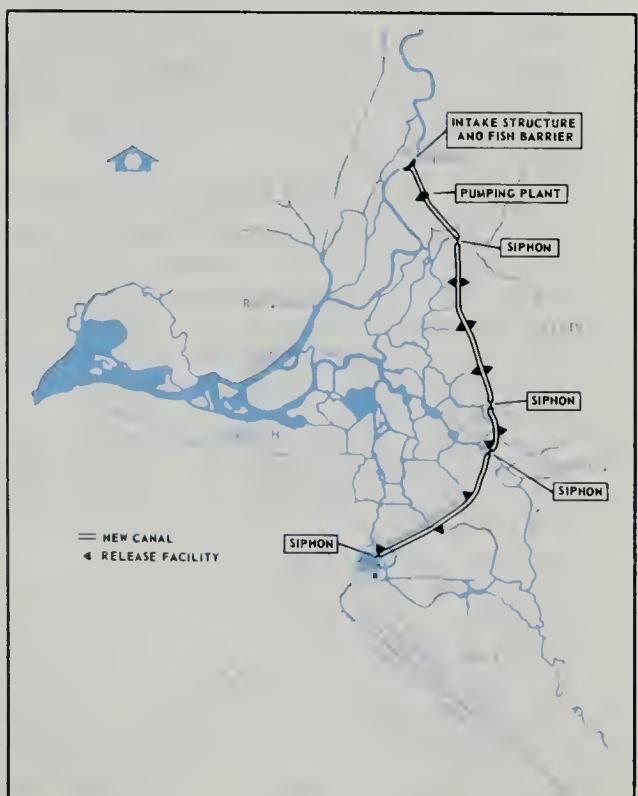


Figure B-4. Peripheral Canal Plan.

proved DWR Bulletin No. 192 as a conceptual Delta levees plan.

8. Water conservation and waste water reclamation in project service areas was combined into a single goal and increased to 860 cubic hectometres (700,000 acre-feet) per year by year 2000.

At this point, a specific Delta water transfer facility had not been recommended and the proposal still included one of three remaining alternatives—the New Hope Cross Channel with an enlarged Clifton Court Forebay; the New Hope Cross Channel with a South Delta Intake Channel; or the Peripheral Canal. A revised status report, "Delta Alternative Review Status, Draft—February 1977", including the above changes in the program, was published and given wide distribution. Figure B-5 shows the key elements of the plan described in the February 1977 status report.

Selection of a Delta Water Transfer Facility

Following the release of the February 1977 status report, DWR staff concentrated on further review and analysis of the three remaining alternative Delta water transfer facilities. The following discussion examines each of these alternatives and concludes with the selection of a staged Peripheral Canal as the



Figure B-5. Key Elements, Delta Alternatives Plan, February 1977.

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Delta Water Transfer Facility. The recommendation was made on May 10, 1977, by a DWR and DFG staff memorandum to the Directors of Water Resources and Fish and Game.

Need for a Facility

Delta water transfer facilities are needed to correct adverse environmental conditions in the Delta associated with the present method of conveying water through the Delta for the SWP and CVP and to help meet increased needs of the projects.

A north Delta facility (New Hope Cross Channel) would eliminate reverse flow around Sherman Island, reduce damage to the striped bass spawning and nursery area in the western Delta, reduce damage to salmon and shad, and conserve extra outflow now required for salinity control.

A south Delta facility (South Delta Intake Channel or Enlarged Clifton Court Forebay) would increase the channel conveyance capacity and export diversion capability without causing excessive scour or low water problems at low tide in the southern Delta. The South Delta Intake Channel would remove the export flows from the existing channels, would allow more water to be diverted without scour or low water problems, and would provide positive downstream flow in Middle and Old Rivers for fish. Enlarging Clifton Court Forebay to double the existing capacity would allow more water to be diverted at high tide, thereby increasing the average sustained rate of export without causing excessive scour or low water problems in the southern Delta. However, with enlarged Clifton Court, flow reversal and fishery problems in Old and Middle Rivers would continue.

An isolated channel (Peripheral Canal) would perform the functions of both the north and south Delta facilities, but would separate water for export from the Delta estuary. It would eliminate reverse flow, salt pickup, and damage to the striped bass nursery area in the western Delta; correct scour, low water, and reverse flow problems in the southern Delta; and provide the Delta with freshwater releases at slough and river crossings.

Figure B-6 depicts summer flow patterns in the Delta under present conditions and under conditions that would exist with each of the three Delta transfer alternatives that remained to be evaluated. This figure shows that of the three alternatives, only the Peripheral Canal would correct virtually all the reverse flow problems in the Delta.

A combination of north and south Delta facilities (New Hope Cross Channel with either the South Delta Intake Cannel or an Enlarged Clifton Court Forebay) or an isolated canal (Peripheral Canal) would produce about the same annual export yield. Under State Water Resources Control Board 1975 Basin Plan criteria, about 0.6 cubic kilometres (0.5 million

acre-feet) of additional water could be conserved that cannot be captured with the present system. With adoption of flow and salinity criteria for the Delta fishery as proposed in the draft Four-Agency Fish and Wildlife Agreement, the export yield gained would be about 1.2 cubic kilometres (1.0 million acre-feet). Annual export yield of a Delta transfer facility under the SWRCB draft Delta Water Quality Control Plan released March 15, 1978, is estimated to be bracketed by the above values, but would be closer to that resulting from the Four-Agency Fish and Wildlife Agreement.

Fish Screens

As discussed in Chapter V, State law requires the installation of fish screens on new diversions. Therefore, an acceptable Delta water transfer facility must include an adequate fish screen in the intake structure(s).

Participants in the Four-Agency study are considering a positive screening system for these facilities that would require diverted water to flow through a screen consisting of plates or rotating drums with small holes to exclude small fish. The intake approach structure being considered will be large enough to permit low flow velocity through the screen. The Peripheral Canal Plan would include a screen in an intake facility that would allow the screened fish to return to the Sacramento River without further handling. The other two plans discussed would include an intake and fish screen facility at the Sacramento River similar to the Peripheral Canal Plan and would also require one or more fish screening facilities in the south Delta which would require handling and transporting the salvaged fish to Delta areas away from the influence of the pumps.

The fish screening system, screens with small openings and low screen approach velocities, will require large, relatively expensive, intake structures. Fish screens and intake facilities that will meet these requirements are estimated to represent one-fourth the cost of the Peripheral Canal Plan and one-half or more of the cost of the other plans.

Isolated or Nonisolated Facility

The basic issue is that of isolated or nonisolated transfer of water through the Delta.

Export Water User Viewpoint. Most export water users prefer the isolated facility (Peripheral Canal) because they view it as a more reliable source of good quality water. With either of the nonisolated alternatives, they are concerned that the projects would be vulnerable to severe quality degradation and interruption of export supply in the event of a levee break such as occurred on Andrus Island in the summer of 1972. They believe this situation would lead to the need to eventually complete the Peripheral Canal at greatly increased cost. Furthermore,

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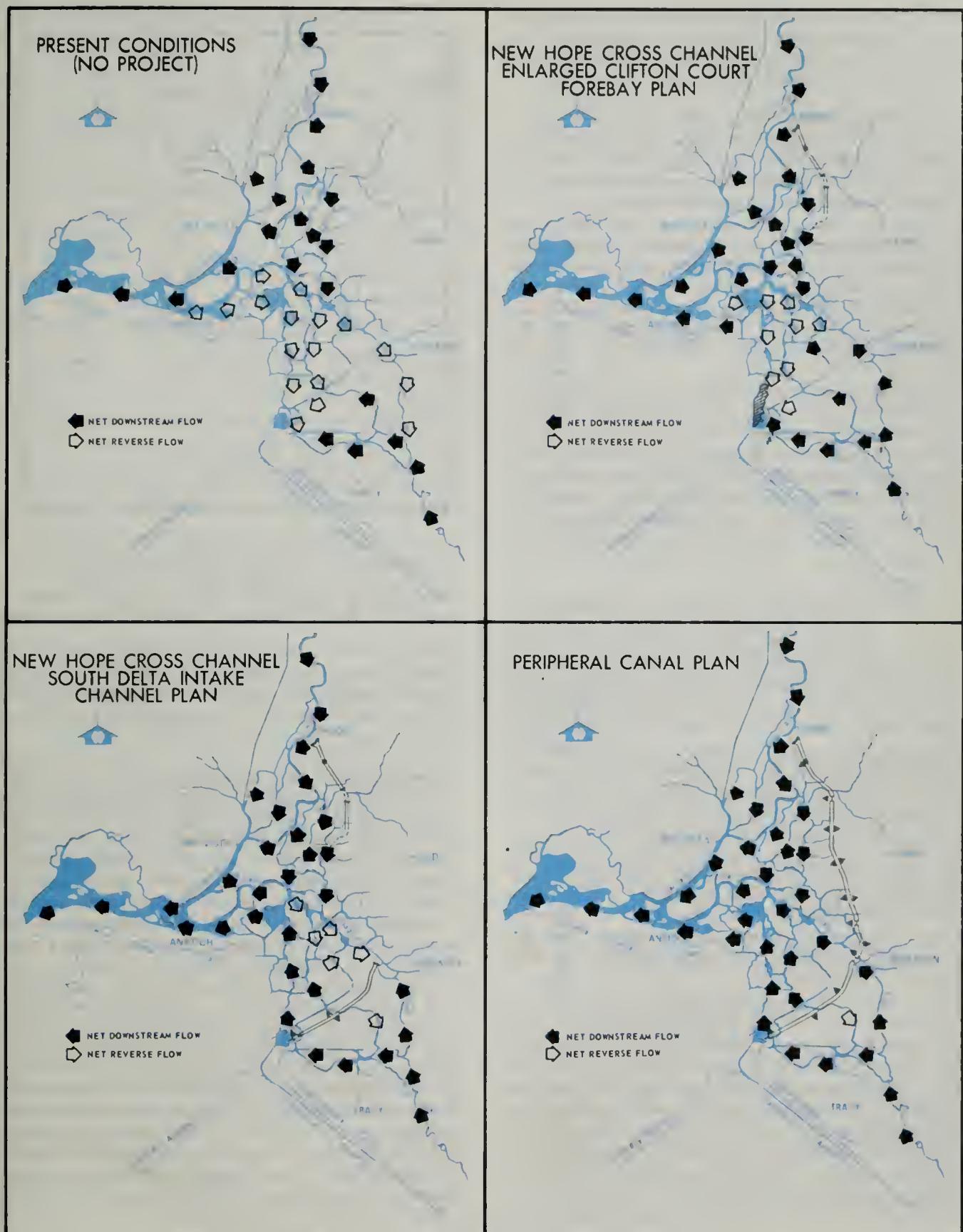


Figure B-6. Typical summer flow patterns.

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they point out that the nonisolated alternatives would transport much greater quantities of salt to the San Joaquin Valley that would ultimately have to be removed from the Valley.

Fishery Interest Viewpoint. Most fishery interests and environmentalists prefer the isolated canal concept, such as the Peripheral Canal, provided there are strong institutional guarantees to govern project operation to protect the estuary.

The Department of Fish and Game has concluded that the Peripheral Canal is the best of the alternative facilities considered. The Canal would alleviate the adverse effects of the present system on fishery resources. This improvement would result from moving the diversion point for water exports from the southwest Delta to the Sacramento River near the upstream edge of the Delta.

Young striped bass and catfish would no longer be diverted from their nursery area in the Delta. Also the exports would no longer interfere with salmon migrating to and from the San Joaquin River or draft young salmon and shad migrating down the Sacramento River out of their normal migration route. Fish screens at the intake to the Peripheral Canal would be more effective than at their present location, as fish could be returned to the Sacramento River without handling.

The New Hope Cross Channel would create a new fishery problem in addition to not alleviating all of the existing adverse effects. Many adult fish migrating to the Sacramento River would try to migrate through this canal and be blocked by the pumping plant. (The potential for a similar problem with upstream migrants exists with the Peripheral Canal at the release sites, but this is of much smaller magnitude than discharging the entire flow back into Delta channels.) Years of additional research would be required to develop passage facilities for the New Hope alternative, and many experts doubt such research would be successful. Either of the south Delta alternatives would only compound the fish screening problems at the present diversion sites. Figure B-7 is a summary of the DFG's analysis of the impacts of the Peripheral Canal and the nonisolated alternatives on Delta fish and wildlife population at the predicted year 2000 level of Delta exports.

As another indication of environmental support for an isolated facility, the DWR Delta Environmental Advisory Committee (DEAC) has concluded that "... when and if combined with limits on the amount of water that can be exported, well designed and operated fish screens, and a set of firm institutional guarantees to protect the Delta, Bay, Suisun Marsh, and North Coast environments, the Peripheral Canal is the best water transfer concept available. Without these 'conditions and guarantees' it, like all other engineering solutions, presents major environmental

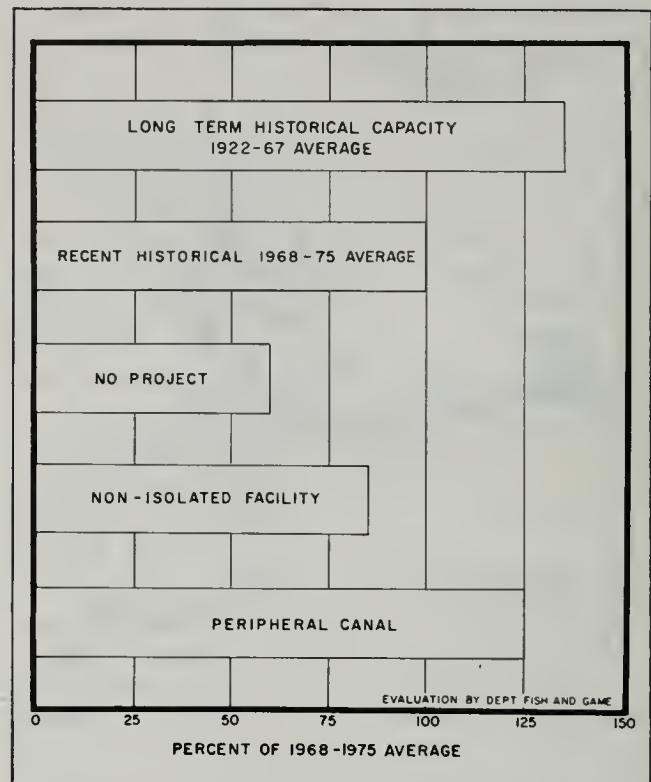


Figure B-7.
Summary of impacts on Delta fish and wildlife.

risks that we believe will be unacceptable to environmental and conservation groups. With them, we believe it could receive significant support." (DEAC's January 1977 report on a Delta Water Transfer Facility.)

Delta Water User Viewpoint. Some Delta water users have expressed no preference between the alternatives. On the other hand, other Delta water users prefer the nonisolated alternatives that keep the export water flowing through the Delta channels. These are principally users located where the export water now flows by on its way to the export pumps. They are fearful that in times of water shortage the operators of the CVP and SWP will be compelled to export water needed in the Delta. Continuing to convey export water through Delta channels would provide greater dilution of salts in Delta water supplies and a physical, rather than an institutional or statutory, guarantee that the SWP and CVP would be operated to protect Delta water quality. Continuing the status quo also reduces the need for payment by Delta water users for any net benefits received from operation of CVP and SWP. Still others have said DWR should not proceed with any Delta water facilities until adequate water quality standards are established to protect the entire San Francisco Bay-Delta estuarine system.

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Recommended Delta Water Transfer Facility

The DWR and DFG staff concluded that of the three remaining Delta water transfer facilities under consideration, the Peripheral Canal would best meet the requirements of the SWP and CVP for providing water of adequate quantity and quality at the export pumps while, at the same time, providing for the maintenance of water quality and the protection of the fish and wildlife resources within the Delta.

This conclusion was based on the fact that the needs of both the Delta fishery and Delta agriculture can be met with isolated conveyance, while with either of the nonisolated alternatives, many of the fishery requirements could not be met even though Delta water quality to some extent might be better assured.

Incumbent in this conclusion is the need for strong guarantees that both the SWP and CVP will be operated to protect the Delta fishery and Delta agricultural, municipal, and industrial uses. Such guarantees can be obtained in a four-pronged approach:

1. Contracts with Delta water users
2. The Four-Agency Fish and Wildlife Agreement
3. Appropriate federal and State agreements or legislation
4. Water quality standards set by the State Water Resources Control Board and approved by the federal Environmental Protection Agency

Staging and Scheduling of the Peripheral Canal

Technical questions regarding the operation of the Peripheral Canal must be addressed (these problems would also be present with the nonisolated alternatives). These questions can be answered by constructing and testing the Peripheral Canal in three stages as follows: Stage 1—Hood to Shima Tract, with fish screen and operational tests; Stage 2—Pre-consolidation, San Joaquin River to Clifton Court (concurrent with Stage 1); and Stage 3—Hood to Clifton Court completion (see Figure B-8).

Under this plan, the capacity of the Stage 1 release facilities would be increased from the 59 cms (2,100 cfs), proposed in the 1974 Peripheral Canal Draft EIR, to 159 cms (5,600 cfs) by increasing the capacity of the release structures outlined in that document and by adding others at new locations.

The necessary environmental and design activities would proceed concurrently with appropriate federal and State legislation. The objective is to complete Stage 1, conduct a 2-year test of the fish screen, and then complete the full Peripheral Canal. DFG opposed a test period longer than two years for fear that the water yield would be gained and that there would be no motivation to finish the Canal simply to improve the fishery.

Of the several staging plans examined, the proposed alternative has the following advantages:

1. This staged plan provides for obtaining proto-

type data for the final stages of fish screen development, while moving as rapidly as is reasonable towards canal completion. It would facilitate biological and engineering tests of full-sized units of the fish screen. The first stage would also permit testing the effects of releasing water into the sloughs along the eastern side of the Delta. Since the first stage Canal would dead-end on Shima Tract, fish would not be able to enter the Canal at this temporary terminous.

2. The test operation would increase the transfer of water from the Sacramento River to the Central Delta and increase the export yield of the SWP and CVP by approximately 430 cubic hectometres (350,000 acre-feet) annually and thereby reduce the risk of water shortages during the test period.
3. The staging and testing period would provide additional time to conduct new studies of the water quality needs of Delta agriculture before completion of the Peripheral Canal. The larger release facilities in Stage 1 would increase the completed project's capability for making whatever releases are required to maintain interior Delta water quality.

Further Revisions to Proposed Program

With the selection of a staged, isolated Delta conveyance facility, the framework of the staff recommendation made in February 1977 was essentially completed. However, three additional modifications were made.

1. The Delta-Woodbridge Canal was deleted from the plan because it was considered more appropriate as a part of the Memorandum of Understanding on the Lower American River flows and the Folsom-South Canal service area. This document is currently being negotiated by the USBR, DWR, DFG, existing water contractors, and Sacramento and San Joaquin County interests.
2. The installation of fish screens on in-Delta diversions was eliminated from the plan. It was considered more appropriate for DFG to implement such a screening program, at its discretion, under existing authority.
3. The Western Delta Overland Water Facilities were added to the plan. With adoption of dry and critical year fish and wildlife criteria proposed in the Four-Agency Fish and Wildlife Agreement and the new SWRCB March 1978 Draft Water Quality Control Plan, such facilities would provide good quality water to western Delta agricultural areas and reduce the amount of water otherwise needed for salinity control.

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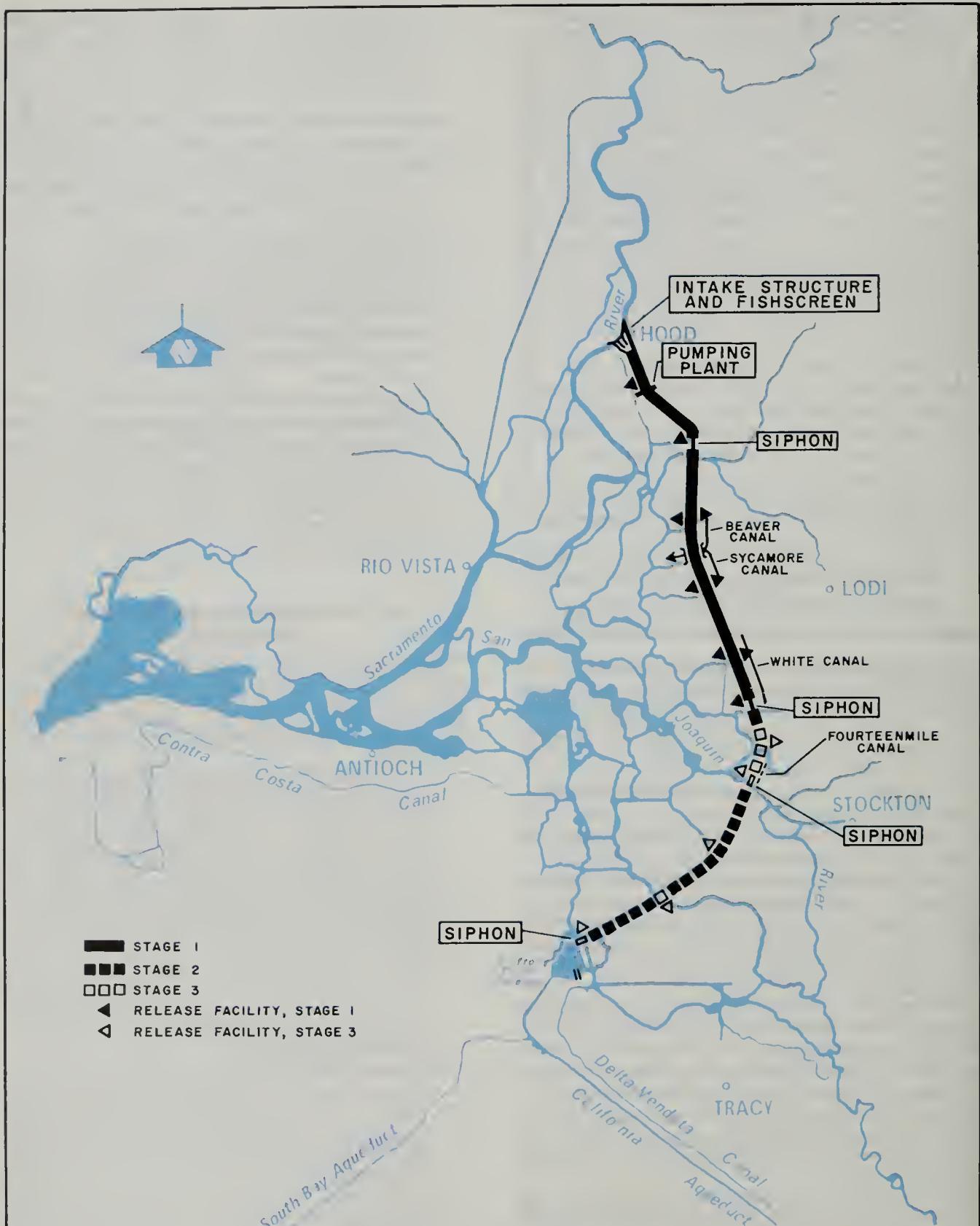


Figure B-8. | Recommended Delta water transfer facility.

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The plan as recommended by the staff of DWR and DFG in May 1977 was endorsed by the Director of DWR and Governor Edmund G. Brown Jr. in June 1977 and was accepted by Senator Ayala and a coalition of water, environmental, labor, farming, and other groups for inclusion in Senate Bill 346. Chapter V describes, in detail, the "Selected Course of Action" that resulted from the reexamination process described in this appendix.

Description of Alternative Components Not Included in Selected Plan

Following is a brief description and discussion of those alternatives and plan components that were not included in the selected plan.

Reduction of Delta Export

Several alternative components for reducing the demand for Delta export were suggested. Of those components, the following were not included in the selected plan.

Desalting Sea Water. Desalination could be a potential source of additional water supply in coastal areas of California. Such a facility would require a source of water supply, source of energy, a desalter, a means to dispose of the brine, and, where the distillation process is used, a means to dispose of the cooling water. Although improvement in desalting technology continues, substantial costs, large energy requirements, and potential adverse environmental impact to marine life have led to the conclusion that the large-scale conversion of brackish and sea water is not a viable new water source to significantly reduce project demand for additional water in the near future.

Desalting Geothermal Brines. Hot brines from California's geothermal areas, principally the Salton Sea region, might be reclaimed in conjunction with production of energy to produce fresh water for Southern California. Limited availability, need for substantial research and development work, high cost, and unsolved environmental problems reduce the near future use of desalinated geothermal brines as a new water source.

Amend Water Service Contracts. The SWP and CVP water service contracts could be amended to either reduce substantially future deliveries or freeze them at the present levels. Reduction of Delta exports through amendment of water service contracts would present some formidable legal and political problems. No contractors have expressed the desire to reduce their contract entitlements. Unilateral changes cannot be made in these contracts.

Many of the water agencies who receive water from the SWP and CVP have constructed distribution facilities financed by local bond issues. Changes in supply contracts could create bond repayment difficulties.

Curtail Water to New Lands. Curtailment of possible new land development in the San Joaquin Valley was suggested as a means to reduce future water demands and, therefore, reduce future diversions from the Delta. However, Delta water exports to the San Joaquin Valley through facilities of the SWP and CVP were 5.2 cubic kilometres (4.2 million acre-feet) in 1976. This quantity is approximately equal to the Valley's maximum contracted entitlements from the SWP and allocations from the presently authorized CVP. The proposed federal Mid-Valley Canal is primarily a rescue project to offset the present ground water overdraft in the project service area and will not generally involve new lands.

Therefore, San Joaquin Valley lands that would use planned diversions from the Delta have already largely been developed. Curtailment of new agricultural land development is not, then, a viable method of reducing project demand in the present contract and Mid-Valley service areas.

Reduced Central Arizona Project. In 1963, after lengthy litigation, a Supreme Court decision¹ fixed the allocation of Colorado River water available to California at 5.4 cubic kilometres (4.4 million acre-feet) per year. This decision increased the water available to Arizona with a commensurate reduction in that available to Southern California. Subsequent legislation² gave California a priority over the Central Arizona Project to the extent of deliveries to California of 5.4 cubic kilometres (4.4 million acre-feet). The Central Arizona Project is scheduled to go into operation in 1985.

If the size of the Central Arizona Project were to be reduced, the availability of water to Southern California from the Colorado River would increase, resulting in reduced exports from the Delta. However, in view of the history of the controversy over the water in the Colorado River, a reduction in the use of this water by the Central Arizona Project does not appear to be politically feasible.

Icebergs. The idea of using Antarctic icebergs as a freshwater supply has been considered a number of times during the past century. Some have suggested that icebergs could be towed from the Antarctic to points along the Southern California coast where they would be melted and fresh water delivered to water customers.

There are many technical problems concerning

¹Arizona v. California, 373 U.S. 546 (1963).

²Colorado River Basin Project Act (1968) Public Law 90-537, 82 Stat 885, Central Arizona Project

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transport of the icebergs from Antarctica to the southern coastal area including ways to insulate the bergs during transport, development of energy sources to melt the ice, and design and construction of offshore and onshore facilities to lift and distribute the water recovered to the points of need. Development of the technology to solve these and other problems appears to be too far in the future to depend on this as an alternative source of water that would significantly reduce exports from the Delta between now and the year 2000.

Delta Protection

Providing for specific Delta needs and protection of the Delta environment has been included as a key part of the Department's program to transfer water supplies across the Delta for export. Many institutional, legal, and physical measures were proposed to insure the protection of Delta fisheries and in-Delta agricultural, municipal, and industrial uses. Most of these proposed Delta protection alternatives were included in the selected plan. Following is a discussion of those components that were dropped from further consideration.

Fish Hatcheries. A study to determine the feasibility of constructing two fish hatcheries in the Delta has been proposed. These hatcheries would be in addition to fish screens at the intake to Delta diversion facilities and Delta facility operating procedures to protect fish food organisms, spawning, and migration. The main purpose of the hatcheries would be to offset unavoidable losses of Delta striped bass and king salmon.

At the present time there are technical uncertainties as to the possible effectiveness of a fish hatchery for striped bass. Although fish hatcheries for king salmon have been and are successful, there remains some doubt that increasing the number or size of these hatcheries will produce increased benefits.

Fish Screens on In-Delta Diversions. The California Fish and Game Code requires a diverter taking water from a stream that supports anadromous fish to provide adequate fish screens as protection against removal of fish from the channel. However, most in-Delta diversions began before this section of the code became law. The Fish and Game Code does provide that DFG can, upon its own initiative, install screens on old diversions; and a systematic program of fish screen installations by DFG has been suggested. The installation of fish screens on in-Delta diversions was not included in the selected plan. It was considered more appropriate for DFG to implement such a screening program, at its discretion, under existing authority.

Delta Levees Improvement. The Delta islands

are ringed by 1,770 kilometres (1,100 miles) of levees essential for the maintenance of Delta agriculture and the many communities that exist in the Delta. These levees also have value in maintaining fish and wildlife resources and for Delta recreation. DWR Bulletin 192 recommended improvement of 499 kilometres (310 miles) of substandard levees. Any program that involves the Delta levees must be compatible with the Nejedly-Mobley Delta Levees Act that incorporates the conceptual Delta levees plan as recommended in DWR Bulletin 192. Delta levee rehabilitation is sufficiently independent of other actions to be treated separately and was, therefore, not included as part of the selected course of action.

Delta-Woodbridge Canal. The Delta-Woodbridge Canal facility was proposed during negotiations concerning the Folsom South Canal. This facility would transport water from the Delta water transfer facility to Lodi Lake on the Mokelumne River at Woodbridge, California. The canal would be about 13 kilometres (8 miles) long with one pumping plant to lift the water approximately 15 metres (50 feet). The purpose of this facility would be to provide for more efficient management of water supplies for fish, recreation, and irrigation in the Folsom South service area, American and Mokelumne Rivers, and the Delta. This facility was not included in the selected plan because it was considered more appropriate as a part of the Memorandum of Understanding on the Lower American River flows and the Folsom South Canal service area which is currently being negotiated.

Delta Water Transfer Alternatives

There were 30 suggested alternative physical facilities¹ for increasing the efficiency of transferring water across the Delta. For purposes of orderly comparison and analysis, these alternatives were classified into five basic concepts. Following is a discussion of 29 alternative facilities that were not included in the selected plan.

Existing Channel Conveyance Alternatives. This concept provides for conveyance of export water through the present channel system using a continuous freshwater outflow to Suisun Bay for Delta salinity control and to protect the quality of water at the export pumps. This freshwater outflow forms a "hydraulic barrier" which inhibits salinity intrusion. Most of the water available for export is Sacramento River inflow and is presently transferred to the south Delta through the existing Delta Cross Channel and Mokelumne River system, Georgiana Slough, Three-mile Slough, reverse flow around the west end of Sherman Island into the San Joaquin River, Old River, and Middle River.

¹ Delta facilities are authorized as part of the State Water Project, California Water Code Section 12934(d)(3)

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Existing channel capacities limit the amount of water that can be transferred through the central Delta to the export pumps. This causes a portion of the water to flow through the western Delta which in turn causes the quantity of water required to control salinity to increase as export rates increase. It also tends to scour restricted channels and cause low water level problems near the pumps when pumping rates exceed about 310 cms (11,000 cfs), which is only about 73 percent of the combined capacity of the State and federal aqueducts. These conditions restrict the effective diversion capacity of the SWP and CVP.

Simply enlarging the restricted channels would be a relatively simple and inexpensive way to provide more water for the projects. Reduction or elimination of flow reversals in the lower San Joaquin River would lessen the diversion of young fish and their food supply but significant damage would continue due to flow reversals and high velocity in the central and southern Delta channels. Placing fish screens on the various channels that transfer water from the Sacramento River to the central Delta would reduce the number of fish influenced by the pumps, but

would greatly increase the cost. Passage of upstream migrants would also be a problem. The louver screens at the present CVP and SWP diversions are not efficient for small fish. While providing new and improved screens would add to the cost, any fish salvage system in the south Delta would be inherently inadequate because the Delta is a major nursery area, so fish too small to be screened are present much of the year. Furthermore, except during flood flow conditions, water in all southern Delta channels flows toward the pumps, so even fish successfully screened must be collected and trucked to the western Delta. This operation results in substantial losses. In essence, therefore, even with large expenditures to place fish screens both in the north and south Delta, all of the existing channel conveyance alternatives are inherently inadequate for solving the fishery problem. All four suggested alternatives of this concept were eliminated from further separate consideration during the actual screening process.

Figure B-9 illustrates these alternatives except for the "Continue Present Method". The following describes these alternatives and the "Continue Present Method" concept.

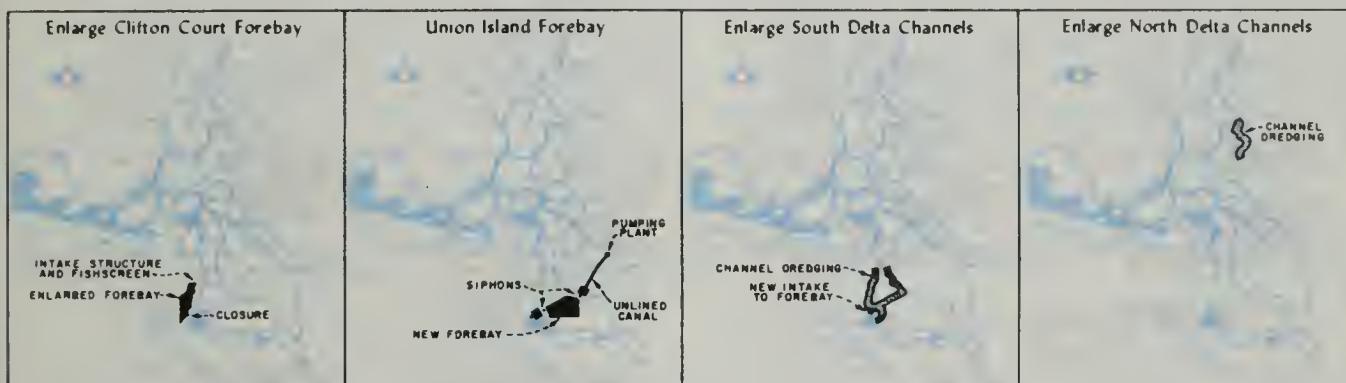


Figure B-9. Existing channel conveyance alternatives.

1. Continue Present Method. This constitutes a "No Project" alternative as it would not include any new physical works in the Delta. The impact of the "No Project" alternative was discussed previously in this appendix.

2. Enlarge Clifton Court Forebay. Doubling the capacity of the existing Clifton Court Forebay would allow more water to be diverted at high tide. This would increase the average sustained rate of export that could be made without causing excessive scour or low water problems in the southern Delta. New embankments would be constructed and existing levees improved to use a portion of Byron Tract as an additional pumping forebay. Embankments forming the western border would extend from the vicinity of Discovery Bay, south to Clifton Court Forebay. Old River would border on the east and Indian Slough on the north. Intake to

the new forebay would be in Old River at Indian Slough. Italian Slough would have to be closed. A causeway would be constructed for Highway 4.

3. Union Island Forebay. This plan would provide for 62 cubic hectometres (50,000 acre-feet) of additional active forebay storage. Water would be received from an unlined canal connection to the San Joaquin River west of Stockton. Two siphons would provide crossings of Old River and Middle River. A pumping plant would be required at the San Joaquin River to provide the necessary hydraulic head. Exports from the San Joaquin River would be isolated from the southern Delta and could be increased without excessive scour and low water problems. The plan would allow greater off-peak pumping flexibility.

4. Enlarge South Delta Channels. The south

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Delta channels could be enlarged to increase channel carrying capacity to the State and federal pumping plants and eliminate the potential for channel scour. A new forebay intake at the north end of Clifton Court would be constructed. This would increase the present dependable export capability.

5. **Enlarge North Delta Channels.** The north Delta channels could be enlarged so more water would flow through the central Delta. Reverse flow in the western Delta and commingling with saline waters would be reduced but not eliminated. The reduced reverse flows in the western Delta between Antioch and Franks Tract would be beneficial to the fishery but would not eliminate all adverse effects. This would also reduce the required Delta outflow for controlling salinity intrusion and consequently increase export yield capability. Howev-

er, with this action alone, the increase would not be enough to meet project requirements.

Modified Channel Conveyance Alternatives. Physical works could be constructed within existing Delta channels to control flow through existing, or new or enlarged, interior Delta channels. This would eliminate reverse flows near Sherman Island and commingling with the saline water in the western Delta, thereby reducing water required for salinity control and conserving water for increased project yield. Where appropriate, controlled freshwater releases would be made through channel control structures for local use, water quality control, and fish. Provisions for passage of floodflows, migrating fish, and boats would be provided where needed.

Figure B-10 illustrates these suggested modified channel conveyance alternatives. Following is a discussion of the alternatives.

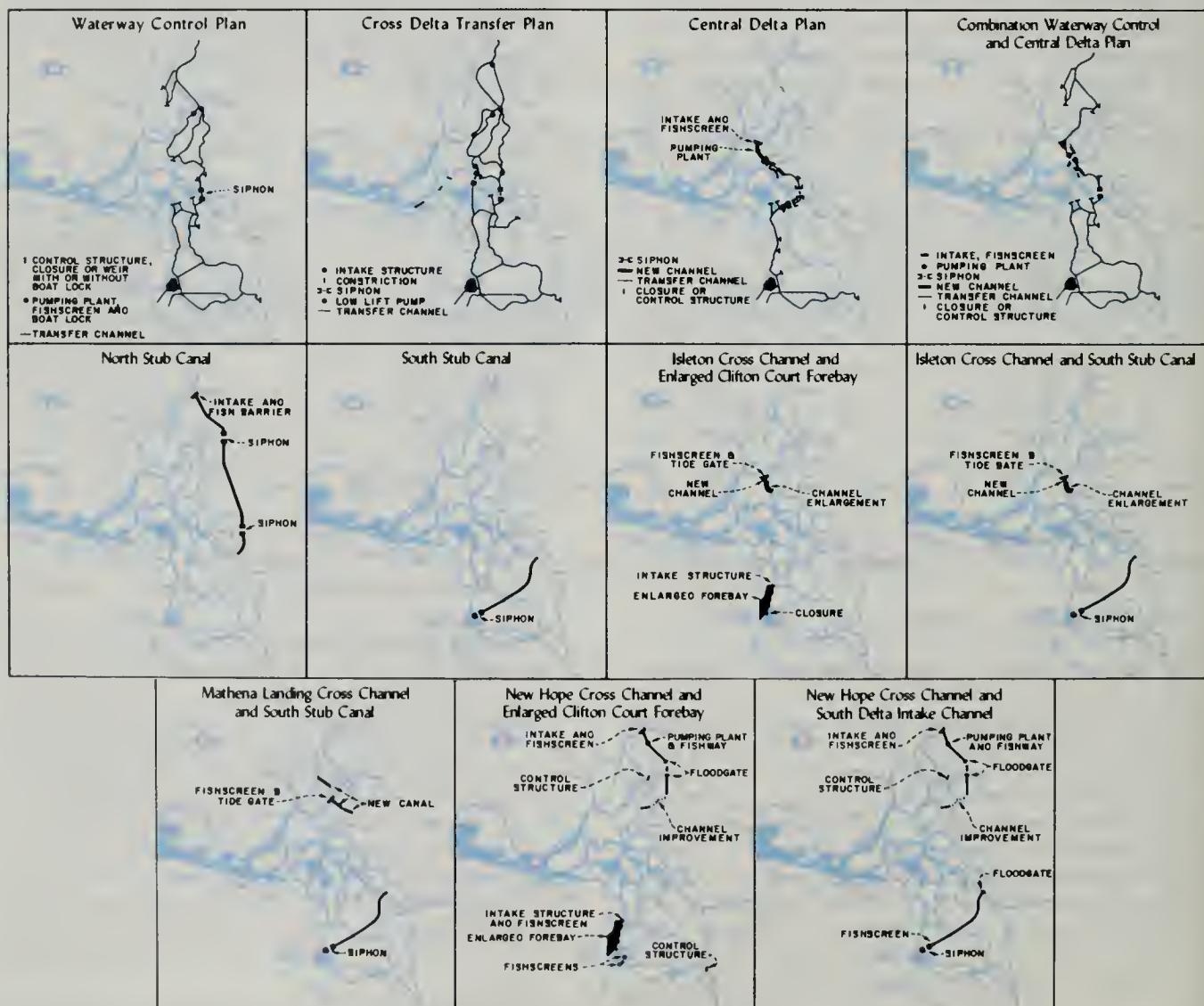


Figure B-10. Modified channel conveyance alternatives.

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1. **Waterway Control Plan.** This is an updated version of the alternative plans presented in the preliminary edition of Bulletin 76 in 1960. Delta channel structures would be constructed to hydraulically isolate about one-third of the Delta for conveying project water. Portions of the levees upstream of the channel structures would be rehabilitated to handle the higher water levels. Control structures or pumping plants would divert Sacramento River water into the Mokelumne system through the Delta Cross Channel and Georgiana Slough. The diverted water, combined with Mokelumne River flows, would be siphoned under the San Joaquin River. Middle and Old Rivers, plus other channels, would be used for conveyance from the siphon to the export pumps. The isolated channels would no longer be a part of the estuarine system. This would reduce the habitat for the existing fishery although another type fishery would evolve in these channels.
2. **Cross Delta Transfer Plan.** This plan would combine the Waterway Control Plan and the "hydraulic barrier" concept. Water would be taken into the Mokelumne River from the Sacramento River at Snodgrass Slough, the Delta Cross Channel, Georgiana Slough, and at Isleton. In all but wet years, temporary summertime structures (constrictions) would isolate the water from the San Joaquin River and two low-lift pumping plants would force water under the river in two large siphons. Middle River and Old River would then convey project water to the Delta and Tracy Pumping Plants. Constrictions would only partially isolate the transfer waters in Middle and Old Rivers from salinity intrusion in dry and critical years.
3. **Central Delta Plan.** This plan would utilize both existing waterways and new channels to transport Sacramento River water to Clifton Court Forebay and the Tracy Pumping Plant. A new channel (with pumping plant) would be constructed between the Sacramento River at Isleton and Potato Slough to transfer water to the central Delta. Siphons would be constructed to cross the Mokelumne, San Joaquin, and Middle Rivers. Control structures and closures would be used to hydraulically isolate the channels from the rest of the Delta except during flood season.
4. **Combination Waterway Control Plan and Central Delta Plan.** Features of both the Waterway Control Plan and the Central Delta Plan would be combined as part of this plan. Existing channels and new channels with siphons at major waterway crossings would be utilized to transport water from a pumping plant on the Sacramento River near Isleton to the Clifton Court Forebay inlet gates and the

Tracy Pumping Plant intake channel. Control structures and closures would be used to hydraulically isolate the channels from the Delta except during flood season.

5. **North Stub Canal.** The North Stub Canal would consist of a 39.3 kilometre (24.4 mile) canal following the Peripheral Canal alignment from Hood on the Sacramento River to the San Joaquin River. Water releases would be made into sloughs flowing into the Mokelumne River for water quality purposes. The maximum capacity of the canal would be 660 cms (23,300 cfs).

Reverse flows in the western Delta would be reduced but would continue in Old and Middle Rivers. Fish screens at the intake could provide some improvement in the Delta fishing; however, adverse effects on anadromous fish in the San Joaquin system and on resident fish in the south Delta would continue.

6. **South Stub Canal.** An isolated 19 kilometre (12 mile), 524 cms (18,500 cfs) capacity, canal would be constructed essentially along the Peripheral Canal alignment between the San Joaquin River and Clifton Court Forebay. Water releases would be made into Middle River south of the canal for water quality purposes.

Reverse flows in Old and Middle Rivers would be eliminated but reversal would continue in the western Delta and extend further into the eastern Delta. Fish in the south Delta would not be subject to the effect of the pumps, but adverse effects on anadromous fish in the San Joaquin River system would continue.

7. **Isleton Cross Channel and Enlarged Clifton Court Forebay.** A channel, 1,860 metres (6,100 feet) long, would be constructed between the Sacramento River at Isleton and Georgiana Slough to transfer more water through the central Delta and reduce reverse flow and salt pickup in the western Delta. The channel would be designed to handle a maximum tidal and transfer flow of 780 cms (25,000 cfs) at a maximum average velocity of 0.8 metres (2.5 feet) per second, with a net flow of about 280 cms (10,000 cfs). The intake works would include control gates for tidal pumping and fish screens. Georgiana Slough would be widened between the canal and the South Fork of the Mokelumne River. Clifton Court Forebay would be enlarged (using a portion of Byron Tract) for additional capacity, and some south Delta channels would be dredged to increase conveyance capability. This plan would eliminate reverse flow near Sherman Island but not in Middle and Old Rivers. Fishery problems would be partially solved.

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8. **Isleton Cross Channel and South Stub Canal.** This plan would combine the construction of the Isleton Cross Channel with the South Stub Canal. The South Stub Canal would receive water routed through the Delta by the Isleton Cross Channel and the San Joaquin River and would convey it to Clifton Court Forebay. It would include an in-channel fish screen and collection facility. Some reverse flows would be eliminated and fishery problems partially solved.
9. **Mathena Landing Cross Channel and South Stub Canal.** Construction of the Mathena Landing Cross Channel would be combined with the South Stub Canal to provide for the transfer of water through the Delta. Reverse flow near Sherman Island would be eliminated, but reverse flows in the San Joaquin River would remain. Fishery problems would be partially solved. This plan could be staged and at a later date converted to an isolated system similar to the Peripheral Canal with the construction of 26 kilometres (16 miles) of canal, 5 additional siphons, and a pumping plant.
10. **New Hope Cross Channel and Enlarged Clifton Court Forebay.** The New Hope Cross Channel was introduced as an alternative north Delta transfer facility late in the evaluation process after initial screening of alternative components was completed. The New Hope Cross Channel would consist of a 19.8 kilometre (12.3 mile) canal following the Peripheral Canal alignment from Hood on the Sacramento River to Beaver Slough. Water would be discharged into the Mokelumne River, Lost Slough, and enlarged Beaver Slough. The South Fork of the Mokelumne River would be enlarged and a 2,400 metre (8,000 foot) channel constructed across Staten Island to allow a portion of the transfer water to be conveyed to the North Fork of the Mokelumne River. The Delta Cross Channel must be closed and a boat lock structure provided for recreational boat passage.
The initial capacity of this canal would be 470 cms (16,500 cfs) and would require pumping. Lost Slough and the Mokelumne River would be crossed by the canal in open channel section. Approximately 130 cms (4,500 cfs) would be released into Lost Slough and 42 cms (1,500 cfs) into the Mokelumne River. About 310 cms (11,000 cfs) would be conveyed through the balance of the canal to Beaver Slough and the South Fork of the Mokelumne River. The canal across Staten Island would carry approximately 180 cms (6,500 cfs) to the North Fork of the Mokelumne River.

Flood flows from Stone Lake would be passed over the canal upstream of the pumping plant and into Snodgrass Slough with a gated weir. Between Lost Slough and the Mokelumne River, the existing floodway cannot be blocked, so the canal embankment would be designed for overtopping by the floodwaters. Floodgates would be constructed in the canal upstream of Lost Slough and downstream of the Mokelumne River to protect the canal embankments on either side of the floodway. Enlarged Clifton Court Forebay would provide additional storage capacity up to two times that of the existing facility. There would be an additional intake on Old River near Indian Slough. This facility would provide more active storage to achieve greater operational flexibility and would reduce the probability of scour in portions of Old River.

A large fish screen would be required at the intake to the New Hope Cross Channel, and provisions for a facility to return upstream migrating fish from the canal to the Sacramento River would be included. Fish screens would be constructed at both intakes to the forebay. A more efficient type fish collector system would be required in the Delta Mendota Intake Channel as the USBR would continue pumping directly from the Delta. Reverse flows around Sherman Island would be eliminated, but some reverse flows in the central Delta would continue. Some fishery problems would continue.

This combination of facilities could be converted in the future to an isolated water transfer system by construction of 43 kilometres (27 miles) of new canal from the end of the New Hope Cross Channel at Beaver Slough to the Forebay. This isolated system would involve the construction of three siphons, several road relocations and bridge crossings, and eleven water quality release structures. It would require abandonment of the fishway and collection system near the pumping plant, the canal across Staten Island, the fish screens at the Forebay intake and the Delta Mendota Canal, and the floodgates. An isolated facility would eliminate reverse flows except for that resulting from releases into Middle River and would provide adequate protection for fish.

11. **New Hope Cross Channel and South Delta Intake Channel.** This nonisolated Delta water transfer facility would combine the New Hope Cross Channel with a South Delta Intake Channel. The South Delta Intake Channel would be similar to the South Stub Canal and was so designated at the same time the New Hope Cross Channel was introduced into the study. Fish screens would be required in both the in-

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takes to the New Hope Cross Channel and South Delta Intake Channel. Reverse flows around Sherman Island would be eliminated, but a large reverse flow in the San Joaquin River would continue. Fish survival would be somewhat improved.

Since the New Hope Cross Channel and South Delta Intake Channel are essentially similar to the north and south stubs of the Peripheral Canal, future conversion to a fully isolated system would be hydraulically possible. A 22.0 kilometre (13.7 mile) canal similar in cross section and alignment to the Peripheral Canal would be constructed between Beaver Slough and the San Joaquin River along with appurtenant water quality turnouts, drainage structures, and bridges. In addition, the fish screen at the intake and the pumping plant would be enlarged to a capacity of 620 cms (21,800 cfs) and a siphon constructed at the Mokelumne River. Removal of the fishway louver system and the channel across Staten Island would also be required. Future isolation would eliminate reverse flows, except in Middle River, and would improve the fishery resources.

Isolated Channel Conveyance Alternatives.

This concept involves construction of a new canal to transfer water around or across the Delta without using existing Delta channels. The canal would release fresh water to Delta channels at strategic locations for Delta use, water quality control, and fish.

Canal releases would provide positive downstream flows in Delta channels and would contribute to the outflow required for protecting the Delta from salinity intrusion. By eliminating reverse flows in the western Delta, this concept would reduce the amount of water needed for salinity control and thus conserve water for increased project yield. Provisions for passage of floodflows, migrating fish, and boats would be provided.

Figure B-11 shows the eight isolated channel conveyance alternatives considered in this study. The Peripheral Canal concept became part of the selected course of action and is described in Chapter V. Following is a brief description of those alternatives not included in the selected plan.

1. ***East Delta Canal.*** The East Delta Canal was identified as an alternative Peripheral Canal alignment. The diversion point for this canal would be approximately 27 river kilometres (17 river miles) downstream from Hood. Flow distributions would be approximately the same as the Peripheral Canal.
2. ***East Central Delta Canal.*** Another alternative Peripheral Canal alignment was identified as the East Central Delta Canal. The diversion point would be approximately 29 river kilometres (18 river miles) downstream from Hood. Flow distributions in the Delta and the effect on Delta fisheries would be similar to those for the East Delta Canal.
3. ***Central Delta Canal.*** Water would be

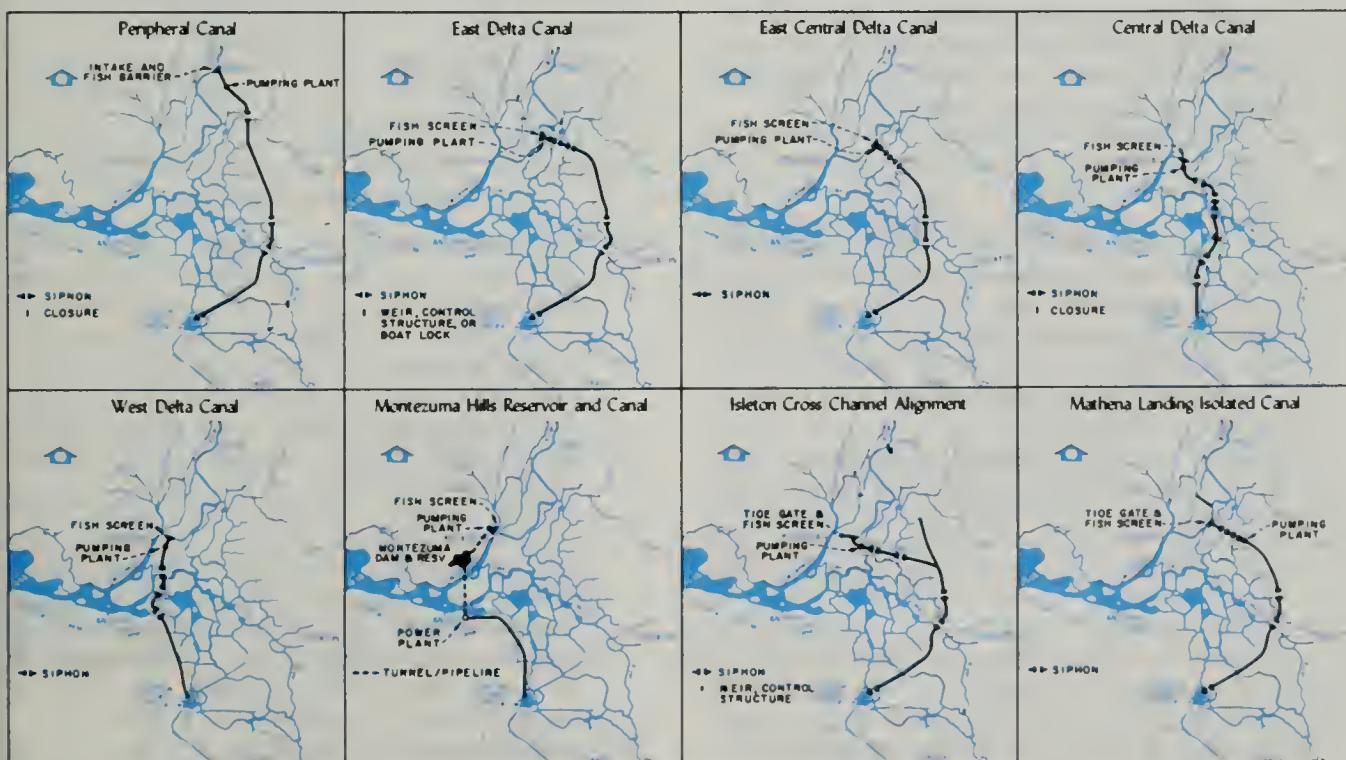


Figure B-11. Isolated channel conveyance alternatives.

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diverted at Isleton, pumped into a 510 cms (18,000 cfs) capacity canal, and would traverse several central Delta islands to Clifton Court Forebay. Other physical features would include fish screens, bridges, siphons, water release structures, and closures.

Compared to the Peripheral Canal, releases to the Delta channels would not be as effective in controlling water quality throughout the Delta; and many of the canal bank foundations would be on deep peat.

4. **West Delta Canal.** Water would be diverted at Isleton into a 510 cms (18,000 cfs) capacity canal and would traverse several western Delta islands for transport to Clifton Court Forebay. A fish screen, bridges, three siphons, and structures to release water into upper Snodgrass Slough from the Sacramento River and into Old River from Clifton Court Forebay would be included. This canal would not be as effective as the Peripheral Canal in controlling water quality and in providing for fish protection.
5. **Montezuma Hills Reservoir and Canal.** Two variations of this plan were identified—one with and one without a storage reservoir. Under the first variation, water would be diverted from the Sacramento River adjacent to north Rio Vista and pumped into a 430 cubic hectometre (350,000 acre-foot) reservoir in the Montezuma Hills. The reservoir would supply projects during periods of diversion curtailment. Water would pass from the reservoir through a tunnel and pipeline across the Sacramento and San Joaquin Rivers to a power plant near Antioch which would utilize excess energy head. A canal would convey water to Clifton Court Forebay.

Under the second variation, water would be transported in a concrete lined canal to the vicinity of Montezuma Hills, then siphoned through pipelines under the Sacramento and San Joaquin Rivers to an energy dissipation structure near Antioch. An unlined canal would carry the water to Clifton Court Forebay. Provisions to release water into Old River from Clifton Court Forebay would be included. Some measure of water quality control and fish protection would result.

6. **Isleton Cross Channel Alignment.** This plan is the isolated version of the Isleton Cross Channel and South Stub Canal combination previously discussed. The intake structure and fish screens would be just downstream of the town of Isleton.

Through associated works, water release facilities could be included for the eastern dead-end sloughs and Snodgrass Slough. Control structures with boat locks would be required in Steamboat, Miner, and Georgiana Sloughs. Reversed flows in the western Delta would be

eliminated. There would be improvement in fish and wildlife protection, but boating would be impaired in the closed channels. This plan would also provide flood control for Isleton.

7. **Mathena Landing Isolated Canal.** Connection of the Mathena Landing Cross Channel and the South Stub Canal would result in an isolated Delta transfer facility that would function in a manner similar to the Peripheral Canal. Conversion to an isolated canal would involve approximately 24 kilometres (15 miles) of canal, several siphons, water quality release structures, and the abandonment of the flood and control gates and the fish screen and collection facility in the South Stub Canal. Reverse flows would be eliminated, and there would be an improvement to the Delta fisheries.

Modified and Isolated Channel Conveyance Alternatives. Following is a description of two variations of this concept that could shunt a portion of the export water around the Delta by modifying existing channels and constructing new canal conveyance facilities (Figure B-12).

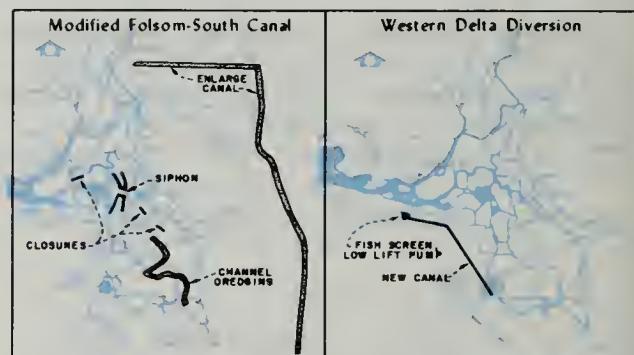


Figure B-12. Modified and isolated channel conveyance alternatives.

1. **Modified Folsom South Canal.** The proposed Hood-Clay Connection and the Folsom South Canal of the CVP could be enlarged to divert 110 cms (3,800 cfs) for release down the Mokelumne, Calaveras, and Stanislaus Rivers. Construction in the Delta would include channel closures, channel improvements, and a siphon under the San Joaquin for the Mokelumne River to control water transfer through existing channels. As proposed by the Central Delta Water Agency, this plan would limit CVP and SWP export pumping to 180 cms (6,300 cfs) during controlled flow periods, which would cause excessive impacts on Delta exports. This plan would correct some of the reverse flows in the Delta, but would not appreciably improve the conditions for migrating fish.

2. **Western Delta Diversion.** Export water could be diverted at a point in the western Delta

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just west of Antioch into a canal to convey water along the western edge of the Delta to Clifton Court Forebay. Facilities would include low lift pumps, a fish screen, and a canal with a capacity of approximately 540 cms (19,000 cfs) for export. A channel would be constructed between the Tracy Pumping Plant and Clifton Court Forebay to provide a connection for federal export water. This plan would not eliminate reverse flows in the western Delta. Because diversions would be from the center of the striped bass spawning and nursery area, this plan would not improve conditions for fish.

Physical Barrier Alternatives. This concept would involve the construction of a low level dam to separate fresh water from the saline tidal waters. The Delta channels containing the freshwater pool would serve as a water supply source for local Delta uses, as well as provide for an enclosed conveyance facility to transfer water to the State and federal export pumps in the southern Delta.

Three physical barriers have been studied; one located near Chipps Island, one in the Carquinez Strait at Dillon Point, and one at the head of San Pablo Bay. These three barriers have the following common environmental concerns: uncertainties of water quality (eutrophication) in the barrier pool; possible adverse impacts on fish and wildlife resulting from loss of tidal currents; steady flow toward the SWP and CVP pumps; and elimination of the gradual salt to freshwater transition zone important to anadromous fish species.

The U.S. Corps of Engineers is also studying a submerged barrier in Carquinez Strait to offset saltwater intrusion that could be caused by the proposed deepening and straightening of existing ship channels.

Location of these barrier sites is shown in Figure B-13.

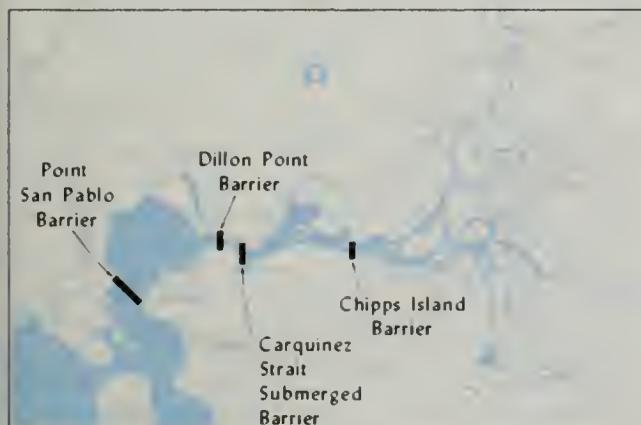


Figure B-13. Physical barrier alternatives.

1. **Chipps Island Barrier.** This plan includes a physical barrier across the Sacramento River at Chipps Island in the western Delta, closure of

Montezuma Slough and Spoonbill Creek, improved levees adjacent to barrier, and associated features for navigation, flood control, and fish passage. Many waste discharges presently entering the Delta would have to be transported downstream from the barrier.

2. **Dillon Point Barrier.** This plan includes a physical barrier across Carquinez Strait between Crockett and Benicia, and associated features for navigation, flood control, and fish passage. Wastes presently being discharged into the Delta and Suisun Bay would have to be transported downstream from the barrier.

3. **Point San Pablo Barrier.** This plan includes a physical barrier across San Pablo Strait separating San Francisco and San Pablo Bays and associated features for navigation, flood control, and fish passage. Waste presently discharged into the Delta, Suisun Bay, and San Pablo Bay would have to be transported downstream from the barrier.

4. **Submerged Barrier in Carquinez Strait.** U.S. Corps of Engineers' hydraulic model tests show that deepening of the Baldwin and Stockton Deep Water Ship Channels would cause increased salinity intrusion into the interior Delta. To mitigate this effect, the Corps has proposed a submerged barrier in Carquinez Strait to block off the heavier saline water that would otherwise intrude upstream through the deepened channel. Further tests are planned by the Corps to evaluate water quality and the effects on floodflows, fish, sediment, and nutrients. Since the submerged barrier would basically provide for mitigation for the ship channel project, it would be common to all alternative Delta transfer facilities and was not included in the Department's plan.

Facilities South of the Delta

New off-stream storage reservoirs and available ground water storage capacity south of the Delta, offer substantial opportunity to increase dependable yield from the SWP and CVP by maximizing the use of the California Aqueduct facilities. Use of such storage could conserve excess Delta inflow during wet periods to provide an uninterrupted supply of water south of the Delta during periods of low inflow. Potential ground water and off-stream surface storage sites that were considered during this study, including those that became part of the selected plan, are shown in Figure B-14.

Off-Stream Surface Storage. The SWP and CVP aqueducts or other connections to the Delta could be used for filling off-stream surface storage reservoirs south of the Delta during periods of high inflow to the Delta. During low inflow periods, re-

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Figure B-14. Potential surface and ground water storage sites.

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leases from these reservoirs would be made through the aqueducts to supply water to the south. Off-stream storage south of the Delta would improve the operational flexibility of the SWP and the CVP and add to the reliability of the two systems.

Off-stream storage reservoirs that could be supplied from existing aqueducts would be on the west side of the San Joaquin Valley. Following is a description of alternative off-stream storage facilities south of the Delta that were considered during the study but not included in the selected plan.

1. ***Los Banos Grandes-Los Vaqueros Combination Reservoirs.*** The Los Vaqueros Reservoir and the Los Banos Grandes Reservoir, as an alternative to Los Vaqueros, are discussed in Chapter V of the report as part of the selected course of action. The combination of these two off-stream reservoirs was also included in the alternatives study. The Los Vaqueros and Los Banos Grandes Reservoirs could be operated in tandem to produce a combined dry period yield of 490 cubic hectometres (400,000 acre-feet) per year. The operation sequence would be similar to that of the individual reservoirs except the pump-generating capacity of the Los Vaqueros Reservoir complex would be increased to allow the capture of more of the winter flows as they were subsequently transferred to Los Banos Grandes for long-term storage.
2. ***Sunflower Reservoir.*** The Sunflower Reservoir site would be on Avenal Creek approximately 3 kilometres (2 miles) west of the Coastal Branch of the California Aqueduct on the Kings-Kern County line. Preliminary design studies have indicated this reservoir would provide only 740 cubic hectometres (600,000 acre-feet) of storage and a yield of 74 cubic hectometres (60,000 acre-feet) per year. Recent development of underlying oil reserves has increased the land values and decreased the feasibility of the site for off-stream storage.

Additional Supply North of the Delta

Increasing the regulated supply of water reaching the Delta could reduce the effects of increasing exports by providing more water to the Delta during the dry years. Many actions and alternative facilities were considered during the study to increase water supplies north of the Delta, and several of these were included in the selected plan as discussed in Chapter V. Figure B-14 shows the general locations of the alternative ground and surface storage facilities considered. Following is a discussion of the actions and alternative storage facilities not included in the selected plan.

Revise Operation of the SWP and CVP Reservoirs.

Operation of the SWP and CVP reservoirs

(that supply water to the Delta) below the present minimum pool elevations could increase water yield, but it would have some adverse effects. A serious effect of this type of operation would be the loss of dependable power capacity and the associated increases in net costs. Loss of power capacity at Oroville's Hyatt Power Plant alone would be 305 megawatts, with a commensurate increased annual cost to the State of \$7.3 million in penalties. In addition, operation of Lake Oroville below the minimum pool elevation would increase maintenance costs due to increased cavitation in the turbines. Maximizing water yield at CVP reservoirs would result in a loss of power capability from between 120 and 150 megawatts.

Water associated recreation at all these lakes would be reduced, particularly during dry years. Boat ramps would need to be extended and other recreation facilities revamped. There would also be adverse effects on the fisheries.

Weather Modification. Augmenting precipitation by cloud seeding with artificial nuclei, particularly in the Sierra Nevada, may offer long-range possibilities for increasing water supplies. Several weather modification projects are in operation in California, but significant questions remain as to their effectiveness. Continuing research on seeding techniques and effectiveness, legal relationships, and social and environmental effects may advance sufficiently so that future application may be a feasible supplement to the California water supply. In the meantime, Assembly Bill 3161 (Gualco), currently being considered by the Legislature, would increase the authority of DWR to regulate all cloud seeding operations in the State.

Long-Range Weather Forecasting. Existing project yield could be increased if reservoir inflow could be reliably predicted at least one year in advance. At present, long-range forecasts are considered experimental and cannot be relied upon to determine reservoir operating procedures.

Purchase Dry Year Supplies. The Sacramento Valley supports a large annual rice crop. Growing and storing surplus grain during wet and normal years would make it possible to tap the stored surplus grain during dry years and reduce rice plantings, thereby reducing water needs. Water saved could then be sold to the CVP and SWP for use in meeting Delta requirements. This suggested plan is still being studied by DWR as a possible drought emergency measure, but was not included in the selected plan.

Purchase Interim Water Supplies from the Central Valley Project. Some additional water for the SWP during the earlier years could be purchased from the CVP, thereby delaying the need for additional SWP facilities. Although this might pro-

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vide for partial, short-term water supplies to the SWP, it would not contribute to long-term water supply. This approach will continue to be studied as part of the coordinated operation of the two projects.

Sacramento Valley Surface Water Storage.

Most of the undeveloped runoff in the Sacramento Valley comes from tributaries to the Sacramento River between Shasta Dam and Hamilton City. In addition, substantial flood control releases are made from Shasta Reservoir in most years. These releases, together with uncontrolled runoff, are often surplus to downstream needs and thus could support new reservoir storage developments.

Table B-10 lists the potential Sacramento Valley reservoirs that were considered. The first group

would develop tributary streams. The second group would divert surplus flows into off-stream storage reservoirs. These would develop portions of both the tributary runoff and the flood control releases from Shasta Reservoir. The third is an enlargement of Shasta Reservoir on the Sacramento River.

To some extent the reservoirs listed in Table B-10 depend on the same water supplies. Therefore, there is an upper limit of potential for additional yield development from the Sacramento Valley; that is, the potential yield from the individual reservoirs shown is not directly accumulative. Based on preliminary appraisal, the surplus storage reservoirs included in the selected plan (see Chapter V) were considered the best of those reviewed to develop the potential additional yield from the Sacramento Valley.

TABLE B-10
SACRAMENTO VALLEY SURFACE WATER STORAGE POSSIBILITIES

Potential Reservoir	Stream	Approximate Gross Storage Capacity		Approximate New Annual Yield Potential ³	
		Cubic Kilometres	(Million acre-feet)	Cubic Kilometres	(Million acre-feet)
Tributary Storage					
Cottonwood Creek Project ⁴					
Dutch Gulch.....	Cottonwood Creek	1.36	(1.10)	0.25	(.20)
Tehama	South Fork Cottonwood Creek	1.11	(.90)		
Millville	South Fork Cow Creek	0.30	(.24)		
Wing	Inks Creek ¹	0.57	(.46)		
Schoenfield	Red Bank Creek	0.22	(.18)		
Gallatin	Elder Creek	0.46	(.37)		
Newville	North Fork Stony Creek ²	1.97	(1.60)	0.83	(.67)
Rancheria	Stony Creek	1.48	(1.20)		
Marysville	Yuba River	1.23	(1.00)		
Nashville	Cosumnes River	1.11	(.90)		
Offstream Storage					
Tuscan Buttes	Inks Creek	6.78	(5.50)	0.79	(.64)
Glenn ⁴	Stony and North Fork Stony Creeks ²	10.73	(8.70)	1.23	(1.00)
Colusa ⁴	Various westside streams	3.95	(3.20)	0.57	(.46)
Enlarged Berryessa	Putah Creek	12.34	(10.00)	1.23	(1.00)
Mainstream Storage					
Enlarged Shasta	Sacramento River	17.02	(13.80)	1.23	(1.00)

¹ Plus diversions from Battle and Paynes Creeks.

² Plus diversion from Thomas Creek.

³ Measured as inflow to the Delta. Without a Delta Transfer Facility in operation the yield available for SWP and CVP diversions would be less because some of this water would be required for additional salinity control.

⁴ Included in selected plan.

Sacramento Valley Ground Water Storage.

The Sacramento Valley ground water basin is the largest north of the Delta. This 13,000 square kilometre (5,000 square mile) area has an estimated usable storage capacity of 35 cubic kilometres (28 million acre-feet) between depths of 6 and 60 metres (20 and 200 feet). Because this area has abundant surface water supplies, ground water is not used to its full potential. There is the potential to extract annually (with subsequent recharge) more than the approximately 2.5 cubic kilometres (2 million acre-feet)

that was pumped in 1970, especially during critical and dry years. Two ground water basins were identified as having potential for development. However, people in the Sacramento Valley vigorously opposed development of ground water in that area to help meet SWP water needs and the development of these two ground water basins was not included in the selected plan.

1. **Stony Creek Fan Basin.** The Stony Creek Fan, in the Orland area, is one of the most absorptive ground water areas in the Sacramento

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Valley. It accounts for 21 percent of the total natural recharge to the Sacramento Valley ground water basin, according to model studies by the United States Geological Survey (USGS). In 1970, approximately 220 cubic hectometres (180,000 acre-feet) was pumped from the entire fan area for irrigation use.

The Glenn-Colusa Canal crosses the lower portion of the fan and delivers water diverted from the Sacramento River to all lands between the canal and the Sacramento River. Over 370 cubic hectometres (300,000 acre-feet) of surface water is utilized in Glenn County on lands within the Glenn-Colusa Irrigation District.

Additional ground water development from a planned well field upslope from the canal and within the boundaries of the Glenn-Colusa Irrigation District is possible. Pumpage in dry years of up to 280 cubic hectometres (225,000 acre-feet) per year (6 months of pumpage) of additional ground water could be exchanged for an equal amount of diverted surface water. Ground water would be replenished by natural recharge during wet years. Artificial recharge projects could be implemented in the upper fan area to augment natural recharge.

2. **Thermalito Basin.** The Thermalito ground water area has over 4.9 cubic kilometres (4 million acre-feet) of water in storage to depths of 150 metres (500 feet). This basin extends from Thermalito Afterbay west to Butte Creek and south to Sutter Buttes. There is at present little ground water pumpage except near the Feather River and in an area of about 31 square kilometres (12 square miles) near Butte Creek.

A planned well field within and adjacent to the areas of use could develop about 300 cubic hectometres (250,000 acre-feet) of water per year (6 months pumpage). This would be about one-half of the irrigation demand from Thermalito Afterbay for the area north of Sutter Buttes; and, if exchanged for an equal amount of water from Thermalito, would make available 300 cubic hectometres (250,000 acre-feet) at the Delta in dry years.

The resulting pumping depressions would induce natural recharge through subsurface inflow from adjacent areas. The time required to completely recharge the area after pumping

ceased is unknown, but might be many years. Artificial recharge possibilities to replenish the basin at a greater rate do not appear to exist.

Water levels in adjacent areas of use would be significantly lower and would result in increased pumping costs to well owners. Some wells might have to be deepened at project expense. Land subsidence in the pumping areas is also a possible consequence.

Importation from North Coast Rivers. The 1972 California Wild and Scenic Rivers legislation places the Eel River, along with other North Coast rivers, into the wild rivers system and requires DWR to report to the Legislature by December 20, 1984, on whether the Eel River should be removed from the system. In light of the requirement for a December 1984 report by DWR, two reservoirs on the Eel River were considered: Dos Rios Reservoir and English Ridge Reservoir.

1. **Dos Rios Reservoir.** The proposed 9.4 cubic kilometre (7.6 million acre-foot) capacity Dos Rios Reservoir would be formed by a 223-metre (730-foot) high earthfill dam on the middle fork of the Eel River near Dos Rios. The increased project yield at the Delta from this facility would be 1150 cubic hectometres (930,000 acre-feet) per year during a critical period. Water could be transported from the Dos Rios Reservoir to the Sacramento River by the construction of a 37 kilometre (23 mile) tunnel to allow water to discharge into Stony Creek and the existing Black Butte Reservoir or a new Glenn Reservoir, and from there through a new canal to the Sacramento River. It could also be transported through a more southerly route via Clear Lake.

2. **English Ridge Reservoir.** Another alternative development on the Eel River is the English Ridge Reservoir which would be above Outlet Creek. This 2.2 cubic kilometre (1.8 million acre-foot) capacity reservoir would be formed by a 168-metre (550-foot) high earthfill dam. The critical period yield at the Delta from this facility would be about 250 cubic hectometres (200,000 acre-feet).

In addition to being illegal, there is no need to develop any North Coast rivers to meet project needs through the year 2000. Therefore, these projects were rejected.

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APPENDIX C

**SYNOPSIS OF PREVIOUS STUDIES
RELATED TO DELTA ALTERNATIVES**

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SYNOPSIS OF PREVIOUS STUDIES RELATED TO DELTA ALTERNATIVES

Salinity intrusion into the Delta, which was recorded in 1841 and 1871, was recognized by the early settlers as a potential problem to water supplies, and a salt water barrier was first proposed in the 1860's (DWR preliminary Edition Bulletin No. 76, "Delta Water Facilities", December 1960, p.4). Since that time, there have been numerous studies of means for controlling salinity intrusion and otherwise improving our ability to manage the water resources of the Delta for the benefit of all Californians. This is a résumé of those studies.

WHEN: 1879-1880

WHO: State Engineer, William Hamilton Hall

WHAT, WHERE, WHY: Flood Control Barrier in the vicinity of Carquinez Strait to check upstream tidal flow and replace the tidal prism with flood water formerly stored in the natural basins upstream.

CONCLUSIONS, RECOMMENDATIONS, OR FINDINGS: Construction of weir across the strait was feasible, but storage within tidal prism was not sufficient to lower flood plain. It would, in fact, raise the flood plain.

REFERENCE DOCUMENT: Discussions, reports and recommendations of C. E. Grunsky, November 1929, reproduced by Weber Foundation, September 1, 1952.

WHEN: 1919

WHO: Colonel Robert Bradford Marshall

WHAT, WHERE, WHY: As part of his plan for the full and fair distribution of the State's water resources to all the people of the State, development of a storage reservoir with sufficient water to meet local irrigation needs and in the interim, hold back salt water from the Delta in the dry season. This would be followed by building a dam and lock (physical barrier) at Army Point (east end of Carquinez Strait) to protect forever the Delta from salt water intrusion and permit diversion (into canals) of water being used to hold back the salt water.

CONCLUSION, RECOMMENDATION, OR FINDINGS: To make complete survey of all possible reservoir sites; to determine the practical maximum amount of water available for development; and to enact legislation to put it into effect.

REFERENCE DOCUMENT: Letters and newspaper clippings on file in Central Records of Department of Water Resources.

WHEN: 1921

WHO: Captain C. S. Jarvis, U.S. Army Corps of Engineers

WHAT, WHERE, WHY: Considered six alternative sites for saltwater barriers in the Bay system—Chipps Island, Army Point, Point San Pablo, Point Richmond, and two alignments outside the Golden Gate.

CONCLUSIONS, RECOMMENDATIONS, OR FINDINGS: Barrier at Chipps Island with movable crest and multiple locks for flood and salinity control. Cited advantages were: a positive barrier against saltwater intrusion; agricultural development of interior valleys; and increased depth of navigable channel to Stockton and Sacramento.

REFERENCE DOCUMENT: Jarvis, Captain C. S., U.S. Army Corps of Engineers, "Control of Flood and Tidal Flow in the Sacramento and San Joaquin Rivers, California", ASCE Transactions, Vol. 84, Paper No. 1472, 1921.

WHEN: 1924-1928

WHO: Walker R. Young, U.S. Bureau of Reclamation; in cooperation, State of California, Division of Engineering and Irrigation, and the Sacramento Valley Development Association.

WHAT, WHERE, WHY: Considered four alternative saltwater barriers at Army Point, Dillon Point, Benicia, and Point San Pablo to store fresh water and permit water from the Sacramento River to be carried across the Delta for use in the San Joaquin Valley without fear of saltwater encroachment. No economic analysis was made.

CONCLUSIONS, RECOMMENDATIONS OR FINDINGS: Construction of a saltwater barrier at any one of the four sites is physically feasible. Without a barrier, salinity conditions in the Delta will become more acute unless mountain storage is provided to be released during periods of low river discharge. Delta lands would be better off with a barrier than without it.

REFERENCE DOCUMENTS: T. H. Means, Consulting Engineer, "Saltwater Problem, San Francisco Bay and Delta of the Sacramento and San Joaquin Rivers", April, 1928; and California Department of Water Resources, Preliminary Edition Bulletin 76, "Delta Water Facilities", p.4, December 1960.

WHEN: 1929-1931

WHO: State of California, Division of Water Resources

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WHAT, WHERE, WHY: A study of the economic aspects of a saltwater barrier. Considered the effect of a barrier on present and future developments in the upper San Francisco Bay and Sacramento-San Joaquin Delta regions, and considered alternate plans of serving the needs of these, the regions with and without a barrier.

CONCLUSION, RECOMMENDATIONS, OR FINDINGS: It was concluded that it was not economically justifiable to construct a barrier. With conditions of upstream water use at that time, it was concluded that the most economical solution to salinity intrusion and provisions of adequate water supplies in the Delta could be achieved by constructing upstream storage and controlling rates of outflow during periods of insufficient natural outflow.

REFERENCE DOCUMENTS: California Division of Water Resources, Reports on the State Water Plan, Bulletin No. 28, "Economic Aspects of a Saltwater Barrier", 1931; and California Department of Water Resources, Preliminary Edition Bulletin No. 76, "Delta Water Facilities", p.4, December 1960.

WHEN: 1929-1931

WHO: California Division of Water Resources

WHAT, WHERE, WHY: An intensive study of the occurrence and variation of salinity in the upper San Francisco Bay and the Sacramento-San Joaquin Delta. Study includes the basic factors of stream flow and tidal action as they affect salinity and its variation.

CONCLUSIONS, RECOMMENDATIONS, OR FINDINGS: Invasion of salinity as far as the lower end of the Delta is a natural phenomenon, which in varying degree has occurred each year as far back as historical records reveal. It was also concluded that the Delta could be protected from salinity intrusion and be assured of an ample and dependable water supply if mountain storage reservoirs were used to provide a controlled rate of outflow from the Delta.

REFERENCE DOCUMENTS: California Division of Water Resources, Reports on the State Water Plan, Bulletin No. 27, "Variation and Control of Salinity in the Sacramento-San Joaquin Delta and Upper San Francisco Bay", 1931; and California Department of Water Resources, Preliminary Edition Bulletin No. 76, "Delta Water Facilities", p.4, December 1960.

WHEN: 1929-1931

WHO: State of California, Division of Water Resources

WHAT, WHERE, WHY: Delta Cross-Channel Study of two alternative plans to facilitate water conveyance across the Delta for use in the San Joaquin Basin as part of the original State Water Plan (now CVP).

CONCLUSION, RECOMMENDATIONS, OR FINDINGS: Construction of a new channel (with control headgates) from the Sacramento River into the head of Snodgrass Slough, enlargement of some existing channels and construction of a diversion dam, (equipped with navigation locks) across the Sacramento River to provide positive operation.

REFERENCE DOCUMENT: California Division of Water Resources, Reports on the State Water Plan, Bulletin No. 29, "San Joaquin River Basin", 1931 (p.288).

WHEN: 1939-1950

WHO: U.S. Bureau of Reclamation, in collaboration with the State of California

WHAT, WHERE, WHY: Studies of a number of alternative plans for a Delta Cross-Canal as part of the CVP. Included among these alternatives was a proposal to construct a closed conduit around the eastern edge of the Delta, with headworks on the Sacramento River near Freeport. The conduit was to be siphoned under the Mokelumne River, Stockton Deep Water Channel, Middle River and Paradise Cut and discharge directly into the Headworks of the Delta-Mendota Canal.

CONCLUSION, RECOMMENDATION, OR FINDINGS: It was concluded that: (1) the construction of additional cross-cut channels to augment the capacity of the natural channels for the transfer of water from the Sacramento River across the Delta was required; and (2) that the site for the initial cross-cut would be on the left bank of the Sacramento River between the towns of Locke and Walnut Grove—the site of the present Delta Cross Channel which was completed in 1951.

REFERENCE DOCUMENT: California Division of Water Resources reports titled, "Hydraulics and Comparative Costs of Alternative Plans for the Sacramento-San Joaquin Delta Cross Channel," July 1950.

WHEN: 1946

WHO: John M. Reber

WHAT, WHERE, WHY: The Reber Plan—a multiple-purpose barrier project for development of San Francisco Bay comprised of a north barrier between Castro Point and San Quentin, and a south barrier from Rincon Point in San Francisco to an offshore barrier fill in the east bay which would form the westside of a connecting waterway between the two barrier pools. Navigation locks would accommodate traffic to inland ports. Project purposes include: Formation of fresh water lakes for salinity control and water conservation, and transbay highway crossings at the barrier sites.

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CONCLUSIONS, RECOMMENDATIONS, OR FINDINGS: Although the plan had many proponents, no formal feasibility report was prepared by Reber. Later studies found the plan infeasible, largely due to economics.
REFERENCE DOCUMENT: L. H. Nishkian, "Report on the Reber Plan and Bay Land Crossing", to Joint Army-Navy Board, August, 1946; Division of Water Resources, "Barriers in the San Francisco Bay System", March 1955.

WHEN: 1949-1951

WHO: Special State Legislative Committee—"Interim Fact-Finding Committee on Tideland Reclamation and Development in Northern California, Related Traffic Problems and Relief of Congestion on Transbay Crossings" (R. J. Dolwig Committee).

WHAT, WHERE, WHY: The Committee conducted public hearings on the San Francisco Bay problem and engaged John L. Savage and the International Engineering Company to analyze and evaluate the Reber Plan and other barrier proposals.

CONCLUSIONS, RECOMMENDATIONS, OR FINDINGS: Recommend a functional adaptation of the Reber Plan known as the Savage Plan in which the vast filled areas of the Reber Plan were eliminated.

REFERENCE DOCUMENT: John L. Savage and International Engineering Company, "Report on Development of San Francisco Bay Region", January 1951.

WHEN: 1953-1955

WHO: California Division of Water Resources for the California Water Project Authority.

WHAT, WHERE, WHY: Pursuant to the Abshire-Kelly Salinity Control Barrier Act of 1953, seven alternative plans for barriers in the Bay and Delta system were investigated. To help meet expanding water requirements in the region, these plans were considered for salinity control, water conservation and other purposes.

CONCLUSIONS, RECOMMENDATIONS, OR FINDINGS: Barriers in the San Francisco Bay System would not be functionally feasible due to uncertainty of the quality of water in the barrier pool. Further consideration should be given to barriers at or upstream from the Chipps Island site at the outlet of the Delta.

REFERENCE DOCUMENT: Division of Water Resources, "Barriers in the San Francisco Bay System", March 1955; and Department of Water Resources, Preliminary Edition Bulletin No. 76, "Delta Water Facilities", p.4, December 1960.

WHEN: 1955-1957

WHO: California Department of Water Resources (and predecessor agencies)

WHAT, WHERE, WHY: Pursuant to the Abshire-Kelly Salinity Control Barrier Act of 1955, the Chipps Island Barrier Plan, the Junction Point Barrier Plan (between Isleton and Rio Vista), and the Biemond Plan were studied. The principal purposes of these studies were to develop complete plans for water supply in the San Francisco Bay area and to provide salinity control and flood protection in the Delta.

CONCLUSIONS, RECOMMENDATIONS, OR FINDINGS: A water plan for the San Francisco Bay area was outlined and it was recommended that the North Bay Aqueduct be authorized for construction. The North Bay Aqueduct was authorized for construction by the California Legislature in 1957. It was further recommended that further study be limited to the Biemond Plan.

REFERENCE DOCUMENT: California Department of Water Resources Bulletin No. 60, "Salinity Control Barrier Investigation", March 1957; Department of Water Resources, Preliminary Edition Bulletin No. 76, "Delta Water Facilities", p.4 and 5, December 1960.

WHEN: 1947-1957

WHO: California Department of Water Resources

WHAT, WHERE, WHY: As part of "The California Water Plan", certain facilities in the Delta were shown as a means to transport water to be developed in the upper Sacramento River Basin and North Coastal Area across the Delta. Other features of the Delta Division included provisions to divert water from the Delta to the southern portions of the San Francisco Bay Area and northern portions of the Central Coastal area.

CONCLUSIONS, RECOMMENDATIONS, OR FINDINGS: (1) The Cross-Delta Canal of the Biemond Plan using natural and modified channels hydraulically isolated from the remainder of the Delta and a siphon under the San Joaquin River; (2) A conduit from the proposed Montezuma Reservoir to the southerly edge of the Delta with siphons under the Sacramento and San Joaquin Rivers near Antioch; (3) A system of master levees along flood channels in the Delta; (4) Provision for passing anadromous fish and boats and control structures blocking Delta channels; (5) The South Bay Aqueduct; and (6) Kirker Pass Aqueduct to serve a portion of Contra Costa County not serviceable by other facilities. Of these facilities, only the South Bay Aqueduct has been built. Facilities to meet the other functional objectives are still under study.

REFERENCE DOCUMENT: California Department of Water Resources, Bulletin No. 3, "The California Water Plan", 1957.

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WHEN: 1957-1960

WHO: California Department of Water Resources

WHAT, WHERE, WHY: Pursuant to the Abshire-Kelly Act of 1957 and to additional legislation in 1959, the Delta investigation included further study of the Biemond Plan and variations thereof (three Delta water projects) and an updating of the Chipps Island Barrier Plan. Purposes were expanded to include means for providing adequate quantity and quality of water in the Delta, providing improved flood protection in the Delta, and making the most beneficial use of water resources of the State.

CONCLUSIONS, RECOMMENDATIONS, OR FINDINGS: It was recommended that the Single Purpose Delta Water Project be adopted as an integral feature of the State Water Resources Development System (State Water Project) and that other economically justified facilities for flood and seepage control, transportation and recreation be incorporated if requested by local authorities and if provisions for repayment of reimbursable costs are made. It was further recommended that the extent of federal interest be investigated and that further planning for the Delta Water Project include consideration of joint financing and construction by federal, state, and local agencies.

REFERENCE DOCUMENTS: California Department of Water Resources, Preliminary Edition Bulletin No. 76, "Delta Water Facilities", December 1960; and six supporting appendices—four published and two unpublished.

WHEN: 1962-1963

WHO: California Water Commission and Department of Water Resources

WHAT, WHERE, WHY: Public hearings to review plans for development of the Delta as presented in DWR Bulletin No. 76, and to receive comments on these plans.

CONCLUSIONS, RECOMMENDATIONS, OR FINDINGS: Opposition to plans in Bulletin No. 76 was so great, particularly from boating and fish and wildlife interests, that they were never adopted. The Water Commission passed a resolution calling for the development of a Fish and Wildlife Master Plan in conjunction with the State Development Plan for Water Resources.

REFERENCE DOCUMENTS: Transcripts of meetings of the California Water Commission, July 5, 1962, March 1, 1963, and July 12, 1963.

WHEN: 1950-1963

WHO: U.S. Army Corps of Engineers

WHAT, WHERE, WHY: An investigation of eight physical barrier plans—five that would have as their major objective the prevention of salt water intrusion into the Sacramento-San Joaquin Delta and the conservation of water otherwise needed for this purpose; and three for flood, land enhancement, and for use as transbay highway crossings. Report brings together relative merits of the various barriers.

CONCLUSIONS, RECOMMENDATIONS, OR FINDINGS: Several years of additional study may be required to determine whether or not one of the various physical barriers investigated, or one of the three other basic concepts—a hydraulic barrier, a waterway control plan, or a Peripheral Canal (or combination thereof)—would offer the best solution for controlling salinity intrusion and conveying surplus waters across the Delta.

REFERENCE DOCUMENT: U.S. Army Corps of Engineers, San Francisco District, "Technical Report on Barriers", July 1963.

WHEN: 1961-1964

WHO: California Department of Fish and Game in cooperation with California Department of Water Resources.

WHAT, WHERE, WHY: As part of the cooperative Delta Fish and Wildlife Protection Study, the Department of Fish and Game conducted evaluation of the effects of alternative Delta water facilities on the fish and wildlife resources of the Delta. The alternative concepts evaluated were: the Hydraulic Barrier, the Physical Barrier, the Waterway Control Plans, and the Peripheral Canal.

CONCLUSIONS, RECOMMENDATIONS, OR FINDINGS: Based on intensive biological studies, the Department of Fish and Game concluded that the Peripheral Canal Plan was the most desirable plan and the only plan that would fully protect and offer enhancement opportunities for fish and wildlife. Fish and Game recommended that the Canal be constructed at the earliest possible date.

REFERENCE DOCUMENT: California Departments of Fish and Game and Water Resources, "Delta Fish and Wildlife Protection Study, Report No. 3, The Effect of Water Development on the Delta Environment", June 1964.

WHEN: 1961-1965

WHO: Interagency Delta Committee (with representatives from the California Department of Water Resources, the U.S. Corps of Engineers, and the U.S. Bureau of Reclamation).

WHAT, WHERE, WHY: Coordination of state and federal water planning in the Delta with the objective of reaching agreement on a mutually acceptable coordinated plan in the Delta and to formulate and recommend a joint action program for its implementation. The numerous plans that had been advanced over the years for

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improving water management and solving water problems in the Delta were classified under four basic concepts. (1) Hydraulic barriers; (2) Physical barriers; (3) Waterway control works, and (4) A Peripheral Canal around the Delta. These concepts were compared against a common set of planning and functional objectives adopted early in the study. Public hearings before the California Water Commission were included as part of this study.

CONCLUSION, RECOMMENDATIONS, OR FINDINGS: It was concluded that the Peripheral Canal Plan would best meet the objectives and provide for balance development in the Delta. Several other project elements for flood protection, navigation, fish and wildlife management and local water supplies were to be developed by responsible federal, state or local agencies, as needed. The Peripheral Canal was adopted by the Department of Water Resources as the Delta Facilities of the State Water Project in 1966.

REFERENCE DOCUMENTS: Interagency Delta Committee, "Plan of Development, Sacramento-San Joaquin Delta", January 1965; and supporting Task Force reports and appendix; and DWR Project Order No. 12, "Delta Facilities".

WHEN: 1965-1969

WHO: California Department of Water Resources; California Water Commission.

WHAT, WHERE, WHY: Study of alternative interim intakes for California Aqueduct including enlargement of Delta channels and various forebays.

CONCLUSIONS, RECOMMENDATIONS, OR FINDINGS: In 1966, Clifton Court Forebay Project included as part of California Aqueduct intake and diversion works with water regulation and recreation established as project purposes. In 1967, Clifton Court Forebay declared single-purpose project with recreation development to be reconsidered in the future. By October 1969, Forebay constructed and operational with minimal recreational access.

REFERENCE DOCUMENTS: California Department of Water Resources, "Project Order No. 13: Clifton Court Forebay", March 21, 1966; and memorandum, "California Aqueduct, North San Joaquin Division, Clifton Court Forebay, Dual-Purpose Water Facility", February 8, 1966; California Water Commission Hearing, January 1967.

WHEN: 1966-1968

WHO: California Department of Water Resources and U.S. Bureau of Reclamation

WHAT, WHERE, WHY: A series of five public meetings on the preliminary alignment of the proposed state-federal Peripheral Canal project. Comments received can be classified into either of two general categories: (1) Statements concerning the specific alignment; and (2) Statements concerning possible seepage damage, land and water access, drainage and water supply facilities, and water rights.

CONCLUSION, RECOMMENDATIONS, OR FINDINGS: Several recommendations for DWR and USBR to consider before adopting a final alignment for the Canal, including the recommendation that the Peripheral Canal and Interstate Highway 5 projects be coordinated to minimize the impact on the local land owners and economy. This latter recommendation lead to the Highway Borrow Agreements between DWR and CALTRANS, wherein CALTRANS would obtain fill material for the highway from the Canal prism, where such material would not be needed for Canal embankments.

REFERENCE DOCUMENTS: DWR and USBR Peripheral Canal Alignment Committee, "Peripheral Canal Alignment Meetings", February 1966; and Interagency Agreements No. 460526, January 1968, and No. 460593, September 1968.

WHEN: 1963-1969

WHO: U.S. Bureau of Reclamation, Department of the Interior

WHAT, WHERE, WHY: An investigation of the feasibility of constructing the Peripheral Canal as a Unit of the Federal Central Valley Project and as a joint-use with the State Water Project in which the State would share in the costs.

CONCLUSION, RECOMMENDATIONS, OR FINDINGS: Project is physically feasible and economically justified. State and federal governments should share equally in the costs.

REFERENCE DOCUMENTS: U.S. Bureau of Reclamation, Region 2, "Peripheral Canal Unit, Central Valley Project", September 1968; and Commissioner of Reclamations Report, "Peripheral Canal Unit, Central Valley Project, California", May 6, 1969 (approved by the Assistant Secretary of the Interior on July 3, 1969).

WHEN: 1966-1969

WHO: U.S. Bureau of Reclamation, California Department of Water Resources, U.S. Bureau of Sport Fisheries and Wildlife, and California Department of Fish and Game.

WHAT, WHERE, WHY: Recognizing that with the size, cost, and other complexities of the Peripheral Canal, a study of interim measures for the protection of fish and water quality was undertaken. Particular attention was devoted to striped bass, San Joaquin River Salmon, and the annually recurring dissolved oxygen deficiency near Stockton.

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CONCLUSIONS, RECOMMENDATIONS, OR FINDINGS: On March 10, 1969, an agreement on interim measures to protect fish and wildlife in the Delta prior to construction of the Peripheral Canal. Protective measures include: annual installation of the temporary closure on Old River and providing supplemental flows from the Delta Mendota Canal during the fall salmon migration, maintenance of salmon stocks in the San Joaquin River tributaries, improving the fish salvage operation at the Tracy Pumping Plant, and reducing export pumping during the striped bass spawning period. This agreement is to be reevaluated and revised as may be necessary in 1976 if the Peripheral Canal is not operational by that time.

REFERENCE DOCUMENTS: U.S. Bureau of Reclamation, "Interim Measures for Protection of Fish and Water Quality", January 1968; and USBR, DWR, USBSF and WL, and DFG "Memorandum of Understanding on Interim Measures to Protect Fish in the Sacramento-San Joaquin Delta prior to the construction of the Peripheral Canal", March 10, 1969.

WHEN: 1969-1970

WHO: State of California

WHAT, WHERE, WHY: Official State Review of federal feasibility report on the Peripheral Canal. Review was made by 11 state agencies and included a two-day public hearing held jointly by the State Assembly Committee on Water and the State Senate Committee on Water.

CONCLUSION, RECOMMENDATIONS, OR FINDINGS: As a result of the public hearings, each committee submitted a report to the Secretary for Resources endorsing the joint-use Peripheral Canal for solving Delta water conveyance problems of the CVP and SWP and for protecting and enhancing the Delta environment. Senator Nejedly submitted a minority report withholding approval until Delta protection is guaranteed, not just promised. Based on the committee reports and comments received from each of the 11 reviewing agencies, the Secretary for Resources submitted the State's official comments to the Secretary of the Interior strongly recommending authorization of the Peripheral Canal as soon as possible, emphasizing that it must be designed, constructed, and operated to protect the Delta eco-system.

REFERENCE DOCUMENTS: Letter to Walter J. Hickel, U.S. Secretary of the Interior from Norman B. Livermore, Jr., California Secretary for Resources, April 28, 1970; and letter to Secretary for Resources, from Assembly Committee on Water, October 14, 1969; and letter to Secretary for Resources from Senate Committee on Water Resources, November 7, 1969; and Minority Report of Senator John A. Nejedly on the Bureau of Reclamation's Proposed Peripheral Canal Report-letter to Secretary for Resources, November 7, 1969.

WHEN: 1966-1970

WHO: California Department of Water Resources

WHAT, WHERE, WHY: Studies of various alternatives for extending the time when a full Peripheral Canal must be built to meet contractual obligations of the State Water Project. Among the various alternatives studied were stub canals (portions of the Peripheral Canal) of various lengths; relaxation of operational standards; temporary seasonal channel closures; use of the Folsom-South Canal; a State-only Peripheral Canal with pumping plant; and a full-length, full-sized gravity canal to meet SWP needs, with the later addition of a pumping plant required for the state-federal, joint-use canal.

CONCLUSION, RECOMMENDATIONS, OR FINDINGS: Studies were mainly exploratory and informational and no definite conclusions or recommendations were made.

REFERENCE DOCUMENTS: California Department of Water Resources, Delta Branch, various working papers and memos (unpublished) 1966-1970. Located in DWR Delta Branch files.

WHEN: 1970-1973

WHO: California Department of Water Resources

WHAT, WHERE, WHY: On the premise that federal authorization for a full joint-use Peripheral Canal might be several years away, the scope of this study was to examine interim plans for Delta Water Facilities to meet the needs of the SWP. Six alternatives were studied: (1) Channel closures in Sutter and Steamboat Sloughs; (2) A stub canal from Hood to the San Joaquin River with siphons at Mokelumne River and Disappointment Sloughs; (3) A stub canal from Hood to the San Joaquin River with a siphon at the Mokelumne River and an open channel connection at Disappointment Slough; (4) A stub canal from Hood to Disappointment Slough with siphon at the Mokelumne River; (5) A full-length gravity canal from Hood to Clifton Court Forebay (canal prism sized for joint federal-state capacity with the future addition of a pumping plant near Hood) and (6) A modified waterway control plan. Studies included a discussion of comparative environmental advantages and disadvantages of each alternative as well as the functional efficiency of meeting SWP needs.

CONCLUSIONS, RECOMMENDATIONS, OR FINDINGS: That the State construct a full-length gravity canal from Hood to Clifton Court Forebay to serve as an interim facility of the SWP until federal participation in the full joint-use Peripheral Canal is authorized.

REFERENCE DOCUMENTS: California Department of Water Resources, Draft Report on "Interim Delta Facilities", January 1973 (unpublished).

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WHEN: 1973-1975

WHO: California Department of Water Resources

WHAT, WHERE, WHY: Preparation of a Draft Environmental Impact Report (EIR) on the Peripheral Canal to meet the combined water conveyance needs of the SWP and the CVP, and the water and environmental needs of the Delta. It proposed that construction begin in the summer of 1975. One chapter is devoted to a discussion of six alternatives in the Delta and five alternative water supply sources outside the Delta. Also as part of this effort, six public hearings were held by DWR on the Draft EIR in October and November 1974. In addition, the California Senate Committee on Natural Resources and Wildlife held an additional hearing in December 1974.

CONCLUSIONS, RECOMMENDATIONS, OR FINDINGS: The final EIR was not completed and no final conclusions or recommendations were made.

REFERENCE DOCUMENTS: California Department of Water Resources, "Draft Environmental Impact Report —Peripheral Canal Project", August 1974; and transcripts of public hearings on the DEIR plus written comments received by mail during the public review period; and California Senate Committee on Natural Resources and Wildlife, a report to the Legislature on "The Peripheral Canal Project", January 1975.

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APPENDIX D

CHRONOLOGICAL LIST OF REFERENCES

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APPENDIX E

ABBREVIATIONS USED IN THIS BULLETIN

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and would you like to add anything else?

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ABBREVIATIONS

Entities

CCCWCD	— Contra Costa County Water District
CEQA	— California Environmental Quality Act
CVP	— Federal Central Valley Project
DEAC	— Delta Environmental Advisory Committee
DFG	— Department of Fish and Game
DWR	— Department of Water Resources
EPA	— Environmental Protection Agency
EIR	— Environmental Impact Report
EIS	— Environmental Impact Statement
IDC	— Interagency Delta Committee
IDP	— Interagency Drainage Program
M&I	— Municipal and Industrial
MWD	— Metropolitan Water District of Southern California
NEPA	— National Environmental Policy Act
SES	— Socio-Economic Systems, Inc.
SWP	— State Water Project

SWRCB	— State Water Resources Control Board
USBR	— U.S. Bureau of Reclamation
USCE	— U.S. Corps of Engineers
USFWS	— U.S. Fish and Wildlife Service

Technical

AF	— Acre-feet
CFS	— Cubic Feet per Second
Cl ⁻	— Chloride Ion
cms	— Cubic Metres per Second
kwh	— Kilowatt hours
MAF	— Million Acre-feet
mg/l	— Milligrams per Litre
mmhos	— Micromhos
NWS	— Normal Water Surface
OMP&R	— Operation, Maintenance, Power, and Replacement
TAF	— Thousand Acre-feet
TDS	— Total Dissolved Solids

METRIC CONVERSION

<i>Parameter</i>	<i>English Unit</i>	<i>Multiply by</i>	<i>To Get Metric Unit</i>
<i>Length</i>	inches	25.4	millimetres
	feet	0.3048	metres
	miles	1.6093	kilometres
<i>Area</i>	square feet	0.092903	square metres
	acres	0.40469	hectares
	thousand acres	0.40469	kilohectares
<i>Volume</i>	square miles	2.590	square kilometres
	gallons	3.7854	litres
	cubic yards	0.76455	cubic metres
<i>Flow Rates</i>	million cubic yards	0.76455	cubic kilometres
	acre-feet	1233.5	cubic metres
	thousand acre-feet	1.2335	cubic hectometres
<i>Mass</i>	million acre-feet	1.2335	cubic kilometres
	feet per second	0.3048	Metres per second
	cubic feet per second	0.028317	cubic metres per second
<i>Miscellaneous</i>	acre-feet per day	1233.5	cubic metres per day
	million tons	0.90718	megatonne
Electrical Conductance ..	mho	1.0	siemens
Electrical Conductivity....	micromho per centimetre	0.001	millisiemens per centimetre
Energy, Work	Kilowatt hours	1.0	kilowatt hours
Concentrations	parts per million	1.0	milligrams per litre
Power.....	kilowatts	1.0	kilowatts
Power.....	megawatts	1.0	megawatts
Unit cost of water	dollars per acre-foot	0.8107	dollars per cubic dekametre

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