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ISSUE SUMMARY

Financing The State Water Project

By
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DIGEST

The Department of Water Resources (DWR) is rightfully proud when it says "[t]he California State Water Project is the largest state-built, multi-purpose water project in the nation."[1] Authorized in 1960 when the voters approved the Burns-Porter Act, the State Water Project (SWP) has become one of the most extensive water projects in the world.

The SWP provides nearly eight percent of the state's developed water supply. The DWR supplies this water to 29 local and regional agencies under terms specified in the individual water contracts. Under the terms of the 29 contracts, these agencies are entitled to receive a total of 4,154,201 acre-feet of water from the SWP in 1994. By 2021, these *entitlements* will increase to an ultimate total of 4,217,786 million acre-feet per year.

This paper describes how the SWP is financed. At its most basic level, three things determine State Water Project financing:

1. The planned, existing, and uncompleted projects,
2. The amount of water delivered, and
3. The current contractual and financial obligations.

These three items are not independent. Indeed, they are intricately intertwined. Yet even at this basic level, a full discussion of each of these items would require hundreds of pages. Consequently, this paper focuses primarily on the financing of the SWP. However, an understanding of both the history of the SWP and the determinants of the supply of SWP water are important to understanding the complexities of SWP financing. Consequently, this paper covers these topics in the appendices.

The body of the report focuses on how the SWP is financed. The key points made in each section are:

- Overview Of Project Financing:
  - Construction of the State Water Project is predominantly debt financed.
  - Debt service, including principal and interest, is treated as an operating expense.
  - Contractors for State Water Project water have paid over 75 percent of the operating expenses.

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1 Department Of Water Resources, Division Of Operations And Maintenance, "Data Handbook: State Water Project", (Sacramento: The Department, 1992), p.2.

- State Water Project Cost Allocation
  - The DWR allocates costs among project participants based on a complex set of criteria.
  - Some of the criteria the DWR uses require valuing the relative benefits of water among water users, recreation, and fish and wildlife -- and have not been revisited in over a dozen years.
  - The way the DWR allocates cost determines, in large part, the contractors' water bills.
- The Contractors' Water Bills
  - There are five basic components to the contractors' water bills.
  - The water service contracts require the DWR to distribute most costs among contractors based on *annual entitlements*.
  - Many components of the contractors' water bills have a built-in upwards creep to recover full project costs.
- Allocating SWP Water To Contractors
  - Article 18(a) of the water service contracts dictates how the DWR is to allocate reductions to requested water deliveries.
  - This year, 1994, the DWR allocated reductions in apparent conflict with Article 18(a).
  - If the DWR determines there is a permanent reduction in the minimum project yield, Article 18(b) requires the DWR to reduce all *entitlements* proportionately.
- Effects Of Water Supply & SWP Financing
  - Most of the contractors' water bill does not vary with water deliveries.
  - The average price of SWP water is determined in large part by water deliveries.
  - Some contractors are paying more for an equivalent unit of water than other contractors.

This paper also includes a variety of background materials on topics relating to SWP financing. The appendices contain information on the following topics:

- Overview Of The State Water Project
- Early History Of The State Water Project
- Changes To The State Water Project
- Contracting Principles
- Separable Costs-Remaining Benefits
- Determining The Supply Of SWP Water

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INTRODUCTION

THE STATE WATER PROJECT

The Department of Water Resources (DWR) is rightfully proud when it says "[t]he California State Water Project is the largest state-built, multi-purpose water project in the nation."[1] The State Water Project (SWP) consists of 27 lakes and reservoirs, approximately 700 miles of canals and pipelines, 27 pumping and/or power plants, over 1,500 DWR employees, and 29 SWP contractors. The DWR has water service contracts with maximum annual entitlements[2] totaling 4,217,786 acre-feet. (One acre-foot is 325,851 gallons -- enough water to meet the needs of five or six people for a year.)

PROJECT AUTHORIZATION

Although the history of state water development begins in the 1880's, it was not until November 8, 1960, that the voters of California authorized construction of the SWP. The margin of victory was small. The ballot proposition, Proposition 1, passed on a 2,857,586 to 2,719,942 vote, a 137,644-vote margin of victory. Nonetheless, it was sufficient to spur construction of one of the most extensive water projects in the world.

CALIFORNIA'S WATER SUPPLY

In an average year, California has a developed water supply of about 36.5 million acre-feet.[3] Of this, just over three-fourths (28.0 million acre-feet) is surface water, the other fourth (8.5 million acre-feet) is ground water. The State Water Project provides about 2.8 million acre-feet in an average year, or 7.7 percent of all developed water in the state. By comparison, the federally built and operated Central Valley Project (CVP) provides about 7.5 million acre-feet in an average year, or just over 20 percent of the state's developed water supply.

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1 Department Of Water Resources, Division Of Operations And Maintenance, "Data Handbook: State Water Project", (Sacramento: The Department, 1992), p.2.

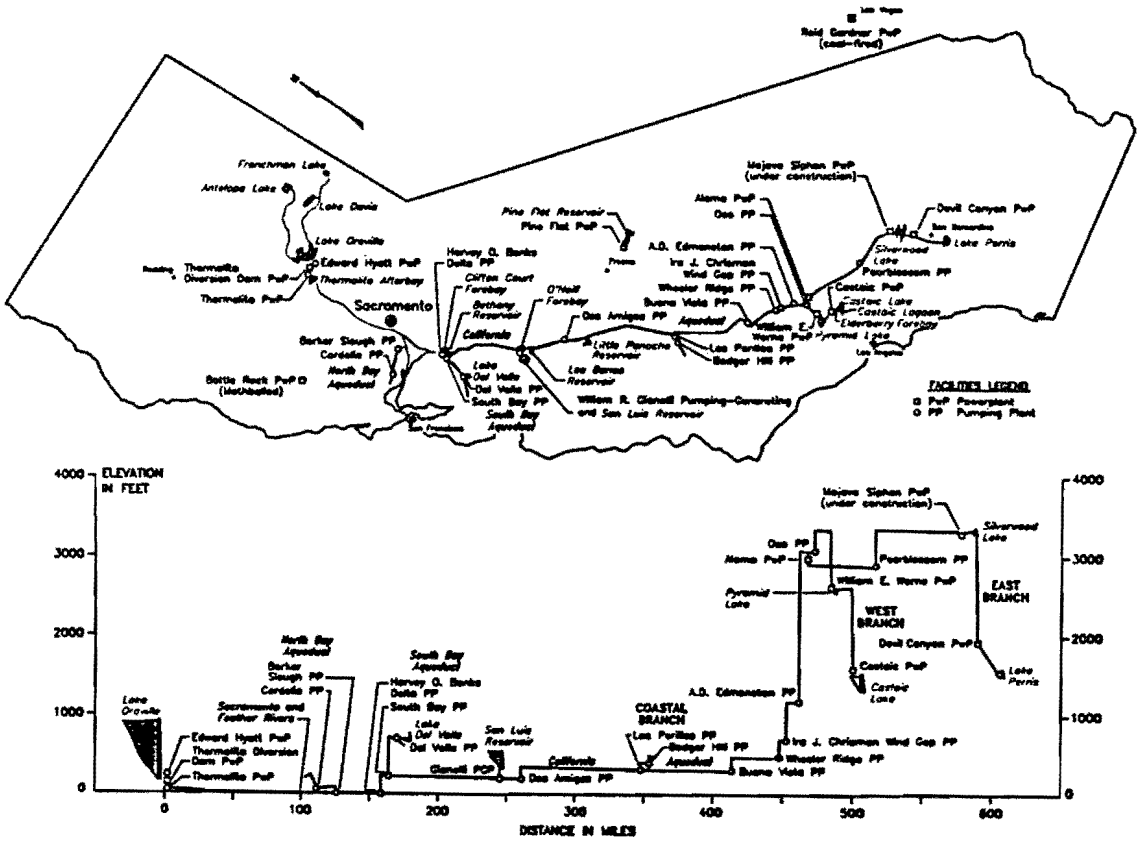
2 The maximum annual entitlement is the most amount of water the water service contracts require DWR to deliver to the contractors (when supplies allow).

3 California's receives a total of 63.7 million acre-feet of water in an average year. The balance, 27.2 million acre-feet, is dedicated natural flow. Department Of Water Resources, "California Water Plan Update", Draft Bulletin 160-93, Volume I, (Sacrament: The Department, November 1993), p. 6.

CONTRACTORS FOR SWP WATER

The DWR contracts with 29 local and regional agencies to supply SWP water under terms specified in the individual contracts. Under the terms of the 29 contracts, these agencies are entitled to receive a total of 4,154,201 acre-feet of water from the SWP in 1994. By 2021, these *entitlements* will increase to an ultimate total of 4,217,786 million acre-feet per year. All 29 contracts are effective until the year 2035 or until the contractors have paid off all outstanding SWP debt, which ever comes last.

Figure I.1
State Water Project
Major Features & Elevations



Map reprinted from : Department Of Water Resources, "Data Handbook: State Water Project", (Sacramento: The Department, 1992)

STATE WATER PROJECT FACILITIES

Figure I.1 shows the main features of the SWP. The SWP runs about two-thirds the length of the state. The project begins high in the mountains in the Feather River watershed, near the towns of Portola and Crescent Mills. Water drains from Frenchman Lake, Antelope Lake, and Lake Davis, down the streams and rivers of the Upper Feather River Basin into Lake Oroville, where the SWP stores the water until needed for water supply or Delta water quality purposes. Once the DWR releases water from Oroville, it moves down the Sacramento River to the Sacramento-San Joaquin Delta.

The Delta functions as a natural distribution system for the SWP. In the North Delta, the DWR pumps water from Baker Slough to feed the North Bay Aqueduct. At the extreme southern edge of the Delta, the DWR pumps water from the Clifton Court Forebay, first into Bethany Reservoir, and then on into the South Bay Aqueduct and the California Aqueduct. The California Aqueduct runs south over 400 miles, ending in Riverside County. Facilities north of the Delta generally collect water -- facilities south of the Delta, with the notable exception of the San Luis Reservoir, transport water to the contractors.

PURPOSE

This paper describes how the SWP is currently financed. The focus is on what has actually happened to this point -- not on what the DWR plans to have in the future. Consequently, this paper is not concerned with the financing of planned or future projects nor the potential effects such projects may have on contractor payments.

In developing this paper, the author relied solely on publicly available resources. Consequently, some data are a bit dated. Where this paper uses such data, we acknowledge it in a footnote.

This paper was originally prepared as a background brief at the request of Senator Dan McCorquodale, Chair of the Senate Committee on Agriculture and Water Resources. Presented at the committee's hearing on "The State Water Project: Supply, Demand and Financing", the paper was released as a discussion draft. This paper now reflects the numerous helpful comments made by the DWR and others.

APPROACH

At its most basic level, three things determine State Water Project financing:

1. The planned, existing, and uncompleted projects,
2. The amount of water delivered, and
3. The current contractual and financial obligations.

These three items are not independent. Indeed, they are intricately intertwined. Yet even at this basic level, a full discussion of each of these items would require hundreds of pages.

Consequently, this paper focuses primarily on the financing of the SWP. However, an understanding of both the history of the SWP and the determinants of the supply of SWP water are important to understanding the complexities of SWP financing. Therefore, this paper covers these topics in the appendices.

ORGANIZATION

This paper is organized into two main parts:

- The Main Report
- The Appendices

MAIN REPORT

The body of the report focuses on how the SWP is financed.

- *Chapter 1* -- Provides an overview of project financing.
- *Chapter 2* -- Describes how the DWR determines who pays what costs.
- *Chapter 3* -- Explains how the DWR turns the costs assigned to the contractors into the contractors' water bills.
- *Chapter 4* -- Describes how the DWR allocates SWP water to the contractors.
- *Chapter 5* -- Discusses some of the implications of SWP water pricing.

APPENDICES

The appendices provide additional background that is helpful for a full appreciation of SWP financing.

- *Appendix A* -- Provides an overview of the State Water Project, both the facilities and the contractors.
- *Appendix B* -- Describes the early history of the State Water Project.
- *Appendix C* -- Presents the history of the three major uncompleted projects, the Eel River, San Joaquin Drain, and Delta Facilities.
- *Appendix D* -- Reprints Governor Edmund G. Brown's "Contracting Principles for Water Service Contracts Under The California Water Resources Development System"
- *Appendix E* -- Describes the method the DWR used to allocate costs to recreation and fish and wildlife, using the "Separable Costs-Remaining Benefits" method.
- *Appendix F* -- Discusses what determines the supply of SWP Water.

CHAPTER 1
OVERVIEW OF PROJECT FINANCING
"Where Does The Money Come From – And Where Does It Go?"

This chapter presents three key points:

- *Construction of the State Water Project is predominantly debt financed.*
- *Debt service, including principal and interest, is treated as an operating expense.*
- *Contractors for State Water Project water have paid over 75 percent of the operating expenses.*

INTRODUCTION

In a way, the financing of the SWP is a lot like financing the construction of a house. With a house, you first arrange the financing for constructing the house. That is, you get the necessary loan(s). Then, you direct your attention to financing the ongoing costs of maintaining the house along with making the ever important mortgage payments. The state financed the SWP in much the same way. This chapter provides an overview of how the DWR financed construction of the SWP and how it finances operating expenses and services the outstanding debt.[1]

TWO SEPARATE SETS OF ACCOUNTS

The DWR finances the SWP through two sets of accounts:

- Capital Financing Accounts, and
- Operating Expenses Accounts.

FINANCING CAPITAL EXPENDITURES

Figure 1.A shows how the DWR has financed $5.1 billion in SWP capital expenditures from 1952 through 1993.[2] The pie on the right, labeled "Use Of Funds", shows the composition of the expenditures. Moving clockwise around the pie, capital expenditures to date break out as follows:

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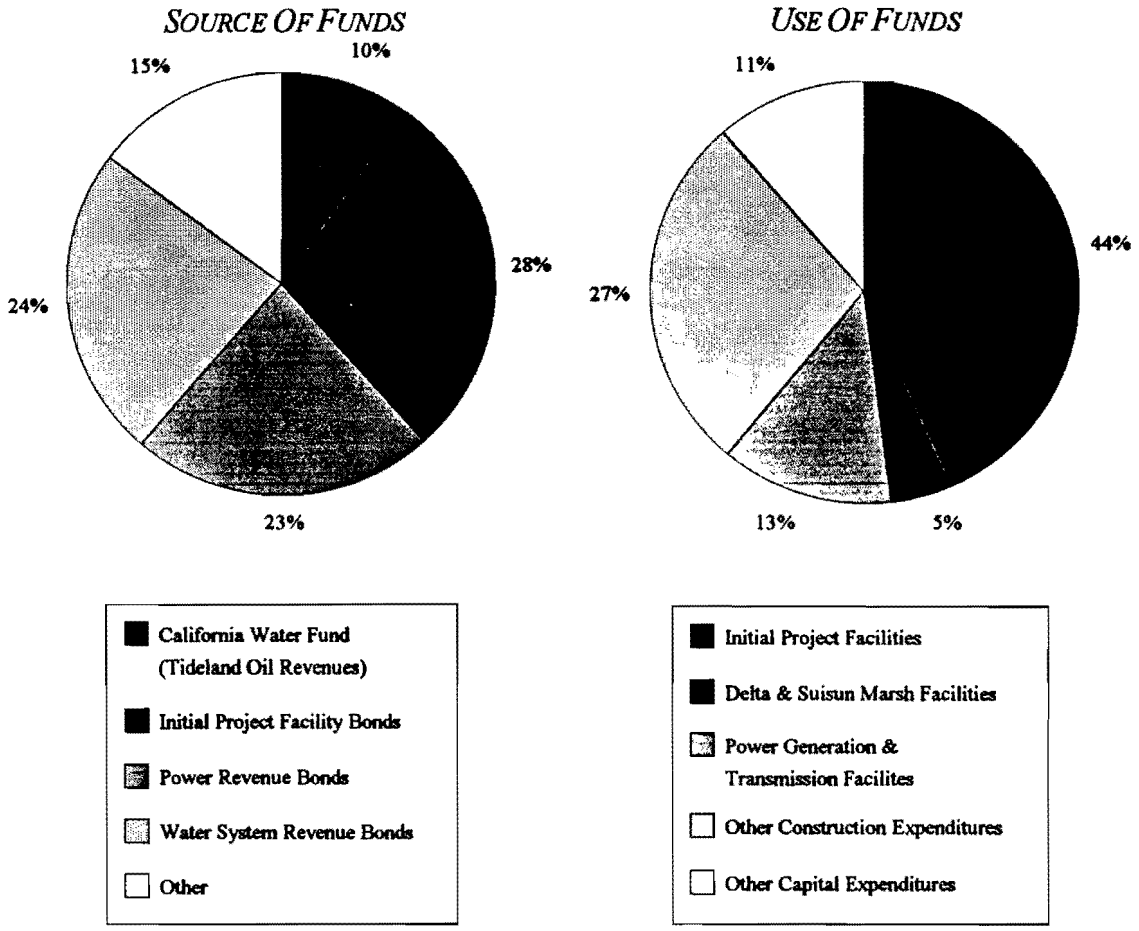
1 This chapter draws heavily on Department Of Water Resources, "Management Of The California State Water Project", Bulletin 132-91, (Sacramento: The Department, December 1991). Numbers quoted in this section are actual through 1990 and estimates for 1991 - 1993. (DWR did not publish Bulletin 132-92 until February 1994 -- after the release of the discussion draft of this paper.)

2 For an overview of current SWP facilities, see Appendix A.

Figure 1.A
SWP Capital Financing:
$5.1 Billion From 1952 Through 1993



Source: Department Of Water Resources, "Management Of The California State Water Project", Bulletin 132-91, (Sacramento: The Department), December 1991, Table 29

- Initial facilities -- $2.20 billion (44 percent)
- Delta and Suisun Marsh facilities -- $0.24 billion (5 percent)
- Power generation and transmission facilities -- $0.67 billion (13 percent)
- Other construction expenditures -- $1.38 billion (27 percent)
- Other capital expenditures -- $0.58 billion (11 percent)

The pie on the left, labeled "Source Of Funds", shows the sources of the capital funds. Moving clockwise around the pie, capital funds consist of:

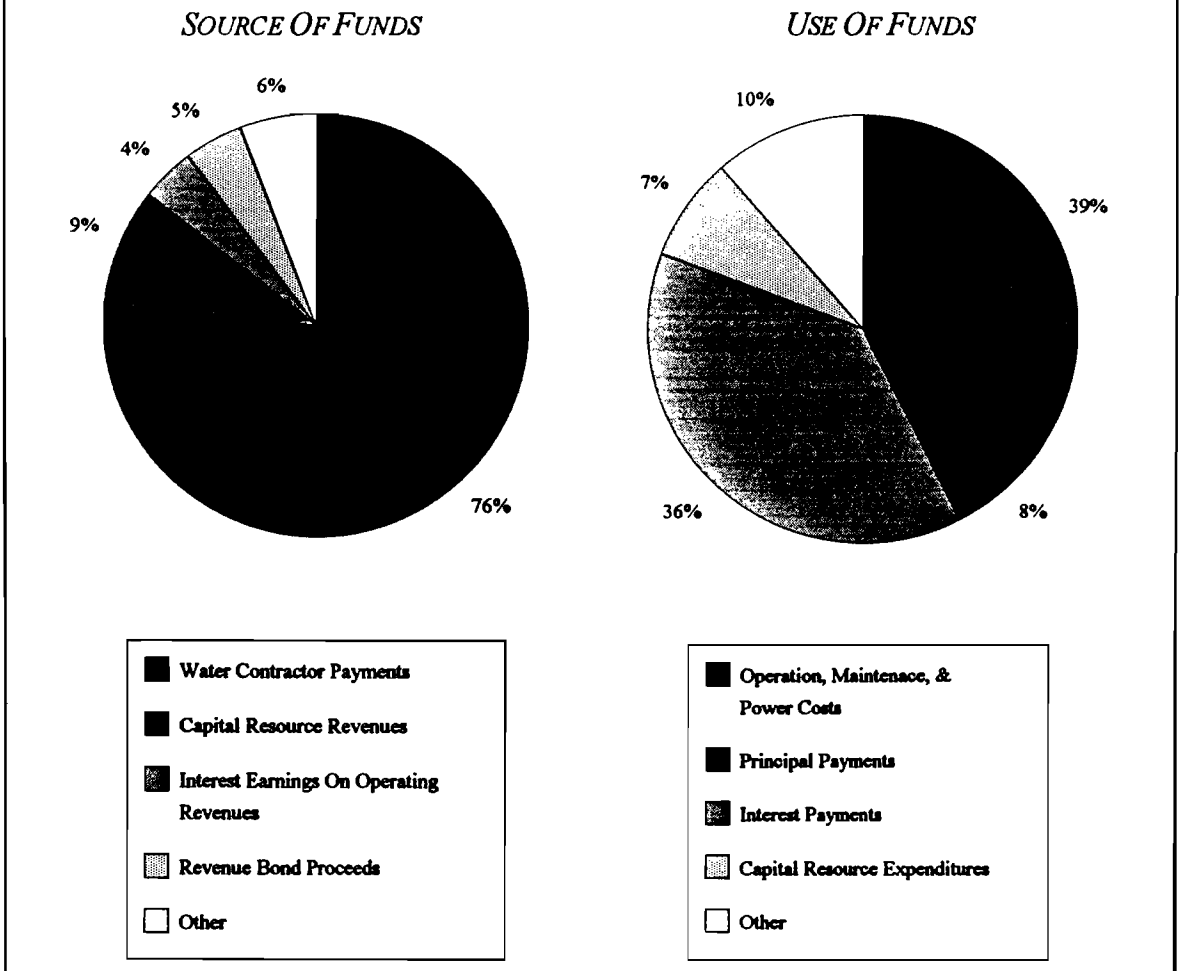
- California Water Fund -- $0.51 billion (10 percent)
- Initial Project Facilities Bonds -- $1.45 billion (28 percent)
- Power Revenue Bonds -- $1.16 billion (23 percent)
- Water System Revenue Bonds -- $1.21 billion (24 percent)
- Other Revenue Sources -- $0.74 billion (15 percent)

FINANCING OPERATING EXPENSES

Figure 1.B shows how the DWR has financed $8.5 billion in SWP operating expenses from 1952 through 1993. The pie on the right, labeled "Use Of Funds", shows the composition of the expenditures. Moving clockwise around the pie, operating expenses to date break out as follows:

- Operation, maintenance, and power costs -- $3.27 billion (35 percent)
- Principal payments -- $0.68 billion (8 percent)
- Interest payments -- $3.07 billion (38 percent)
- Capital Resource Expenditures -- $0.57 billion (8 percent)
- Other operating expenses -- $0.86 billion (10 percent)

Figure 1.B
SWP Operations Financing:
$8.5 Billion From 1952 Through 1993



Source: Department Of Water Resources, "Management Of The California State Water Project", Bulletin 132-91, (Sacramento: The Department), December 1991, Table 32

The pie on the left, labeled "Source Of Funds", shows the sources of the operating revenues. Moving clockwise around the pie, capital operating revenues consist of:

- Water contractor payments -- $6.50 billion (76 percent)
- Capital resource revenues -- $0.75 billion (9 percent)
- Interest earnings on operating revenues -- $0.36 billion (4 percent)
- Revenue bond proceeds -- $0.38 (5 percent)
- Other operating revenues -- $0.47 billion (6 percent)

CONSTRUCTION EXPENDITURES

In the early years of the SWP, the DWR's main concern was building the project. To date, the DWR has spent $5.1 billion building the SWP. The next section describes the capital outlay components in more detail.

TYPES OF EXPENDITURES

As noted above, the DWR has spent $5.1 billion in capital outlay on:

- Initial facilities -- $2.20 billion (44 percent)
- Delta and Suisun Marsh facilities -- $0.24 billion (5 percent)
- Power generation and transmission facilities -- $0.67 billion (13 percent)
- Other construction expenditures -- $1.38 billion (27 percent)
- Other capital expenditures -- $0.58 billion (11 percent)

Initial Facilities

The DWR defines initial facilities as those facilities completed before 1974.[3] By 1974, the DWR had completed or nearly completed construction of virtually all the aqueduct and storage facilities that are in operation today.[4] The DWR spent $2.20 billion on these facilities.

Delta And Suisun Marsh Facilities

Through 1993, the SWP has spent an estimated $244 million on Delta and Suisun Marsh facilities. Including in these expenditures are:

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[3] For a year by year history of the construction of initial facilities as well as a recap of (then) ongoing construction, see: Department Of Water Resources, "The California State Water Project In 1974", Bulletin 132-74, (Sacramento: The Department, 1974), pp. 14-18.

[4] See Appendix D for a history of the three projects initially authorized for construction have not been completed. They are the Eel River Facilities, San Joaquin Drain, and the Delta Facilities.

- Planning costs for general Delta facilities,
- Historical costs associated with the Peripheral Canal,
- Planning costs for the Suisun Marsh, and
- Construction costs for the Suisun marsh Salinity Control Gates.

Power Generation And Transmission Facilities

At $0.67 billion, power generation and transmission facilities comprise the second largest capital expenditure category. The three "off-aqueduct" facilities comprise the bulk of the expenses. These facilities are:

- Reid Gardner ($266 million),
- Bottle Rock[5] ($122 million), and
- South Geysers[6] ($50 million).

Other Construction Expenditures

The $1.38 billion in other construction expenditures consists of a number of different projects, including:

- Both construction and expansion of the East Branch;
- Phase II construction of the North Bay Aqueduct and a portion of the Coastal Branch;
- Planning for additional conservation facilities, including the Kern Water Bank and Los Banos Grandes;
- Construction of the West Branch (except the William E Warne power plant), including the Vista Del Lago Visitors' Center;
- Planning costs of the San Joaquin Valley Drain, including monitoring costs of the San Joaquin Valley Drainage Monitoring Program.

Other Capital Expenditures

Other capital expenditures include costs such as general design and construction and costs of completing operation and maintenance facilities and some initial facilities of the California Aqueduct.

CONSTRUCTION FUNDING

Construction of the SWP was largely bond financed. Bonds provided just over three-fourths of the construction resources through 1993. The next section describes the sources of capital funds in more detail.

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5 Now "mothballed".

6 Indefinitely postponed.

SOURCE OF FUNDS

As noted above, the DWR used the following sources of revenue to fund construction of the SWP:

- California Water Fund -- $0.51 billion (10 percent)
- Initial Project Facilities Bonds -- $1.45 billion (28 percent)
- Power Revenue Bonds -- $1.16 billion (23 percent)
- Water System Revenue Bonds -- $1.21 billion (24 percent)
- Other Revenue Sources -- $0.74 billion (15 percent)

California Water Fund

The key non-bond source of construction funding is the California Water Fund. The primary revenue source for the California Water Fund is tideland oil revenues.[7] Under the Burns-Porter Act (which authorized the SWP)[8] the state can use general obligation bonds to fund construction only after the state has used any available money in the California Water Fund. The California Water Fund supplied $504 million for construction of the SWP.

Initial Project Facility Bonds

Initial project facility bonds are general obligation bonds authorized in 1960 by the Burns-Porter Act.[9] The Burns-Porter Act authorized $1.75 billion of general obligation bonds. Of the $1.75 billion authorization, the Burns-Porter Act reserved $130 million specifically for programs authorized by the Davis-Grunsky Act. (The Davis-Grunsky Act provides grants and loans for local water development projects.) The Burns-Porter Act requires all bond proceeds be deposited in the California Water Resources Development Bond Fund-Bond Proceeds Account. To date, initial project facility bonds have supplied $1.45 billion in SWP construction financing.

Power Revenue Bonds

The state Central Valley Project Act of 1933 (CVPA) authorized the state to issue revenue bonds for construction of the Central Valley Project.[10] In 1963, the California Supreme Court, upheld the DWR's authority to issue revenue bonds under the CVPA for construction of SWP facilities.[11] Proceeds of these bonds are deposited in the Central

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7 The state obtains tideland oil revenues from leasing state lands for oil production, primarily off the Long Beach and Santa Barbara coastlines.

8 For a description of early history of the SWP, including authorization of the Burns-Porter Act, see Appendix B

9 The history of the Burns-Porter Act is presented in Appendix B.

10 The Central Valley Project Act was originally a state project, and voters approved bonds to finance construction. The history of the Central Valley Project Act is recounted in Appendix B.

11 *Warne* v. *Harkness*, 60 Cal. 2d 579

Valley Water Project Construction Fund. To date, the DWR has issued $1.16 billion in revenue bonds for construction of SWP power facilities and related bond issue costs.

Water System Revenue Bonds

Water system revenue bonds are CVPA revenue bonds issued to fund construction of non-power related SWP facilities. To date, $1.21 billion in water system revenue bonds have been issued for construction of SWP water facilities and related bond issue costs.

Other Resources

Other revenue sources are a hodgepodge of revenue sources, such as:

- Proceeds of Davis-Grunsky Act bonds,
- Federal payments for SWP capital expenditures, and
- Appropriations for capital costs allocated to recreation.

OPERATING EXPENSES

By 1974, the DWR had largely built the SWP. The DWR's financial interests then shifted to operating and maintaining the project. To date, the DWR has spent $8.5 billion to fund SWP operations and maintenance activities. The next two sections describe what the DWR spent the $8.5 billion on and where the money came from.

TYPES OF EXPENDITURES

As noted above, the DWR has spent $8.5 billion on the following operating expenses:

- Operation, maintenance, and power costs -- $3.27 billion (35 percent)
- Principal payments -- $0.68 billion (8 percent)
- Interest payments -- $3.07 billion (38 percent)
- Capital Resource Expenditures -- $0.57 billion (8 percent)
- Other operating expenses -- $0.86 billion (10 percent)

Operations, Maintenance, And Power Costs

Approximately $3.3 billion of the operating funds spent to date were for the ongoing costs of operating, maintaining and powering (OM&P) the SWP. A review of OM&P costs for the period 1962 through 1993[12] shows OM&P costs composed as follows:

54% Headquarters and field personnel costs
32% Net pumping power costs
14% All other OM&P costs

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[12] Department Of Water Resources, "Management of the California State Water Project", Bulletin 132-91, (Sacramento: The Department, December 1991), Table 35

Principal Payments

The DWR services construction-bond debt through the operations accounts. Through 1993, SWP has paid $0.7 billion in principal payments.

Interest Payments

Interest payments on outstanding debt totaled nearly $3.1 billion through 1993, almost as large as the operating costs.

Capital Resource Expenditures

Instead of financing their share of capital construction costs with debt instruments, some project participants opted to pay their share of construction costs up front. (See Capital Resource Revenues below.) The DWR applies these revenues to capital expenditures, as appropriate, when the DWR incurs the costs. Expenditures of these capital resource revenues have totaled $670 million through 1993.

Other Operating Expenses

The $863 million in other operating expenses consists of:

- Special Reserves Under Revenue Bond Financing, ($423 million);
- Repayment of the California Water Fund, ($201 million);
- Replacement Reserves, ($195 million);
- Reserves for future construction, ($42 million); and
- Current operating funds, ($2 million).

OPERATING REVENUES

Operation of the SWP is largely contractor financed. SWP contractors provided just over three-fourths of the operating revenues through 1993.

SOURCE OF FUNDS

As noted above, the sources of the funds the DWR has used to pay the $8.5 billion in operating expenses are:

- Water contractor payments -- $6.50 billion (76 percent)
- Capital resource revenues -- $0.75 billion (9 percent)
- Interest earnings on operating revenues -- $0.36 billion (4 percent)
- Revenue bond proceeds -- $0.38 (5 percent)
- Other operating revenues -- $0.47 billion (6 percent)

Water Contractor Payments

Contractor payments have supplied $6.5 billion in operating revenues to date.[13] The balance of this report focuses on how the DWR raises the funds from the contractors.

Capital Resource Revenues

A distant second in magnitude, providing $749 million, is Capital Resources Revenues. The seven sources of these revenues are:

1. *Federal payments for SWP capital expenditures;*
2. *Appropriations for capital costs allocated to recreation*
3. *Appropriations for SWP capital expenditures prior to the Burns-Porter Act and under SB 261 (1968);*
4. *Payments for Los Angeles Department of Water and Power for Castaic Power Development;*
5. *Water contractor advances for construction of requested works;*
6. *Investment earnings on the Capital Resources Account; and*
7. *Investment earnings on unexpended revenue bond proceeds.*[14]

Interest Earnings On Operating Revenues

The $357 in interest earnings includes earnings on:

- Unexpended proceeds from the sale of general obligation bonds
- Interest on operating reserves, and
- Other short-term instruments earnings on SWP revenues.

Revenue Bond Proceeds

Technically not a revenue, but rather a special reserve, the DWR uses some of the revenue bond proceeds to offset such things as revenue bond service and debt service reserve requirements. Through 1993, these revenue bond proceeds account for $381 million in operating funds.

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[13] To date, contractors have paid 76 percent of the operating expenses. However, the DWR estimates that over the life of the project, contractor payments will equal about 95 percent. The contractors' percentage payment grows because of the way the state and federal governments paid for certain capital expenditures. The state and federal governments fully reimbursed the SWP for costs of certain recreation and flood control projects. The DWR accounts for these payments under capital resource revenues. The contractors, however, pay capital costs over the life of the project. (See Chapter 3).

[14] Department Of Water Resources, "Management of the California State Water Project", Bulletin 132-91, (Sacramento: The Department, December 1991), p. 167

Other Operating Revenues

Other operating funds include:

- Federal payments for project operating costs,
- Pre-1983 power sales from the Hyatt and Termalito power plants, and
- Appropriations for operating costs allocated for recreation.

CHAPTER 2
STATE WATER PROJECT COST ALLOCATION
"How Does The DWR Determine Who Pays For What?"

This chapter presents three key points:

- *The DWR allocates costs among project participants based on a complex set of criteria.*
- *Some of the criteria the DWR uses require valuing the relative benefits of water among water users, recreation, and fish and wildlife -- and have not been revisited in over a dozen years.*
- *The way the DWR allocates cost determines, in large part, the contractors' water bill.*

INTRODUCTION

On January 20, 1960, Governor Edmund G. Brown issued his statement of "Contracting Principles for Water Service Contracts Under The California Water Resources Development System" (Principles).[1] The fundamental doctrine behind these 13 Principles was that those who benefit from the project should pay for the project. These Principles established the financing framework for the State Water Project and became the basis for contract negotiations.

GOVERNOR EDMUND G. BROWN'S CONTRACTING PRINCIPLES

In 1963, the Department of Water Resources summarized the key features that ensured that the contracts met the Governor's principles as follows:

1. *Charges for water must insure the return to the State of all reimbursable project costs, with interest, and must at the same time provide for equitable allocation of costs to the individual contractors.*
2. *The total annual charge to contractors will be the sum of the Delta water charge and the Transportation charge, for that year.*
3. *Each of the two charges will be further subdivided into the following components:*
   (a) A capital cost component
   (b) A minimum operation, maintenance, power, and replacement component
   (c) A variable operation, maintenance, power, and replacement component
4. *The capital and minimum components will be collected irrespective of the annual amounts of water received, while the variable component will be collected on the basis of the annual amounts of water received.*

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[1] The text is reproduced in Appendix D.

5. *The Delta water charge together with revenue from sale of power must return all costs allocated to the project function of water conservation, and will be a single price per acre-foot for all contractors.*
6. *The Transportation Charge must return all costs allocated to the project function of water transportation*
7. *Cost allocations shall be on a proportionate use basis by contractors for water transportation facilities.*[2]

The purpose of this chapter is two-fold. First, we focus on the overall project and provide a general overview of SWP financing. Then, we start to shift our focus to the water contractors and describe how the DWR categorizes expenditures for billing purposes.

COST ALLOCATION[3]

The SWP water contractors pay all *reimbursable* costs associated with acquiring and distributing SWP water. However, the SWP also incurs costs not associated with acquiring and distributing SWP water, such as flood control costs. The way the DWR allocates costs to contractors varies depending on how the DWR classifies the cost. This section describes how the DWR categorizes SWP costs. The subsequent section will explore the implications of the categorization.

THE ALLOCATION PROCESS

Cost allocation is a process in which the DWR applies a series of accounting definitions to SWP costs.[4] That is, the DWR categorizes costs based on a predetermined set of criteria. For illustrative purposes we can describe project cost allocation as a five step process.[5]

1. Assigning costs to facilities;
2. Separating costs among project "partners";
3. Allocating the DWR costs to purposes, e.g. recreation;
4. Subdividing costs by function and type; and
5. Allocating costs to contractors.

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2 California Department of Water Resources, "The California State Water Project In 1963", Bulletin 132-63, (Sacramento: The Department, April 1963), pages 171-172

3 This section draws heavily on: Madalene Mary Curie, "The California State Water Project; Analytical Description Of Water Allocation, Water Pricing; Conditions For Market Formation And Market Activity", Unpublished Ph.D. Dissertation, University of California, Davis, March 1983.

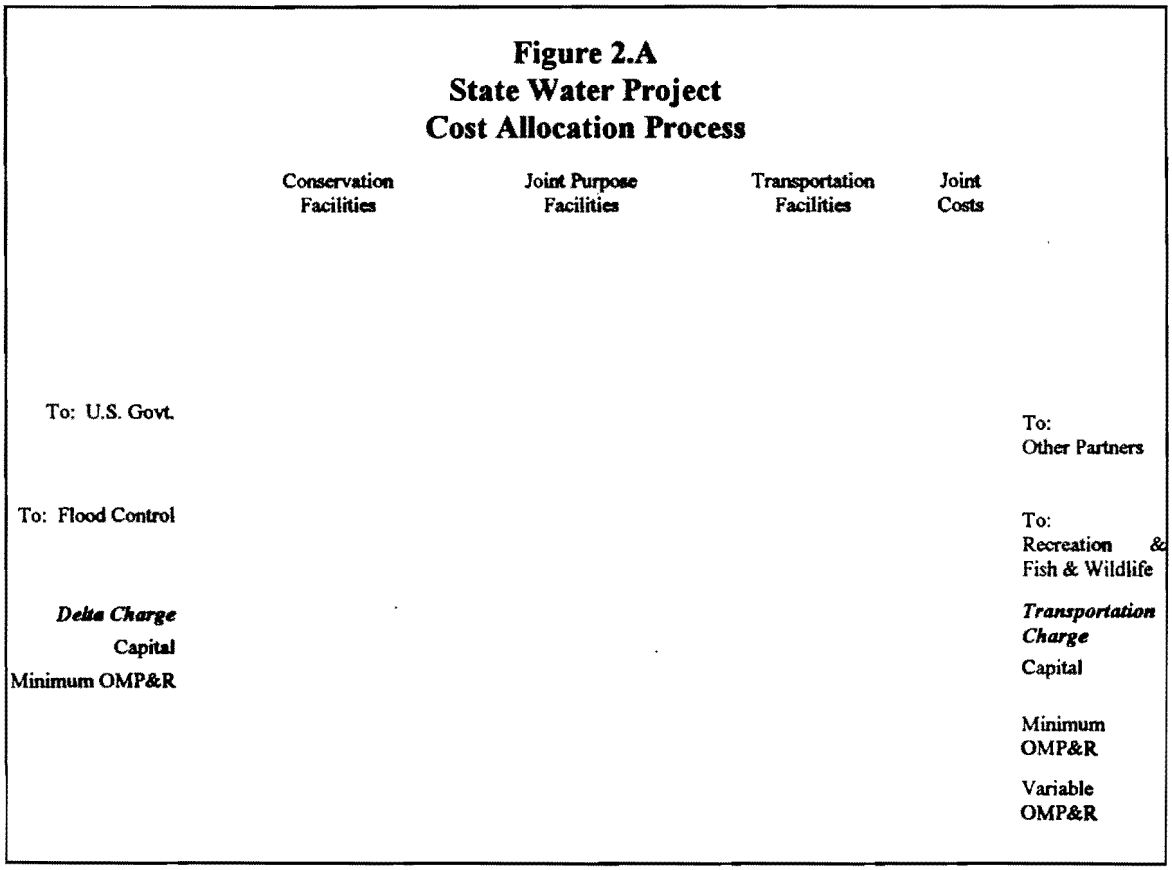
4 Curie, p. 140

5 This sequence was selected for conceptual simplicity. The actual sequence is steps (1), (4), (2), (3), and (5). Department Of Water Resources, "California State Water Project", Bulletin 200, Volume 1, (Sacramento: The Department, November 1974), pp. 28-29

THE PLUMBING CHART

The cost-allocation process is very complex. In attempting to simply describe the first four steps in the process, we use a *plumbing* metaphor. Figure 2.A consists of the following components:

Figure 2.A
State Water Project
Cost Allocation Process



Vertical Pipes Symbolize SWP Facilities

Each vertical pipe symbolizes an individual SWP facility. The two vertical pipes on the left represent conservation facilities, such as Oroville Dam and the Delta facilities. The two pipes on the right represent transportation facilities; such as Lake Perris and Reach 19.[6] The vertical pipe in the middle represents facilities that serve both conservation and transportation functions; such as Reach 3.

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[6] DWR divided the aqueducts into repayment reaches. DWR defined each reach so that the relative uses of project transportation facilities are essentially the same for all the contractors. Where the relative use of the facility changes, one reach ends and another reach begins. These points are generally at aqueduct branch turnouts or junctions, aqueduct regulatory reservoirs, and major delivery structures for contractors. For an overview of the SWP facilities, including descriptions of the reaches, See Appendix A.

Funnels Symbolize The DWR's Initial Categorizing Of Costs
Each funnel symbolizes the DWR assigning a cost to either a specific facility or group of facilities. The funnels on top of the vertical pipes symbolize costs that the DWR assigns directly to specific facilities. The funnel on the upper right represents costs incurred by the DWR that are related to the SWP, but which are not directly attributable to particular facilities.

Horizontal Pipes Symbolize Where The DWR Allocates Costs
As the plumbing chart shows, the DWR allocates costs among various "partners", purposes, and functions. The horizontal pipes symbolize the assignment of these costs away from the SWP contractors.

Valves Represent The DWR's Criteria For Assigning And Distributing Costs
The DWR assigns and distributes costs based on:

- Specific water contract provisions
- Governor Edmund G. Brown's contracting principles
- Generally accounting principles

The valves represent points where the DWR applies one of these accounting definitions to assign or distribute costs. Understanding the DWR's rationale for setting these "valves" is key to understanding the cost-allocation process.

ASSIGN COSTS TO FACILITIES

The DWR identifies all costs incurred by the state with specific facilities and aqueduct reaches.[7] In some cases, the assignment process is simple; such as assigning the cost of a new pump to the pumping station at which it is installed. However, the appropriate way to assign the department's cost of negotiating and managing contracts to specific facilities is not as clear. This section describes how the DWR assigns costs to specific project facilities.

CONSERVATION AND TRANSPORTATION FACILITIES

The DWR has divided the SWP's facilities into conservation and transportation facilities.[8] For conservation facilities that supply water to the Delta, the physical facility is the cost accounting unit.[9] For conservation facilities south of the Delta, the associated reach is the cost accounting unit. For transportation facilities, the reach is the cost accounting unit.

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7 Department Of Water Resources, "The California State Water Project In 1970", Bulletin 132-70, (Sacramento: The Department, June 1970), p. 111

8 For an overview of the different facilities, including the classification of facilities into conservation and transportation facilities, see: Appendix A.

9 Curie, p. 141

DIRECT COSTS

Any expenditure that the DWR can identify directly with an individual facility or reach, the DWR charges to that facility. Direct charges include:

- Capital outlay and right of way expenditures;
- Direct labor charges for field operational and maintenance personnel;
- Equipment, materials, and supplies;

By way of metaphor, the plumbing chart shows the assignment of direct costs to facilities as part of the first tier of assignments. The funnels over each set of columns represent the capturing of direct costs by facility.

DISTRIBUTED COSTS[10]

Not all the Department's activities can be readily identified with specific facilities. The department incurs some costs for groups of facilities and reaches, or for the SWP as a whole. Nevertheless, the DWR must distribute these costs among the facilities and reaches to provide a basis for determining contractor charges.

Four Types Of Distributed Costs

The DWR distributes four types of cost to facilities. They are:

1. General Operating Costs,
2. General Administrative Costs,
3. Direct Operating Costs, and
4. General Capital Costs.

Again, using the plumbing metaphor, Figure 2.A shows the assignment of distributed costs by means of the large funnel on the right. Costs that the DWR can not assign directly to a facility get dumped into the funnel, and get distributed to the facilities based on the valve settings. Each type of distributed cost, figuratively speaking, has its own set of valve settings. Where the plumbing chart shows one set of criteria for all distributed costs, there actually are many sets -- one set for each type of distributed cost.

DISTRIBUTE COSTS AMONG PARTNERS

Certain SWP facilities coexist with facilities owned or operated by others and serve non-SWP purposes. For example, the SWP shares the costs of the San Luis Dam and Reservoir with the CVP. Once the DWR has associated all costs with project facilities, the next step is to distribute the costs among project partners. We define project partners as entities with whom the SWP has entered into joint-operation or joint-ownership

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[10] Department Of Water Resources, "The California State Water Project In 1970", Bulletin 132-70, (Sacramento: The Department, June 1970), pp. 110-113

relations. These relationships are not directly associated with joint acquisition or distribution of *SWP* water. Rather, the agreements are for facilities that benefit the partners in ways *besides* SWP water.

CRITERIA FOR ALLOCATING BETWEEN PARTNERS

The DWR owns and operates most facilities by itself. Hence, most facilities do not have non-SWP partners. However, for those facilities with partners, some type of authorizing agreement establishes the terms of the partnerships. These agreements include details on how the partners are to share costs. In some of the agreements, the SWP owns and/or operates the facility, in others the partner owns and/or operates the facility. Where the partner owns and/or operates the facility, they incur the costs and bill the DWR for reimbursement. In this case, the DWR treats the charges as either a direct or joint cost, depending on the facility. However, where the SWP owns and/or operates the facility, the SWP incurs the costs and bills the partner(s) for reimbursement.

The plumbing chart illustrates the distribution of costs to project partners through the first set of horizontal pipes. The DWR has first assigned all costs to the facility, and now distributes the costs among the partners. It is as if the DWR set the cost allocation *valves* according to percentages set forth in authorizing agreements.

ALLOCATE COSTS TO PURPOSES

The SWP serves four distinct purposes. These purposes are:

1. Water supply
2. Power generation,
3. Flood control, and
4. Recreation, fish and wildlife enhancement.

THE SECOND CONTRACTING PRINCIPLE

The second Contracting Principle states:

> 2. ***For purposes of project commodity pricing, costs will be allocated among water supply, flood control, recreation, enhancement of fish and wildlife, drainage, quality control, and such other functions as may be authorized and performed by the particular facility or facilities under consideration.***

The DWR must somehow allocate costs among purposes. This is not always a simple process. Many facilities serve multiple purposes; while some charges are clearly for one purpose or another, there are a number of charges for activities that serve joint purposes. The following sections first describe the different purposes that SWP water serves and identifies who is responsible for paying the associated costs. Then, we describe how the DWR allocates costs among purposes.

SWP PURPOSES

Water Supply

The primary purpose of the SWP is to acquire water through its conservation facilities and distribute the water to the contractors through the transportation facilities. The contractors pay all costs associated with acquiring and transporting water to them through their water rates. In the vernacular of the SWP, costs borne by the water contractors, such as water supply costs, are *reimbursable* costs.

Power Generation

The fourth Contracting Principle states:

> 4. *The project will require more power for pumping purposes than it will produce. Power required in the operation of the project must be paid for by the water users whether it is obtained from project or nonproject sources. Therefore, the costs of the project facilities producing the power is properly a cost of water supply ... .*

The contractors pay all capital and operating costs of producing power for transporting water to them. The contractors also pay the costs of purchasing any additional power necessary to deliver their water. Hence, power generation costs are also reimbursable.

Flood Control

The Oroville, Los Banos, and Del Valle Dams all contribute to flood relief. Up to certain limits, the Army Corps of Engineers pays all costs allocated to flood control.[11] Since the contractors are not responsible for flood control costs, flood control costs are *non-reimbursable*.

Recreation & Fish & Wildlife Enhancement[12]

In 1961, the Davis-Dolwig Act was chaptered.[13] In it, the Legislature made, in part, the following statement of policy.

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[11] The federal government paid its share of capital costs at or around the time of construction. For example, DWR and the Army Corps of Engineers entered into a contract for federal payments for construction of the flood control aspects of Oroville Dam and Reservoir on March 8, 1962. The contract provided for federal payments equal to 22% of the construction cost of the Dam and Reservoir, not to exceed $85 million. DWR and the Army Corps reached a similar agreement regarding construction of Del Valle Dam and Reservoir. Source: Department Of Water Resources, "California State Water Project", Bulletin 200, Volume 1, (Sacramento: The Department, November 1974), p. 27.

[12] Although recreation and fish and wildlife enhancement are distinct purposes in practice, the SWP treats them as one purpose for cost allocation purposes. Source: Department of Water Resources, "Management of the State Water Project - Appendix D: Costs of Recreation and Fish and Wildlife Enhancement", Bulletin 132-91, (Sacramento: The Department, June 1992), p.7

[13] Statutes of 1961, Chapter 861

The Legislature further finds and declares it to be necessary for the general public health and welfare that facilities for the storage, conservation or regulation of water be constructed in a manner consistent with the full utilization of their potential for the enhancement of fish and wildlife and to meet recreational needs; and further finds and declares that the providing for the enhancement of fish and wildlife and for recreation in connection with water storage, conservation, or regulation facilities benefits all of the people of California and that the project construction costs attributable to such enhancement of fish and wildlife and recreation features should be borne by them.[14]

Originally, the General Fund paid the costs assigned to recreation, and fish and wildlife purposes.[15] Since 1989, those costs not reimbursed by the General Fund offset an equal amount the SWP owes the California Water Fund.[16] Recreation and fish and wildlife enhancement costs are non-reimbursable by SWP contractors. (However, contractors are responsible for reimbursing mitigation costs related to recreation, fish and wildlife.)

ALLOCATING COSTS[17]

In trying to allocate SWP costs among purposes for multipurpose facilities, the problem is not in allocating charges that are clearly for one specific purpose. The problem is in allocating the joint costs.

Joint Costs

The DWR charges costs that are specific to a non-reimbursable purpose to that purpose. The DWR charges joint costs differently. As the DWR incurs joint costs for a specific multipurpose SWP facility, the DWR pro rates the costs among purposes based on distribution ratios. The DWR developed these ratios using a four step approach.

(1) Estimate the total costs of the facility over the life of the payback period.
(2) Determine the total costs to be allocated to each purpose.
(3) Identify the costs in (1) that are specific to each purpose.
(4) Determine the joint costs attributable to each purpose by subtracting the specific costs from the allocated costs.

Steps 1,3, and 4 are comparatively straight forward. The dilemma is with step 2.

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14 Water Code §11900

15 Water Code §11913 (Statutes of 1961, Chapter 867)

16 Water Code §11913 (Statutes of 1989, Chapter 716). The offset of funds is subject to annual approval by the Legislature.

17 This section is drawn primarily from: Department Of Water Resources, "The California State Water Project - Appendix D: Costs of Recreation and Fish and Wildlife Enhancement", Bulletin 132-80, (Sacramento: The Department, April 1980), pp. 15-18; and Senate Fact Finding Committee On Water, "Contracts, Cost Allocations, Financing for State Water Development", March 1960, printed in Legislature Of The State Of California, "Supplement to Appendix to the Journal of the Senate", (Sacramento: The Senate, 1960 Regular Session), pp. 37-39.

Separable Costs-Remaining Benefits

The Separable Costs-Remaining Benefits method is the key to allocating joint costs. The first statement of the Contracting Principles is:

> 1. *Cost allocations shall be on the separable costs-remaining benefits basis for multipurpose facilities and on a proportionate use basis by areas for water transportation facilities.*

The "separable costs-remaining benefits" and the "proportionate use" basis of cost allocation are two of many different methods of allocating costs between multiple purposes.[18] (The DWR uses the proportionate use basis to allocate transportation costs between contractors. This process is described more fully in the next chapter.)

Justifiable Costs

The separable costs-remaining benefits method is complicated.[19] However, the most critical aspect of the method is the concept of *justifiable costs*. This concept holds that the most one should spend on a facility is either the value of its benefits or the cost to construct and operate it, which ever is less. Any amount over that cannot be justified. The lessor of costs or benefits is the *justifiable costs*. For example, suppose we needed to identify the justifiable costs of a flood control facility. Assume again that a flood control only dam would have an estimated total cost of $70 million. Assume further that the estimated benefits of the flood control dam totaled $50 million. The justifiable costs for flood control would then be $50 million, (lessor of $70 m. and $50 m.).

Bottom Line

The separable costs-remaining benefits method uses justifiable costs to allocate among purposes, including fish and wildlife purposes. This means the DWR had to estimate in dollar terms the benefits fish and wildlife, for example, received as a result of the SWP. It appears the last time the DWR reestimated these benefits was around 1981.[20] It also seems likely that society may value the benefits of recreation or fish and wildlife differently from in the early 1980s. To the extent that a reestimation would increase the cost

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18 For a survey of the different methods that were initially considered for allocating costs between purposes, see: Senate Fact Finding Committee On Water, "Contracts, Cost Allocations, Financing for State Water Development", March 1960, printed in: Legislature Of The State Of California, "Supplement to Appendix to the Journal of the Senate", (Sacramento: The Senate, 1960 Regular Session), pp. 37-39.

19 For details on the Separable Costs-Remaining Benefits methodology, see Appendix E.

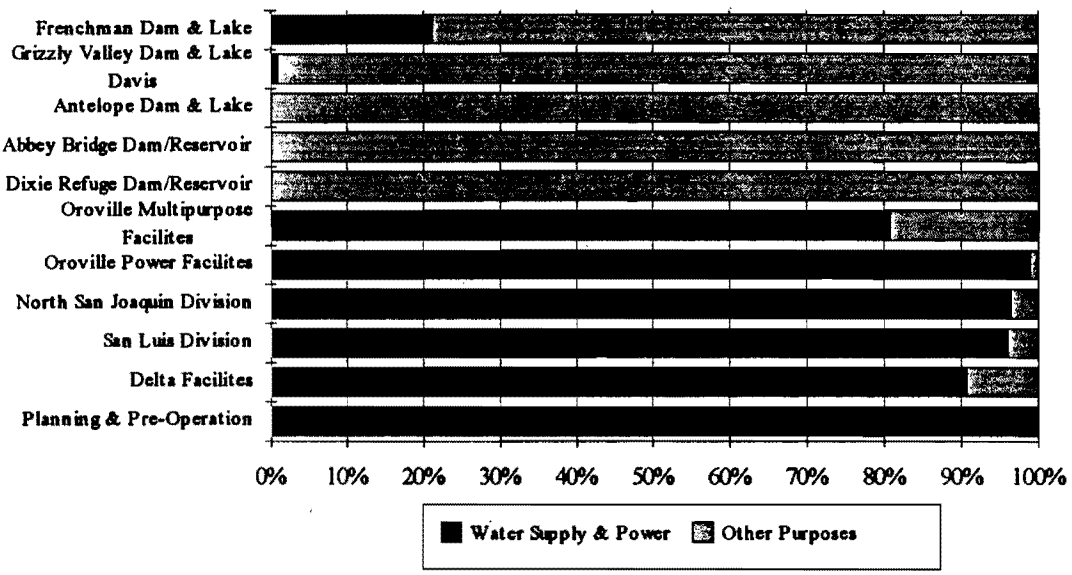
20 The explanation is complicated. Essentially, the cost allocation ratios DWR prints in the Bulletin 132s have not changed for most facilities since Bulletin 132-81. However, DWR has described reestimated costs for these same facilities in various Bulletin 132 Appendix D's. Given the complicated calculations involved, it is unlikely the cost reestimation included reestimating the distribution of joint cost.

The DWR's intent, at least initially, was to periodically review and revise cost allocations for each multi-purpose facility. From 1971 through 1982, the DWR published in Bulletin 132 Appendix D, tentative schedules for reporting and reviewing cost allocations. The schedules followed a staggered five year cycle.

allocation for recreation and fish and wildlife enhancement, costs allocated to the contractors would decrease.[21]

It is important to note, however, that the DWR separates the costs *after* it has made the decision to build the particular facility. That is, the DWR does not consider the environmental effects of building the facility when allocating costs among purposes. Take, for example, when the DWR allocated costs for Oroville Dam. The DWR's calculations on the benefits to fish and wildlife did not take into consideration the fact that *building* the dam would have an effect on the then existing environment. Nor did anything require them to. However, if the DWR had *netted* the effects on fish and wildlife of building the dam with the benefits, the DWR would likely allocate less costs to fish and wildlife.

Figure 2.B
State Water Project Conservation Facilities
Allocation Of Costs Between Purposes



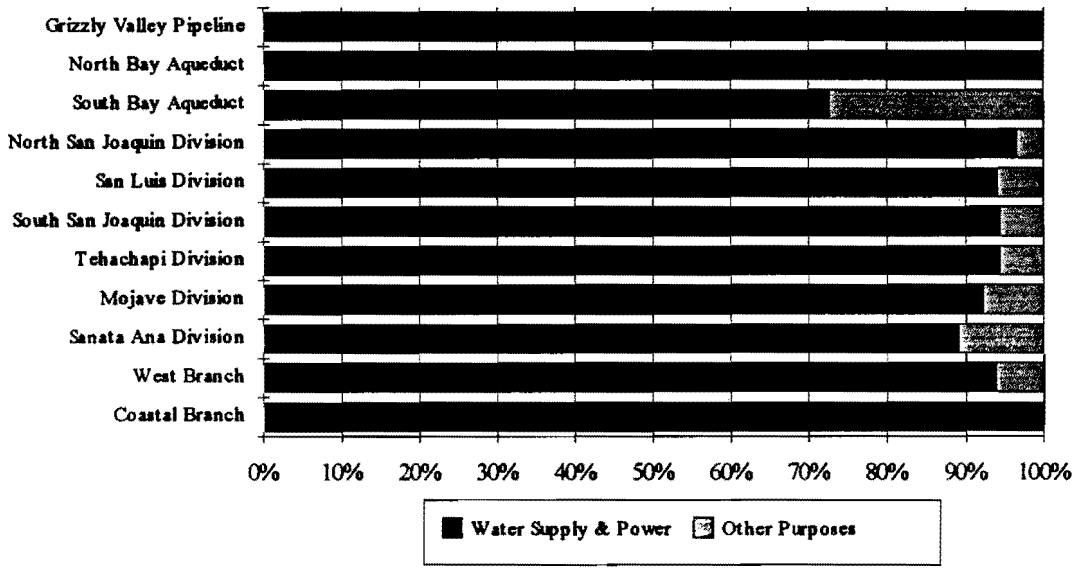
Source: Department Of Water Resources, "Management Of The California State Water Project", Bulletin 132-91, (Sacramento: The Department), December 1991, Table B-7.

Results

Figures 2.B and 2.C show how the DWR has allocated total costs between reimbursable and non-reimbursable costs. Using the plumbing metaphor, these figures show how much the DWR figuratively opens the valves and conveys costs to someone besides the contractors.

[21] It is not "a given" that a reestimation would increase the cost allocation to recreation or fish and wildlife, but it is a possibility.

Figure 2.C
State Water Project Transportation Facilities
Allocation Of Costs Between Purposes



Source: Department Of Water Resources, "Management Of The California State Water Project", Bulletin 132-91, (Sacramento: The Department), December 1991, Table B-7.

SUBDIVIDE COSTS BY FUNCTION AND TYPE

The fourth step of the allocation process sub-divides reimbursable costs into categories necessary for the allocation of water bills. The fifth and sixth Contracting Principles state (in part):

> 5. *Under the Delta pooling concept, there will be a single price for state project water at the Delta and for state project service areas above the Delta which will be referred to as the Delta water rate. The Delta water rate will consist of an annual (1) capital costs component, (2) necessary minimum operation, maintenance and replacement component; and (3) an operation and maintenance component which will vary with the amounts of water furnished.*
>
> 6. *Those contracting for water from a project aqueduct will pay, in addition to the Delta water rate, a charge herein referred to as the "transportation rate." The transportation rate will consist of an annual (1) capital cost component, (2) necessary minimum maintenance and replacement component, and (3) maintenance and operation component which will vary with the amount of water furnished.*

TWO FUNCTIONAL PURPOSES

The DWR segregates all reimbursable costs based on the purpose of the facility (conservation or transportation), and the type of cost (capital, fixed operating, or variable

operating). The segregation based on purpose is fairly simple. The SWP water contracts classify every SWP facility as being either a conservation facility, or a transportation facility, or both.[22] The contracts classify all reimbursable charges associated with conservation facilities as Delta charges.[23] The contracts classify all reimbursable charges associated with conveyance facilities as transportation charges.[24] The contracts also require charges for facilities classified as serving both conservation and transportation purposes be separated using the proportional use principle.[25]

Proportional Use

Simply stated, the proportional use principle assigns cost in proportion to the facility's use. For example, Reaches 1, 2a, and 2b (Delta to O'Neill Forebay) serve both conservation and conveyance purposes. The contracts measure proportionate use based on two measures:

- The maximum annual entitlements of water, and
- The peak capacity of the reach.[26]

Therefore, to determine the proper allocation between purposes, the DWR first determined the proportionate use for the reaches using each measure. Then, they averaged the two results. Consequently, the DWR classified 69 percent of costs assigned to Reaches 1, 2a, and 2b as transportation costs, and 31 percent of the costs as conservation costs.

THREE TYPES OF COST

The segregation based on the type of cost is also fairly simple. The contracts, consistent with Principles 5 and 6, categorize costs as:

> *(1) capital costs;*
> *(2) operation, maintenance, power and replacement costs incurred irrespective of the amount of project water delivered to the contractors; and*
> *(3) operation, maintenance, power and replacement costs incurred in an amount which is dependent upon and varies with the amount of project water delivered to the contractors ... .*[27]

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22 Articles 1(g), 1(h), and 1(i). Unless otherwise noted, all contract references are to: "Contract Between The Metropolitan Water District Of Southern California And The State Of California Department Of Water Resources For A Water Supply And Selected Related Agreements", October 1, 1991

23 Article 22. The term Delta Charge is figurative. Perhaps it reflects on the fact that the SWP appropriates all "surplus" water from the Delta.

24 Article 23.

25 Article 22(e). The exception is Reach 3. DWR based the allocation for Reach 3 on the "cost-of-a-substitute-conveyance-facility" method. See: Department Of Water Resources, "The California State Water Project In 1969", Bulletin 132-69, (Sacramento: The Department, June 1969), p. 108

26 Article 24(b)

27 Article 22(c)

In the vernacular of SWP, these cost categories are called:

(1) The capital cost component;
(2) The minimum operation, maintenance, power and replacement (minimum OMP&R) component; and
(3) The variable operation, maintenance, power and replacement (variable OMP&R) component.

Definitions

Capital Costs

For any facility, the DWR generally defines capital costs as all charges incurred from the date of authorization to the date the facility became operational. The capital cost component also includes initial costs for pumps, that the DWR scheduled for staged installation or construction.

OMP&R

The OMP&R components capture all costs associated with operating and maintaining each facility, once the DWR places the facility into service. Generally speaking, the *variable OMP&R* component is the electric bill for the SWP, while the *minimum OMP&R* component covers most other operating costs. The key exception is the variable OMP&R component of the Delta charge. For all practical purposes there isn't one. The DWR last published a variable OMP&R estimate for the Delta charge in 1968.[28] At that time, they estimated the variable component of the Delta charge would be 6¢ per acre-foot through 2035.[29] Since then, the DWR has included any variable portion of the Delta charge in the minimum OMP&R charge.

On the plumbing chart, the final two sets of branches illustrate the distribution of cost by function and type. Most facilities serve only one purpose. Hence, the plumbing chart shows no branching for the two facilities on either end. However, some facilities, such as the one represented in the middle of the chart, do serve both transportation and conservation purposes. For such facilities, the proportionate use is the criterion for metaphorically "setting the valves".

Continuing with the plumbing metaphor, the last step is the classification by type. The three sets of conservation costs represented on the left show the segregation of the delta water charge into capital and minimum OMP&R. Under the Delta pooling concept described in Principle 5, all contractors pay the same Delta water price. Consequently, the DWR sums like Delta components together into single Delta capital and Delta minimum OMP&R charges. The plumbing chart represents this by having like costs feed into the same horizontal pipe. Transportation charges are handled differently. As described later in Chapter 3, the DWR distributes transportation charges to individual contractors based

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[28] Department Of Water Resources, "The California State Water Project In 1968", Bulletin 132-68, (Sacramento: The Department, June 1968), p. 226

[29] They also estimated the total Delta charge would be $9.84 per acre-foot for 1994-2035, including construction costs for Dos Rios.

on their proportionate use of the facility. This requires the DWR to maintain separate balances for each facility. Consequently, although the plumbing chart groups transportation costs by type, the chart maintains the connection with the source facility.

Table 2.D
Composition Of
Delta Water Charge And Transportation Charges

DELTA WATER CHARGE

CAPITAL COST COMPONENT	• Planning, design, right of way, and construction costs of conservation facilities. • O&M costs for newly constructed conservation facilities prior to initial operation • Activation costs for newly constructed conservation facilities • Power costs allocated to initial filling of San Luis Reservoir • Capitalized O&M costs (major repair work, etc.) for conservation facilities • Program costs (portion) to mitigate impacts on current Delta fishery population due to SWP pumping before 1986 (DWR-DFG Agreement)
MINIMUM OMP&R COMPONENT	• Direct O&M costs of conservation facilities • Headquarters and field divisions (portion) • Insurance and FERC costs (portion) • General O&M costs allocated to conservation facilities • Replacement deposits for SWP control centers (portion) • Credits for a portion of Hyatt-Thermalito power generation • Power costs and credits related to pumping water to San Luis Reservoir for project operations (storage changes) • Value of power used and generated by Gianelli Pumping-Generating Plant • Program costs (portion) to offset annual fish losses resulting from pumping at Banks Pumping Plant (DWR-DFG Agreement)

TRANSPORTATION CHARGE

CAPITAL COST COMPONENT	• Planning, design, right of way and construction costs of transportation facilities • O&M costs for newly constructed transportation facilities prior to initial operation • Activation costs for newly constructed transportation facilities • Power costs allocated to initial filling of Southern California reservoirs • Capitalized O&M costs (major repair work, etc.) for transportation facilities • Program costs (portion) to mitigate impacts on current Delta fishery population due to SWP pumping before 1986 (DWR-DFG Agreement)
MINIMUM OMP&R COMPONENT	• Direct O&M costs of transportation facilities • General O&M costs allocated to transportation facilities • Power costs and credits related to pumping water to Southern California reservoirs for project operations (storage changes) • Power costs for pumping water to replenish losses from transportation facilities • Other power costs • Replacement deposits for SWP control centers (portion) • Off-aqueduct power facility costs -- bond service, bond cover costs (25% of bond service), bond reserves, transmission costs to provide service to "backbone", fuel costs taxes, and O&M -- less power sales allocated to off-aqueduct poser facilities • Program costs (portion) to offset annual fish losses resulting from pumping at Banks Pumping Plant (DWR-DFG Agreement)
VARIABLE OMP&R COMPONENT	• Power purchase costs • Alamo, Devil Canyon, Warne, and Castaic power generation credited at the power plant reach and charged to aqueduct pumping plants • Hyatt-Thermalito and Thermalito Diversion Dam power plant generation charged to aqueduct pumping plants (credits for this generation are reflected in the Delta Water Rate) • Replacement deposits for equipment at pumping plants and power plants • Credits from sale of excess SWP system power • Program costs (portion) to offset annual fish losses resulting from pumping at Banks Pumping Plant (DWR-DFG Agreement)

Source: Department Of Water Resources, "Appendix B", Bulletin 132-93, (Sacramento: The Department), July 1993, Figure-3

CHAPTER 3
THE CONTRACTORS' WATER BILL
"What Are All These Charges?"

This chapter presents three key points:

- *There are five basic components to the contractors' water bills.*
- *The water service contracts require the DWR to distribute most costs among contractors based on annual entitlements.*
- *Many components of the contractors' water bills have a built-in upwards creep.*

CONTRACTOR PAYMENTS[1]

THE WATER BILL

As previously noted, the SWP water contractors pay all reimbursable costs associated with acquiring and distributing SWP water. The water service contracts require the DWR to send each contractor its SWP water statement by July 1 of each year.[2] The statement includes:

- The next year's bill for each of five cost components:
  1. The Delta water charge -- capital component,
  2. The Delta water charge -- minimum OMP&R component,
  3. The transportation charge -- capital component,
  4. The transportation charge -- minimum OMP&R component;
  5. The water system revenue bond surcharge,[3] (discussed later in this Chapter);
- The next year's estimated per acre-foot price for variable OMP&R; and
- The total charges for the previous year's variable OMP&R.

In addition, the DWR provides each contractor with a monthly statement of the previous month's variable OMP&R charge based on actual delivery.

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1 This section focuses on payments for the basic system. That is, unless specifically noted, this discussion ignores charges for features constructed solely at the request of a specific contractor or set of contractors. DWR charges contractors for these facilities under separate agreements or contract amendments. Examples of such features include additional capacity of specific reaches, additional turn-outs, and the "East Branch Enlargement" project.

2 Article 29.

3 Article 50.

THE REPAYMENT SCHEDULE

The contracts also specify the repayment schedule.

- By January 1, the contractors pay:
  1. One-half (1/2) of the Delta water charge -- capital component,
  2. One-half (1/2) of the transportation charge -- capital component, and
  3. One-half (1/2) of the water system revenue bond surcharge;
- By July 1, the second half of the above payments are due.
- In additino, each month the contractors pay:
  1. One-twelfth (1/12) of the Delta water charge -- minimum OMP&R component,
  2. One-twelfth (1/12) of the transportation charge -- minimum OMP&R component, and
  3. The entire bill received the previous month for the transportation charge -- variable OMP&R component.[4]

If a contractor over or under pays the state, (because of calculation errors, for example), the DWR credits or debits the following year's account, with interest.

PROTECTION AGAINST DEFAULT

The contracts include provisions to prevent default by the contractors. Article 34(a) states:

> *If in any year the District fails or is unable to raise sufficient funds by other means, the governing body of the District shall levy upon all property in the District not exempt from taxation, a tax or assessment sufficient to provide for all payments under this contract then due or to become due within that year.*[5]

REDETERMINATION

Each year, the DWR reviews and reestimates all water supply and financial aspects of the SWP. The DWR reports the results of the ***redetermination*** in what is commonly referred to as "Appendix B" of Bulletin 132.[6] This annual redetermination is the basis for calculating the contractors' bills.

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4 Payments for Delta and Transportation minimum OMP&R are due by the 1st of each month. Payments for variable OMP&R is due by the 15th.

5 In *Goldman v. County of Riverside* (1983) 140 Cal. App. 3d 900, the Fourth District Court of Appeals found that this article did not violate Proposition 13's property tax limitation. See Appendix B, footnote 36.

6 The proper title is: Department Of Water Resources, "Management Of The State Water Project", Appendix B, Bulletin 132, (Sacramento: The Department, various years)

The next three sections describe how the DWR calculates each of the three main components of the contractors' bills, namely, the Delta charges, transportation charges, and (for some contractors) surplus/unscheduled water charges.

DELTA CHARGES

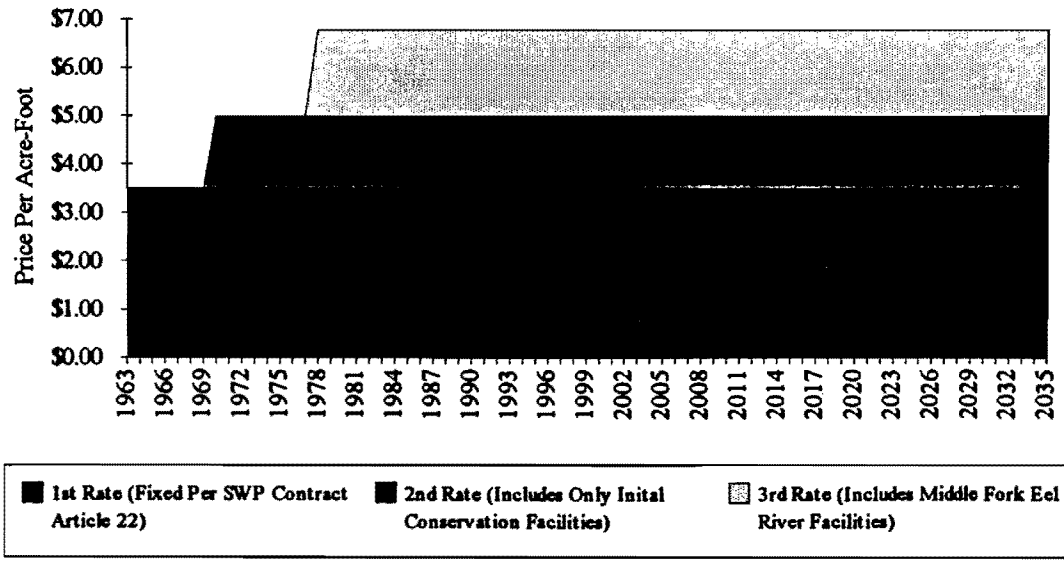
The Delta water charge is one of the two major components of the contractors' water bill.

> *The Delta water charge is basically a charge to insure the availability of water for delivery to the contractor, and as such, is determined on the basis of a rate per acre-foot of water. Those costs allocated to the purpose of water conservation form the basis for the charge.*[7]

INITIAL DESIGN

The Delta water charge, as envisioned in the Contracting Principles, was designed to produce an essentially constant unit price for water, "with adjustments only in the years of initial capital expenditures for construction of additional or supplemental conservation facilities."[8] Figure 3.A shows the Delta water charges the DWR projected in 1963.

Figure 3.A
Initial Computation Of The Delta Water Charges
1963



Source: Department Of Water Resources, "The California State Water Project In 1963", Bulletin 132-63, (Sacramento: The Department), April 1963, Table 30.

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7 Department Of Water Resources, "The California State Water Project In 1963", Bulletin 132-63, (Sacramento: The Department, April 1963), p. 172

8 Department Of Water Resources, "The California State Water Project In 1963", Bulletin 132-63, (Sacramento: The Department, April 1963), p. 189

The contracts set the initial Delta water charge at $3.50 per acre-foot. The DWR estimated that in 1970, the Delta water charge would climb to $4.99, (based on a formula we describe later in this chapter). The DWR estimated that the Delta water charge would finally reach $6.78 in 1978, when construction of the Eel River Facilities was to begin. These rates, when applied to annual entitlements, were designed to cover all reimbursable conservation costs.

CALCULATION

The formula for calculating the Delta water charges, as defined in the water service contracts, requires three key pieces of information:

- Actual and estimated capital and minimum OMP&R costs and credits for each year of the project (1952 - 2035),
- Total annual entitlements for each year of the project, and
- The project interest rate.

Costs And Assumptions

The DWR reports the cost data they used to calculate the Delta water charge each year in Appendix B of Bulletin 132. Future year capital cost estimates reflect prices prevailing at the time of calculation; that is, capital costs include no provision for inflation. Annual operating costs do include provisions for inflation, but only for the current year and subsequent two years.[9] Beyond that, costs reflect zero inflation. The capital component of the Delta water charge includes planning and pre-operating costs for initial and additional conservation facilities. However, under amendments to Article 22, the Delta water charge includes planning and pre-operating costs for additional conservation facilities only after they have been incurred.

Annual Entitlements

Each contract defines the contractor's annual entitlement to SWP water. Article 1(n) defines ***annual entitlement*** as "... the amount of project water to be made available to a contractor ***during the respective year*** ... under the terms of its contract with the state" (emphasis added). Detailed by year in Article 6 of each contract, the annual entitlement is the maximum amount of water the DWR is obligated to deliver, given sufficient supply.[10] As described later in this section, the calculation of the Delta water charge includes the total annual entitlements for all contractors.

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[9] The current rates are zero percent for 1993, five percent for 1994, and four percent for 1995. Department Of Water Resources, "Management Of The State Water Project: Appendix B", Bulletin 132-93, (Sacramento: The Department, July 1993), p. 12

[10] There is another type of entitlement. Typically, when the discussion is about minimum project yield, any reference to entitlement is usually to *maximum annual* entitlement. Article 1(o) defines *maximum annual entitlement* as "... the *maximum* amount of project water to be made available to a contractor *in any one year* ..."(emphasis added).

Project Interest Rate

The contracts define the project interest rate as "the weighted average interest rate" on most but not all SWP bonds, advances, or loans.[11] Notable exceptions are rates on:

- Central Valley Project Revenue Bonds issued prior to May 1, 1969,
- Power Revenue Bonds for off-aqueduct Facilities, and
- Water System Revenue Bonds.

The Formula

The formula for calculating the Delta water charge is quite elegant, but is somewhat difficult to describe. Essentially, the equation divides the *net present value* of actual and projected Delta Water costs and credits by the *net present quantity* of annual entitlements. The calculation results in a per unit Delta water charge for each component.

The Eight Steps

The formula for calculating the Delta water charge is complex. We can best describe the how the DWR estimates the Delta water charge by dividing the calculation into eight steps:

1. Estimate capital and minimum OMP&R costs and credits for each year of the life of the contract.
2. Calculate and sum the discounted or *present value* of all costs and credits for each component using the project interest rate.
3. Calculate and sum the present value of all contractor payments for each component at the project interest rate.
4. Subtract the sum of the present value of payments from the sum of the present value of costs and credits. This yields the *net present value* of the costs for each component.
5. Calculate and sum the discounted or *present quantity* of all annual entitlements at the project interest rate.
6. Calculate and sum the present quantity of all annual entitlements delivered to date, assuming delivery of all entitlements.
7. Subtract the sum of the present quantity of deliveries from the sum of the present quantity of total entitlements. This yields the *net present quantity* of the entitlements.
8. Divide the net present value of costs for each component by the net present quantity of water. This yields the per unit Delta water charge for each component.

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[11] Article 1(t).

Water System Revenue Bonds

> *The ... capital outlay expenditures included in the current Delta Water Rate were financed with bonds sold in 1990 at an interest rate of 7.197 percent. Because the Delta Water Rate is calculated at an interest rate of 4.713 percent, the $1.9 million in annual revenues collected under the capital component of the Delta Water Rate is not sufficient to pay the annual debt service of $3.1 million. The annual difference of $1.2 million is paid by the water contractors under the water system revenue bond surcharge.*[12]

The contractors and the DWR added the water system revenue bond surcharge to the contracts by amendment in 1987. The purpose of the surcharge is to make up the difference between the contractor payments calculated at the project interest rate and the actual payments required by all outstanding water system revenue bonds. This difference arises from the definition of the project interest rate. Recall from above that the project interest rate excludes from the calculation interest on certain bonds. As it happens, the excluded bonds that the DWR has sold to date have interest rates significantly above the project interest rate. Consequently, the Delta water charge does not raise sufficient funds to recover all necessary bond repayments. The water system revenue bond surcharge makes up the difference.

ALLOCATION TO CONTRACTORS

The water contracts define the Delta water charge for any contractor as follows. It is the per unit Delta water charge for each component multiplied by the contractor's annual entitlement to project water for the respective year. Consequently, the DWR calculates the Delta water charge based on the full entitlement, whether or not the contractor requests or receives its full entitlement. The Delta water charge is, therefore, a fixed cost to the contractor. That is, the Delta water charge does not vary with actual water deliveries. Should a contractor request or receive less than its full entitlement, its Delta water charge would not fall. From the contractors' perspective, they would be paying more per acre-foot of water it uses, the less water the contractor receives.

REDETERMINATION

The contracts require the DWR to redetermine the water charges each year.[13] Assuming the DWR had:

(a) "Perfect" information on future costs and payments, *and*
(b) No change in the project interest rate, *and*
(c) No additional planning or pre-operating costs for additional conservation facilities;

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[12] Department Of Water Resources, "Kern Water Bank: First Stage Kern Fan Element: Feasibility Report", (Sacramento: The Department, December 1990), p. 217.

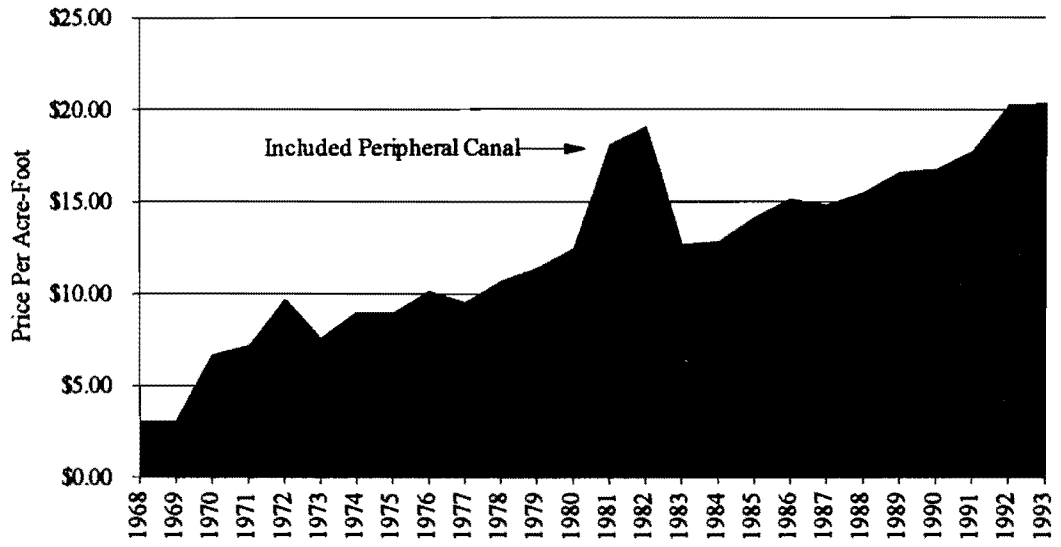
[13] Article 22(f) requires DWR to redetermine the of Delta Water Charges annually, Article 28 requires DWR to redetermine the Transportation Charge annually, Article 50 allows DWR to redetermine the Water System Revenue Bond Surcharge annually.

the formula provides a constant price per acre-foot for both components of the Delta water charge -- just as designed. Under these circumstances, the contractors' Delta water charge would not need adjusting from year to year. However, these three conditions have yet to be met.

Delta Charge Creeps Upward

As shown in Figure 3.B, the Delta water charge per acre-foot of annual entitlements has grown at a fairly steady rate. The notable exception is 1981-1982, when the Delta water charge jumped due to the anticipated costs of constructing the Peripheral Canal. Once the voters defeated the canal, the Delta water charge resumed its previous trend.

Figure 3.B
Effective* Per Unit Delta Water Charge



* Total Delta water charges divided by total annual entitlements.
Source: Department Of Water Resources, "Management Of The State Water Project: Appendix B", Bulletin 132-93, (Sacramento: The Department), July 1993, Tables B-4 and B-21

Part of the variation in the pattern is due to lack of perfect information. The DWR must project costs into the future. Actual costs often differ from the estimates -- some costs come in high, some come in low. That is why the contracts require the DWR to redetermine the water charges each year. However, a major part of the upward trend is structural. That is, even if the DWR had perfect information on past and future costs and payments, the per unit Delta water charge would increase.

Sources Of Upward Trend

Two key sources for structural increases in the per unit Delta water charge are:

- Inflation, and
- Planning and preoperating costs.

The DWR's Inflation Assumptions

As noted previously, the DWR does not adjust future year capital cost estimates for inflation. Additionally, it adjusts annual operating costs for inflation only for the current year and subsequent two years. It is unrealistic to assume inflation will be zero over the balance of the project. By recognizing inflation only once it occurs, the DWR virtually guarantees that the Delta water charge will continue growing.[14] The inflation adjustment will not cause the capital component to rise much, as the DWR has projected sharply declining capital costs. However, the DWR projects that it will spend a fairly constant amount on operating cost. Consequently, the Delta water charge - minimum OMP&R component will continue growing.[15] If, however, the DWR instead estimated inflation for the life of the project, the Delta water charge would be higher in the short run, but would not rise in the future.

Planning And Preoperating Costs

A similar situation exists with planning and pre-operating costs for additional conservation facilities. The contracts categorize these costs as Delta water charge - capital component. Under amendments to Article 22, the Delta water charge ignores these charges until after they occur. Yet, the DWR shows estimated planning and pre-operating costs out through 2010.[16] Ignoring this information affects prices over time like ignoring inflation. That is, as long as there are planning and pre-operating costs for additional conservation facilities, the Delta water charge - capital component will grow.

TRANSPORTATION CHARGES

The transportation charge is the other major component of the contractors' water bill.

TRANSPORTATION CHARGE IS UNLIKE DELTA CHARGE

> *In contrast to the Delta water charge, which is basically a unit commodity charge, the Transportation Charge is essentially a charge for the use of facilities.*[17]

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14 Assuming positive annual inflation over the balance of the project, all other things being equal.

15 The explanation is complicated. Essentially, each year you apply one year's inflation to the balance of the project's costs, and roll those costs into the Delta Water Charge.

16 Department Of Water Resources, "Management Of The State Water Project: Appendix B", Bulletin 132-93, (Sacramento: The Department, July 1993), Table B-13.

17 Department Of Water Resources, "The California State Water Project In 1963", Bulletin 132-63, (Sacramento: The Department, April 1963), p. 175

Allocation Philosophy

Unlike the Delta water charge, the transportation charge was designed to reflect use: those who use more of the transportation system, pay more. To account for this varying level of use, the DWR divided the aqueducts into repayment reaches. The DWR defined each reach so that the relative use of project transportation facilities are essentially the same for all the contractors.[18] Where the relative use of the facility changes, one reach ends and another reach begins. These points are generally at aqueduct branch turnouts or junctions, aqueduct regulatory reservoirs, and major delivery structures for contractors.[19]

Calculation Sequence

The essential approach to calculating the transportation charge is also different from the Delta water charge. For the Delta charge, the DWR grouped all reimbursable costs by component (capital and minimum OMP&R) regardless of which facility or reach was the source of the charges. The DWR then distributed the Delta charges to the contractors. For the transportation charge, component costs for each facility and reach remain distinct through distribution to the contractors. As a result, allocation of the transportation charge to contractors is much more involved than for the Delta water charge.

Components

Finally, unlike the Delta water charge, some transportation charges are calculated differently from one group of contractors to another. In particular, the way the DWR amortizes capital costs differs between agricultural contractors and M&I contractors.

The balance of this subsection describes:

- Allocation of the component costs to the contractors, and
- Calculation of the components of the transportation charge.

ALLOCATION TO CONTRACTORS

Capital & Minimum OMP&R

Like the Delta water charge, the DWR distributes fixed transportation costs to the contractors based on maximum annual use. The difference is that the Delta water charge measures use by maximum annual entitlement (a quantity measured in acre-feet), whereas the fixed transportation costs measure use based on both maximum annual entitlements (a quantity measured in acre-feet) and maximum capacity (a flow measured in cubic feet per second).

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[18] For an overview of the SWP facilities, including descriptions of the reaches, See Appendix A.

[19] Department Of Water Resources, "The California State Water Project In 1964", Bulletin 132-64, (Sacramento: The Department, June 1964), p. C-5

Proportionate Use

> *Fixed transportation costs consist of the capital cost component and the minimum operating component of the transportation charge. These charges are allocated by a proportionate use of facilities method of cost allocation. The measure of proportionate use is the mean [average] of the following ratios:*
>
> 1. *The ratio of each contractor's maximum annual entitlement to be delivered from or through a reach to the total maximum annual entitlements of all contractors to be delivered from or through a reach; and*
>
> 2. *The ratio of the capacity provided in a reach for the transport and delivery of project water to a contractor to the total capacity provided in a reach for the transport and delivery of project water to all contractors from or through a reach.*[20]

In general, the proportionate use calculations are the same for capital and minimum OMP&R. However, there are exceptions. Some contractors, such as the Metropolitan Water District, requested the DWR to construct portions of the aqueduct with extra capacity. Before the DWR would do this, however, they required payment for the capital portion of the extra capacity up front. The DWR did not, however, require up front payment of the minimum OMP&R charge. Consequently, the proportionate use calculations for capital purposes excluded the requested excess capacity (since it is already paid for) while the calculations for minimum OMP&R do not. Table 3.A shows how the DWR calculated proportionate use for Reach 17F - Carley V. Porter Tunnel to Junction, West Branch, California Aqueduct.

Off-Aqueduct Charges

There is one exception to the forgoing description -- off-aqueduct power facilities charges. There are three off-aqueduct power facilities. They are:

- Reid Gardner Power Plant,
- Bottle Rock Power Plant, and
- South Geysers Power Plant.

The contractors, through the off-aqueduct power facilities charges, repay all off-aqueduct power costs. These costs include:

- Bond service,
- Deposits for reserves,
- Operation and maintenance costs,
- Fuel costs,
- Taxes, and
- Insurance.

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[20] Department Of Water Resources, "The California State Water Project In 1963", Bulletin 132-63, (Sacramento: The Department, April 1963), p. 178

The DWR categorizes these charges as minimum OMP&R, and allocates the costs among the contractors in proportion to the electrical energy required to pump entitlement water for the year. The DWR bases the initial allocation on its estimates of energy needed to pump requested entitlement deliveries.[21]

Table 3.A
Proportionate Use Of Reach 17F
Carley V. Porter Tunnel To Junction, West Branch, California Aqueduct

Water Supply Contractor	Measure Of Use	Capacity Provided In Reach*	Proportionate Use For Allocation Of Capital Costs		Capacity Provided In Reach		Proportionate Use For Allocation Of Capital Costs	
			Ratio Of Total Reach Use	Average Of Ratios	Requested Excess peaking	Total Capacity	Ratio Of Total Reach Use	Average Of Ratios
The Metropolitan Water District of Southern California	Q AF	2067702.5	80.22%			2067702.5	80.22%	
	C CFS	3130.58495	79.65%	79.94%	188.00000	3318.58495	80.58%	80.40%
San Bernardino Valley Municipal Water District	Q AF	106187.0	4.12%			106187.0	4.12%	
	C CFS	178.77653	4.55%	4.33%	0	178.77653	4.34%	4.23%
San Gabriel Valley Municipal Water District	Q AF	29807.0	1.16%			29807.0	1.16%	
	C CFS	48.00938	1.22%	1.19%	0	48.00938	1.17%	1.16%
San Gorgonio Pass Water Agency	Q AF	17905.0	0.69%			17905.0	0.69%	
	C CFS	30.14002	0.77%	0.73%	0	30.14002	0.73%	0.71%
Crestline-Lake Arrowhead Water Agency	Q AF	6002.7	0.23%			6002.7	0.23%	
	C CFS	10.11277	0.26%	0.25%	0	10.11277	0.25%	0.24%
Mojave Water Agency	Q AF	52192.3	2.02%			52192.3	2.02%	
	C CFS	77.72325	1.98%	2.00%	0	77.72325	1.89%	1.96%
Desert Water Agency	Q AF	39144.2	1.52%			39144.2	1.52%	
	C CFS	65.94939	1.68%	1.60%	0	65.94939	1.60%	1.56%
Coachella Valley County Water Agency	Q AF	23733.1	0.92%			23733.1	0.92%	
	C CFS	39.99275	1.02%	0.97%	0	39.99275	0.97%	0.95%
Antelope Valley-East Kern Water Agency	Q AF	139429.0	5.41%			139429.0	5.41%	
	C CFS	207.20029	5.27%	5.34%	0	207.20029	5.03%	5.22%
Littlerock Creek Irrigation District	Q AF	2332.4	0.09%			2332.4	0.09%	
	C CFS	3.46854	0.09%	0.09%	0	3.46854	0.08%	0.09%
Palmdale Water District	Q AF	17507.9	0.68%			17507.9	0.68%	
	C CFS	26.03052	0.66%	0.67%	0	26.03052	0.63%	0.66%
Ventura County Flood Control District	Q AF	20365.8	0.79%			20365.8	0.79%	
	C CFS	30.24985	0.77%	0.78%	0	30.24985	0.73%	0.76%
Castaic Lake Water Agency	Q AF	55191.1	2.14%			55191.1	2.14%	
	C CFS	81.97676	2.09%	2.11%	0	81.97676	1.99%	2.07%
Totals	Q AF	2577500.0	100.00%			2577500.0	100.00%	
	C CFS	3930.21500	100.00%	100.00%	188.00000	4118.21500	100.00%	100.00%

* Includes allowances for operational losses and scheduled outages

Source: Department Of Water Resources, "Management Of The California State Water Project", Bulletin 132-91, (Sacramento: The Department), December 1991, Tables B-1 & B-2, pp. 246-247

[21] The timing of contractor requests for entitlement water is discussed in Appendix G.

The DWR calculates the total fixed transportation charge to any contractor at the turnout point; i.e., the point the contractor receives delivery from the SWP. The DWR adds together the contractor's share of each reach's costs. Since all reaches have positive fixed transportation costs, these charges grow as you move further away from the Delta. (See Table 3.B)

Table 3.B
Unit Transportation Costs Of Water
Cumulative Unit Costs From The Delta
($ Per Acre-Foot)

Reach Number	Description	Capital Costs	Minimum OMP&R	Variable OMP&R	Total
1	Delta Through Bethany Reservoir	$1.98	$5.56	$7.24	$14.78
2A-2B	Bethany Reservoir To O'Neill Forebay	$3.88	$6.20	$7.24	$17.32
3	O'Neill Forebay To Dos Amigos Pumping Plant	$4.42	$6.38	$7.24	$18.04
4-13B	Dos Amigos Pumping Plant To Buena Vista Pumping Plant	$9.94	$11.31	$10.57	$31.82
14A-14C	Buena Vista Pumping Plant To Wheeler Ridge Pumping Plant	$13.37	$16.63	$15.55	$45.55
15A	Wheeler Ridge Pumping Plant To Crisman Pumping Plant	$15.30	$22.11	$21.70	$59.11
16A	Crisman Pumping Plant To A. D. Edmonston Pumping Plant	$18.51	$32.43	$34.88	$85.82
17E-17F	A. D. Edmonston Pumping Plant To Junction, West Branch	$32.26	$66.11	$81.52	$179.89
18A-22A	Through Alamo Power Plant To Pearblossom Pumping Plant	$42.50	$71.08	$79.16	$192.74
22B	Pearblossom Pumping Plant To West Fork Mojave River	$52.22	$87.30	$93.65	$233.17
23-25	West Fork Mojave River To South Portal, San Bernardino Tunnel	$63.45	$89.48	$89.17	$242.10
26A-28H	Through Devil Canyon Powerplant To Lake Perris	$80.36	$98.73	$64.31	$243.40
26A-28J	Perris Dam And Lake Perris	$165.08	$136.27	$64.31	$365.66

Note: Hypothetical rates – For illustrative purposes only

Source: Department Of Water Resources, "Appendix B", Bulletin 143-93, (Sacramento: The Department), July 1993, Table B-25

Variable OMP&R

> ***In accordance with Article 26 of the standard contract provision, the proportionate use of an aqueduct reach for the purpose of allocation of variable transportation costs is measured by the total quantity of water delivered from or through the reach to each contractor within a given year. The variable cost is the only component of the transportation charge whose proportionate distribution among contractors changes from year to year.***[22]

Like fixed transportation charges, the DWR calculates the total variable OMP&R charge to any contractor at the turnout point. The DWR adds the contractor's share of each reach's costs to make the total bill. However, unlike fixed transportation charges, not all reaches have positive variable transportation costs. Reaches with pumping plants have positive variable charges, since the pumping plants consume electricity (and money) to

[22] Department Of Water Resources, "The California State Water Project In 1963", Bulletin 132-63, (Sacramento: The Department, April 1963), pp. 178-179

move the water on. Reaches with generating plants have negative variable charges, since the pumping plants generate electricity (and money) as a byproduct of moving the water on. Consequently, variable OMP&R charges do not necessarily grow as you move further away from the Delta.

CALCULATION OF THE TRANSPORTATION CHARGE

As noted above, the DWR calculates the transportation charge significantly differently from the Delta charge. Each component of the transportation charge has its own idiosyncrasy. However, the key attribute common to all is that costs for each facility and reach remain segregated by facility and reach.

Costs And Assumptions

The DWR reports the costs and credits used to calculate the transportation charge annually in Appendix B of Bulletin 132, along with information on the other water charges. As noted previously, future year capital cost estimates reflect prices prevailing at the time of calculation. That is, capital costs include no provision for inflation. The estimates reflect future cost inflation only after it has occurred. Annual operating costs do include provisions for inflation, but only for the current year and subsequent two years.[23] Beyond that, costs reflect zero inflation.

Capital Component

Once the DWR allocates capital costs to contractors, the annual payments must be calculated. The DWR uses one of two methods to calculate payments, depending on the type of water service. The DWR, in negotiating contracts, allowed contractors to choose how the department would bill them for capital costs. Contractors for municipal and industrial (M&I) water service elected to have their capital costs billed one way, agricultural water contractors elected another.

Municipal And Industrial Water Contractors

The M&I contractors elected to have their capital costs billed similar to a mortgage. Accordingly, the DWR finances each year's capital costs over fifty (50) years, calculated at the ***project interest rate***. The payment for any one year, then, is the sum of the annual "mortgage payments" bills for capital costs in current and previous years.[24]

Table 3.C illustrates how the DWR calculates an M&I contractor's transportation charge - capital component. Suppose for Year 1, the DWR allocates $100 of capital costs to Contractor X. At an annual interest rate of 4.6 percent, the M&I contractors would make 50 annual $4.92 payments. The payment for Year 1, then, is $4.92. Suppose for Year 2, the DWR allocates $105 to Contractor X. This in turn translates into 50 annual payments

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[23] The current rates are zero percent for 1993, five percent for 1994, and four percent for 1995. Department Of Water Resources, 'Management Of The State Water Project: Appendix B", Bulletin 132-93, (Sacramento: The Department, July 1993), p. 12

[24] Article 24(c)

of $5.16. The payment for Year 2, then, is $10.08, ($4.92 from Year 1 plus $5.15 from Year 2). This process continues as long as there are outstanding payments.

The Agricultural Contractors

The agricultural contractors elected to have their capital costs billed like the Delta water charge. That is, the DWR divides the *net present value* of actual and projected capital costs by the *net present quantity* of annual entitlements to get a per unit price.[25] The annual payment is the per unit price times the annual entitlement.[26]

Table 3.C
Calculation Of
Transportation Charge - Capital Component
For Hypothetical M&I Contractor

		Year Costs Are Incurred								
		Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	
	Capital Costs For Year	$100	$105	$110	$115	$120	$125	$130	$135	Total Payment
Year Costs Are Billed	Year 1	$4.92								$4.92
	Year 2	$4.92	$5.16							$10.08
	Year 3	$4.92	$5.16	$5.41						$15.49
	Year 4	$4.92	$5.16	$5.41	$5.65					$21.14
	Year 5	$4.92	$5.16	$5.41	$5.65	$5.90				$27.04
	Year 6	$4.92	$5.16	$5.41	$5.65	$5.90	$6.15			$33.19
	Year 7	$4.92	$5.16	$5.41	$5.65	$5.90	$6.15	$6.39		$39.58
	Year 8	$4.92	$5.16	$5.41	$5.65	$5.90	$6.15	$6.39	$6.64	$46.22

For illustrative purposes only. Assumes a 4.6 percent project interest rate.

Water System Revenue Bond

Like the Delta water charge, there is a water system revenue bond surcharge for transportation capital as well. Again, the surcharge makes up the difference between the contractor payments calculated at the project interest rate and the actual payments required by all outstanding bonds.

Minimum OMP&R

Unlike the transportation capital component, the DWR uses the same method to calculate minimum OMP&R payments regardless of the type of water service. And, unlike the minimum OMP&R component of the Delta water charge, the DWR does not calculate a

[25] See the discussion of calculating the Delta Water Charge for more details on the calculation of net present value and net present quantity.

[26] See, for example, Article 45(c) of "Contract Between The State Of California Department Of Water Resources And Tulare Lake Basin Water Storage District For A Water Supply", December 20, 1963.

per acre-foot transportation minimum OMP&R component based on projected life of the project costs. Instead, the DWR bills each contractor annually for the contractor's share of the minimum OMP&R costs the DWR expects to incur that year.[27]

Variable OMP&R

Like the minimum OPM&R component of the transportation charge, the DWR bills variable OMP&R charges when it incurs the costs. Each year, before sending out the July 1 water bills, the DWR estimates the per-acre-foot rate for variable OMP&R for the following year. The key variable to this estimate is the contractors' requested delivery for the upcoming year.

By each October 1, the contractors submit their water delivery requests for the following five years to the DWR. The DWR uses the delivery requests for the second year to estimate the variable OMP&R rate.

The Process

The process the DWR uses for estimating the variable OMP&R rate is, generally, as follows:

1. Determine power needs to pump requested delivery to contractors, by reach.
2. Estimate costs to supply required power, by reach.
3. Divide estimated costs by requested delivery, by reach. This yields the estimated per-acre-foot charge by reach.

As the DWR delivers water through the year, it bills the contractors for delivered water at the estimated per-unit rate.

DATA REDETERMINATION

As previously noted, the contracts require the DWR to redetermine the water charges each year. Unlike the Delta water charge, the effects of redetermination vary substantially between the different component charges.

Capital Component

Redetermination has two results, depending on the type of water service. The DWR estimates include no allowance for capital price inflation. Consequently, agricultural water users will see their capital charge rise for reasons explained above in the Delta water charge discussion. M&I contractors will also see their charges rise, but to a much lesser extent. This is because M&I contractors finance each year's capital charges over the next 50 years, (with repayment extending beyond 2035, the contractual end of the SWP). As a result, in the course of redetermination, the DWR adds only *one* year's inflation to the charge, and the inflation effect gets spread over 50 years.

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[27] Article 25.

However, regardless of type of service, the effects for most contractors are small. This is because the transportation system, for most contractors, is largely complete.[28] Indeed, current capital cost estimates show the entire transportation capital program finished by the end of the year 2000.[29] That future year capital cost estimates do not include any allowance for price inflation means there will be an upward effect on capital charges. However, given the relatively short life of the balance of the transportation capital program, the effects will be short lived.

Minimum OMP&R

By design, minimum OMP&R charges will rise for the first 50 years of the project, regardless of type of service. In the absence of inflation, and assuming a constant level of staffing and constant project interest rate, minimum OPM&R charges would rise in 50 equal increments. Then the charge would stabilize at that level, as one year's first payment is added to the charge, while the charges from 51 years back drop off. Since the DWR included the effects of inflation in calculating operating costs for the current year and subsequent two years, there is no inflation effect in redetermination. However, because the estimates include an inflation factor for only two years out, the DWR's projections of minimum OMP&R beyond that time understate likely future charges.

Variable OMP&R

The effects of annually redetermining variable OMP&R varies greatly. And unlike virtually all other components, the variation is due solely to lack of perfect information. As previously noted, the DWR estimates unit variable OMP&R charges based on water delivery requests. These requests are occasionally greater than actual deliveries. Consequently, the DWR purchases less power than anticipated, thereby lowering the power cost element. However, since the DWR also delivered less water, the divisor also is lower. Nonetheless, assuming the DWR buys the cheapest power first, the next cheapest second, and so on, the results generally will be lower per unit charges -- and a lower variable OMP&R charge. The DWR applies the resulting credits to the following year's water bill.

UNSCHEDULED & SURPLUS WATER

There is one other component to some contractors' water bills, namely, charges for unscheduled and surplus water. The contracts define surplus and unscheduled water as

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[28] The notable exception is the Coastal Branch, where 84 percent of the capital charges are scheduled to be incurred between 1994 and 2000. This compares to just over 2 percent of capital charges for all other reaches over the same period. Department Of Water Resources, 'Management Of The State Water Project: Appendix B", Bulletin 132-93, (Sacramento: The Department, July 1993), Table B-10.

[29] Notwithstanding planning and pre-operating costs, this is also true of initial conservation facilities. However, given the escalating problems in the Delta, DWR's estimate of incurring no additional capital charges for initial conservation facilities after the year 2000 seems optimistic.

water in excess of all other SWP requirements.[30] To receive surplus or unscheduled water, a contractor must first execute a separate contract with the DWR. This additional contract is to be in conformity with Article 21 and include additional provisions scheduling surplus water and provisions regarding times and methods of payment.

THE COMPONENTS

The surplus water charge has three components.

1. An administrative charge to cover the DWR's general operating costs;
2. An energy charge equivalent to the variable OMP&R rate; and
3. A replacement rate to cover pro-rata equipment replacement charges.

In addition, SWP contractors acquiring water for purposes other than agriculture or groundwater replacement pay an additional amount equal to one-half of the Delta water rate.

[30] Surplus water and DWR's water allocation process are described in Chapter 4.

CHAPTER 4
ALLOCATING SWP WATER TO CONTRACTORS
"How Does The DWR Decide How Much Water Each Contractor Gets?"

This chapter presents three key points:

- *Article 18(a) of the water service contracts dictates how the DWR is to allocate reductions to requested water deliveries.*
- *This year, 1994, the DWR allocated reductions in apparent conflict with Article 18(a).*
- *If the DWR determines there is a permanent reduction in the minimum project yield, Article 18(b) requires the DWR to reduce all entitlements proportionately.*

INTRODUCTION

Each year, the DWR estimates how much water will be available for water supply purposes.[1] Once the DWR determines how much water is available for the year, it schedules the water for delivery to the SWP contractors. When the amount of available water exceeds contractor requests, allocation is easy. However, when the contractors request more water than is available, the DWR becomes the bearer of bad news. The DWR must reduce some, if not all, of the water deliveries to the contractors.

There are two consequences of the DWR reducing requested water deliveries. First and most obvious, contractors must either find alternative water sources or make do with less water. Replacement water is more expensive than SWP water.[2] Foregoing water also has its costs; it can lower income, decrease production, and force lifestyle changes. The second consequence of reduced deliveries, is that the average price of the water that the DWR does deliver also increases. (This effect is explained more fully in Chapter 5.) Given the double-barrel effect of reduced water deliveries, the method of allocating these reductions becomes critical.

This chapter describes how the DWR allocates SWP water among the contractors. As with the previous chapter, we begin with some definitions. Specifically, in this chapter we describe:

- The basic types of SWP water,
- The water allocation schedule and basic water allocation process, and
- The DWR's method of allocating water when requests exceed supply.

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1 For details on how the DWR estimates the annual water supply, see Appendix F.

2 Assuming contractors buy the least expensive water first, second least expensive water second, etc.

The focus is on both how the contracts say the water should be allocated and how the DWR has interpreted the contracts when making reductions. Finally, we focus specifically on how the DWR made the initial allocation of water this year.

TYPES OF SWP WATER

The contracts establish a number of different classes of water, each class of water with its own priority. Not all contracts include provisions for all classes of water. In addition, not all contractors avail themselves to all classes of water. The five major classes of water are:

- Entitlement Water (Article 6),[3]
- Carry-Over Water,
- Make-Up Water (Article 12(d) and Article 14(b)),
- Wet Weather Water (Article 7 and Article 45), and
- Surplus/Unscheduled Water (Article 21).

ENTITLEMENT WATER

The contracts define two types of water entitlements -- *annual entitlements* and *maximum annual entitlements*. When the discussion is about a specific year's delivery, typically any reference to entitlement is to *annual* entitlement.[4] Article 1(n) defines *annual entitlement* as "... the amount of project water to be made available to a contractor *during the respective year* ... under the terms of its contract with the state" (emphasis added). Detailed by year in Article 6 of each contract, the annual entitlement is the maximum amount of water the DWR is obligated to deliver, given sufficient supply. As described in Chapter 3, the entitlement is the basis for allocating the Delta water charge.

CARRY-OVER WATER

For several years the DWR has offered interested contractors the opportunity to carry over a portion of their *approved* entitlement (described later in this chapter) to the next year. The DWR designed the programs to encourage the most effective use of water and to avoid obligating the contractors to use or lose the water by December 31. Because conditions change from year to year, the DWR establishes these programs for one year terms.

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3 All references to "Article __" refer to specific articles in the water supply contracts.

4 Typically, when the discussion is about minimum project yield, any reference to entitlement is usually to *maximum annual* entitlement. Article 1(o) defines *maximum annual entitlement* as "... the *maximum* amount of project water to be made available to a contractor *in any one year* ..."(emphasis added).

MAKE-UP WATER

The DWR allocates make-up water according to Article 12(d) and Article 14(b). According to Article 12(b), if for reasons beyond its control, the DWR is unable to deliver any portion of the District's annual entitlement, the contractor may elect to receive the water at another time that year or in the next succeeding year. Article 14(b) provides similar delayed delivery if the DWR cannot deliver the water due to necessary investigations, inspections, maintenance, repairs, or replacement of SWP facilities.

WET WEATHER WATER

Article 7 (for South Bay contractors) and Article 45 (for San Joaquin Valley contractors) provides that contractors can acquire credits for future deliveries when above-normal local water supplies reduce the need for SWP water. At the time of delivery, the sum of current annual entitlement plus wet-weather water cannot exceed a contractor's maximum annual entitlement.

SURPLUS/UNSCHEDULED WATER

Article 21 defines surplus water as water in excess of that required to meet:

1. All entitlement demands,
2. Reservoirs storage goals,
3. Water quality requirements, and
4. All other SWP requirements (such as recreation water).

The key aspects of surplus water are that the DWR can release it from reservoirs and schedule delivery in advance. The contracts give first priority for surplus water to SWP contractors for agricultural use or for groundwater replenishment. Second priority goes given to SWP contractors for other uses, and non-SWP contractors receive the lowest priority.

Unscheduled water is similar to surplus water, except the DWR cannot schedule its delivery months in advance. The contracts define unscheduled water as water that is sometimes available in the Delta, as opposed to water released from SWP storage. Its availability may be as brief as one day or as long as two weeks. The contracts give first priority for unscheduled water to groundwater replenishment or to agricultural use in lieu of groundwater pumping. Second priority is for pre-irrigation to increase soil moisture prior to planting.

THE SCHEDULE

Article 12(a) of the water supply contracts establishes the timetable for processing delivery requests. By October 1 each year, the contractors submit their preliminary delivery requests to the DWR. The requests include the total quantity of entitlement water

requested for the following five years, any requests for surplus water, and tentative monthly delivery schedules for each year.

The DWR reviews the requests to ensure that the amounts, times, and rates of delivery for the up coming year are consistent with the state's overall delivery abilities. If the requests are not consistent with the state's overall delivery abilities, the DWR can modify the request(s), after first consulting with the affected contractor(s).

By December 1 each year, the DWR must give the contractors the initial water delivery schedule for the following year. In doing so, the DWR establishes the initial *approved entitlements* for each contractor for that year. As actual precipitation and snow depth data becomes known, the DWR updates its water supply estimates. When the updated water supply estimates change significantly, the DWR updates the delivery schedule and (generally) increases the approved entitlement.

ALLOCATING REDUCTIONS

When the amount of available water exceeds contractor requests, allocation is easy. However, when the contractors request more water than is available, the DWR reduces deliveries to some, if not all, of the contractors. This section describes how the contracts direct the DWR to allocate reductions.

SURPLUS WATER

If there is insufficient water to meet all contractor requests for both entitlement *and* surplus water, the contracts require the DWR to reduces requests for surplus water first. The DWR makes the reductions in reverse priority order. That is, first the DWR cuts surplus water requests by non-SWP contractors, then water requested by SWP contractors for non-agricultural and non-groundwater replenishment uses. The last cuts made are to SWP contractors' requests for agricultural use or for groundwater replenishment.

SHORT TERM REDUCTIONS -- ARTICLE 18(a)

If the DWR cannot deliver sufficient water due to drought or other temporary cause, Article 18(a) dictates how the DWR is to reduce requests. Article 18(a) establishes a two-tiered approach to reducing requests. The first round reduces agricultural requests:

(a) "... up to fifty percent (50%) ... of that portion of the contractor's annual entitlement for the respective year ..."; but not more than
(b) "... a total of one hundred percent (100%) [of one year's entitlement] in any series of seven consecutive years ...".[5]

[5] Article 18(a)

If the first-round cuts are insufficient, any additional cuts are to be made regardless of the use to which the water will be put. Under the second round of cuts, "... the state shall reduce deliveries to each contractor in an amount which bears the same proportion to the total amount of such necessary further reduction that the contractor's annual entitlement bears to the total of the annual entitlements of all contractors for that year ...". However, the DWR "... may apportion on some other basis if such is required to meet minimum demands for domestic supply, fire protection, or sanitation during the year."[6]

The DWR's Interpretation Of Article 18(a)

During the recent drought, the DWR had to implement Article 18(a). However, some would argue that the DWR did not implement Article 18(a) as it was intended. The DWR based the reductions in proportion to the requests, not in proportion to the contractors' annual entitlements. Consequently, some contractors, who were not previously requesting their full annual entitlement, changed how they calculated their annual requests.

This Year

Partially in response to how the DWR has administered reductions to annual requests, the MWD and other contractors have requested their full entitlements, regardless of whether they actually 'needed" that much water. As a result, the DWR had requests totaling 3.8 million acre-feet, more water than they had ever delivered. The DWR felt the requests were unrealistic. In response, they claimed authority under the contract[7] to modify the initial requests. The DWR reviewed actual deliveries to each of the 29 contractors over the last ten years. Then, where appropriate, the DWR reduced the initial requests to the largest quantity received in the last ten years. This lower amount became the modified initial request. Based on 99 percent exceedence standard, the DWR then made an initial commitment to deliver 1.56 acre-feet -- one-half of the modified initial request. (See Table 4.A)

Predictably, the affected contractors protested vigorously.[8] After a series of discussions, the DWR and the contractors agreed to a revised allocation process.[9] They agreed that *for 1994 only*, the DWR would allocate to each contractor 50 percent of the contractors' annual entitlement. In essence, they agreed to a literal interpretation of Article 18(a). In addition, the DWR 'found" 474,000 acre-feet of additional water, thereby avoiding the need to reduce the initial allocation of water to any contractor.

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6 Article 18(a)

7 Article 12(a)(2) or Article 18(a). Also Article 38, and Article X, section 2 of the California Constitution.

8 For example, The MWD Board of Directors, in December 1993 voted to withhold their SWP payment.

9 For details of the allocation method, see: Water Services Contractors Council Memo No. 2078, February 3, 1994.

Table 4.A
Initial 1994 Entitlement Allocations

S.W.P Contractors	1994 Entitlement	1994 Requested Deliveries	Maximum Entitlement Used Since 1980	Reduction From Requested Delivery	Approved Entitlement Delivery At 50%	Percent of Requested Delivery
Feather River:						
County of Butte	1,200	1,101	459	(642)	230	21%
Plumas County	1,200	1,200	548	(652)	274	23%
Yuba City	9,600	2,700	642	(2,058)	321	12%
Subtotal	12,000	5,001	1,649	(3,352)	825	16%
North Bay:						
Napa County	9,135	9,135	6,940	(2,195)	3,470	38%
Solano County	28,080	28,080	20,881	(7,199)	10,441	37%
Subtotal	37,215	37,215	27,821	(9,394)	13,911	37%
South Bay:						
Alameda County, Zone 7	40,000	40,000	34,500	(5,500)	17,250	43%
Alameda County WD	42,000	42,000	34,189	(7,811)	17,095	41%
Santa Clara Valley WD	100,000	100,000	92,000	(8,000)	46,000	46%
Subtotal	182,000	182,000	160,689	(21,311)	80,345	44%
San Joaquin Valley:						
Oak Flat WD	5,700	5,700	5,700	0	2,850	50%
County of Kings	4,000	4,000	4,000	0	2,000	50%
Castaic Lake WA - - Ag.	12,700	12,700	12,700	0	6,350	50%
Dudley Ridge WD	57,700	57,700	55,600	(2,100)	27,800	48%
Empire West Side ID	3,000	3,000	3,000	0	1,500	50%
Kern County WD	1,153,400	1,153,400	1,153,400	0	576,700	50%
Tulare Lake Basin WSD	118,500	118,500	118,500	0	59,250	50%
Subtotal	1,355,000	1,355,000	1,352,900	(2,100)	676,450	50%
Central Coastal:						
San Luis Obispo County	25,000	0	0	0	0	--
Santa Barbara County	45,486	0	0	0	0	--
Subtotal	70,486	0	0	0	0	--
Southern California:						
Antelope Valley - East Kern WD	138,400	55,902	55,902	0	27,951	50%
Castaic Lake WA -- M&I	41,500	25,100	22,139	(2,961)	11,070	44%
Coachella Valley WD	23,100	23,100	23,100	0	11,550	50%
Crestline	5,800	1,950	1,950	0	975	50%
Desert WA	38,100	38,100	38,100	0	19,050	50%
Littlerock Creek ID	2,300	2,300	1,747	(553)	874	38%
Mojave WA	50,800	50,800	11,800	(39,000)	5,900	12%
Metropolitan WD	2,011,500	2,011,500	1,373,800	(637,700)	686,900	34%
Palmdale WD	17,300	15,060	9,009	(6,051)	4,505	30%
San Bernardino Valley MWD	102,600	17,068	17,068	0	8,534	50%
San Gabriel Valley MWD	28,800	16,000	16,000	0	8,000	50%
San Gorgonio Pass	17,300	0	0	0	0	--
Ventura County	20,000	5,000	4,836	(164)	2,418	48%
Subtotal	2,497,500	2,261,880	1,575,451	(686,429)	787,727	35%
Total All Areas	**4,154,201**	**3,841,096**	**3,118,510**	**(722,586)**	**1,559,258**	**41%**

Source: Department Of Water Resources, Water Service Contractors Council Memo No. 2072, December 9, 1993

LONG TERM REDUCTIONS -- ARTICLE 18(b)

If the shortage of water is of a more permanent nature, and threatens to reduce the minimum project yield, Article 18(b) takes over. Under Article 18(b), the DWR would be required to proportionately reduce the annual entitlements and the maximum annual entitlements "... to the extent necessary so that the sum of the revised maximum annual entitlements of all contractors will then equal such reduced minimum project yield ...".[10]

[10] Article 18(b). Conversely, Article 18(c) allows for the proportional restoration of the reduced entitlements after circumstances justify an upward revision.

CHAPTER 5
EFFECTS OF WATER SUPPLY & SWP FINANCING
"What Does All This Mean To Water Prices"

This chapter presents three key points:

- *Most of the contractors' water bills do not vary with water deliveries.*
- *The average price of SWP water is the result of two independent sets of actions -- cost allocation and water deliveries.*
- *Some contractors are paying more for an equivalent unit of water than other contractors.*

INTRODUCTION

This chapter examines how water supply and SWP financing affect prices.[1] To do this, we first discuss the composition of the water charges, focusing on fixed versus variable costs. Then, we review the amount of water the SWP has delivered over time. Next, we look at how total water charges have changed over time. Finally, we describe how water charges and deliveries over time have changed average water prices.

Throughout this chapter we focus on:

- Metropolitan Water District (MWD), the largest M&I contractor
- Kern County Water Agency (KCWA-Ag), the largest agricultural contractor
- SWP contractors as a whole.

FIXED VS VARIABLE COSTS

Recall from Chapter 3 that the DWR allocates costs among capital, minimum OMP&R, and variable OMP&R based, in part, on whether the costs vary with water deliveries.[2] Accordingly, the SWP charges can be segregated into two types of charges -- those that vary with deliveries and those that do not. Economists refer to these types of charges as *variable costs* and *fixed costs*.

The distinction between fixed and variable costs is important for a number of reasons. Perhaps the most important reason, according to economists, is that people make

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1 Some would assert that the SWP does not sell water at a price. Instead, they argue that the SWP is a cost-recovery operation with a zero cost for water itself. In other words, the water is free -- shipping and handling are extra. This is true, but irrelevant. The analysis in this chapter is just as valid if discussing shipping and handling charges.

2 Our review of how the DWR categorized costs revealed no obvious mis-categorized costs.

allocation decisions *at the margin*. That is, people decide how much of something to buy on the basis of the price of buying just one more unit. For fixed costs, contractors face a marginal cost of zero -- within limits, contractors can consume however much of an item carrying a fixed cost at no additional charge. For variable costs, contractors face positive marginal costs -- if they want more of an item carrying a variable charge, they pay more.

SWP charges sort out as follows:

Fixed Costs

- Delta water charge -- capital component
- Delta water charge -- minimum OMP&R
- Transportation charge -- capital component
- Transportation charge -- minimum OMP&R
- Water system revenue bond surcharge

Variable Costs

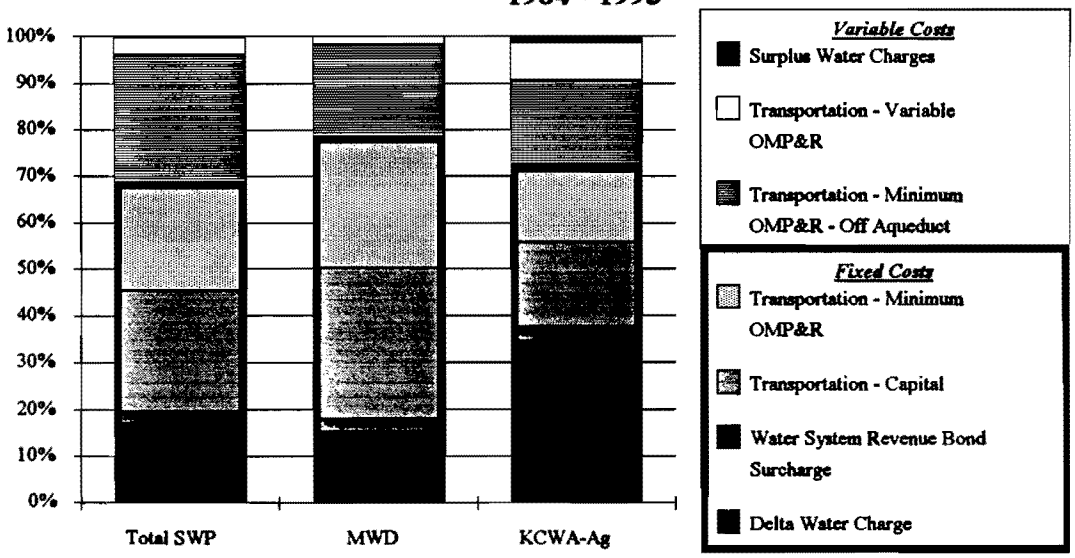
- Transportation charge -- minimum OMP&R - off-aqueduct power charge
- Transportation charge -- variable OMP&R
- Surplus/unscheduled water

THE IMPLICATIONS

As shown in Figure 5.A only 20 to 30 percent of the water charges are variable and 70 to 80 percent are fixed This means that contractors will pay 70 to 80 percent of the costs of recieving their full entitlements regardless of how much water they actually use.[3] Another 20 to 30 percent of the charges will vary with the amount of water they use. Because only 20 to 30 percent of the contractors' bills are affected by how much water they use, the marginal cost of SWP water is relatively small. Consequently, the contractors likely will use more water than they would if their entire bill was based on a set per acre-foot rate; i.e., if the marginal cost was relatively large . The implications are significant.

[3] This type of pricing structure is often referred to as "take-or-pay" pricing.

Figure 5.A
Composition Of State Water Project Water Charges
1984 - 1993



Source: Department Of Water Resources, "Appendix B", Bulletin 132-93, (Sacramento: The Department), July 1993.

ENTITLEMENT VS DELIVERIES

The DWR assigns fixed costs to the contractors based on their entitlements. When all contractors receive their full entitlement, each contractor pays the same for an equivalent amount of water.[4] Even if the contractors are not receiving their full entitlements, if all are receiving proportionately the same, all pay comparatively the same "price" per acre-foot. However, if one contractor consistently receives proportionately less of its entitlements than other contractors, that first contractor is paying more for an equivalent amount of water than the others.[5]

As shown in Figure 5.B, contractors are neither receiving their full entitlements nor receiving the same proportion of their entitlement. Over the last ten years, contractors as a whole received water equal to 57 percent of their annual entitlements. About 55 percent was entitlement water, the balance was surplus/unscheduled water. Over this same ten year period, the MWD received about 47 percent of their entitlements, ten percent less than the average. In contrast, the KCWA-Ag received nearly 79 percent of their annual entitlements, and this includes one year when they received virtually no entitlement water.

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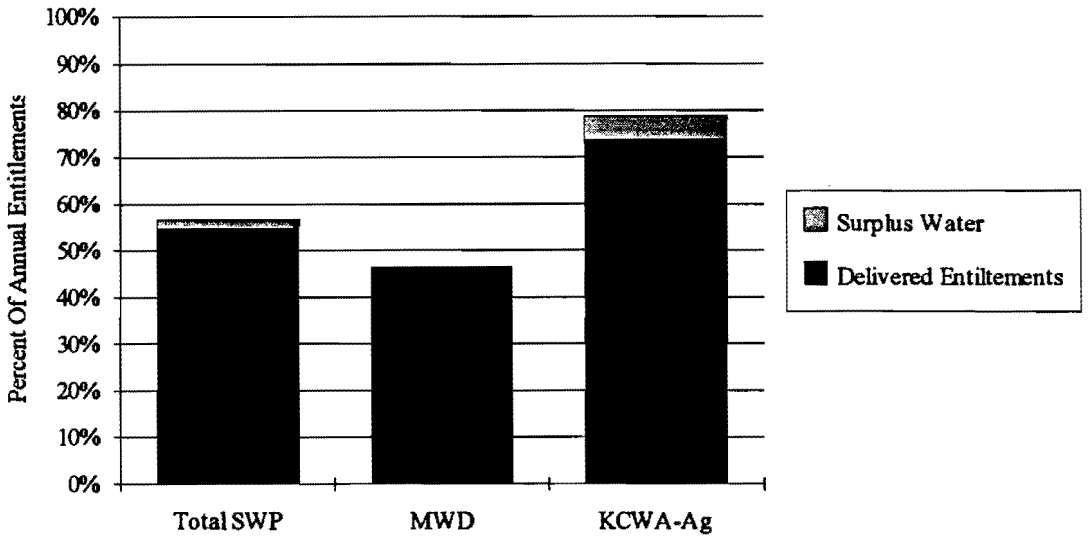
4 Stated another way, assume all contractors took delivery at the same place. If all contractors received their full entitlement, they would all pay the same amount per acre-foot of water.

5 Again, assume all contractors took delivery at the same place. If one contractor received proportionately less of their entitlements than others, that contractor would pay more per acre-foot of water than the others.

Figure 5.B
Deliveries As A Percent Of Entitlements
1984 - 1993



Source: Department Of Water Resources, "Appendix B", Bulletin 132-93, (Sacramento: The Department), July 1993.

The question, then, is why would a contractor sign a contract for more annual entitlement water than it expected to request? This is an especially significant question since the DWR allocates 70 to 80 percent of the contractor's bill based on contractual entitlements. The answer must be that the contractor believed that the annual entitlements themselves had some intrinsic value. For example, assume the DWR implemented Article 18(a) reductions on the basis of annual entitlements. Then, a contractor's "surplus" entitlements would represent a sort of insurance policy against delivery cuts.[6] This is because the DWR would cut that contractor's "surplus" entitlements instead of requested deliveries. Meanwhile, the DWR would be cutting the other contractors' requested deliveries. The DWR would therefore reduce actual deliveries to the contractor with "surplus" entitlements less than the other contractors. However, if the water allocation rules are something other than those implied by a literal reading of Article 18(a), it may be that the "surplus" entitlements in fact have no value. If this is the case, then some contractors are clearly paying proportionately more for an equivalent amount of water than others pay.

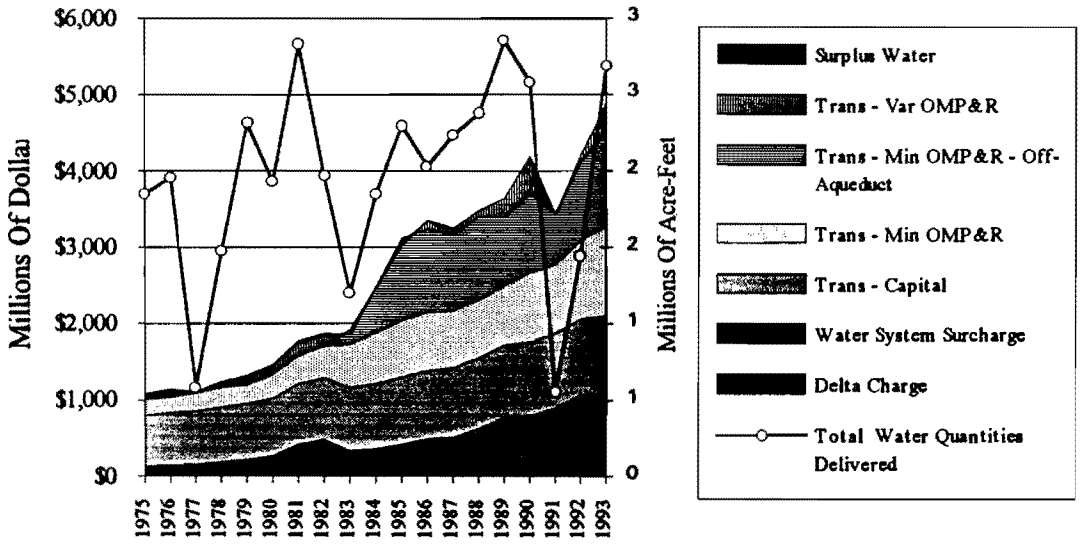
WATER CHARGES VS WATER DELIVERIES

Although fixed costs constitute most of the contractors' bills, that doesn't mean that the bills themselves are fixed over time. Indeed, the contractors' bills exhibit a pronounced upwards trend. As described in Chapter 3, much of the growth is by design. Nonetheless, it is remarkable how poorly this growth relates to increased water deliveries.

[6] Especially if all other contractors did not also have "surplus" entitlements.

Figure 5.C shows total SWP deliveries on the right axis and total SWP charges on the left axis. Deliveries are represented by the black line with the white circles. The components of SWP charges are represented by various shadings. The chart shows the strong growth in virtually all components of the contractors' bills. The notable exceptions are 1983, when the Delta charge dropped reflecting the defeat of the peripheral canal,[7] and 1991, when variable costs fell sharply reflecting the extraordinary reduction in SWP deliveries due to the drought. Water deliveries, too, exhibit somewhat of an upwards trend, though not nearly as pronounced as the charges. Indeed, although SWP deliveries and total charges are both trending upwards, it is difficult to discern a strong relationship between the two.

Figure 5.C
SWP Deliveries Vs. Total SWP Charges
1975 - 1993

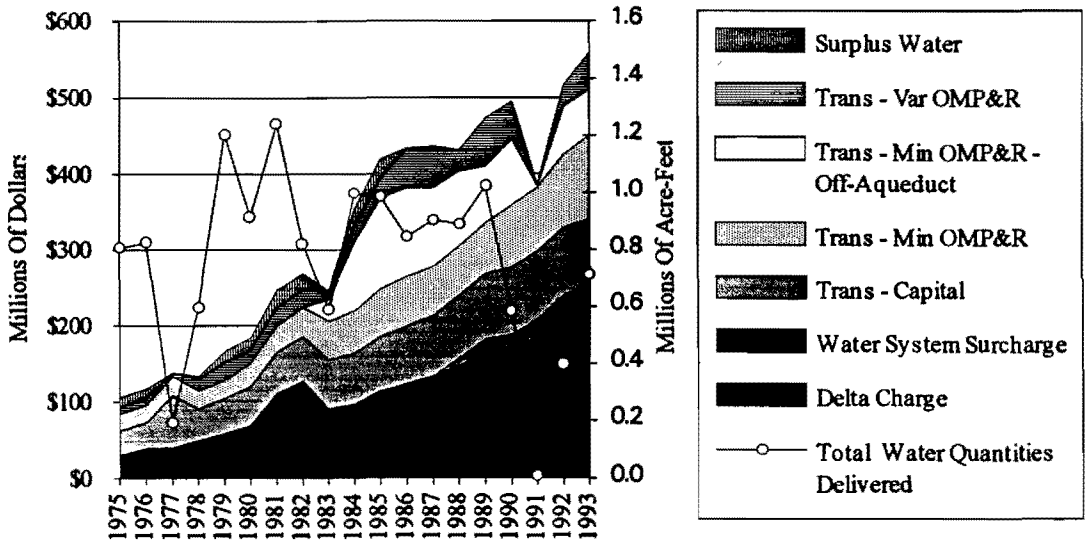


Source: Department Of Water Resources, "Appendix B", Bulletin 132-93, (Sacramento: The Department), July 1993.

Figures 5.D and 5.E show similar pictures. Figure 5.D shows water deliveries and charges for the KCWA-Ag, Figure 5.D shows water deliveries and charges for the MWD. In both cases there is a similar drop in charges in 1983 and 1991. However, in neither case was the drop in charges nearly as large as the drop in water deliveries.

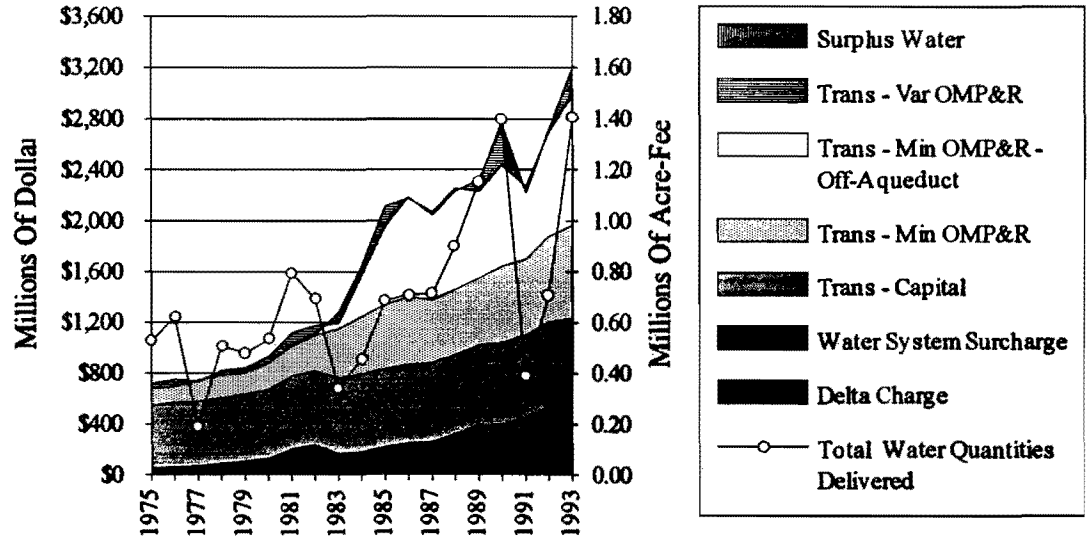
7 For a history of the peripheral canal, see Appendix C.

Figure 5.D
KCWA-Ag Deliveries Vs. KCWA-Ag Charges
1975 - 1993



Source: Department Of Water Resources, "Appendix B", Bulletin 132-93, (Sacramento: The Department), July 1993.

Figure 5.E
MWD Deliveries Vs. MWD Charges
1975 - 1993



Source: Department Of Water Resources, "Appendix B", Bulletin 132-93, (Sacramento: The Department), July 1993.

AVERAGE WATER PRICES

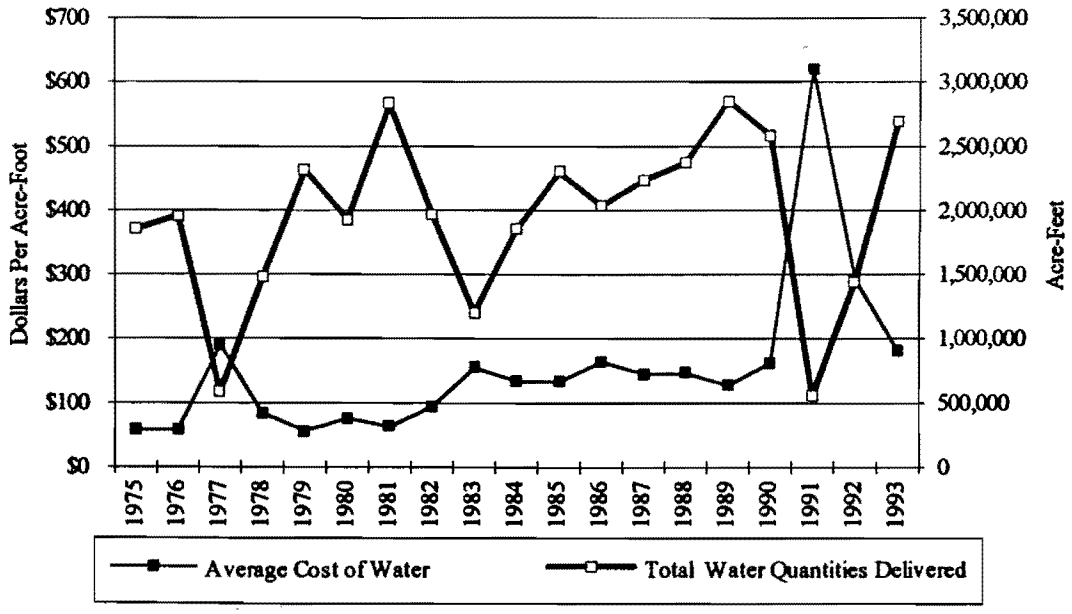
The DWR, in operating the SWP, does not *set* a price on SWP water. Instead, prices, in the form of average prices, result from two independent sets of actions. These actions are:

- Allocating costs, and
- Allocating water.

As we have demonstrated, most of the contractors' water bills do not change with deliveries. Consequently, any change in the level of deliveries has a profound effect on the per acre-foot price of water. In particular, the practical effect of water shortages is to drive the average price of water skyward.

Figure 5.F shows the strong negative relationship between the average price of water and the quantity of water delivered for the SWP in total. The chart shows the average price of water per acre-foot on the left, represented by the thin black line with black boxes. The quantity of water delivered is shown on the right, represented by the bold black line with white boxes. The chart shows two spikes in the average price, both associated with drought related cutbacks. In 1977, the DWR cut water deliveries 70 percent from the prior year's level. This resulted in an over 225 percent increase in the per acre-foot price of water. In 1991, the DWR cut water deliveries nearly 80 percent, driving up the per acre-foot price of water over 280 percent to $620 per acre-foot.

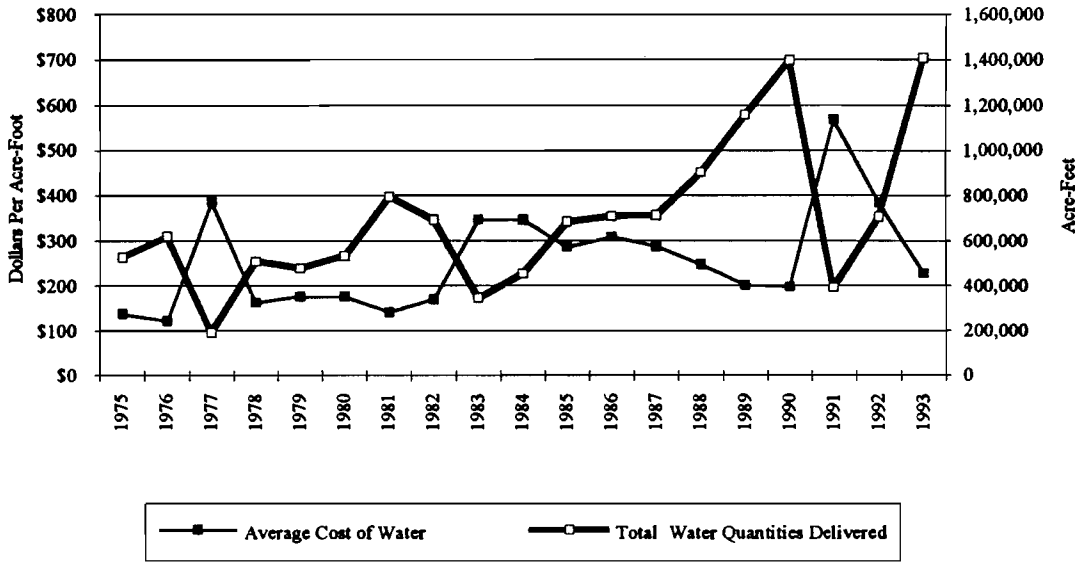
Figure 5.F
SWP Average Price Vs. SWP Deliveries
1975 - 1993



Source: Department Of Water Resources, "Appendix B", Bulletin 132-93, (Sacramento: The Department), July 1993.

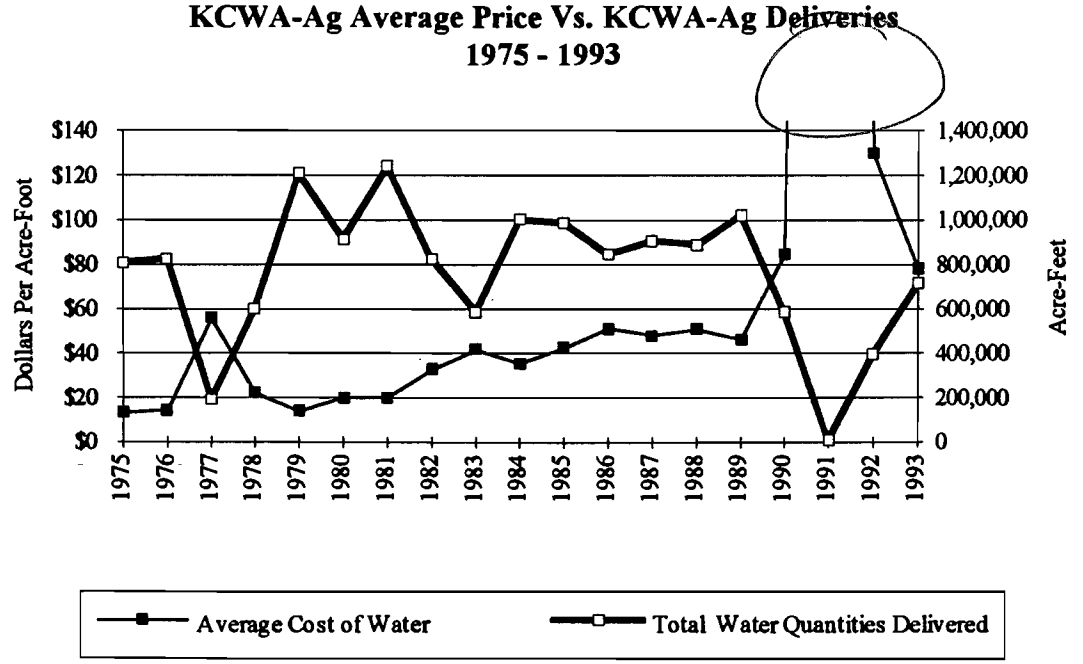
Figures 5.G and 5.H both show similar relationships for the MWD and KCWA-AG. The average price to the MWD shows the expected mirror like movement with the delivered quantity of water. In particular, the price spikes in 1977 and 1991 are readily apparent, as well as the overall downward price trend associated with the MWD's increased deliveries. The picture for KCWA-AG is even more dramatic. With a meager 8,965 acre-feet delivered in 1991, the price reached the stratospheric level of $4,285 per acre-foot.

Figure 5.G
MWD Average Price Vs. MWD Deliveries
1975 - 1993



Source: Department Of Water Resources, "Appendix B", Bulletin 132-93, (Sacramento: The Department), July 1993.

Figure 5.H
KCWA-Ag Average Price Vs. KCWA-Ag Deliveries
1975 - 1993



Source: Department Of Water Resources, "Appendix B", Bulletin 132-93, (Sacramento: The Department), July 1993.

APPENDIX A
OVERVIEW OF THE STATE WATER PROJECT

INTRODUCTION

The DWR is rightfully proud when it says '[t]he California State Water Project is the largest state-built, multi-purpose water project in the nation."[1] The State Water Project (SWP) consists of 27 lakes and reservoirs, approximately 700 miles of canals and pipelines, 27 pumping and/or power plants, over 1,500 DWR employees, and 29 SWP contractors. The DWR has water service contracts with maximum annual entitlements[2] totaling 4,217,786 acre-feet. (One acre-foot is 325,851 gallons -- enough water to meet the needs of five or six people for a year.)

This chapter has two purposes. First, it describes the SWP as it stands today and identifies the component facilities. Second, it describes where the SWP contractors are and how much water they are entitled in their contracts. This overview also introduces some key financial concepts, because the physical plant and the contractors are key components of the SWP financing mechanism.

CURRENT PHYSICAL PLANT & CHARACTERISTICS

As the map in Figure A.1 shows, the State Water Project runs about 2/3rds the length of the state. The project begins high in the mountains in the Feather River watershed, near the towns of Portola and Crescent Mills. Water drains from Frenchman Lake, Antelope Lake, and Lake Davis, down the streams and rivers of the Upper Feather River Basin into Lake Oroville, where the water is stored until needed for water supply or Delta water quality purposes. Once water is released by the DWR from Oroville, it moves down the Sacramento River to the Sacramento-San Joaquin Delta. The Delta functions as a natural distribution system for the SWP. In the North Delta, water is pumped from Baker Slough to feed the North Bay Aqueduct. At the extreme southern edge of the Delta, water is pumped from the Clifton Court Forebay, first into Bethany Reservoir, and then on into the South Bay Aqueduct and the California Aqueduct. The California Aqueduct runs south over 400 miles, terminating in Riverside County. With a few notable exceptions, facilities north of the Delta collect water -- facilities south of the Delta transport water to the contractors.

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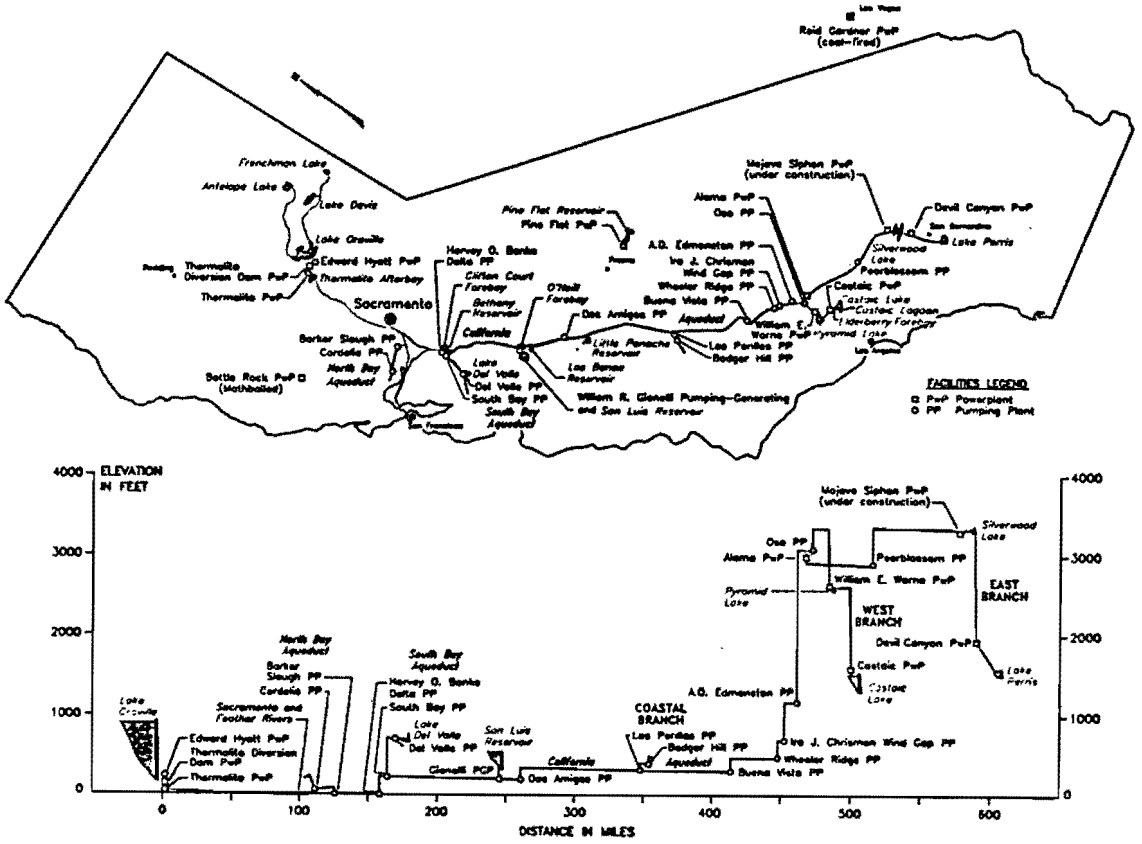
1 Department Of Water Resources, Division Of Operations And Maintenance, 'Data Handbook: State Water Project", (Sacramento: The Department), 1992, p.2.

2 The maximum annual entitlement is the most amount of water DWR is required to deliver (when supplies allow).

Figure A.1
State Water Project
Major Features & Elevations



Map reprinted from : Department Of Water Resources, "Data Handbook: State Water Project", (Sacramento: The Department, 1992)

OVERVIEW OF FACILITIES

The fundamental purpose of the SWP is to collect water from "wet" areas in the state and move it to "dry" areas. To this end, water project facilities serve one of two primary functions; they either collect water, or move water, or both. Facilities that help collect water are called *conservation facilities*.[3] Facilities that aid water movement are called *transportation facilities*. Some facilities serve both conservation and transportation functions. The distinction between conservation and transportation facilities is important not only to why a facility was built but to how the particular facility is financed as well.

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[3] Often people are confused by the term "conservation" when it is used in discussing SWP facilities. This confusion especially abounds when talk turns to "Delta conservation facilities". Within the context of the SWP, conservation means "not wasting or allowing to go unused" -- it does not mean "protect from use".

Dams and Reservoirs

Table A.2, at the end of this appendix, lists the heights of dams and storage capacities of reservoirs in the SWP. The SWP contains 27 dams and reservoirs with a total storage capacity of 7.8 million acre-feet of water. The reservoirs range in capacity from the Santa Clara Terminal Reservoir's 9 acre-foot capacity, to Oroville Lake's 3.5 million acre-foot capacity. The second largest storage facility is San Luis Reservoir, with a capacity of 2 million acre-feet. The SWP owns 1 million acre-feet of San Luis Reservoir's capacity, and the federal Central Valley Project owns slightly less than 1 million acre-feet. Of the 23 dams and reservoirs over 500 acre-feet in capacity, the DWR classifies 9 as strictly conservation facilities, 10 as strictly transportation facilities, and 4 as combination conservation and transportation facilities. The 23 dams range in size from the Tehachapi Afterbay with its two 16 square-foot gates, to the 770-foot high Oroville Dam.

Aqueducts -- Canals and Pipelines.

The canals and pipelines that transport water in the SWP generally are called aqueducts. Aqueducts are divided into repayment *reaches*. Reaches are accounting units defined so that for any reach, the relative uses of project transportation facilities are essentially the same for all the contractors using the facilities. Where the relative use of the facility changes, one reach ends and another reach begins. Reach junctions are generally at facilities such as aqueduct branch turnouts or junctions, aqueduct regulatory reservoirs, and major delivery structures (such as a pumping station) for contractors.[4] Table A.3, at the end of this Chapter, lists the major groupings of reaches for the aqueduct system in the SWP. Aqueducts are classified as either conservation or transportation facilities, or a combination of the two.

Power Plants and Pumps

The SWP both generates and consumes large quantities of electric power. It has 24 hydroelectric generating plants, one geothermal-powered generating plant, and one coal-fired generating plant. The SWP generates an average of 7.6 billion kilowatt-hours (kWh) of electricity per year. The SWP uses an average of 12.2 billion kWh per year to pump water through its transportation facilities, and to meet other electrical needs. Figure A.4 describes the power generating facilities in the SWP. Figure A.5 describes the SWP's pumping facilities. The DWR classifies all power plants and pumps as transportation facilities.

TOUR OF SWP FACILITIES

The DWR manages and operates the SWP through its five field divisions. The map in Figure A.2 shows the geographic coverage of the Oroville, Delta, San Luis, San Joaquin, and Southern Field Divisions.

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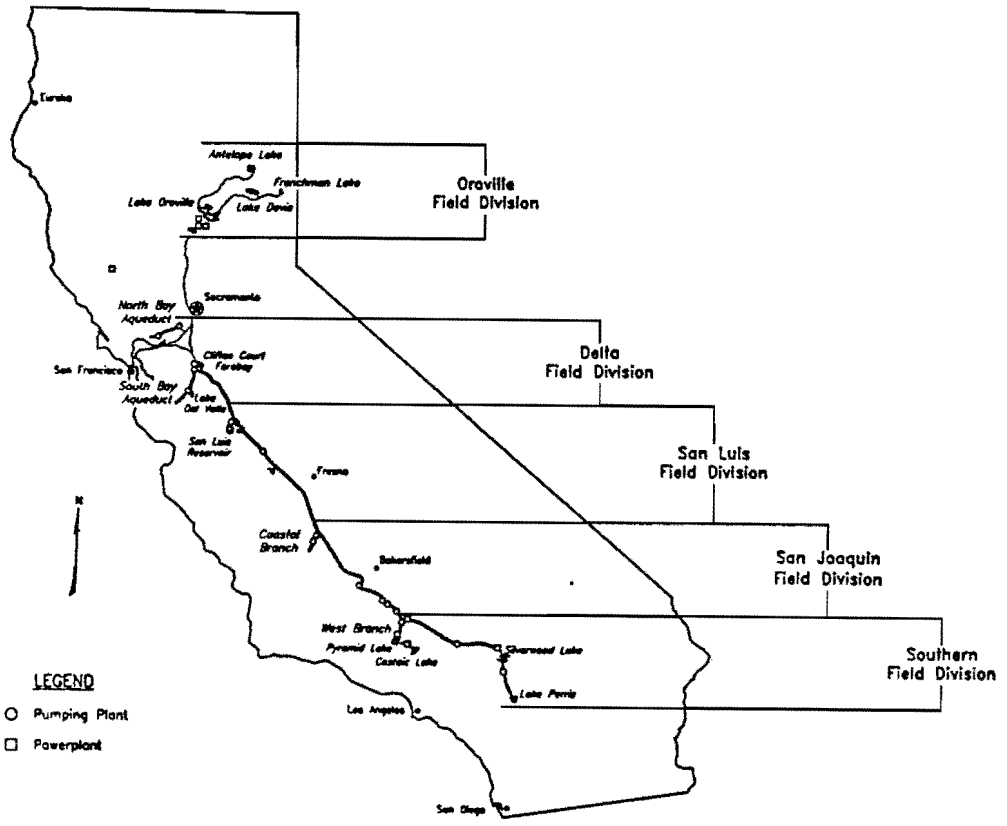
[4] Department Of Water Resources, "The California State Water Project In 1964", Bulletin 132-64, (Sacramento: The Department, June 1964), p. C-5

Figure A.2
State Water Project
Field Divisions

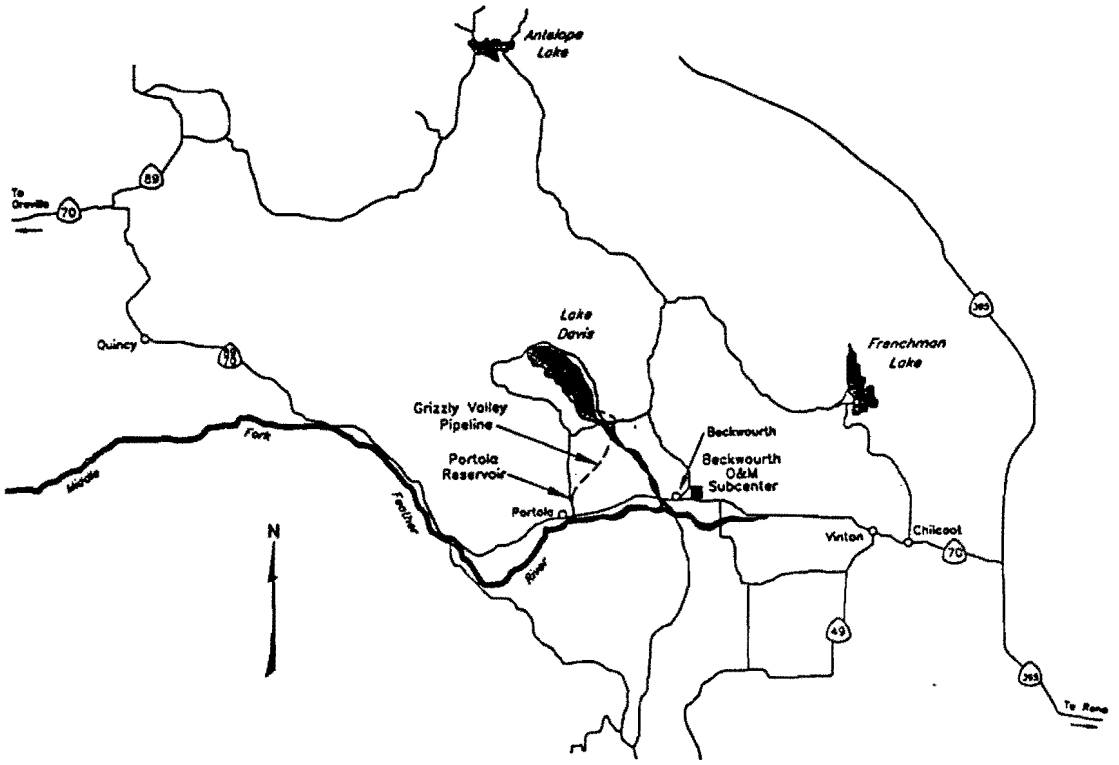


Map reprinted from : Department Of Water Resources, "Data Handbook: State Water Project", (Sacramento: The Department, 1992)

Oroville Field Division

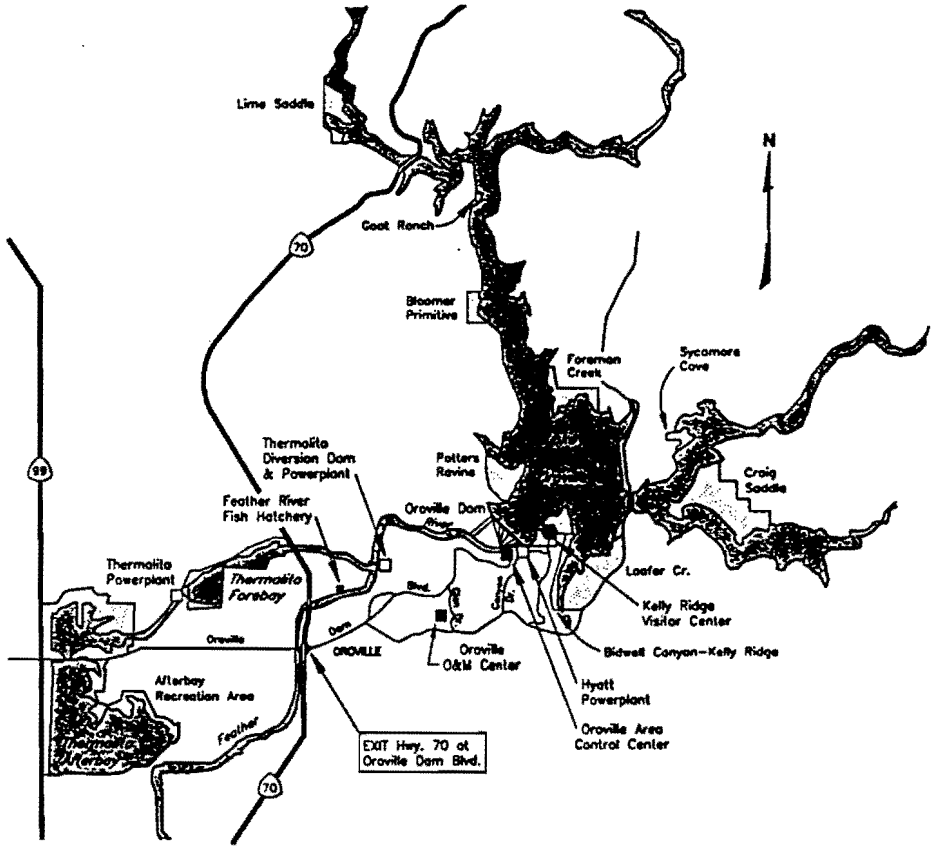
The Oroville Field Division oversees 8 dams and 3.8 million acre-feet of storage capacity. The SWP's largest storage facility, Lake Oroville, has a capacity of 3.5 million acre-feet, or 45 percent of the 7.8 million acre-foot capacity of the SWP. All reservoirs in the division are conservation facilities. This portion of the SWP relies on rivers for water transportation and does not contain any aqueducts, except the Grizzly Valley Pipeline.

Figure A.3
State Water Project
Oroville Field Division
Upper Feather River



Map reprinted from : Department Of Water Resources, "Data Handbook: State Water Project", (Sacramento: The Department, 1992)

Figure A.4
State Water Project
Oroville Field Division

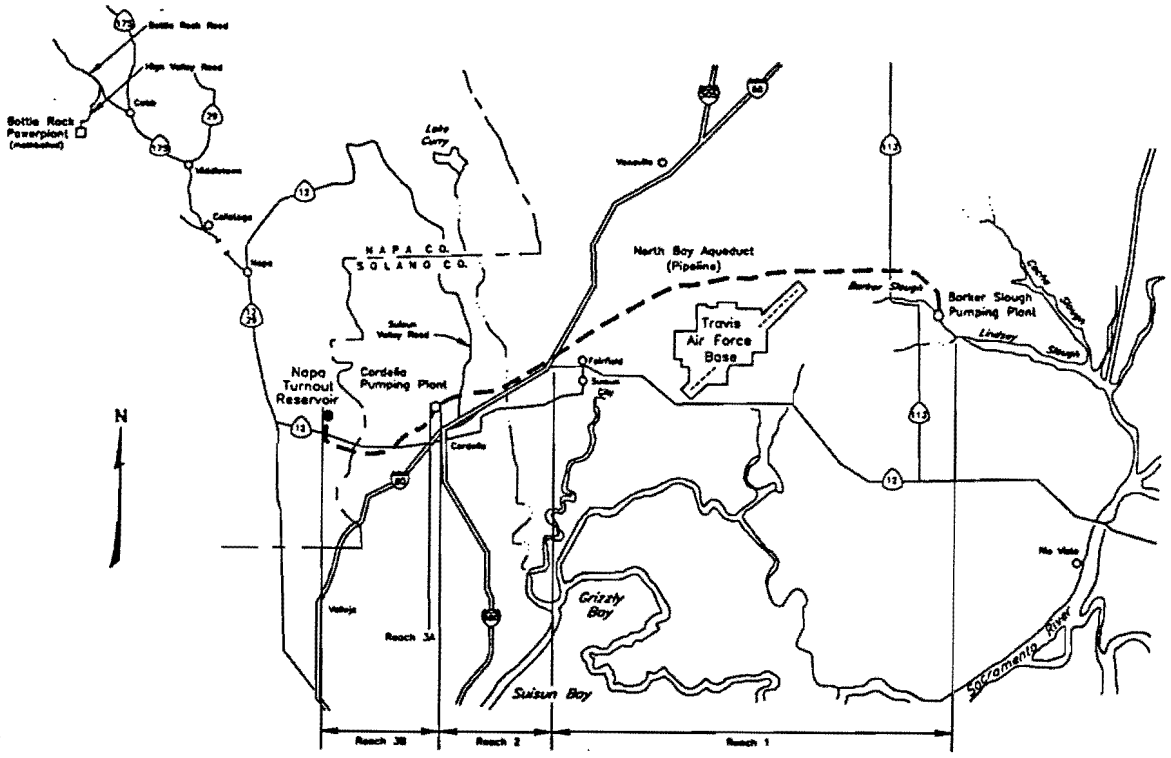


Map reprinted from : Department Of Water Resources, "Data Handbook: State Water Project", (Sacramento: The Department, 1992)

Delta Field Division

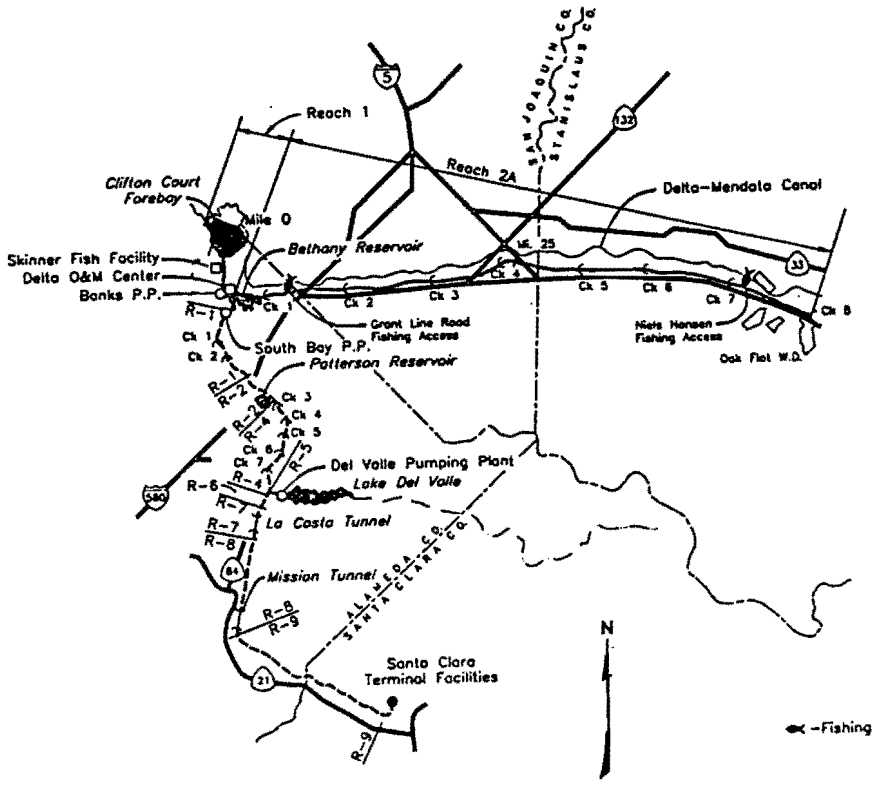
The Delta Field Division oversees seven dams and reservoirs with a total capacity of 114,000 acre-feet. Its largest reservoir, Lake Del Valle, has a 77,100 acre-foot capacity. The DWR classifies approximately 90 percent of the reservoir capacity in the Delta Field Division as transportation-related. The division contains the North Bay Aqueduct, the South Bay Aqueduct, and the beginning of the California Aqueduct.

Figure A.5
State Water Project
Delta Field Division
North Bay Aqueduct



Map reprinted from : Department Of Water Resources, "Data Handbook: State Water Project", (Sacramento: The Department, 1992)

Figure A.6
State Water Project
Delta Field Division
South Bay Aqueduct & California Aqueduct

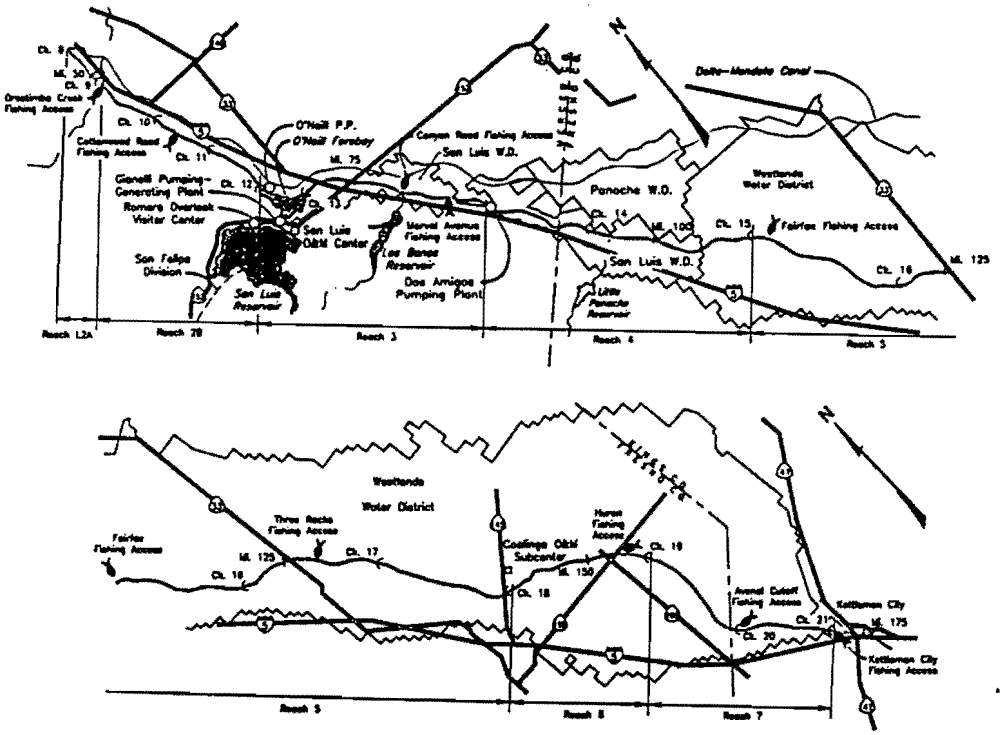


Map reprinted from : Department Of Water Resources, "Data Handbook: State Water Project", (Sacramento: The Department, 1992)

San Luis Field Division

The San Luis Field Division contains four dams and reservoirs with 2.1 million acre-feet of capacity, of which 1.2 million is under the control of the SWP. The San Luis Reservoir, with 2 million acre-feet of capacity, is shared by the SWP (52 percent of capacity) and the federal Central Valley Project (48 percent). The San Luis Reservoir is second only to Lake Oroville (3.5 million acre-feet) in size. The DWR classifies approximately 98 percent of reservoir capacity in the San Luis Field Division as conservation-related. The division contains the California Aqueduct, as well as the San Luis Canal.

Figure A.7
State Water Project
San Luis Field Division
California Aqueduct, San Luis Canal, & Joint-Use Facilities

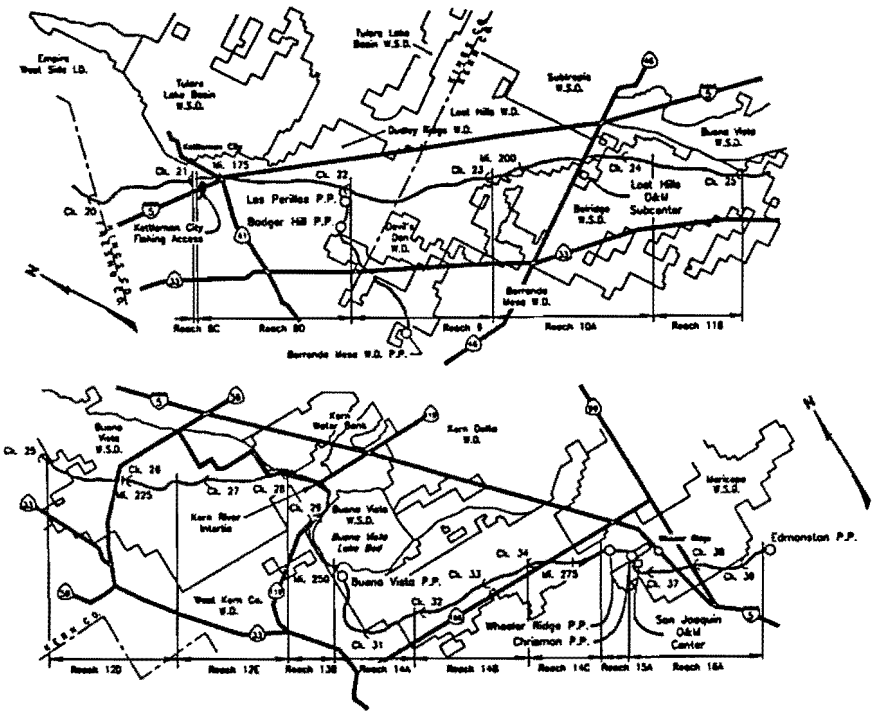


Map reprinted from : Department Of Water Resources, "Data Handbook: State Water Project", (Sacramento: The Department, 1992)

San Joaquin Field Division

The San Joaquin Field Division does not contain any dams or reservoirs. It contains the California Aqueduct and the Coastal Branch aqueduct.

Figure A.8
State Water Project
San Joaquin Field Division
California Aqueduct & Coastal Branch

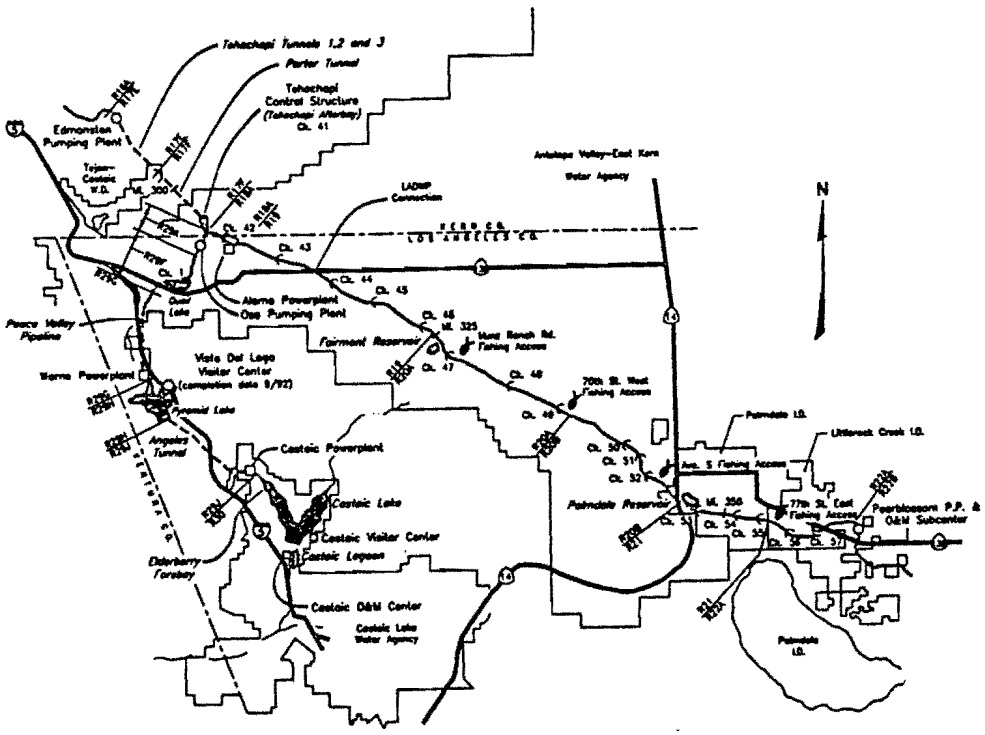


Map reprinted from : Department Of Water Resources, "Data Handbook: State Water Project", (Sacramento: The Department, 1992)

Southern Field Division

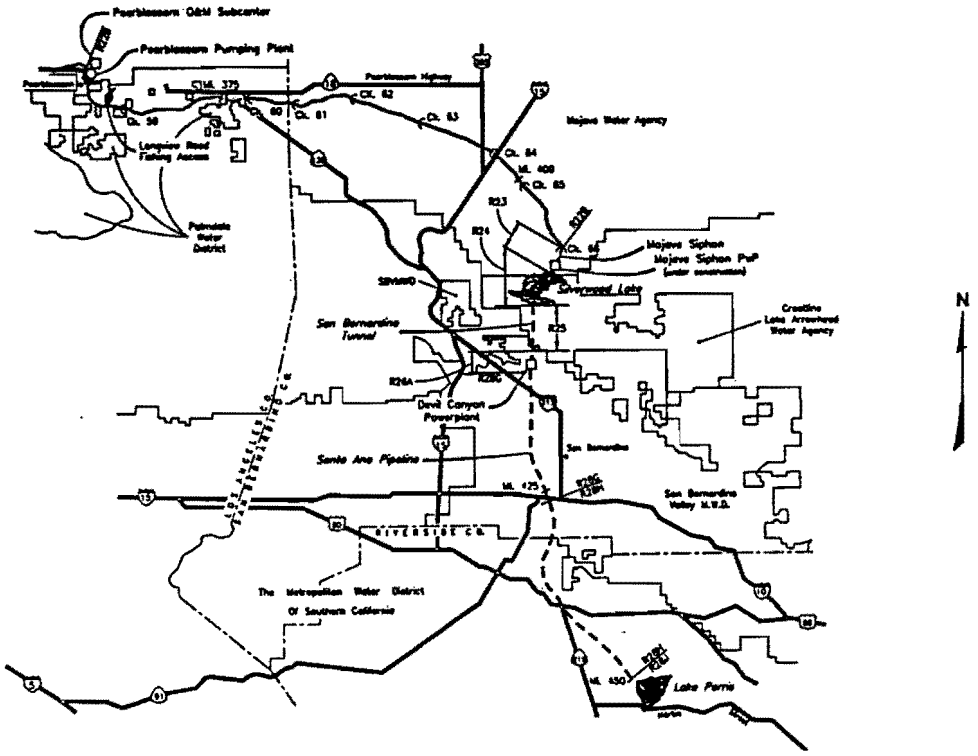
The Southern Field Division contains eight dams and reservoirs with 748,200 acre-feet of capacity, all of which the DWR classifies as transportation-related. Its largest reservoir is Castaic Lake, with a capacity of 323,700 acre-feet. The division contains part of the California Aqueduct, the East Branch aqueduct, and the West Branch aqueduct.

Figure A.9
State Water Project
Southern Field Division
California Aqueduct, East Branch, & West Branch



Map reprinted from : Department Of Water Resources, "Data Handbook: State Water Project", (Sacramento: The Department, 1992)

Figure A.10
State Water Project
Southern Field Division
East Branch



Map reprinted from : Department Of Water Resources, "Data Handbook: State Water Project", (Sacramento: The Department, 1992)

THE SWP CONTRACTORS

The DWR contracts with 29 local and regional agencies to supply them with SWP water under terms specified in the individual contracts. Under the terms of the 29 contracts, the agencies are entitled to receive a total of 4,154,201 acre-feet of water from the SWP in 1994. By 2021, these *entitlements* will increase to a total of 4,217,786 million acre-feet per year. All 29 contracts are effective until the year 2035 or until the SWP is paid off, which ever comes last. Table A.1 lists the SWP contractors and shows their entitlements.

Table A.1
State Water Project
Contracting Water Agencies

Agency	Counties Served	Primary Type Of Water Service	Date of Contract (Preamble)	Year Of Initial Entitlement	Year Of Initial Delivery	Current Annual Entitlement (1994)	Maximum Annual Entitlemen	First Year Delivery Of Maximum Annual Entitlement
Feather River Area								
City Of Yuba City	SUT	M & I	12/30/63	1984	1984	9,600	9,600	1991
Butte Co.	BUT	M & I	12/26/63	1968	1971	1,200	27,500	2001
Plumas Co. F.C. & W.C.D.	PLU	M & I	12/26/63	1968	1970	1,200	2,700	2016
North Bay Area								
Napa Co. F.C. & W.C.D.	NAP	M & I	12/19/63	1988	1968	9,135	25,000	2021
Solano Co. F.C. & W.C.D.	SOL	M & I	12/26/63	1980	1986	28,080	42,000	2015
South Bay Area								
Alameda Co. F.C. & W.C.D. Zone 7	ALA	M & I	11/20/61	1968	1962	40,000	46,000	1997
Alameda Co. W.D.	ALA	M & I	11/29/61	1968	1962	42,000	42,000	1994
Santa Clara Co. F.C. & W.D.	SCL	M & I	11/20/61	1968	1965	100,000	100,000	1994
San Joaquin Valley Area								
Dudley Ridge W.D.	KIN	Ag	12/13/63	1968	1968	57,700	57,700	1990
Empire West Side I.D.	KIN	Ag	12/30/63	1968	1968	3,000	3,000	1969
Kern Co. W.A.	KER	Ag	11/15/63	1970	1968	1,153,400	1,153,400	1990
Kings Co.	KIN	Rec	8/31/67	1968	1968	4,000	4,000	1987
Oak Flat W.D.	STA	Ag	3/23/65	1968	1968	5,700	5,700	1990
Tulare Lake Basin W.S.D.	KIN TUL	Ag	12/20/63	1968	1968	118,500	118,500	1990
Central Coastal Area								
San Luis Obispo Co. F.C. & W.C.D.	SLO	M & I	2/26/63	1980	1996	25,000	25,000	1990
Santa Barbara Co. F.C. & W.C.D.	SB	M & I	2/26/63	1980	1991	45,486	45,486	1990
Southern California Area								
Antelope-Valley-East Kern W.D.	LA VEN KER	M & I	9/20/62	1972	1972	138,400	138,400	1991
Castaic Lake W.D.*	LA	M & I	4/30/63	1968	1968	54,200	54,200	1991
Coachella Valley Co. W.D.	RIV IMP SD	M & I	3/29/63	1972	1973	23,100	23,100	1990
Crestline-Lake Arrowhead W.A.	SBD	M & I	6/22/63	1972	1972	5,800	5,800	1990
Desert W.A.	RIV	M & I	10/17/62	1972	1973	38,100	38,100	1990
Littlerock Creek I.D.	LA	M & I	6/22/63	1972	1972	2,300	2,300	1990
Mojave W.A.	SBD	M & I	6/22/63	1972	1972	50,800	50,800	1990
Palmdale I.D.	LA	M & I	2/2/63	1972	1985	17,300	17,300	1990
San Bernardino Valley M.W.D.	SBD	M & I	12/30/60	1972	1972	102,600	102,600	1991
San Gabriel Valley M.W.D.	LA	M & I	11/3/62	1972	1974	28,800	28,800	1990
San Gorgonio Pass W.A.	RIV	M & I	11/16/62	1980	1995	17,300	17,300	1990
The Metropolitan W.D. Of Southern California	LA SBD RIV VEN ORA SD	M & I	11/4/60	1972	1972	2,011,500	2,011,500	1990
Ventura Co. F.C.D.	VEN	M & I	12/2/63	1980	1990	20,000	20,000	1990
Total						4,154,201	4,217,786	

* Formerly Upper Santa Clara Valley Water Agency

Sources: Department Of Water Resources, "Appendix B", Bulletin 132-93, (Sacramento: The Department), July 1993, Table B-4, Table B-5B;
_____, "The California State Water Project In 1968", Bulletin 132-68, Sacramento: The Department), June 1968, Table 2.

METROPOLITAN WATER DISTRICT FIRST AND LARGEST CONTRACTOR

The Metropolitan Water District of Southern California (MWD) signed the first SWP contract on November 3, 1960. Today, the MWD's contract entitles it to a maximum of 2,011,500 million acre-feet of water per year, more than any other contractor. The MWD's entitlements account for 48 percent of total entitlements in SWP contracts. The MWD provides water to municipalities and industries.

The Kern County Water Agency (KCWA), which signed its contract in 1963, has the second largest entitlement among the 29 SWP contractors. Its entitlement of 1,153,400 acre-feet per year is 28 percent of total SWP entitlements. The KCWA provides water primarily to agricultural users. However, KCWA's water service to Bakersfield also makes KCWA the third largest supplier among municipal and industrial contractors.

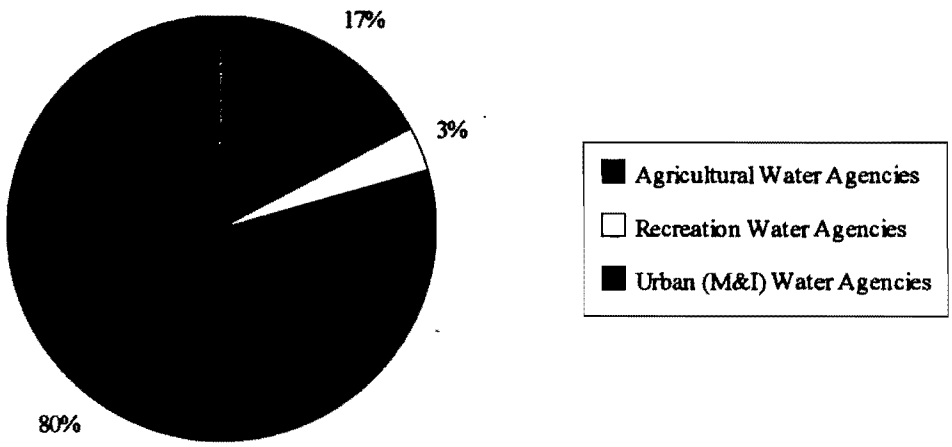
The MWD and the KCWA are much larger than any of the other 27 agencies. The agency with the next largest entitlement is the Antelope Valley-East Kern Water District with an entitlement of 138,400 acre-feet per year, or 3 percent of total entitlements.

THREE TYPES OF WATER SERVICES

Each of the 29 SWP contractors provides water to one of three types of water users -- municipal and industrial, agricultural, or recreational. Figure A.11 shows the type of users the 29 contractors serve. Figure A.11 shows that 23, or 80 percent, of the contractors provide water to municipal and industrial users. Five, or 17 percent, of the contractors serve agricultural users. One, or 3 percent, serves recreational users.

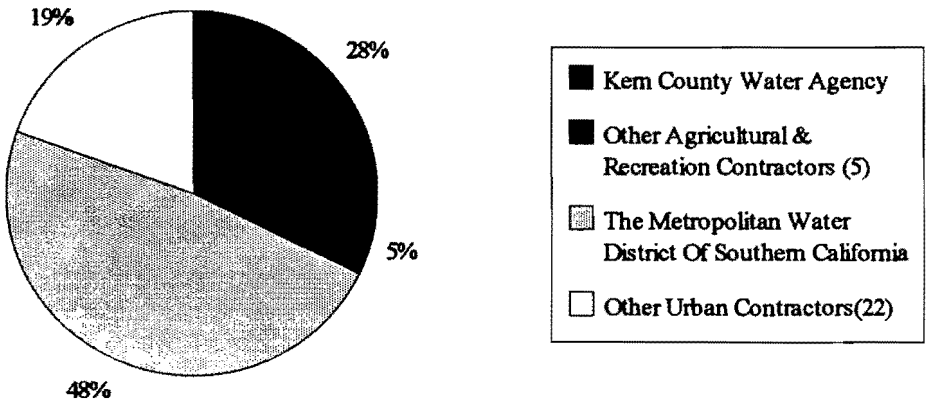
Figure A.12 shows how entitlements are distributed among the three types of users. Municipal and industrial users account for 67 percent of total entitlements. Agricultural users account for 33 percent of entitlements. Kings County, the one contractor serving recreational users, has an entitlement of 4,000 acre-feet per year, or less than 1 percent of total entitlements.

Figure A.11
State Water Project
Types Of Water Agencies



Sources: Department Of Water Resources, "Appendix B", Bulletin 132-93, (Sacramento: The Department), July 1993, Table B-4, Entitlements for 1994;
_____, "The California State Water Project In 1968", Bulletin 132-68, Sacramento: The Department), June 1968, Table 2.

Figure A.12
State Water Project
Distribution Of Current Water Entitlements



Sources: Department Of Water Resources, "Appendix B", Bulletin 132-93, (Sacramento: The Department), July 1993, Table B-4, Entitlements for 1994;
_____, "The California State Water Project In 1968", Bulletin 132-68, Sacramento: The Department), June 1968, Table 2.

Table A.2
State Water Project
Dams & Reservoirs

Facilities	Dams Structural Height (Feet)	Reservoirs Capacity (Acre-Feet)	Purpose	
			Conservation (Percent)	Transportation (Percent)
Oroville Field Division				
Frenchman Lake	139	55,500	100	0
Antelope Lake	120	22,600	100	0
Lake Davis	132	84,400	100	0
Lake Oroville	770	3,537,600	100	0
Thermalito Diversion Pool	143	13,400	100	0
Fish Barrier Pool	91	600	100	0
Thermalito Forebay	91	11,800	100	0
Thermalito Afterbay	39	57,000	100	0
Delta Field Division				
Clifton Court Forebay	30	31,300	31	69
Bethany Reservoir	121	5,100	31	69
Lake Del Valle	235	77,100	0	100
San Luis Field Division				
O'Neill Forebay	88	56,400	27	73
San Luis Reservoir	385	2,027,800	--	--
SWP Share	--	1,062,200	100	0
Los Banos Reservoir	167	34,600	27	73
Little Panoche Reservoir	151	5,600	0	100
Southern Field Division				
Tehachapi Afterbay	*	600	0	100
Silverwood Lake	249	75,000	0	100
Lake Perris	128	131,500	0	100
Quail Lake	40	7,600	0	100
Pyramid Lake	400	171,200	0	100
Elderberry Forebay	200	33,000	0	100
Castaic Lake	425	323,700	0	100
Castaic Lagoon	25	5,600	0	100

* Two 16 x 16 ft radial gates

Note: There are also five reservoirs with less than 500 acre-feet individual capacity.

Sources: Department Of Water Resources, Division Of Operations And Maintenance, 'Data Hand Book: State Water Project", (Sacramento: The Department), 1992, Table 4;
_____, 'Management Of The State Water Project", Bulletin 132-93, Appendix B, July 1993, pp.189-190;
_____, "California State Water Project", Bulletin 132-69, June 1969, p. 108
Section 12934(d) of the California Water Code

Table A.3
State Water Project
Repayment Reaches (Aqueducts)

Mile Post	Reach Number*	Description	Purpose	
			Conservation (Percent)	Transportation (Percent)
Grizzly Valley Pipeline				
0.00				
	Reach 1	Grizzly Valley Dam To Portola Reservoir	0	100
6.00				
North Bay Aqueduct				
27.62				
South Bay Aqueduct				
0.00				
	Reaches 1-2, 4-9	Bethany Reservoir through Santa Clara Terminal Facilities	0	100
42.89				
California Aqueduct				
	Reaches 1-2B	Delta To O'Neill Forebay	31	69
66.74				
	Reach 3A	Sisk Dam, San Luis Reservoir, and Gianelli Pumping-Generating Plant	100	0
66.74				
	Reach 3	O'Neill Forebay To Dos Amigos Pumping Plant	27	73
86.49				
	Reaches 3-17F	Dos Amigos Pumping Plant To Junction, West Branch	0	100
304.04				
East Branch				
304.04				
	Reaches 18-28J	Junction, West Branch To Perris Dam and Lake Perris	0	100
443.44				
West Branch				
0.00				
	Reaches 29A-30	Junction, West Branch To Castaic Dam And Lake	0	100
31.50				
Coastal Branch				
0.02				
	Reach 31A	Avenal Gap To Devil's Den Pumping Plant	0	100
14.83				
	Reaches 33A-35	Devil's Den Pumping Plant Through Santa Maria Terminus	0	100
102†				

* Reach numbers are occasionally discontinuous.

† Alternative routes are under study, lengths and reaches subject to change.

Sources: Department Of Water Resources, Division Of Operations And Maintenance, "Data Hand Book: State Water Project", (Sacramento: The Department), 1992, Table 8;
_____, "California State Water Project", Bulletin 132-69, June 1969, p. 108
Section 12934(d) of the California Water Code

Table A.4
State Water Project
Power Generating Facilities

Facility	Number Of Units	Total Generator Rating (mw)	Annual Energy Demand* (gwh)
Oroville Field Division			
Hyatt Power Plant	6	715	1,938
Thermalito Diversion Dam Power Plant	1	3	18
Thermalito Power Plant	4	126	240
Delta Field Division			
Bottle Rock Power Plant	1	61	*Mothballed*
South Geysers Power Plant	1	--	*Postponed*
San Luis Field Division			
Gianelli Power Plant	8	424	195
Southern Field Division			
Alamo Power Plant	1	18	110
Mojave Siphon Power Plant	3	12	*Under Construction*
Devil Canyon Power Plant	5	291	1,723
Warne Power Plant	2	78	358
Castaic Power Plant	7	1,320	569
Off-Site Facilities			
Pine Flat Power Plant	3	58	?
Reid Gardner Power Plant, Unit 4	1	250	1,280
Total			6,431

* State Share

Note: All power plants are classified as transportation facilities

Sources: Department Of Water Resources, Division Of Operations And Maintenance, 'Data Hand Book: State Water Project", (Sacramento: The Department), 1992, Table 4; _____, 'Management Of The State Water Project", Bulletin 132-91, December 1991, Table 2.

Table A.5
State Water Project
Pumping Plants

Facility	Number Of Units	Normal Static Head (ft)	Total Design Flow (cfs)	Annual Energy Demand* (gwh)
Oroville Field Division				
Hyatt	6	500-660	5,610	***
Thermalito	1	85-102	9,120	***
Delta Field Division				
Barker Slough Pumping Plant	9	95-120	228	15
Cordelia Pumping Plant	11	104-439	146	23
North Bay Interim Pumping Plant	4	320	39	*Mothballed*
Banks Pumping Plant	11	236-252	6,400	1,230
South Bay Pumping Plant	9	566	330	151
Del Valle Pumping Plant	4	0-38	120	2
San Luis Field Division				
Gianelli Pumping Plant	8	99-327	11,000	255
Dos Amigos Pumping Plant	6	107-125	15,450	545
San Joaquin Field Division				
Las Perillas Pumping Plant	6	55	461	16
Badger Hill Pumping Plant	6	151	454	42
Buena Vista Pumping Plant†	10	205	5,405	653
Wheeler Ridge Pumping Plant†	9	233	5,445	756
Chrisman Pumping Plant†	9	518	4,995	1,609
Edmonston Pumping Plant†	14	1,926	4,480	5,580
Southern Field Division				
Pearblossom Pumping Plant‡	9	540	2,575	1,247
Oso Pumping Plant	8	231	3,252	170
Total				12,294

* State Share

† Includes one spare unit

‡ Three of the nine units are under construction

Note: All pumping plants are classified as transportation facilities

Sources: Department Of Water Resources, Division Of Operations And Maintenance, "Data Hand Book: State Water Project", (Sacramento: The Department), 1992, Table 4;
_____, "Management Of The State Water Project", Bulletin 132-91, December 1991, Table 2.

APPENDIX B
EARLY HISTORY OF THE STATE WATER PROJECT

INTRODUCTION

The State Water Project (SWP) was not designed and constructed over night. Rather, it has slowly evolved from a grandiose concept first proposed by a geographer with the U. S. Geological Survey in 1919 into the less comprehensive though still impressive system we know today. Many of the concerns regarding the operations and financing of the SWP derive from the fact that the institutional relations defined in the contracts for SWP water were designed with a very different view of how the SWP would be operating today. Indeed, many of the decisions made during the design and construction of the SWP made eminent sense at the time, yet with the benefit of hindsight, seem quite questionable now.

This is the first of two Chapters on the history of the SWP. This Chapter presents a brief history of the development of the SWP; from initial concept through signing of the contracts for water with the (then) 31 contractors and the establishment of the first-phase construction schedule. The following Chapter describes key events that changed SWP from the shared vision of the 1960's to the reality of today.[1]

DEVELOPMENT OF THE CALIFORNIA WATER PLAN

WATER DEVELOPMENT IN 1880'S

Early settlers of California's Central Valley recognized the potential of the area for irrigated agriculture, if only they could get additional surface water. In the 1880's, William "Ham" Hall, the first State Engineer, proposed the development of a great system of irrigation canals.[2] However, the dynamics of agricultural economics and politics[3] meant local interests developed those plans of Hall's that were developed.

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1 This history draws heavily on two key sources: Department Of Water Resources, "California State Water Project", Bulletin 200, Volume 1, (Sacramento: The Department, November 1974); and William L. Kahrl, Project Director and Editor, The California Water Atlas, (Sacramento: The Governor's Office Of Planning And Research, 1979).

2 See for example; William Hammond Hall, "The Irrigation Question In California, Synopsis Of A Lectured Delivered On This Subject In The Assembly Chamber", 1878; William Hammond Hall, "The Irrigation Question [Memoranda No.1-2]", (Sacramento: J.J. Ayres, Superintendent of State Printing, 1886); and "William Hammond Hall Collection, 1817-1915", California State Library.

3 Including the dominance of dry land wheat farming in the late 1800's, the economic recovery of the early 1900's, and Hall's own opposition to State ownership of irrigation systems

MARSHALL'S GRAND VISION

In 1919, Colonel Robert B. Marshall, Chief Geographer of the U. S. Geological Survey became the first person to initiate water development on a Statewide basis. He outlined in a bulletin published under the sponsorship of the California State Irrigation Association a proposal to develop a basin-wide water plan for the Central Valley.[4] He proposed to construct a storage reservoir on the Sacramento River above Redding that would feed two parallel aqueducts running down both sides of the Sacramento and San Joaquin valleys to Dos Palos on the west and the San Joaquin River to the east. His plan would also supply water for the Central Valley from the Stanislaus River. In addition, the plan called for saltwater barriers at the Carquinez Straits and a tunnel to divert the waters of the Kern River south, through the Owens Valley to Los Angeles.

LEGISLATURE ORDERS COMPREHENSIVE STUDIES

Marshall's proposal was far too ambitious to gain ready acceptance by public officials or the engineering community. However, inspired by the popular enthusiasm Marshall's plan generated, and the example of the spectacular success of Los Angeles' aqueduct to the Owens Valley, the Legislature, in 1921, authorized the Department of Public Works' Division of Engineering, to conduct a series of comprehensive studies of California's water resources. These studies culminated in a 1931 report by State Engineer Edward Hyatt to the Legislature presenting what he called the State Water Plan.[5]

THE STATE WATER PLAN

Hyatt's report, in contrast to Marshall's proposal, focused primarily on the most acute water problems then facing the state. The California Water Plan called for initial construction of three sets of facilities.

- *The Great Central Valley* -- composed of the Kennett Reservoir (now Shasta Lake), a delta cross channel, a San Joaquin Pumping system, the Friant Reservoir and Power Plant, and aqueducts from Friant Reservoir to the five counties in the Southern San Joaquin Valley.
- *The San Francisco Bay Basin* -- composed entirely of the Contra Costa Conduit.

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[4] A good overview of the plan is Robert Bradford Marshall, "California's Greatest Opportunity: Reclaiming An Empire - The Valley Of California; Making Homes For 3,000,000 People; Increasing Its Present Value More Than $6,000,000", March 16, 1919. A typescript of a speech "to the Governor and The People Of California", it includes three annotated maps showing the location of the proposed facilities.

[5] California Department of Public Works, "Report to Legislature of 1931 on State Water Plan", Bulletin No. 25, 1930. The report is reprinted in: California Legislature, Appendix To Journals Of Senate And Assembly, Forty-Ninth Session, Appendix 3, (Sacramento: The Legislature, 1931); and is summarized in California Division Of Water Resources, "Letter To Legislative Water Committee Transmitting Reports Of Department Of Public Works On The State Water Plan And Summarizing Conclusions Of Bulletin No. 25, 'Report To Legislature Of 1931'", January 21, 1931.

- *The South Pacific Coast Basin* -- composed of the Colorado River aqueduct and a Santa Ana River Basin flood control and conservation works.

The California Water Plan discussed both the physical and economic aspects of the proposed development, provided for an exchange of water between the north and south portions of the central valley, recognized the national benefits, estimated the costs, and discussed possible methods of repayment. The report found that acquiring necessary right of way and water-rights plus construction of the Central Valley and San Francisco Bay Basin facilities (essentially the current Central Valley Project) would cost approximately $160 million.

THE CENTRAL VALLEY PROJECT ACT

Two years after Hyatt presented the State Water Plan to the Legislature, the Legislature passed the Central Valley Project Act of 1933.[6] The act authorized construction of the Central Valley and San Francisco Bay Basin facilities and further authorized the issuance of $170 million in revenue bonds. After passage of the bill, PG&E fought the act with a referendum campaign, arguing that the additional irrigation would add to the state's agricultural surpluses while imposing an unfair burden on Southern California's taxpayers for a project that would benefit the northern and central portions of the state.[7] In a special election held on December 19, 1933, Los Angeles County voted two to one for repeal. Nonetheless, the project won approval on a statewide 459,712 to 426,109 vote.[8]

CALIFORNIA ABANDONS CENTRAL VALLEY PROJECT

Despite voter approval of the referendum, the state did not build the Central Valley Project.[9] The nationwide depression rendered the revenue bonds unmarketable. However, from the time the State Water Plan was first proposed, there had been conversations between state and federal authorities, including President Hoover, regarding federal participation in the project. By 1934, it became apparent to state and federal authorities that the project would need to be entirely federally funded, if it were to be constructed as proposed. Consequently, Congress authorized the project and funding in 1935 and construction began in 1937. Fourteen years later, the U.S. Bureau of Reclamation (USBR) completed construction of the initial Central Valley Project facilities at an estimated cost in excess of $400 million.

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6 Chapter 1042, Statutes of 1933.

7 There are also references to PG&E's anger over the State getting into the electric power business. However, that was not PG&E's public posture.

8 An interesting history of the development of the Central Valley Project (including a humorous thesis that the outcome of the referendum can be attributed to a cow on Catalina), can be found in Robert William De Roos, The Thirsty Land, (Stanford: Stanford University Press, 1948).

9 However, the Department Of Water Resources has used bonds authorized by the Central Valley Project Act to finance construction of SWP facilities. For further information see Chapter 1.

AUTHORIZATION OF THE STATE WATER PROJECT

LEGISLATURE TRIES AGAIN

After World War II, California experienced a period of tremendous growth. That, along with corporate agriculture's dissatisfaction with the CVP's 160 acre limitation,[10] lead to renewed interest in the state developing additional water supplies to serve California's growing population. The Legislature responded in 1945 by creating the State Water Resources Board[11] and directed the Board to conduct a 'Statewide Water Resources Investigation" -- a comprehensive investigation of the water resources of California.

THE CALIFORNIA WATER PLAN

The investigation resulted in the publication of three documents. The first report, 'Water Resources In California",[12] was an inventory of water in California, and included data on precipitation, unimpaired stream runoff, flood flows and frequency, and water quality. The second report, 'Water Utilization and Requirements of California",[13] was an inventory of the current and projected uses of water in the state. The third report, 'The California Water Plan",[14] was a comprehensive review of statewide water needs, both immediate and long terms. This final report included a basin-by-basin review of potential water development projects, and included detailed maps showing the location of the proposed projects. The Legislature authorized the California Water Plan two years later by direct reference to the three bulletins.[15]

BIRTH OF THE FEATHER RIVER PROJECT

Moving parallel with the comprehensive statewide review, was the development of a specific project designed to meet water needs in the immediate future; i.e., the Feather River Project. In May 1951, State Engineer A. D. Edmonston presented the first complete report on the Feather River Project.[16] Edmonston's report proposed a multi-purpose dam and reservoir on the Feather River near Oroville, including a power plant and afterbay dam and power plant, a Delta Cross Channel, an aqueduct from the Delta to Alameda and Santa Clara Counties, another aqueduct from the Delta to the San Joaquin

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10 USBR provided water at a greatly subsidized price to farms limited to 160 acres in size, 320 in the case of community property.

11 Chapter 1514, Statutes of 1945.

12 California State Water Resources Board, "Water Resources In California", Bulletin No. 1, 1951.

13 California State Water Resources Board, 'Water Utilization and Requirements of California", Bulletin No. 2, 1955.

14 California State Water Resources Board, "The California Water Plan", Bulletin No. 3, May 1957.

15 Chapter 2053, Statutes of 1959.

16 California State Water Resources Board, 'Report on Feasibility of the Feather River Project and Sacramento-San Joaquin Delta Diversion Projects Proposed as Features of the California Water Plan", May 1951.

Valley and Southern California, and electric power transmission systems. The Legislature authorized the proposed project that same year by direct reference to the report.[17]

Work continued in further developing and refining the Feather River Project. In 1955, the Department of Public works submitted an updated report on the Feather River Project.[18] The report showed the project was feasible from both an engineering and a financial standpoint. The report also expanded the project, adding the San Luis Reservoir and including San Benito County to the service area of the Alameda-Santa Clara Branch. The Legislature referred the report to the Bechtel Corporation for review and comment. Bechtel found the report reasonable,[19] and so the Legislature formally included the Department's proposed modifications into the project.[20]

The Floods Of 1955-56

In the Winter of 1955-56, devastating floods struck Northern and Central California. Lives were lost and property damage was extensive. In reaction to the evident need for additional flood control, the Legislature appropriated over $25 million to begin construction of the Feather River Project.[21] Construction began in May 1957 on facilities in the Oroville area, chiefly highway and railroad relocations and dam site cleanup and preparation. The Legislature appropriated funds annually through 1960 to continue the Oroville relocations and to begin construction of the South Bay and California Aqueducts in 1959.

GOVERNOR BROWN AND THE BURNS-PORTER ACT

In 1959, the Legislature finally authorized and made a full financial commitment to the Feather River Project. Governor Brown presented a comprehensive water program to the Legislature as a major part of the program of his first administration. The most important of the measures adopted was the California Water Resources Development Bond Act, also known and cited as the Burns-Porter Act.[22]

> *The object of this chapter is to provide funds to assist in the construction of a State Water Resources Development System for the State of California. Said system shall be comprised of the State Water Facilities as defined ... and such additional facilities as may now or hereafter be authorized by the Legislature as a part of (1) the Central Valley Project or (2) the California Water Plan ... .*[23]

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17 Chapter 1441, Statutes of 1951.

18 California Department of Public Works, 'Program for Financing and Construction the Feather River Project as the Initial Unit of the California Water Plan", February 1995.

19 Bechtel Corporation, 'Report on the Engineering, Economic and Financial Aspects of The Feather River Project", (San Francisco: Bechtel Corporation, December 31, 1955).

20 Chapter 54, Statutes of the First Extraordinary Session of 1956.

21 Chapter 15, Statutes of 1957.

22 Chapter 1762, Statutes of 1959.

23 Water Code §12931 as added by Chapter 1762, Statutes of 1959.

FACILITIES AUTHORIZED

The Act authorized the issuance of $1.75 billion in general obligation bonds, subject to a vote of the people at the November 1960 general election. Facilities specifically authorized by the Act were:

- A multi-purpose dam and reservoir at Oroville;
- Dams and reservoirs upstream from Oroville near Frenchman, Grizzly Valley, Abbey Bridge, Dixie Refuge, and Antelope Valley;
- An aqueduct system including:
  - A North Bay aqueduct,
  - A South Bay aqueduct,
  - A reservoir near Los Banos, and
  - A San Joaquin Valley-Southern California aqueduct;
- Delta facilities for "... water conservation, water supply in the Delta, transfer of water across the Delta, flood and salinity control, and related functions";[24]
- A drainage system for the San Joaquin Valley;
- Electricity generating and transmitting facilities; and
- Local water development facilities authorized by the Davis-Grunsky Act.[25]

THE POLITICKING BEGINS

Much occurred between the chaptering of the Burns-Porter Act in July 1959 and the November 1960 election. The Legislature had a number of concerns regarding the basic financing principles of the State Water Resources Development System. The Metropolitan Water District of Southern California (MWD) had similar, though different, concerns. The MWD's concerns were especially important since the MWD's was the first contract negotiated and the contract was to be a model for all future contracts. The Department of Water Resources (DWR) had to somehow resolve these concerns amicably if there was any hope for voter ratification.

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[24] Water Code §12934(d) as added by Chapter 1762, Statutes of 1959.

[25] Chapter 1752, Statutes of 1959.

The Legislature's Concerns

The Legislature's concerns centered on four main areas:[26]

1. Allocating costs between purposes, such as recreation and water supply;
2. Pricing the water, especially any agriculture-municipal/industrial differential;
3. Reimbursing the project for costs associated with recreation and fish and wildlife; and
4. Enriching property values unjustly, as a result of making scarce water available.

Governor Edmund G. Brown's Contracting Principles

Just before the beginning of the Legislature's 1960 Regular Session, the Governor released his "Contracting Principles For Water Service Contracts".[27] Key policies established in the Principles included:

- Costs will be allocated among water supply, flood control, recreation, fish and wildlife, drainage, and water quality;
- Water rates will be calculated to return to the state all costs associated with the project -- costs allocated to non-reimbursable purposes (such as flood control) will not be included in the rate structure;
- Under the "Delta pooling" concept, there will be a single price for water at and above the Delta;
- Transportation costs will be allocated based on proportionate use;
- Construction will not begin on any transportation facility until contracts have been executed to ensure recovery of at least 75 percent of the costs of such facility; and
- Each contracting agency pledges it will use its taxing or assessment power to ensure payment of any and all charges.

In addition, the Principles included estimated water charges for select locations along each aqueduct.

Metropolitan Water District

Although the Principles resolved many of the outstanding issues, the MWD still had its own set of concerns.[28] The biggest sticking point revolved around allocating

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[26] A complete discussion of the key issues is in Senate Fact Finding Committee On Water, "Contracts, Cost Allocations, Financing For State Water Development", March 1960. The report is reprinted in California Legislature, Supplement To Appendix To The Journal Of The Senate, 1960 Regular Session, 1960.

[27] The Principles, along with the transmittal letter, are reprinted in Appendix D

[28] An in-depth discussion of the negotiations between the Department of Water Resources and the Metropolitan Water District leading up to the passage of Proposition 1 can be found in: Joel

transportation charges. The MWD could receive its water throughout the year and store the water in reservoirs -- the potential agricultural contractors did not have that option, and preferred to receive the water when needed. Accordingly, the MWD required less aqueduct capacity to receive an acre-foot of water in a year than did agricultural contractors. The MWD's position was that the capital costs for transportation facilities should be distributed based on aqueduct capacity, while the potential agricultural contractors wanted the charges based solely the maximum quantity of water an agency could draw in a year.

Burns-Porter Passes -- Barely

The parties resolved the issue in October by way of compromise -- transportation charges would be calculated based on an average of capacity and entitlements. On November 1, 1960, the MWD endorsed Proposition 1 and three days later the DWR and the MWD signed the 'Contract Between The State Of California Department Of Water Resources And The Metropolitan Water District Of Southern California For A Water Supply". It is difficult to say precisely how important the MWD's endorsement and subsequent signing of the contract were to the outcome of the election, but it might have been critical: On November 8, the project, in the form of Proposition 1, passed on a 2,857,586 to 2,719,942 vote, a 137,644 vote margin of victory.

DEVELOPMENT OF THE STATE WATER PROJECT

Voter approval of Proposition 1 meant full steam ahead on building what became known as the State Water Project (SWP). There were water contracts to be signed, projects to be designed, and concrete to be poured. The DWR attacked the multitude of problems with vigor; so that by the end of the mid 1960s, virtually all the pieces of the puzzle were in place.

CONTRACTS ARE SIGNED

The water supply contract between the MWD and the DWR was the first of 31 contracts signed. This first contract is sometimes referred to as the 'Prototype Contract". This was because one of its key provisions was that all other contracts SWP contracts were to be substantially uniform regarding basic terms and conditions. The DWR executed four subsequent contracts with public agencies using substantially the same format as employed in the Prototype Contract. These agencies, in order of contract signing, were the San Bernardino Valley Municipal Water District, (12/30/60); Alameda County Flood Control And Water Conservation District, Zone 7, (11/20/61); Santa Clara County Flood Control And Water District, (11/20/61); and Alameda County Water District, (11/29/1).

Schwarz, A Water Odyssey: The Story Of Metropolitan Water District of Southern California, (Metropolitan Water District of Southern California, 1991).

Contracts Standardized

The Director of the DWR approved the 'Standard Provisions For Water Supply Contract" on August 3, 1962. This document contained the preamble of the contract and the portions of the 44 articles of the Prototype Contract required in each contract. Each of the contracts signed after August 3, 1962 used the Standard Provisions.[29]

COURT UPHOLDS SWP

Early in the SWP's life, there were two key legal challenges. The first, *Metropolitan Water District v. Marquart (1963),*[30] was a broad based challenge of both the constitutionality of the Burns-Porter Act and the validity of the prototype contract. The California Supreme Court upheld the validity of both the Burns-Porter Act and the prototype contract. The Court found '[t]he standards laid down by the Legislature for administrative action need not be minutely defined, and it is sufficient if they can be found by implication from the general purposes of a statute and from the reasons which must have led to its adoption."[31] The Court continued 'the conduct of an important public enterprise requires that broad power and discretion be granted to the administrative agency in charge of the project."[32]

The second challenge, *Warne v. Harkness,*[33] tested the authority of the DWR to issue revenue bonds under the Central Valley Project Act[34] in light of the later enactment of the Burns-Porter Act. The California Supreme Court upheld the authority of the DWR to issue such revenue bonds. The Court found '[n]othing in [the Burns-Porter Act] expressly repeals the Central Valley Project Act, and, to the contrary, it expressly continues the Central Valley Project Act in operation without any declaration that the department's authority to issue Central Valley Projects bonds is affected."[35]

The resolution of these two cases cleared away the legal hurdles in the race to build the SWP.[36]

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29 For more information on the initial contracts, see Department of Water Resources, "California State Water Project: Water Supply Contracts", Bulletin No. 141, (Sacramento: The Department, November 1965).

30 59 Cal. 2d 159

31 59 Cal. 2d 176

32 59 Cal. 2d 177

33 60 Cal. 2d 579

34 Chapter 1042, Statutes of 1933.

35 60 Cal. 2d 586

36 A later case affecting the SWP was *Goodman v. County of Riverside* (1983) 140 Cal. App. 3d 900. This case challenged the ability of a local water agency to levy property tax to help fund the agency's payments on its SWP contracts. The Fourth District Court of Appeal upheld the ability of local water agencies to levy property taxes for this purpose. The Court concluded "... when the state's voters approved the [Burns-Porter] Act, that they approved an indebtedness in the amount necessary for building, operating, maintaining, and replacing the Project, and that they intended that the costs were to be met by payments from local agencies with water contracts. Further, we conclude that the voters necessarily approved the use of local property taxes whenever the boards of directors of the agencies

THE MWD NEEDS ADDITIONAL WATER

By the end of 1963, the DWR had executed 30 water supply contracts[37] for water *entitlements*[38] totaling 3,468,000 acre-feet. This left 532,000 acre-feet of the original 4,000,000 acre-foot *minimum project yield*[39] available for redistribution under provisions of Article 8. Also at this time, the United States Supreme Court reduced the amount of water the MWD could divert from the Colorado River.[40] The MWD estimated it needed an additional 500,000 acre-feet per year of SWP water to make up for the loss; however the MWD had optional Article 8 entitlements of only 231,100 acre-feet. On June 26, 1964, the DWR proposed a solution.[41] To make up the 268,900 acre-foot difference, the DWR proposed allocating to the MWD any entitlements left over after meeting all Article 8 requests, (at least 48,400 acre-feet). Then, the DWR proposed increasing the minimum project yield by 230,000 acre-feet and allocate 220,500 acre-feet to the MWD.

California Water Commission Considers Raising The Minimum Project Yield

The California Water Commission had a number of questions regarding the proposed "solution", not the least of which were:

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determined such use to be necessary to fund their water contract obligations, and that the ad valorem taxes levied by DWA [Desert Water Agency] fall within the [voter approved indebtedness] exception of [Proposition 13]." 140 Cal. App. 3d 910.

37 Prior to executing a contract, the DWR would perform a feasibility study to determine if the applicant would be able to meet the terms of the contract. The feasibility studies evaluated such things as the area's future demand for supplemental water, the legal ability of the agency to enter into a water supply contract with the state, the engineering feasibility of providing the proposed water service, and the financial ability of the agency to make required payments. The DWR published the results of their studies in their Bulletin 119 series. See for example: Department of Water Resources, Feasibility Of Serving The Kern County Water Agency From The State Water Project, Bulletin 119-8, (Sacramento?: The Department), September 1963.

38 The SWP contracts define two types of entitlements. Article 1(n) defines *annual entitlement* as "... the amount of project water to be made available to a contractor *during the respective year* ... under the terms of its contract with the State" (emphasis added). Article 1(o) defines *maximum annual entitlement* as "... the *maximum* amount of project water to be made available to a contractor *in any one year* ..."(emphasis added). Unless specifically noted otherwise, this appendix uses the term *entitlement* to mean *maximum annual entitlement.*

39 *Minimum project yield* was originally defined by Article 1(o) as "... the dependable annual supply of project water to be made available, estimated to be *4,000,000 acre-feet per year*, said amount to be determined by the State on the basis of coordinated operation studies of initial conservation facilities *and additional project conservation facilities* ..."(emphasis added). Amendments executed between September 22, 1964, and January 26, 1965, changed the minimum project yield to *4,230,000 acre-feet per year*,(see subsequent discussion in the main text). The definition of minimum project yield has important implications. For further information see Appendix G.

40 *Arizona v. California*, 84 S. Ct. 755 (1964).

41 William E. Warne, Letter to Ralph M. Brody, June 26, 1964. Reprinted in California Water Commission, "Agenda And Data For Meeting Of July 10, 1964", (Sacramento: The Commission, July 1964). Warne was the Director of the Department of Water Resources, Brody was the Chair of the California Water Commission.

- Where will the extra water come from?
- What will the extra water cost the SWP
- Does the Water Commission have the power to approve/disapprove the change in yield?

After quickly determining that changing the minimum project yield was in its bailiwick, the Water Commission turned to the other two questions. The DWR identified two potential sources for the additional water -- the Corps of Engineer's proposed Marysville Dam on the Yuba River and an enlarged Eel River facility. However, the DWR argued '[t]he decision as to which of several possible sources will best provide the additional yield is one which need not be made for several years."[42] The Department estimated that the additional costs would be insignificant.

Water Commission Approves Increase -- Does Not Identify Source Of Additional Water

Despite near unanimous opposition by the other contractors, the California Water Commission approved a resolution increasing the minimum project yield.[43] Consistent with the DWR's position, the resolution states "... the Commission does not at this time endorse nor approve any specific source of water to provide the increased yield."

Eighteen other contractors, having options totaling 462,800 acre-feet, had requested the DWR to increase their entitlements. All the changes were accomplished by contract amendments between September 22, 1964, and January 26, 1965. Table B.1 shows which contractors received increases. Figure B.1 shows the effect on project yield.

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[42] William E. Warne, 'Report Of Activities Of The Department Of Water Resources", presented before the California Water Commission On September 11, 1964, in Stockton, California, page 7. Reprinted in California Water Commission, "Agenda And Data For Meeting Of October 2, 1964", (Sacramento: The Commission, October 1964).

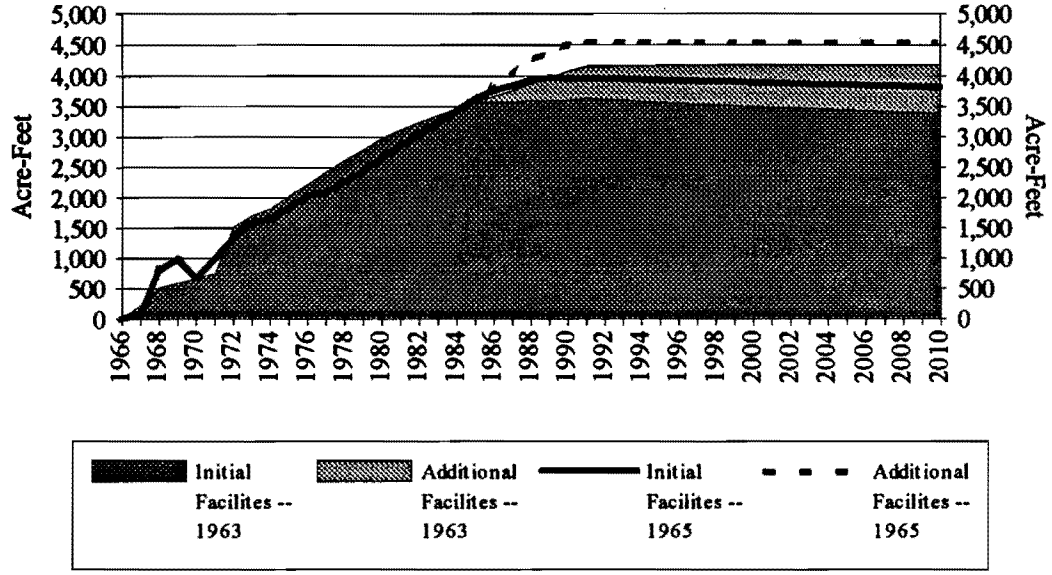
[43] California Water Commission Resolution No. 267, 'Re: Enlargement of the State Water Project", adopted September 11, 1964.

Table B.1
Contractor Characteristics: 1965

Agency	Counties Served	Predominant Type Of Water Service	Date of Contract (Preamble)	Year Of Initial Delivery [Article 6(a)]	Original Maximum Annual Entitlement (Acre-Feet)	Increase In Maximum Annual Entitlement (Acre-Feet)	Revised Maximum Annual Entitlement (Acre-Feet)
Alameda County Flood Control & Water Conservation District, Zone 7	ALA	M & I	11/20/61	USBR 1962 Project 1967	40,000	6,000	46,000
Alameda County Water District	ALA	M & I	11/29/61	USBR 1962 Project 1967	42,000	0	42,000
Antelope-Valley-East Kern Water Agency	LA KER VEN	M & I	9/20/62	1972	120,000	18,400	138,400
City Of West Covina	LA	M & I	12/2/63	1972	10,000	1,500	11,500
City Of Yuba City	SUT	M & I	12/30/63	1981	8,300	1,300	9,600
Coachella Valley County Water District	RIV IMP SD	M & I	3/29/63	1972	20,000	3,100	23,100
County of Butte	BUT	M & I	12/26/63	1968	27,500	0	27,500
Crestline-Lake Arrowhead Water Agency	SBD	M & I	6/22/63	1972	5,000	800	5,800
Desert Water Agency	RIV	M & I	10/17/62	1972	33,000	5,100	38,100
Devil's Den Water District	KIN KER	Agricultural	12/20/63	1968	11,000	1,700	12,700
Dudley Ridge Water District	KIN	Agricultural	12/13/63	1968	50,000	7,700	57,700
Empire West Side Irrigation District	KIN	Agricultural	12/30/63	1968	3,000	0	3,000
Hacienda Water District	KIN	Agricultural	12/20/63	1968	8,500	0	8,500
Kern County Water Agency	KIN	Agricultural	11/15/63	1968	1,000,000	153,400	1,153,400
Littlerock Creek Irrigation District	LA	M & I	6/22/63	1972	2,000	300	2,300
Mojave Water Agency	SBD	M & I	6/22/63	1972	44,000	6,800	50,800
Napa County Flood Control & Water Conservation District	NAP	M & I	12/19/63	1980	25,000	0	25,000
Oak Flat Water District	STA	Agricultural	3/23/65	1968	5,700	0	5,700
Palmdale Irrigation District	LA	M & I	2/2/63	1972	15,000	2,300	17,300
Plumas County Flood Control & Water Conservation District	PLU	M & I	12/26/63	1967	2,700	0	2,700
San Bernardino Valley Municipal Water District	SBD	M & I	12/30/60	1972	90,000	8,000	98,000
San Gabriel Valley Municipal Water District	LA	M & I	11/3/62	1972	25,000	3,800	28,800
San Gorgonio Pass Water Agency	RIV	M & I	11/16/62	1972	15,000	2,300	17,300
San Luis Obispo County Flood Control & Water Conservation District	SLO	M & I	2/26/63	1980	25,000	0	25,000
Santa Barbara County Flood Control & Water Conservation District	SB	M & I	2/26/63	1980	50,000	7,700	57,700
Santa Clara County Flood Control & Water District	SCL	M & I	11/20/61	USBR 1962 Project 1967	88,000	12,000	100,000
Solano County Flood Control & Water Conservation District	SOL	M & I	12/26/63	1980	42,000	0	42,000
The Metropolitan Water District Of Southern California	LA SD RIV ORA SBD VEN	M & I	11/4/60	1972	1,500,000	500,000	2,000,000
Tulare Lake Basin Water Storage District	KIN TUL	Agricultural	12/20/63	1968	90,000	2,000	92,000
Upper Santa Clara Valley Water Agency	LA	M & I	4/30/63	1972	23,000	3,500	26,500
Ventura County Flood Control District	VEN	M & I	12/2/63	1980	20,000	0	20,000
Totals					3,440,700	747,700	4,188,400

Source: Department of Water Resources, "The California State Water Project: Water Supply Contracts", Volume 1, Bulletin 141, (Sacramento: The Department), November 1965, Tables 1 and 2

Figure B.1
Minimum Project Yield
1963 Versus 1965



Source: Department of Water Resources, "California State Water Project", Bulletin 132-63, (Sacramento: The Department), April 1963, Table 9; and Department of Water Resources, "California State Water Project", Bulletin 132-65, (Sacramento: The Department), June 1965, Table 7

PLANNED FACILITIES

Immediately following passage of Proposition 1, the DWR began studies to develop a coordinated financing, construction, and management program. By 1963, the DWR had settled on essentially a two-stage construction program. The initial stage included those facilities necessary to meet immediate water supply needs; the second stage included those facilities needed to bring the minimum project yield to the 4,000,000 acre-feet per year level.

The Department adopted a decentralized organizational approach to construct the SWP. The DWR assigned responsibility for constructing the first stage facilities to various divisions. The DWR divided the first stage facilities (which included all the facilities that now comprise the SWP) as follows:

- *Upper Feather Division* -- Frenchman Dam and Reservoir, Antelope Valley Dam and Reservoir, Grizzly Valley Dam and Reservoir, Dixie Refuge Dam and Reservoir, and Abbey Bridge Dam and Reservoir;
- *Oroville Division* -- Oroville Dam and Reservoir, Oroville Power Plant, Thermalito Features, Western Pacific Railroad Relocations, U.S. 40A Relocation, and other relocations;
- *North Bay Aqueduct* -- All facilities between Lindsey Slough and Novato;

- *South Bay Aqueduct* -- All facilities between Bethany Forebay and Airpoint Reservoir;
- *Delta Facilities* -- As yet undefined;
- *North San Joaquin Division* -- Delta Pumping Plant, and Aqueduct, Delta to San Luis Forebay;
- *San Luis Division* -- San Luis Dam and Reservoir, San Luis Pumping-Generating Plant, Mile 18 Pumping Plant, San Luis relocations, and Aqueduct, San Luis to Kettleman City;
- *South San Joaquin Division* -- Buena Vista Pumping Plant, Wheeler Ridge Pumping Plant No. I, Wheeler Ridge Pumping Plant No. II, and Aqueduct, Kettleman City to Tehachapi Pumping Plant;
- *Tehachapi Division* -- Tehachapi Pumping Plant, and Aqueduct, Tehachapi Pumping Plant to south portal of the Tehachapi Tunnels;
- *Antelope Division* -- Cottonwood Power Plant, and Aqueduct, south portal of the Tehachapi Tunnels to the junction of East and West Branches;
- *East Branch Division* -- Cedar Springs Dam and Reservoir, Perris Dam and Reservoir, Pearblossom Pumping Plant, Devil Canyon Power Plants 1 & 2, and Aqueduct, junction of East and West Branches to Perris Dam;
- *West Branch Division* -- Castaic Dam and Reservoir, West Branch Pumping Plant, Elizabeth Lack Canyon Power Plants Nos. 1, 2, & 3, and Aqueduct, junction of East and West Branches to Castaic Dam; and
- *Coastal Division* -- All facilities between Anenal Gap and Devil's Den Pumping Plant.

As shown in Figure B.2 the first stage facilities did not include two key sets of facilities: Middle Fork Eel River facilities and the San Joaquin Drainage facilities. In addition, the DWR had not developed a construction plan for the Delta facilities. The DWR described the Middle Fork Eel River facilities as "additional conservation facilities".[44] They estimated that the SWP would not need water from the Eel River until 1986. So, construction of these facilities could wait until the DWR completed the initial facilities. The San Joaquin Drainage facilities were to be the first stage of a master drainage project to meet anticipated future needs. Since there was not a pressing need for the drain, and since a number of alternatives were under study, construction of these facilities could also wait. The Delta facilities were proving to be an especially difficult problem. The next appendix discusses how the DWR resolved all three of these projects.

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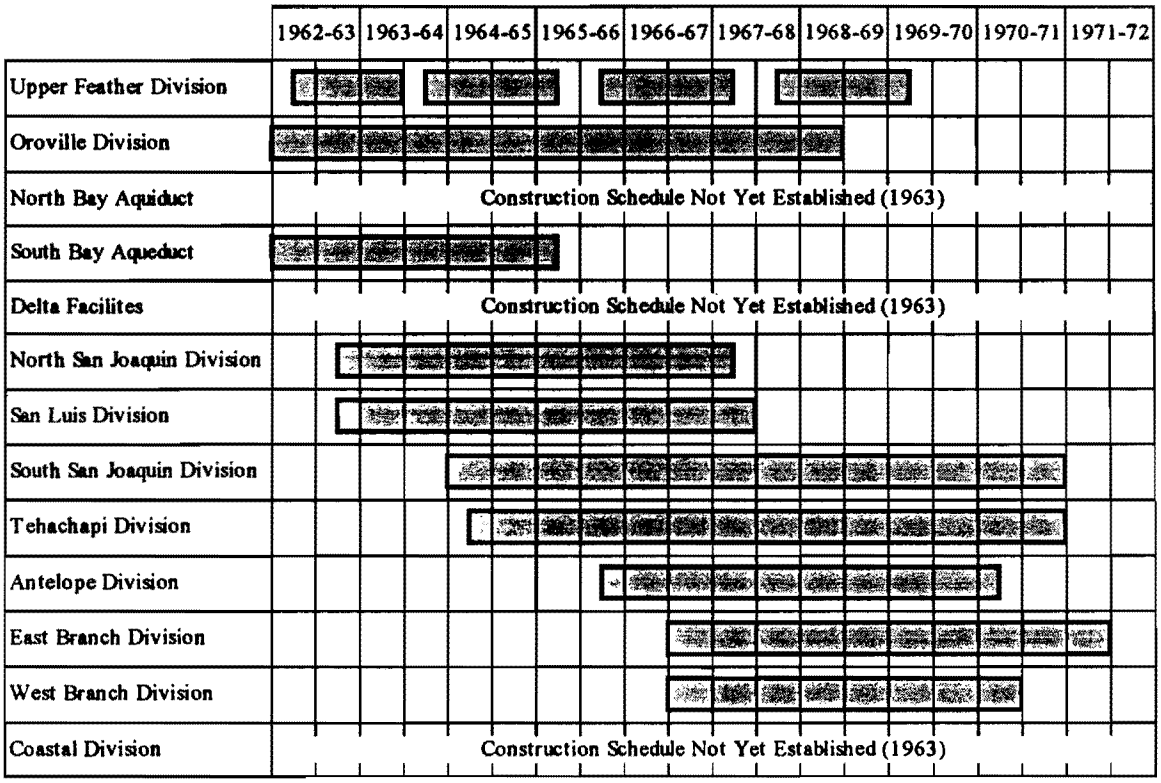
[44] DWR defined the Eel River facilities as "additional conservation facilities" for SWP management purposes only. The State Water Contracts included the Eel River facilities as "initial conservation facilities". See for example, Article 1(g), "Contract Between The Metropolitan Water District Of Southern California And The State Of California Department Of Water Resources For A Water Supply And Selected Related Agreements", October 1, 1991.

Figure B.2
Phase 1 Construction Schedule
1963



Source: Department of Water Resources, "The California State Water Project In 1963", Bulletin 132-63, April 1963

APPENDIX C
CHANGES TO THE STATE WATER PROJECT

INTRODUCTION

The DWR has not built three prominent water facilities specifically authorized by Burns-Porter. They are:

- The Eel River Facilities,
- The San Joaquin Valley Drain, and
- The Delta Facilities.

Many of the key financial issues regarding SWP relate to these facilities. This Appendix describes why these facilities remain unbuilt.

EEL RIVER FACILITIES

Since its inception, the SWP included plans for developing and exporting water from the Eel River. In 1966, the four agencies of the California State-Federal Interagency Group[1] adopted a program for coordinated water resources planning in the Eel and Mad River Basins. The group assigned the Middle Fork Eel River to the Corps of Engineers and the DWR jointly. In 1968, the Corps of Engineers formalized their proposal to construct a dam on the middle fork of the Eel River at Dos Rios.[2] The Corps envisioned a 730-foot-high earth and rockfill, dam creating a reservoir covering 40,000 acres and capacity of 7.6 million acre-feet. This capacity would be allocated 2.0 million acre-feet to dead storage, 5.0 million acre-feet to water supply, and 0.6 million acre-feet to flood control. Water from this project would travel through a 21-mile SWP financed tunnel to the Sacramento Valley.

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1 The Bureau of Reclamation, the Corps of Engineers, the Soil Conservation Service, and the Department of Water Resources.

2 Corps of Engineers, "Eel River Basin, California, Interim Report on Water Resources Development For Middle Fork Eel River", (San Francisco: The Corps, April 1968).

OPPOSITION TO DAM WIDESPREAD

Opponents waged a vigorous campaign against both the economic and environmental aspects of the proposed dam.[3] Specific areas of concern about the project included:

- *Physical Feasibility Of The Project* -- The geology of the dam site was not clearly consistent with the proposed dam design;
- *Economic Impact On The Local Area* -- The reservoir would consume 2.3 percent of Mendocino County's assessed value, and half the assessed value of the Round Valley School District;
- *Relocation Of The Town Of Covelo* -- The reservoir would flood the town of Covelo, whose principle industries were lumber and agriculture;
- *Relocation Of The Indian Community* -- The U.S. Army brought more than twenty tribal groups into Round Valley between 1850 and 1875, and now proposed moving them again;
- *Fish And Wildlife* -- The Middle Fork supported annual spawning runs of 13,000 king salmon and 20,00 steelhead trout; the reservoir would inundate wildlife habitat that supported 381,000 deer-days annually; and
- *Archeological And Anthropological Preservation* -- Round Valley contained nearly 800 recorded archeological sites comprising the total cultural history of the Yuki Indians.

LEGISLATURE PROTECTS WILD AND SCENIC RIVERS

Not independent of the Dos Rios debate, the Legislature moved to protect the state's wild and scenic rivers from undue damage. First, in 1968, the Legislature passed the California Protected Waterways Act.[4] This act declares that it is state policy to conserve those waterways of the state that possess extraordinary scenic, fishery, wildlife, or outdoor recreation values. More significantly, in 1972 the Legislature passed the California Wild and Scenic Rivers Act of 1972.[5] This act prohibited the construction of dams or diversion facilities on virtually all free-flowing North Coast rivers, including those once considered as future water sources for the SWP. However, it also provided that the DWR, after an initial 12 year period, would report to the Legislature about the need for water supply and flood control projects on the Eel River and its tributaries.

TWELVE YEARS LATER

David N. Kennedy, Director of the DWR, closed the Eel River debate on August 30, 1985, when he reported to the Legislature:

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3 Good discussions of the proposed project are in Assembly Committee On Water, "Preliminary Comments On The Dos Rios Project", (Sacramento: The Assembly, January 1969); and Senate Committee On Water Resources, "The Dos Rios Project", (Sacramento: The Senate, January 1969).

4 Chapter 1278, Statutes of 1968.

5 Chapter 1259, Statutes of 1972.

Based upon the situation today, we see no reason to seek legislation to withdraw the Eel river from the Wild and Scenic Rivers System. This is a decision to by considered by future generations.[6]

The consequences of the Eel River debate were many. Foremost, it would take an extrordinary effort to withdraw a river from the Wild and Scenic Rivers System. Consequently, further development of the Eel, Smith, Mad, or Klamath Rivers is unlikely. Second, without other projects to take its place, abandonment of the Eel River theoretically reduced the minimum project yield at least 700,000 acre-feet.[7] Third, the SWP Water contractors "got stuck" for about $8.5 million[8] for studies that did not yield one drop of water.[9]

SAN JOAQUIN DRAINAGE FACILITIES[10]

AGRICULTURAL DRAINAGE A LONG STANDING PROBLEM

Inadequate drainage and accumulating salts have been persistent problems in parts of the San Joaquin Valley for more than a century. As far back as 1882, farmers were abandoning agricultural land because of salinity problems.[11] As more and more land became irrigated, the salt problems worsened. By 1957, in response to the agricultural drain proposal described in The California Water Plan",[12] the Legislature's Joint Committee On Water Problems concluded:

The evidence presented to the committee at the Los Banos meetings showed conclusively and without dissent that the drainage and degradation in water quality conditions in the San Joaquin Valley are now seriously impairing agricultural production, forcing changes in crop patterns, and generally adversely affecting the economy of the valley. It is equally recognized that this situation is steadily growing worse and is rapidly approaching a crisis. The engineers of both state and federal

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6 David N. Kennedy, Letter To The Legislature, August 30, 1985, as quoted in Department of Water Resources, 'Management Of The California Water Project", Bulletin 132-86, (Sacramento: The Department, September 1986), p. 95.

7 The Corp's proposal produced the most amount of water. DWR investigated alternatives that would yield less water. DWR estimated that approximately 700,000 acre-feet of additional conservation water would be needed to reach the minimum project yield, given the 'loss" of the Eel River facilities. Source: Department Of Water Resources, 'The California State Water Project In 1970", Bulletin 160-70, (Sacramento: The Department, 1970).

8 Department Of Water Resources, 'Management Of The California State Water Project", Bulletin 132-91, (Sacramento: The Department, December 1991), p. 161

9 The Corp's proposal would have yielded a maximum 930,000 acre-feet per year at about $43 per acre-foot. Department of Water Resources Northern Division, "Alternative Eel River Projects And Conveyance Routes", (? : The Department, December 1972)

10 This section draws heavily on: Department Of Water Resources, 'Status Of San Joaquin Valley Drainage Problems", Bulletin No. 127-74, (Sacramento: The Department, December 1974)

11 A thorough history of salinity in the San Joaquin Valley is Ronald Loren Nye, Visions Of Salt: Salinity And Drainage In The San Joaquin Valley, California, 1870-1970, (Ann Arbor, Mi.: University Microfilms International, 1986)

12 California State Water Resources Board, "The California Water Plan", Bulletin No. 3, May 1957.

agencies studying this problem have recommended construction of a main stem, master drain as the proper solution. Neither have as yet made an essential full-scale investigation and final report. Preservation of the agricultural economic structure of the San Joaquin Valley demands that such studies and reports be made without delay.[13]

BUREAU OF RECLAMATION GOES IT ALONE

As noted above, included among the facilities approved the Burns-Porter Act was a drainage system for the San Joaquin Valley. That same year, the U.S. Congress authorized construction of the San Luis Unit of the Central Valley Project.[14] At the urging of the state, Congress authorized the U.S. Bureau of Reclamation (USBR) to participate with the state in creating a master drain for the San Joaquin Valley, or alternatively to construct an independent drain to the Delta sufficient to serve the San Luis Unit. However, by June 1961, the DWR had not completed its plans and therefore could not ensure construction of a master drain in time to meet the Bureau's needs. Lacking assurances from the state, the USBR went on with plans to independently construct the San Luis Interceptor Drain. Their plan was to begin construction of the San Luis Interceptor Drain in 1966, and begin operations by 1968.

THE DWR CAME UP WITH A PLAN

The prospect of having two separate state and federal drains seemed to fade in June 1964, when the DWR sent the USBR a proposal for state construction of a San Joaquin Valley Master Drain. Estimated to cost $92 million,[15] DRW planned a 280 mile concrete lined canal running from near Buena Vista lakebed, along the west side of the valley, discharging near Antioch. To ensure repayment of the state's reimbursable costs, the DWR recommended creating a valley-wide drainage district to contract with the state for drainage services.

Along with the proposal, the DWR gave public assurance that the state would implement this proposal. The assurance took the form of an 11 element statement, the key element of which was that the state would complete the first stage, from Kettleman City to the Antioch Bridge, by July 1, 1970.

Contra Costa County Opposed

Support for the proposal was not universal. San Francisco Bay interests in general, and Contra Costa County in particular, objected about "... the projected use of the Delta as a

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[13] California Legislature, Joint Committee On Water Problems, 'Drainage Problems Of The San Joaquin Valley Of Sacramento", (Sacramento: The Senate, March 1957), p. 64

[14] Public Law 86-488, also known as the San Luis Unit Authorizing Act

[15] Department of Water Resources, 'San Joaquin Master Drain", Bulletin No. 127, (Sacramento: The Department, January 1965)

cesspool for pesticides, nutrients, soil salts, sewage plant effluent, and other obnoxious substances from the San Joaquin Valley."[16]

The DWR Not Concerned

The DWR discounted most of the objections. Their ongoing studies suggested that mineral salts would not create problems so long as the drain included storage and dilution facilities. (See Table D.1).

Table D.1
1964 Estimates Of The
Chemical Concentrations In Waste Water*
At The San Joaquin Master Drain Terminus

Constituents	Concentrations (Estimated Parts Per Million)	
	Initial	After 50 Years Operation
Salts	330	120
Calcium	180	40
Magnesium	1,600	720
Potassium	20	10
Carbonate	0	0
Bicarbonate	180	110
Sulfate	3,100	650
Chloride	1,200	900
Boron	10	3
Total Dissolved Solids	6,500	2,500
Nutrients		
Total Nitrogen	21	21
Total Phosphate	0.15	0.15
Pesticides	<0.001	<0.001
Others		
Phenolic Material	0.001	0.001
Grease and Oil	0.5	0.5

* Agricultural waste water only.

Source: Department of Water Resources, "San Joaquin Master Drain", Bulletin 127, (Sacramento: The Department), January 1965, p. 21

Similarly, the DWR was unconcerned about pesticides in the drain waters. William E. Warne, then Director of the DWR, commented at a Legislative hearing:

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[16] Mel F. Neilsen, Supervisor, Contra Costa County, Testimony before the Senate Fact Finding Committee On Water Resources, October 8, 1964; as quoted in: Senate Fact Finding Committee On Water Resources, "Hearing", (Sacramento: The Senate, October 1964), p. 126

"... [W]e are finding pesticides in waters from agricultural sumps and drains in about the same concentration as exist in delta and bay waters and as in the waters of most rivers in the central portion of the State. ... We believe that the drain will not add to the pesticide problems of the bay so long as the concentrations of pesticides in the drain waters and receiving waters are about the same."[17]

The DWR's position on Nitrogen nutrients, however, was different.

I would be less than candid, however, if I attempted lightly to dismiss nutrients in the drain waters. These nutrients have a potential for stimulating algae growth in the receiving bay waters. Algae in sufficient quantity can cause unsightliness and, perhaps, tastes and odors in domestic water supplies. Evidence from other areas of the county indicates that luxuriant algae growths can cause unsuitable conditions for fishlife. Under present concepts of statewide water development, the principal beneficial uses of receiving waters at the point of drain discharge will be those related to fish, wildlife and recreation. Consequently, the Department of fish and Game, in cooperation with our Department, is attempting to define and determine the problems that might be caused by nutrients.[18]

BUREAU OF RECLAMATION GOES IT ALONE -- AGAIN

For nearly three years the DWR and the Bureau worked on plans for the Master Drain. However, the DWR was having difficulties gaining assurances of repayment from potential contractors of the reimbursable portion of the state's share of costs. In particular, potential users balked at paying $16 to $20 per acre-foot to discharge water into the drain. In March 1967, the DWR again informed the Bureau that the state would be unable to go on with construction. The Bureau then proceeded to build the San Luis Drain by itself. Construction began in 1968. By 1975, the Bureau had completed 85 miles of the main drain, 120 miles of collector drains, and the first phase of the regulating reservoir at Kesterson.

The DWR Tries Again

Shortly after pulling out of the master drain project, the DWR asked representatives from several San Joaquin Valley water agencies to develop a plan for constructing and financing state drainage facilities. By developing a working group consisting of private valley interests and by limiting involvement of the Department and the USBR, the DWR Director William R. Gianelli hoped to encourage a common viewpoint amongst potential drainage contractors on how the state might solve the problem. In March 1969, the San Joaquin Valley Drainage Advisory Group reported back with their recommendations. Not surprisingly, the Group had a very definite plan for the proposed facilities, but a substantially less definite plan for the requisite financing.

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[17] William E. Warne, Director, Department of Water Resources, Testimony before the Senate Fact Finding Committee On Water Resources, October 8, 1964; as quoted in Senate Fact Finding Committee On Water Resources, "Hearing", (Sacramento: The Senate, October 1964), p. 23

[18] *Ibid.*, pp. 23-24.

The basic plan, however, is the same as all previously proposed "best" plans -- that is, the primary facility is an open-lined canal or canals located near the trough of the Valley and discharging into western Delta receiving waters.

The plan for repayment is less definite....The Group believes that it is not politically practical or feasible to create a taxing valley-wide district in 1969. The recommended repayment plan requests $8 to $11 million of State general funds in 1969 so that provisions can be made during construction of the federal San Luis Drain for its future enlargement as a single, full-sized drainage canal for the entire San Joaquin Valley. Creation of the master district could then be deferred until after 1985 and its powers could be defined to reflect the economic conditions of that time. The repayment plan suggests that eventually some combination of toll charges, taxes and government funds will provide the best means of recovering reimbursable drainage costs.[19]

Not having a firm financing plan, the DWR's planning activities diminished greatly in 1969. Except for some nitrogen removal treatment studies, desalting studies, and a tile drainage monitoring program, the DWR was essentially out of the drainage business the following year.

BIRTH OF THE INTERAGENCY DRAINAGE PROGRAM (IDP)

In 1975, the DWR, the USBR, and the State Water Resources Control Board (SWRCB) recognized that they shared mutual concerns about agricultural drainage and salt management in the San Joaquin Valley. To that end, they formed the San Joaquin Valley Interagency Drainage Program (IDP) to "... plan an economically and environmentally sound, financially feasible, and politically acceptable drainage program for the valley...."[20]

IDP Recommendations

The IDP conducted the most thorough investigation to date, and in 1979, it issued its 'Final Report And First-Stage Environmental Impact Report". The recommended plan proposed:

1. *A drainage canal (the Valley Drain) along the San Joaquin Valley trough, discharging in Suisun Bay near Chipps Island.*
2. *A total of 64,300 acres of new or restored wetland wildlife habitat, of which 45,300 acres would be brackish marshes and 19,000 acres would be reservoirs or holding ponds. The marshes would help to protect the wildlife resources of the Pacific Flyway. Six sites would be involved, five in the San Joaquin Valley and one on the south shore of Suisun Bay in Contra Costa County.*
3. *Staged construction of drainage facilities.*[21]

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19 Joseph B. Summers, Letter To The William R. Gianelli, March 12, 1969, as reprinted in Department of Water Resources, 'Status Of San Joaquin Valley Drainage Problems", Bulletin 127-74, (Sacramento: The Department, December 1974), pp. 60-61.

20 San Joaquin Valley Interagency Drainage Program, "Agricultural Drainage And Salt Management In The San Joaquin Valley", (Fresno: The Program, June 1979), p. 5-1.

21 *ibid.*, p. 1-2

The IDP recommended reimbursable costs be repaid by "... a) those who, by irrigating, contribute to the drainage problem; and b) those who discharge into facilities of the valley wide drainage system."[22] The IDP estimated that applied water charges would be $1 per acre-foot in federal area and $2 per acre-foot in state areas. They estimated that discharge fees would be $3.50 per acre-foot in federal area and $17.00 to $23.00 per acre-foot in state areas.

IDP Finds Little Environmental Impact

The First-Stage Environmental Impact Report concluded:

> 1. *Discharge of year 2000-level drainage at Chipps Island (drainage from Tulare Lake Drainage District and Kern County Excluded) would not cause widespread salinity increases in the western Delta-Suisun Bay area. Minor salinity increases near the discharge point may require mitigation.*
> 2. *Implementation of the Recommended Plan would not cause significant impacts on algal growth in the Delta or Suisun Bay, although nitrate removal might prove necessary to ensure this.*
> 3. *A drain serving areas north of the Tulare Lake Drainage District is not expected to affect aquatic life of the receiving waters. Due to arsenic content, drainage from certain areas in the Tulare Lake Drainage District and Kern County may not be acceptable for discharge.*[23]

The response to the IDP report was mixed. Generally, the federal contractors supported the plan, while state contractors opposed it.[24] In July 1982, the DWR again withdrew from the joint project, as it believed the districts served by the SWP had developed satisfactory interim disposal method.[25]

PROBLEMS AT KESTERSON

In 1983, aquatic birds at Kesterson Reservoir were discovered dead, deformed, or both. Selenium poisoning was later determined to be the probable cause.

In 1984, the San Joaquin Valley Drainage Program was established as a joint federal and state effort to investigate drainage and drainage related problems, and identify possible solutions. In 1985, the Secretary of the Interior ordered that discharge of subsurface drainage into Kesterson be halted, that the feeder drains leading to the San Luis Drain, and that the reservoir be plugged. The Reservoir closed, vegetation plowed under, and in 1988 the low lying areas filled in.

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22 *ibid.*

23 *ibid.*, p. 1-3

24 See, for example, Stewart Pyle's testimony in Assembly Committee On Agriculture, "San Joaquin Valley Drain Hearing", (Sacramento: The Assembly, November 18, 1980)

25 David G. Huston, "Statement", Presented To California Assembly Water, Parks, And Wildlife Committee, November 16, 1984. Reprinted in Assembly Water, Parks And Wildlife Committee and Senate Natural Resources And Wildlife Committee, "San Joaquin Valley Agricultural Drainage And Kesterson National Wildlife Refuge", (Sacramento: Joint Publications Office, November 16, 1984)

In 1990, the San Joaquin Valley Drainage Program issued its Final Report. The report states '[i]t appears that in-valley actions can manage the problems for several decades without a means of exporting drainage-related salts to the ocean."[26] Instead, the report recommends a multi-program strategy, including:

- Source control,
- Drainage reuse,
- Evaporation systems,
- Land retirement,
- Ground-water management,
- Discharge to the San Joaquin River,
- Protection, restoration, and provision of substitute water supplies for fish and wildlife habitat, and
- Institutional changes.

Financially, the demise of the San Joaquin Valley Drain had little consequence to the SWP. Although the SWP has spent about $46 million[27] on the drain to date, these costs have been reimbursed by the California Water Fund.[28]

Perhaps the key lesson of Kesterson was that you can only mitigate what you recognize as something requiring mitigation. Of all the major reports that assessed the potential negative effects of agricultural drainage, none identified selenium as potentially harmful. Perhaps this was because selenium is an essential nutrient for animals, and is only toxic in excess.[29] Or perhaps it was because it is difficult to get an accurate measure of small amounts of selenium in saline water.

DELTA FACILITIES[30]

Among the facilities authorized by the Burns-Porter Act Delta were facilities for "... water conservation, water supply in the Delta, transfer of water across the Delta, flood and salinity control, and related functions".[31] At the time, the DWR had not embraced a strategy for accomplishing their objectives; they only knew what the objectives were.

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26 San Joaquin Valley Drainage Program, "A Management Plan For Agricultural Subsurface Drainage And Related problems On The Westside San Joaquin Valley", September 1990, p. 1.

27 Department Of Water Resources, 'Management Of The California State Water Project", Bulletin 132-91, (Sacramento: The Department, December 1991), Table 29, 1952 through 1993.

28 If and when the DWR completes the drain, the drain's contractors would be obligated to reimburse the California Water Fund.

29 Indeed, a common problem of livestock over much of California is 'white muscle disease". Caused by a selenium deficiency, it results from consumption of forage grown in low selenium soils. Ray Coppock 'Resources At Risk: Agricultural Drainage In The San Joaquin Valley", (University of California Agricultural Issues Center), 1987

30 This section draws heavily on: W. Turrentine Jackson and Allan M. Paterson, 'The Sacramento-San Joaquin Delta, The Evolution And Implementation Of Water Policy: An Historical Perspective", (Davis: California Water Resources Center, University Of California, Davis, June 1977)

31 Water Code §12934(d) as added by Chapter 1762, Statutes of 1959.

DELTA PROBLEMS WELL KNOWN

The problems facing the Delta were fairly well defined and most have not changed appreciably since then.[32] Indeed, since reclamation of the Delta first began in the 1860's, the issues of flood and salinity control have been topics of contentious debate.[33] Often, the proposed solution to one problem only exacerbated the other. For example, the frequently resurrected plan to create a physical barrier to prevent salt water intrusion would create additional flood control problems by raising the water level of the Delta. Yet despite the problems, the Delta was the key to the SWP. Somehow, water from Oroville had to move south of the Delta with minimal degradation of quality and without creating additional problems.

THE DWR'S FIRST ATTEMPT AT A SOLUTION

In December 1960, less than two months after voters ratified the Burns-Porter Act, the DWR published its analysis of potential Delta water facilities.[34] The report evaluated the four options. They were:

- *Chipps Island Barrier Project* -- Principle features were floodway structure, fishway and navigation locks at Chipps Island (approximately 3 miles down stream from the city of Pittsburgh)
- *Single Purpose Delta Water Project* -- Principle features were a series of control structures and closures that would direct virtually all of the Sacramento River flows down Georgiana Slough and the North and Middle Forks of the Mokelumne river
- *Typical Alternative Delta Water Project* -- Principle features were the same as the Single Purpose Delta Water Project plus flood protection along the Middle Fork of the Mokelumne river
- *Comprehensive Delta Water Project* -- Principle features were the same as the Typical Alternative Delta Water Project plus flood protection along Old River.

The report's benefit-cost analysis showed ratios ranging from 0.93:1 for Chips Island (not cost effective) to 5.36:1 for Single Purpose (very cost effective). Not surprisingly, the DWR recommended "... the Single Purpose Delta Water Project be adopted as an integral feature of the State Water Resources Development System ..."[35] at a cost of $46.6 million.

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32 The characteristics of the then existing problems are essentially the same. However, as described later in this section, new problems have been identified.

33 Complaints of brackish water actually date back prior to the permanent settlement of the Delta and Suisun Bay. However, since the "natural" ebb and flow of saltwater through the Delta is unknown, it is possible the complaints were the result of unrealistic expectations. The geographic history of the Delta is well described in John Thompson, The Settlement Geography Of The Sacramento-San Joaquin Delta, California, (Ann Arbor, Mi.: University Microfilms International, 1980)

34 Department of Water Resources, "Delta Water Facilities", Bulletin 76, Preliminary Edition, (Sacramento: The Department, December 1960).

35 *Ibid.* p. 59

Contra Costa County Opposed

The response to the recommendation was fast and furious. Contra Costa County was particularly vocal. Their concerns centered on the potential degradation of water quality at the intake of the Contra Costa canal, as well as riparian water-rights concerns. The recreational boaters and fishing interests were also vocal. They argued that the Single Purpose Delta Water Project, with its numerous channel closures and control structures, would severely impede their activities. In addition, federal agencies were not supportive. The Army Corps of Engineers generally supported the Chipps Island Barrier Project while the USBR felt the facilities were unnecessary then.

BIRTH OF THE PERIPHERAL CANAL

In 1961, the DWR, the USBR, and the Army Corps of Engineers formed the Interagency Delta Study Committee "... to formulate a mutually acceptable plan of improvement in the Delta, and to recommend an action program for the implementation of the plan."[36] Early analysis revolved around variants of the Single Purpose Delta Water Project, the Chipps Island Barrier Project, and a hydraulic barrier concept, using fresh water outflow for salinity control. However, in 1963, the USBR introduced to the Committee the Peripheral Canal as an alternative project. The Peripheral Canal would be an unlined 43 mile canal that would divert water from the Sacramento River near Hood and convey it to the Clifton Court Forebay near Tracy.

> *The Peripheral Canal Plan, with its continuous channel of definite section, interrupted by cross drainage, would permit more positive control of all water introduced into it than would the complex conveyance system of the Waterway Control Plan. This positive control would provide superior water quality for export as well as a wider distribution of high quality water in the various Delta Channels. From a hydraulic standpoint, a separate canal system as the Peripheral Canal promises a far simpler solution to hydraulic design than does the Waterway Control Plan. The latter plan would require analysis of the entire Delta system and might require a detailed model study. Construction of the Peripheral Canal appears to be relatively simple as compared to that for the Waterway control Plan, which would require a wide variety of hydraulic structures to provide adequate control through Delta channels.*[37]

Only Contra Costa County Opposed

The response to the Peripheral Canal was generally favorable -- only Contra Costa County opposed the plan with any vigor. Commenting on the hearing the California Water Commission held regarding the plan, Chairman Ralph M. Brody noted:

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[36] Interagency Delta Committee, 'Plan Of Development: Sacramento-San Joaquin Delta", (The Committee, 1965), p. 5.

[37] William E. Warne, 'Review Comments Of The Department Of Water Resources", as printed in Interagency Delta Committee, 'Plan Of Development: Sacramento-San Joaquin Delta", (The Committee, 1965), p. 28.

An interesting aspect of the hearing was that, for the first time in our memory, large groups of fish and wildlife and recreation interests supported, almost without qualification, a proposed water project. In fact, the entire San Francisco Bay fishing fleet declared a holiday so that the skippers and their families could be present for the hearing.[38]

Delta area groups generally supported the proposal, although several took a cautious approach and indicated a position, not especially of support but of non-opposition. It should be emphasized that the position of non-opposition was conditioned by specific protection of Delta water-rights, location of the canal, and other factors.[39]

On March 16, 1966, Director Warne officially designated the Peripheral Canal as SWP facility to transfer water across the Delta. The canal would be operational by 1973 at a cost to the SWP of $55.1 million.[40] However, shortly thereafter, work on the canal came to a virtual halt.

PERIPHERAL CANAL DELAYED

The SWP faced a cash flow problem. Deliveries to contractors were still minimal and interest costs had climbed. In June 1967, Director William Gianelli announced the deferment of preliminary design work for the Peripheral Canal to allow additional time to obtain federal authorization of a joint project. Without joint financing, SWP would have a difficult time funding the project. By December, the DWR delayed construction of the Peripheral Canal -- putting off final design until July 1969, and rescheduling first water deliveries to January 1976. Delay of the project became a near annual event.

THE DWR RESTARTS PROJECT

Because of the slow progress being made in securing Congressional authorization of the Peripheral Canal, the DWR Director Gianelli said it was time to move forward with the construction of a state-only Peripheral Canal.[41] The DWR would design the canal to accommodate later federal participation in its use.

Draft EIR Poorly Received

On September 3, 1974, the Department released the 'Draft Environmental Impact Report, Peripheral Canal Project". Criticism of the Draft EIR was swift and severe. During the 90-day review period, the DWR received written comments from about 700 parties and

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38 Ralph M. Broady, 'Summary Of Comments Received By the California Water Commission", as printed in Interagency Delta Committee, 'Plan Of Development: Sacramento-San Joaquin Delta", (?: The Committee, 1965), p. 31.

39 *Ibid.* p. 32.

40 Department of Water Resources, "The California State Water Project In 1966", Bulletin 132-66, (Sacramento: The Department, June 1966).

41 William R. Gianelli, as quoted in: Assembly Committee On Water, 'State Policy Regarding The Provision Of Water Supplies Within The Sacramento-San Joaquin Delta, The Operation Of The State Water Resources Development System, And The Allocation Of Costs For Project Benefits", (Sacramento: The Assembly, 1972), p.103.

heard statements from 136 persons at public hearings. The criticism tended to address one of four general issue areas:[42]

- *Water Quality* -- The EIR was not consistent with existing water quality requirements.[43]
- *Federal Involvement* -- Congress had not authorized the project, yet the EIR assumed a joint-use facility. If there was no federal participation, the environmental improvements/mitigations would not be as effective.
- *Technical Feasibility* -- The EIR assumed yet-to-be-developed fish screens would be effective in protecting the fisheries. Until the screens were developed, it would be difficult to predict their performance.
- *Fish And Wildlife* -- The EIR did not contain an inventory of the environment to be protected, nor did it list the specific means of ensuring the expected level of protection, nor did it offer a guarantee that the suggested protection or mitigation measures would result.

DIRECTOR ROBIE'S REVIEW

When Ronald Robie became Director of the DWR in March 1975, he 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."[44] His objectives for the study were:

- To protect the environment and economy of the Delta,
- To provide dependable water supplies to Delta users and to CVP and SWP users that divert from the Delta, and
- To protect the financial integrity of the SWP and CVP.

Round One Results

The Department presented the results of its efforts in a summary status report in October 1976. The proposal included:

- Delta protection measures -- both physical and statutory;
- Facilities and programs both north and south of the Delta; and
- The three most competitive alternative Delta facilities;
  - The New Hope Cross Channel-South Delta Intake Channel,
  - The New Hope Cross Channel-Enlarged Clifton Court Forebay, and
  - The Peripheral Canal.

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42 Summarized from the 106 specific criticisms of the Draft EIR listed in: The Senate Committee on Natural Resources and Wildlife, "The Peripheral Canal Project, A Report To The Legislature", (Sacramento: The Senate, January 1975)

43 Namely, State Water Resources Control Board Decision 1379.

44 Department of Water Resources, "Delta Water Facilities", Bulletin 76, (Sacramento: The Department, July 1978), p. iii

Public Hearings (Mostly) Favorable

The Department held public hearings on the proposal in October and November 1976. With the exception of Delta water interests, the peripheral canal faced little opposition. Most Delta water users preferred the non-Peripheral Canal options which would allow export water to flow through the Central Delta, thereby improving water quality within the Delta. Environmentalist advocated establishing guarantees and institutional requirements to protect the delta, including federal legislation to require the USBR to comply with Delta water quality standards. Once these guarantees were in place, the environmentalists felt the Peripheral Canal probably provided the best environmental protection.

SB 346

After the hearings, the DWR worked to resolve the outstanding issues. Concurrently, Senator Ruben Ayala, Chairman of the Senate Agricultural and Water Resources Committee, introduced Senate Bill 346 to try to break the logjam and construct the Peripheral Canal. In June 1977, the bill was amended to reflect the interests of a coalition of water, environmental, farm, labor, the DWR, and other groups brought together by Governor Jerry Brown. As amended, the bill authorized construction of:

- *The Peripheral Canal*;
- *South Delta Water Quality Improvement Facilities* -- to distribute good quality water to south Delta areas which currently had poor quality water;
- *Relocation of the Contra Costa Canal Intake* -- to the Clifton Court Forebay;
- *Western Delta Overland Water Facilities* -- to supply water to Sherman Island, Jersey Island, and Hotchiss Tract;
- *Suisun Marsh Facilities* -- to improve water quality within the marsh;
- *Los Vacquesos Off-Stream Storage Reservoir* -- in Contra Costa County;
- *Los Banos Grandes Off-Stream Storage Reservoir* -- as a partial alternative to Los Vacquesos;
- *The Mid-Valley Canal* -- to serve the east side of the San Joaquin Valley;
- *The Cottonwood Creek Project* -- to provide up to 200,000 acre-feet per year during critical dry periods;
- *The Glenn Reservoir-River Diversion Plan* -- to increase the combined yield of the CVP and SWP by 1,000,000 acre-feet per year; and
- *The Colusa Reservoir-River Diversion Plan* -- as a partial alternative to the Glenn Reservoir-River Diversion Plan

The bill also established a number of environmental and project monitoring programs, water-conservation and waste-water-reclamation programs, and groundwater-storage projects. The Department estimated the total program would cost $3.4 million in 1977 dollars, to be shared 46.8 percent by the state and 53.2 percent by the federal government.[45]

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[45] *Ibid.*

On To The Assembly

Senate Bill 346 passed the Senate on June 23, 1977. In the Assembly, the bill was heavily amended. The amendments added additional protections for the North Coast rivers; guaranteed water quality in the area of origin; preserved and restored the Delta, Suisun Marsh and San Francisco Bay; limited exports from the Delta; created programs promoting conservation and water reuse; and required coordination between the CVP and SWP to maintain water quality in the Delta. The bill cleared the Assembly, but died when the Senate refused acceptance of the Conference Committee report.[46]

In The Meantime ...

As SB 346 languished in the inactive files, a number of key events took place. First, the Department of Fish and Game issued a report that evaluated various Delta development plans from a fish and wildlife perspective. Included in the analysis were a "do nothing" option, two through Delta options, and the Peripheral Canal. The report concluded that unlike the other options, "the Peripheral Canal, with adequate water quality and flow standards and Suisun Marsh facilities, could increase fish and wildlife substantially in relation to present conditions and to other alternatives, restoring them to almost historical levels".[47]

Next, the United States Supreme Court issued its decision in *California v. United States.*[48] The Supreme Court found that without clear Congressional direction to the contrary, the USBR was bound by conditions imposed in state water-rights permits regarding control, appropriation, use, and distribution of water. In other words, if SWRCB established terms and conditions on the USBR's water permits regarding operation of the CVP, and there was not a clear Congressional mandate against operation of the CVP in that manner, the USBR must comply.

Finally, SWRCB released its "Water Right Decision 1485" (D-1485). This decision revised terms and conditions on the DWR and the USBR water permits regarding operation of the SWP and CVP. Specifically, D-1485 increased salinity and water-quality standards for the Delta and Suisun Marsh. More significantly, however, D-1485 established a sliding water-quality scale based on water-year.[49] Consequently, water-quality standards in wet years were much higher than in dry or critical years.[50]

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46 A thorough analysis of the politics around SB 346 can be found in: Barbour, John Nicholas, "Water Politics In California: The Peripheral Canal Bill", (Ann Arbor, Mi.: University Microfilms International, 1990)

47 Department of Fish and Game, "Restoration Of Fish And Wildlife In The Sacramento-San Joaquin Estuary", (Sacramento: The Department, June 1978).

48 California v. United States -- 438 U.S. 645 (1978)

49 Water years are a means of classifying runoff for water quality purposes. D-1485 is discussed more fully in Appendix F.

50 D-1485 is still in effect. Draft Decision 1630 was to have taken its place.

SB 200

It is difficult to identify precisely what caused SB 346 to fail. However, in the following session Senator Ayala introduce Senate Bill 200, which contained essentially the same elements of the ill-fated SB 346. Again, a consensus group worked to find a solution, and in May 1979 the bill was amended to reflect the new consensus.

Key Differences From SB 346

As amended, the key difference between SB 346 and SB 200 regarded federal participation. SB 346 would have prohibited construction of the Canal until the federal government agreed:

1. To comply with SWRCB water quality standards;
2. To participate in agreements for guaranteeing restoration of fish and wildlife populations to historic levels; and
3. To contract with Delta agencies regarding guaranteed levels of water quality.

In contrast, SB 200 allowed construction of the Peripheral Canal without prior federal participation, but would allow for federal participation at any time. In addition, SB 200 required the SWP to make water releases to rectify any federal failure to operate the CVP in compliance with SWRCB water quality standards. Also, SB 200 required a comprehensive study of the San Francisco Bay and permitted the state to participate in a study to enlarge Shasta Dam and Reservoir.

ACA 90

As SB 200 moved through the Legislature, Assemblyman Kapiloff introduced Assembly Constitutional Amendment 90. The purpose of ACA 90 was to place constitutional protections on the environmental protection provisions of SB 200. However, Assemblyman Kapiloff joined ACA 90 to SB 200 -- if the Legislature and Governor did not enact SB 200, ACA 90 would not take effect.

SB 200 And ACA 90 Passed By Legislature

Both bills passed the Legislature. ACA 90 became Proposition 8 on the November 1980 ballot, and passed. SB 200 did not fare as well. Almost immediately after Governor Brown signed the bill, opponents of the Peripheral Canal began circulating a petition to submit SB 200 to a referendum. The referendum soon qualified, placing the issue before the voters no later than the next general election -- June 1982.

The Politicking Begins

Governor Brown decided not to call a special election to resolve the referendum. Consequently, the issue became Proposition 9 on the June 1982 ballot. The saying "politics makes strange bedfellows" was never more true than in the case of Proposition 9.

Opposing the Proposition were environmentalist -- who felt the measure didn't go far enough to protect the Delta, and large agricultural interests -- who felt the measure went too far, thereby jeopardizing water deliveries. Supporting the measure were other environmentalist -- who felt the measure was necessary to protect the Delta, and other water contractors -- who felt that by protecting the Delta, the measure would ensure reliable water deliveries. And then there was the issue of the high cost of the project. The department estimated the project cost at $2.5 billion in 1981 dollars, $5.4 billion including inflation.[51]

Peripheral Canal Loses

In June 1982, the voters defeated the Peripheral Canal 2,049,042 (37 percent) to 3,444,483 (63 percent). A post mortem on the election showed 58 percent of the no voters said they voted against the measure because of the cost of the proposal, 40 percent said they thought the plan would hurt the environment.[52]

THE DWR BACKS UP AND TRIES AGAIN

A little over a year after Proposition 9 failed, the DWR released "Alternatives For Delta Water Transfer".[53] This report picked up the remaining pieces of the Department's previous Delta study, and repackaged the proposal. The alternatives the DWR evaluated were essentially variations of the two alternatives rejected in favor of the Peripheral Canal. Chiefly,

- The New Hope Cross Channel-South Delta Intake Channel and
- The New Hope Cross Channel-Enlarged Clifton Court Forebay.

The report also added an Enlarged North Delta Channels-Enlarged Clifton Court Forebay option.

Trihalomethanes

An important, though little noted section of the report concerned export water quality. In it, the DWR brought up an emerging water quality issue -- trihalomethanes (THMs). THMs are suspected carcinogens. They form when water containing dissolved organics and bromide combine with the chlorine used to treat drinking water. Peat soils and decaying plants in the Delta contribute the dissolved organics -- sea water intrusion provides the bromides. Agricultural discharges also contribute THM precursors. The report, noting uncertainties about the health aspect of THMs, discussed the formation of a

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51 Department Of Water Resources, 'Department Of Water Resources Position On Proposition 9 (SB 200), (Sacramento: The Department, April 1982)

52 Respondents could answer more than once. Results of a Field Institute Poll as reported in: Department Of Water Resources, "The California State Water Project - Current Activities And Future management Plan", Bulletin 132-82, (Sacramento: The Department, November 1982).

53 Department Of Water Resources, "Alternatives For Delta Water Transfer", (Sacramento: The Department, November 1983).

health-related water quality monitoring program for the Delta. It further noted that the results would be an input to any ultimate Delta solution.[54]

"DUKE'S DITCH"

On April 5, 1984, Governor Deukmejian introduced his water plan. The key feature was Senator Ayala's Senate Bill 1369. The primary feature of this bill was authorization of the New Hope Cross Channel-Enlarged Clifton Court Forebay Option -- subsequently tagged "Duke's Ditch". SB 1369 also authorized:

- Suisun Marsh Facilities,
- South Delta Water Quality Improvement Facilities,
- Groundwater Storage Programs,
- Relocation of the Contra Costa Canal Intake, and
- Los Banos Grandes Off-Stream Storage Reservoir.

The department placed the SWP cost of SB 1369 facilities at $647 million (1984 dollars). The bill died in committee.

The following year Assemblyman Jim Costa tried to resurrect much of the Governor's plan through his Assembly Bill 1710. His bill did not clear the Assembly.

POST-"DUKE'S DITCH"

Since 1985, the DWR has taken a piece-meal approach to the Delta. Virtually every element of SB 1369 is alive. The DWR has issued scoping reports, draft environmental impact reports, or negative declarations for:

- Suisun Marsh Facilities,[55]
- South Delta Water Quality Improvement Facilities,[56]
- North Delta Channel Improvements,[57]
- Groundwater Storage Programs, and[58]
- Los Banos Grandes Off-Stream Storage Reservoir.[59]

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54 An earlier report on THMs found the Peripheral Canal would significantly reduce the levels of THMs in urban water supplies. See Department Of Water Resources, Central District, "State Water Project Trihalomethane Study", (Sacramento: The Department, April 1982).

55 Department Of Water Resources and U.S. Bureau Of Reclamation, "Scoping Report For The Proposed Western Suisun Marsh Salinity Control Project", (Sacramento: Department Of Water Resources), August 1991.

56 Department Of Water Resources, Division Of Planning, "Initial Study And Negative Declaration, Proposed South Delta Water Management Program, Temporary Barriers Project", (Sacramento: Division Of Planning, February 1991).

57 Department Of Water Resources, Division Of Planning, "North Delta Water Management Program, Scoping Report For Environmental Impact Report And Environmental Impact Statement", (Sacramento: Division Of Planning, November 1989).

58 Department Of Water Resources, "Kern Water Bank: First Stage Kern Fan Element: Feasibility Report And Draft Supplemental Environmental Impact Report", (The Department, December 1990)

It is difficult to precisely estimate the costs of these projects. They are all at different stages of project definition and may not have a current cost estimate. However, assuming all the elements of SB 1369 are eventually built, the cost to SWP may be as high as $2 billion in current dollars.[60]

None of problems facing the Delta when the voters authorized the SWP in 1960 have been "solved", and now there are new problems (at least from a SWP perspective). For example:

- Two species of fish are on the endangered species list, and one more is pending;
- Compared to other drinking water sources, Delta water contains higher concentrations of the precursors to trihalomethanes and other disinfection byproducts -- increasingly stringent Safe Drinking Water Act standards for these byproducts increase the costs of treating Delta water;
- Delta salinity and other water quality standards are now under the auspices of the U.S. Environmental Protection Agency and SWRCB[61] - salinity levels are no longer simply whatever is acceptable to SWP contractors.

To date, the SWP has spent over $240 million on delta facilities and the Delta is still "broken". This amount will surely grow.

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59 Department Of Water Resources, "Los Banos Grandes Facilitates, Draft Environmental Impact Report, Executive Summary", (Sacramento: The Department, December 1990).

60 The estimate was based on a comparison of the cost of Los Banos Grandes in Department Of Water Resources, "Management Of The State Water Project", Bulletin 132-84, (Sacramento: The Department, September 1984) versus that in Department Of Water Resources, Division Of Planning, "Los Banos Grandes Facilitates, Technical Summary Of Engineering Features", (Sacramento: The Department, August 1991). The tripling of cost reflects both inflation and cost changes associated with more precise information of engineering requirements.

61 EPA promulgates the standards and SWRCB implements the standards.

APPENDIX D
CONTRACTING PRINCIPLES[1]

CALIFORNIA DEPARTMENT OF WATER RESOURCES

SACRAMENTO, JANUARY 21, 1960

These principles will establish the framework and terms under which the State will negotiate water delivery contracts with local agencies. Obviously minor details of contracts which may be peculiar to given districts cannot be included in these principles.

The policy to be established on power marketing and acreage limitation is included in a single statement of principle. Because of the fact that the project, under full operation, will consume more power than it will produce, power will be sold at market value in order to reduce the cost of water. The value of the power will be determined by the difference between the actual cost of producing it and what it will bring on the open market.

This value, estimated at between two and three dollars per acre-foot, will be applied to reduce the cost of water for all purposes, agricultural, municipal and industrial, except for use on land in excess of 160 acres (320 acres in the case of community property). Water will be furnished to lands in excess of 160 acres but the price will be the cost of delivering the water, including pricing of necessary power at its market value.

All water in and above the Delta will be sold at the same price, which will reflect the capital costs and operation and maintenance costs of works constructed in and north of the delta. Water exported from the Delta will reflect the Delta price plus each area's proportionate share of capital costs and operation and maintenance costs of transportation facilities (aqueducts, pumping plants, etc.)

In the event of a shortage the water supply will be prorated among all export contractors.

Provision is made for the accumulation of funds to finance additional storage facilities to insure a continuity of supply of water for local needs and for export from the Delta in the event area of origin statutes are exercised and to provide for increased demands.

The State Department of Water Resources will proceed immediately to negotiate water delivery contracts, based upon these principles, with local agencies. Local agencies will be required to sign contracts guaranteeing recovery by the State of at least 75 percent of the

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1 Reprinted from: California Legislature, Supplement To Appendix To The Journal Of The Senate, 1960 Regular Session, 1960, pp. 51-53

cost of transportation facilities necessary to furnish water to them before construction financed wholly or partly from sale of bonds will be initiated.

The State will make every effort to encourage the formation of comprehensive contracting agencies in order to insure that project benefits are spread as widely as possible and also in the interest of guaranteeing a sound market for project water.

CONTRACTING PRINCIPLES FOR WATER SERVICE CONTRACTS UNDER THE CALIFORNIA WATER RESOURCES DEVELOPMENT SYSTEM

JANUARY 20, 1960

1. Cost allocations shall be on the separable costs-remaining benefits basis for multipurpose facilities and on a proportionate use basis by areas for water transportation facilities.

2. For purposes of project commodity pricing, costs will be allocated among water supply, flood control, recreation, enhancement of fish and wildlife, drainage, quality control, and such other functions as may be authorized and performed by the particular facility or facilities under consideration.

3. Rates for water and power and for other reimbursable items will be established so as to return to the State all costs of project operation, maintenance and replacement, all principal and interest on (1) bonds, (2) expenditures from the California Water Fund, and (3) other moneys used in the construction of the project works. Those costs declared by the Legislature to be nonreimbursable and the federal contributions for flood control and for other items will not be included in the rate structure.

4. The project will require more power for pumping purposes than it will produce. Power required in the operation of the project must be paid for by the water users whether it is obtained from project or nonproject sources. Therefore, the costs of the project facilities producing the power is properly a cost of water supply and in the project cost allocation no separate allocation of the capital costs of power facilities will be made. The capital costs of power will be included in the costs allocated to water supply. The difference between the actual cost of power, that is, the amount necessary to repay the capital and operation and maintenance costs of the power facilities, and the market value of the power provides an economic benefit. A cost allocation study will be made with reference to power facilities for the purpose of determining the economic benefit to be derived from the use of project power for project purposes.

In addition, to the extent that from time to time any power is available for sale, it will be sold at its market value. Preference will be given to public agencies in such sale as required under existing law. The difference between the actual cost and the market value of such power will result in income to reduce project costs. This added income (power credit) will be applied, and the computed economic benefit will be made available, to reduce the cost of project water except for water used on land in single ownership in excess of 160 acres (320 acres in the case of community property).

5. Under the Delta pooling concept, there will be a single price for state project water at the Delta and for state project service areas above the Delta which will be referred to as the Delta water rate. The Delta water rate will consist of an annual (1) capital costs component, (2) necessary minimum operation, maintenance and replacement component; and (3) an operation and maintenance component which will vary with the amounts of water furnished.

   The Delta water rate will be based on the cost of construction and the cost of operation, maintenance and replacement of these conservation facilities allocated to water supply upstream from and within the Delta. The capital cost component and the minimum maintenance and replacement component will be collected irrespective of the amount of water furnished. The operation and maintenance component will be collected from the contractors receiving water in proportion to the amount of water furnished. Increases and decreases in the capital cost component of the Delta water rate will be made from time to time to reflect the then outstanding unpaid reimbursable cost incurred in the construction of facilities necessary to make water available at the Delta.

6. Those contracting for water from a project aqueduct will pay, in addition to the Delta water rate, a charge herein referred to as the "transportation rate." The transportation rate will consist of an annual (1) capital cost component, (2) necessary minimum maintenance and replacement component, and (3) maintenance and operation component which will vary with the amount of water furnished.

   The capital cost component, and the minimum maintenance and replacement component will be allocated to service areas by reaches of aqueduct, using the proportionate use method of cost allocation and will be collected annually irrespective of the amount of water furnished. The maintenance and operation component which varies with the quantity of water delivered will be computed for the same reaches of aqueduct as used for the other components of the transportation rate and will be allocated among, and collected annually from, the contractors receiving water in proportion to the amounts of water received. Provision will be made for reserve funds to be used for the purpose of meeting large, unforeseen costs of operation and maintenance, repair and replacement of works.

   The total annual charge to project water contractors will be the sum of the transportation rate plus the Delta water rate.

7. The following is a breakdown of the Delta water rate and the transportation rate. The transportation rate is stated for reaches of the aqueducts where the rate will be set by reaches. These rates are based upon estimated costs. Provision will be made in the contracts for revision of the rates when actual costs become known:

Areas of water service by aqueduct reaches	*Estimated operation and maintenance costs plus the Delta water rate, in dollars per acre-foot*	*Estimated annual capital costs component,* in dollars*
1. Areas within and upstream from Delta (Delta Water Rate)	$3.50 †	
2. Entire North Bay Aqueduct to terminus in Marin County	7.50	$1,440,000
3. Entire South Bay Aqueduct (includes cost of possible future extension to Airpoint Reservoir in Santa Clara County if later found necessary)	13.00	1,910,000
4. Pacheco Pass Tunnel Aqueduct	14.00	980,000
SAN JOAQUIN VALLEY		
5. San Luis Reservoir to Avenal Gap	11.50	330,000
6. Avenal Gap to Buena Vista Lake	11.50	4,700,000
7. Buena Vista Lake to Wheeler Ridge	13.00	2,610,000
8. Wheeler Ridge to Tehachapi Tunnel	18.50	560,000
COASTAL AQUEDUCT		
9. San Joaquin Valley east of Devils Den	14.00	1,580,000
10. San Joaquin Valley west of Devils Den	19.00	1,070,000
11. In San Luis Obispo and Santa Barbara Counties	22.00	4,420,000
WEST BRANCH AQUEDUCT IN SOUTHERN CALIFORNIA		
12. Entire service area	25.00	24,530,000
EAST BRANCH AQUEDUCT IN SOUTHERN CALIFORNIA		
13. Tehachapi Tunnel to Pearblossom	32.00	1,910,000
14. Pearblossom to Perris Reservoir	35.50	22,580,000

* Average annual payment necessary to repay, with interest, the portion of the aqueduct system capital cost allocated to each service area, based on a 50-year pay-out period.

† Delta Water Rate shown includes capital cost component for conservation facilities within and above Delta. Power credit has been deducted.

8. Contracts for dependable water supply shall be for at least 50-year terms, but shall contain provision for changes in rates and operation provisions. Upon expiration of the term of the contract, the contracting agency shall have the option of continued service on terms and conditions prescribed by the State, but at no greater cost than would have been the case had the original contract continued in effect. Should the terms and conditions provide for the furnishing of such continuing water service for only a specified period of years, the contracting agency shall have a like right to continued service at the expiration of such succeeding term during which it was receiving project water.

9. To insure continuity and dependability of water supplies the contracts will provide:

   (a) That contracts for dependable water service will aggregate to no more than a stated amount based upon the yield of the project. This amount, which will be approximately 4,000,000 acre-feet annually, is to be increased by the yield due to added storage facilities when and as constructed. In addition, contracts may be executed for interim or nondependable water supply subject to reduction or termination by the State at any time.

   (b) For the furnishing of stated maximum annual amounts of project water. The time and rate of furnishing of water delivery during any year by the State will be pursuant to schedules and amendments thereof submitted by the contracting agency for such year. The State will comply with such schedules consistent with its delivery ability taking into account all such schedules submitted by agencies entitled under contract to a dependable project water supply.

   (c) That in the event of a shortage in the dependable project supply available in any year for export, project water will be prorated among all export contractors. Each contracting agency will receive an amount of water which bears the same relationship to the available supply, computed on the same basis as the project yield studies, that the amount called for in the agency's contract for a particular year bears to the total amount of water required to be delivered pursuant to all contracts in the respective year. However, the Department will reserve the right to prorate on some other basis if required to meet necessary demands for domestic supply, fire prevention, or sanitation in the respective year or season.

   (d) That bond funds will be used to construct added storage facilities and related facilities for local needs to meet commitments to export from the Delta to the extent that California Water Fund moneys are used for construction of the original facilities and to the extent such added construction is required by virtue of a reduction, occasioned by operation of area of origin statutes, in the amount of water available for export. This will be subject to the proviso, however, that to the extent that the director at any time after 1985 finds that any such funds are not then required to meet such reduction and will not be required for such purpose within the next succeeding 10 years, any such funds may be used for the construction of added storage facilities to meet increased demands for export to or from the Delta and to meet local needs.

(e) That the State will plan the availability of water from the Delta so that deliveries can be made at the time and in the amounts scheduled in the contracts. To the extent possible, five years notice shall be given of any reduction in deliveries which will occur as a result of operation of area of origin statutes.

10. Construction of any transportation facility financed wholly or in part through the sale of bonds, will not be started unless water service contracts have been executed which will insure recovery of at least 75 percent of the cost of such facility.

11. Local contracting agencies may make funds available for construction or completion of construction of initial or ultimate facilities and will be credited to the extent of such contributions.

12. As a general policy, contracts for project water will be executed with public agencies having the taxing, assessment or equivalent power and all other powers required in order to comply with the terms of the contract. Contracts will be executed with others not having the taxing, assessment or equivalent power only when the State can be provided with security sufficient to insure that the obligations incurred will be paid.

13. Each contracting agency will agree that, in the event in any year it is unable or fails through other means to raise the funds necessary in any year to pay to the State the sum required under the contract, it will use its taxing or assessment power to raise such sum.

APPENDIX E
SEPARABLE COSTS-REMAINING BENEFITS

OVERVIEW

The Separable Costs-Remaining Benefits method is the key to allocating costs among water purposes. The first statement of the Contracting Principles is:

> 1. *Cost allocations shall be on the separable costs-remaining benefits basis for multipurpose facilities and on a proportionate use basis by areas for water transportation facilities.*[1]

The "separable costs-remaining benefits" and the "proportionate use" basis of cost allocation are two of many different methods of allocating costs between multiple purposes.[2] (The DWR uses the proportionate use basis to allocate transportation costs between contractors, and is described more fully in the next chapter.)

SEPARABLE COSTS VS. JUSTIFIABLE COSTS

The separable costs-remaining benefits method is complicated. It is a blending of two separate cost allocation concepts: *separable costs* and *justifiable costs*. The essential aspects of these two concepts are as follows.

- Typically, dual-purpose facilities cost more to build than single-purpose facilities; multiple-purpose facilities cost more to build than dual purpose facilities, and so on. Separable costs are defined as the difference between the estimated total costs of the facility and the estimated costs of a similar facility designed to exclude the particular purpose. For example, suppose we needed to separate the costs of a dam between flood control and recreation. Assume the estimated total costs of the multipurpose dam are $100 million. Assume further that a flood control only dam would have an estimated total cost of $70 million. The separable costs for recreation would then be $30 million, ($100 m. - $70 m.).

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1 See Appendix D for full text of the principles.

2 For a survey of the different methods that were initially considered for allocating costs between purposes, see Senate Fact Finding Committee On Water, "Contracts, Cost Allocations, Financing for State Water Development", March 1960, printed in Legislature Of The State Of California, "Supplement to Appendix to the Journal of the Senate", 1960 Regular Session, pp. 37-39.

- All facilities provide some benefit, and (presumably) those benefits can be measured in dollars. The most that should be spent on a facility is either the value of its benefits or the cost to construct and operate it, whichever is less. Any amount over that cannot be justified. The lessor of costs or benefits is the *justifiable costs*. For example, suppose we needed to identify the justifiable costs of a flood control facility. Assume again that a flood control only dam would have an estimated total cost of $70 million. Assume further that the estimated benefits of the flood control dam totaled $50 million. The justifiable costs for flood control would then be $50 million, (lesser of $70 million and $50 million).

METHODOLOGY

The separable costs-remaining benefits method is a seven-step process:

1. Estimate the cost to build an *alternative* facility designed specifically for each purpose.
2. Estimate the *benefits* received for each purpose.
3. Determine the *justifiable costs* for each purpose, (lessor of steps 1 and 2 for each purpose).
4. Estimate the *separable costs* for each purpose of the multipurpose facility.
5. Deduct the separable cost from the justifiable cost for each purpose. The result is *remaining justifiable costs* for each purpose.
6. Prorate the *joint costs* across purposes by the proportion of the remaining justifiable costs. This is the step that determines how the DWR distributes joint costs among purposes.[3]
7. Complete the process by adding the separable costs for each purpose to its associated remaining joint costs. The result is the total cost allocated by purpose.

BOTTOM LINE

The separable costs-remaining benefits method uses justifiable costs to allocate costs among purposes, including fish and wildlife purposes. This means the DWR has had to estimate in dollar terms the benefits fish and wildlife, for example, received as a result of the SWP. It appears the last time the DWR reestimated these benefits was around 1981.[4]

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[3] These are also the percentages shown annually in a text table under the sub-heading 'Bases for Reimbursed Costs" in Department Of Water Resources, 'Management Of The State Water Project: Appendix B", Bulletin 132, (Sacramento: The Department).

[4] The explanation is complicated. DWR prints the joint cost ratios for each multi-purpose facility in Bulletin 132, Appendix B. These joint cost ratios have not changed for most facilities since Bulletin 132-81. However, DWR has described reestimated direct costs for these same facilities in Bulletin 132, Appendix D. The only way the ratios could remain stable would be if the joint costs changed (or were assumed to change) proportionately the same as the direct costs. Given the complicated

It also seems likely that society may value the benefits recreation or fish and wildlife differently than it did in the early 1980s. To the extent that a reestimation would increase the cost allocation for recreation or fish and wildlife, costs allocated to the contractors would decrease.[5]

It is important to note, however, that the DWR separates the costs *after* it has already made its decision to build the facility. That is, when allocating costs among purposes, the DWR does not consider how building the facility might adversely affect recreation or fish and wildlife. Take, for example, when the DWR allocated costs for Oroville Dam. The DWR's calculations on the benefits to fish and wildlife did not take into consideration the fact that ***building*** the dam would have an effect on the then existing environment. Nor did anything require them to. However, if the DWR had *netted* the effects on fish and wildlife of building the dam with the benefits resulting from the dam, the DWR would likely allocate less costs to fish and wildlife.

RESULTS

Figures E.1 and E.2 show how the DWR has allocated total costs between reimbursable and non-reimbursable costs.

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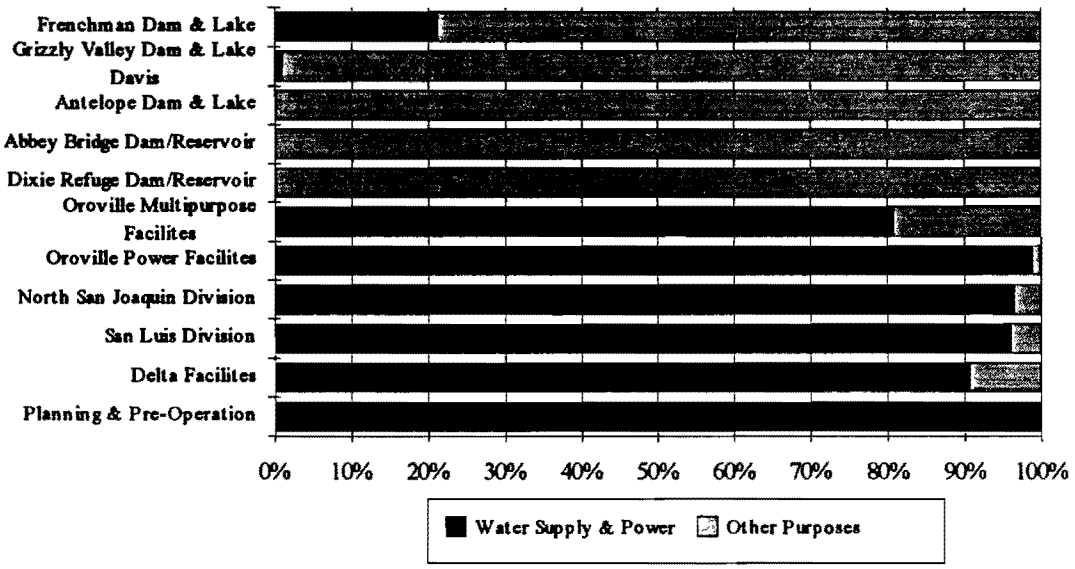
calculations involved, it is unlikely the reestimation of the direct costs included reestimating the distribution of joint cost.

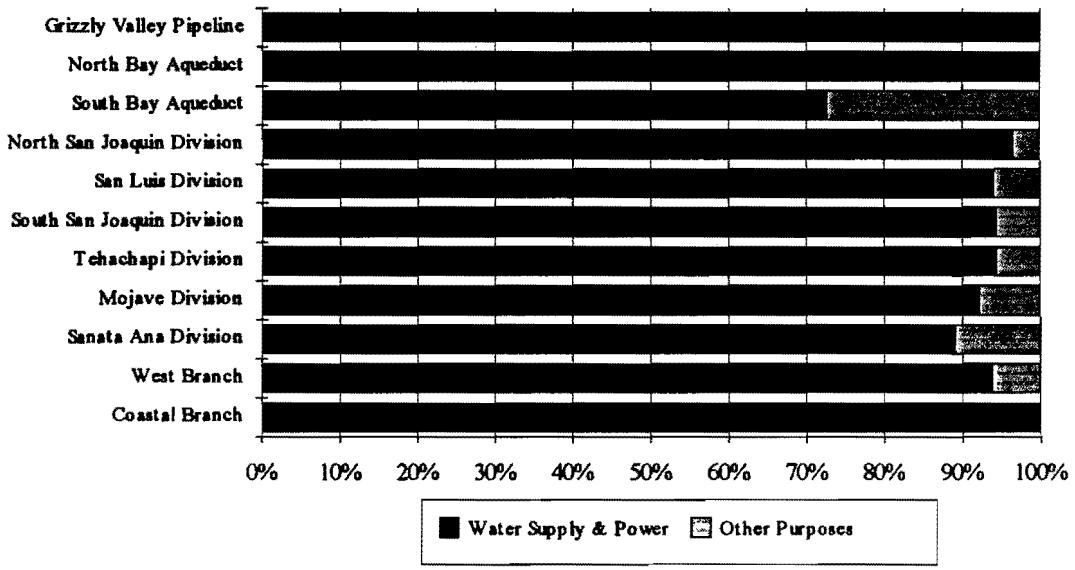
[5] It is not a given that a reestimation would increase the cost allocation to recreation or fish and wildlife, only a possibility.

Figure E.1
State Water Project Conservation Facilities
Allocation Of Costs Between Purposes



Source: Department Of Water Resources, "Management Of The California State Water Project", Bulletin 132-91, (Sacramento: The Department), December 1991, Table B-7.

Figure E.2
State Water Project Transportation Facilities
Allocation Of Costs Between Purposes



Source: Department Of Water Resources, "Management Of The California State Water Project", Bulletin 132-91, (Sacramento: The Department), December 1991, Table B-7.

APPENDIX F
DETERMINING THE SUPPLY OF SWP WATER

INTRODUCTION

Annually, the DWR forecasts the amount of water the SWP will deliver that year. They accomplish this in an environment of unpredictable weather, stringent water quality requirements, and even more stringent endangered species protections. The DWR attempts to resolve these problems with the aid of sophisticated hydrological models and SWP operations models. A thorough discussion of the DWR's hydrologic simulation models is beyond the scope of this paper. Yet it is difficult to understand the financing of the SWP without a basic understanding of the determinants of water supply. However, before we can even begin to discuss these factors, we must first understand the different measures of water supply. Consequently, this appendix begins with a few definitions. Then we review the determinants of supply and approaches to reservoir management. Finally, we discuss how and when the DWR forecasts water supply.

DEFINITIONS

YIELD

There are two key measures of SWP water supply: Minimum project yield and firm yield.

The water supply contracts define *minimum project yield* as:

> *[T]he dependable annual supply of project water to be made available, estimated to be 4,230,000 acre-feet per year, said amount to be determined by the State on the basis of coordinated operation studies of initial project conservation facilities and additional project conservation facilities ....*[1]

When this section of the water supply contracts was last amended in 1965, design work for two of the initial project conservation facilities had not yet begun.[2] Indeed, when the State Water Commission approved the increase of minimum project yield, they specifically did not identify from where the additional water would come. Apparently, this means the definition of minimum project yield does not refer solely to the yield of existing facilities. Rather, it also includes water from planned and other yet to be identified facilities.

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1 Article 1(m), "Contract Between The Metropolitan Water District Of Southern California And The State Of California Department Of Water Resources For A Water Supply And Selected Related Agreements", October 1, 1991

2 The Eel River facilities and the Delta facilities. See Appendix C

Consequently, minimum project yield can be considered an upper theoretical limit of the dependable yield.

In contrast to minimum project yield, *firm yield* is a more tangible measure. Although various DWR Bulletins equate firm yield to minimum project yield, common usage suggests otherwise. Typically, firm yield is used to describe the dependable annual water of existing facilities under current operating rules and restrictions, (even during peroids of drought). It is likely no one knows what the firm yield is currently. Through 1990, the DWR estimated the firm yield was about 2.4 million acre-feet.[3] However, the SWP delivered only 548,969 acre-feet in 1991. Consequently, a firm yield estimate of 2.4 million acre-feet seems high.

WATER YEAR

When the State Water Resources Control Board (SWRCB) issued Decision 1485 in 1978, it established water quality standards for the Delta. The SWRCB based the water quality standards on the principle that Delta water quality should be at least as good as would have occurred had the CVP and SWP not been constructed. To this end, the standards included adjustments to reflect changes in conditions resulting from different water-year types. Decision 1485 defined water-year types based on the estimated unimpaired runoff of the Sacramento River. As shown in Figure F.1, Decision 1485 defined water-years as follows:

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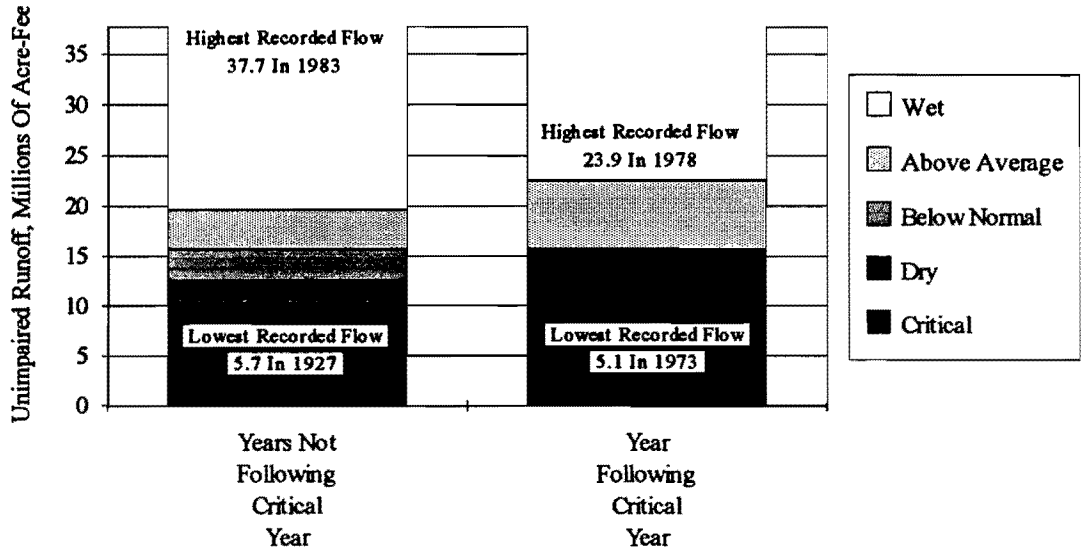
[3] See for example, Department Of Water Resources, "Management Of The State Water Project", Bulletin 132-90, (Sacramento: The Department, September 1990), p. 86.

Figure F.1
Water Year Categories



Source: State Water Resources Control Board, "Water Right Decision 1485", (Sacramento, The Board), August 1978.

- *Wet* -- runoff greater than or equal to 19.6 MAF, (year following a critical year -- runoff greater than or equal to 22.5 MAF).
- *Above Normal* -- runoff less than 19.6 MAF and greater than 15.7 MAF, (year following a critical year -- runoff less than 22.5 MAF and greater than 15.7 MAF).
- *Below Normal* -- runoff less than or equal to 15.7 MAF and greater than 12.5 MAF, (year following a critical year -- classification not used).
- *Dry* -- runoff less than or equal to 12.5 MAF and greater than 10.2 MAF, (year following a critical year -- runoff less than 15.7 MAF and greater than 12.5 MAF).
- *Critical* -- runoff less than or equal to 10.2 MAF, (year following a critical year -- runoff less than 12.5 MAF).

DETERMINANTS OF SUPPLY

Given current water facilities, two things determine the annual supply of SWP water: nature and reservoir management practices. Nature determines winter runoff; the major source of water. Reservoir management determines both the carry-over supply of water and the timing and amount of water released from the reservoirs.

Winter runoff, though unpredictable, is unambiguous -- you get what you get when you get it. The "correct" way to manage a reservoir, however, depends upon your perspective. Dams serve multiple purposes, and those purposes are often in conflict. For example, at the beginning of the water-year:

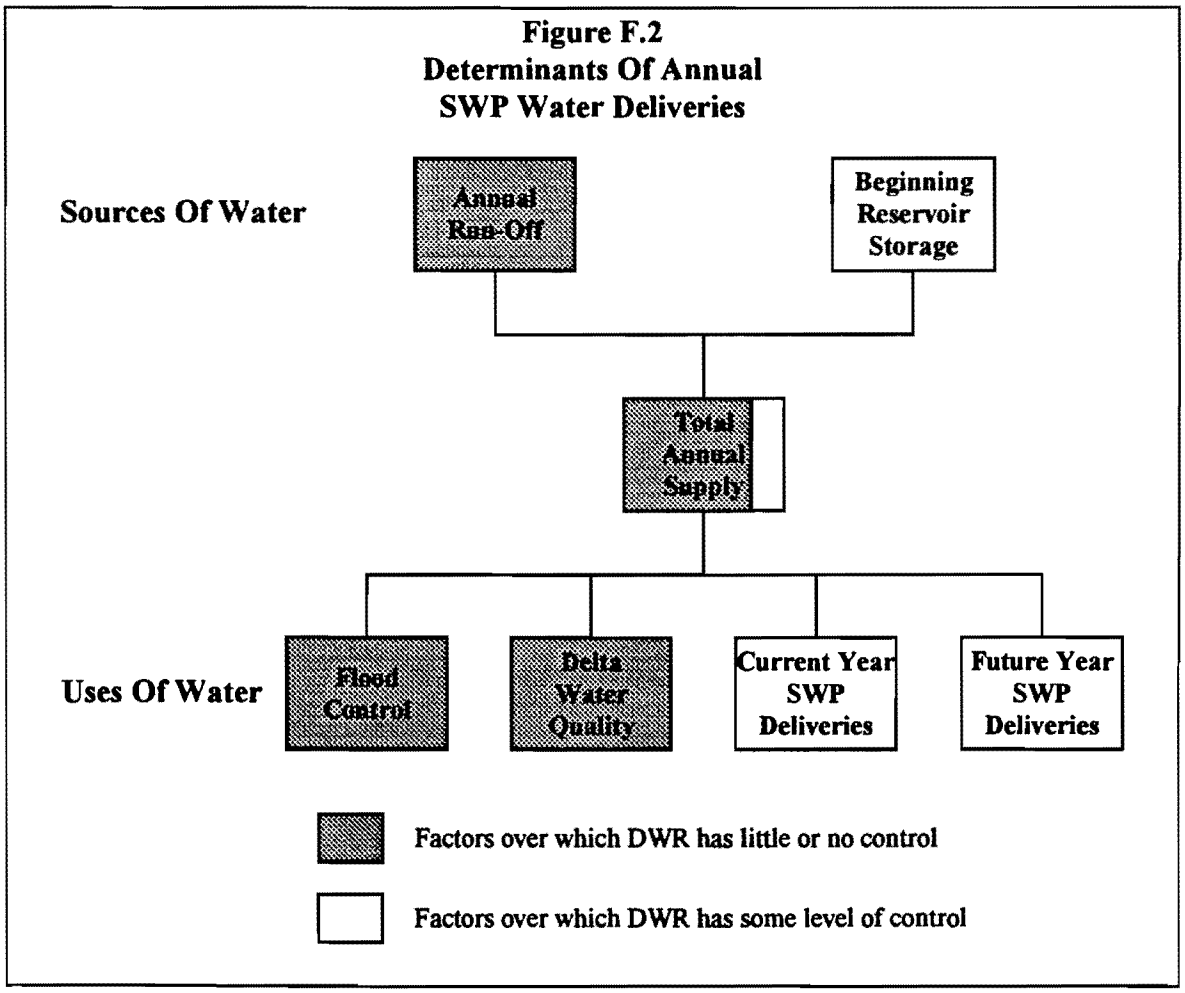
- A flood-control manager's ideal reservoir is empty;
- A water-supply manager's ideal reservoir is full; and
- An environmentalist's ideal reservoir may be no reservoir.

The DWR's charge is to somehow satisfy these competing goals given the uncertainties of nature.

Overview Of The Water Year

On October 1, there is a certain amount of water in the various SWP reservoirs. As the year progresses, it rains and snows, and additional water flows into the reservoirs. Together, beginning storage and annual runoff make up the total water supply for that year. Also throughout the year, the DWR releases water from the reservoirs. Some of the water the DWR releases leaves storage capacity to control flooding, some maintains Delta water quality, and some of the water makes its way to SWP contractors. Water that the DWR does not release is carried over to be used in the following year. This relationship is shown in Figure F.2.

Figure F.2
Determinants Of Annual
SWP Water Deliveries



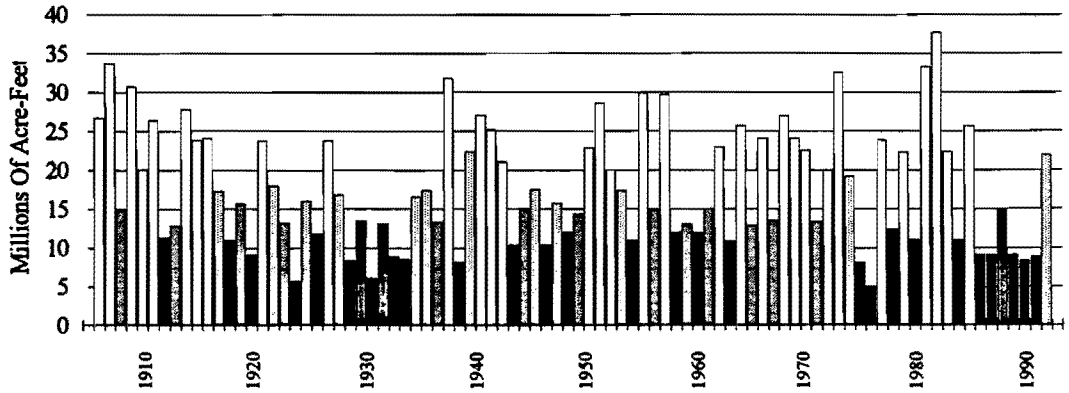
The DWR has discretion over very little of either the supply or use of much the water it impounds. The following sections describe the extent of the DWR's discretion over each of these factors.

RUNOFF

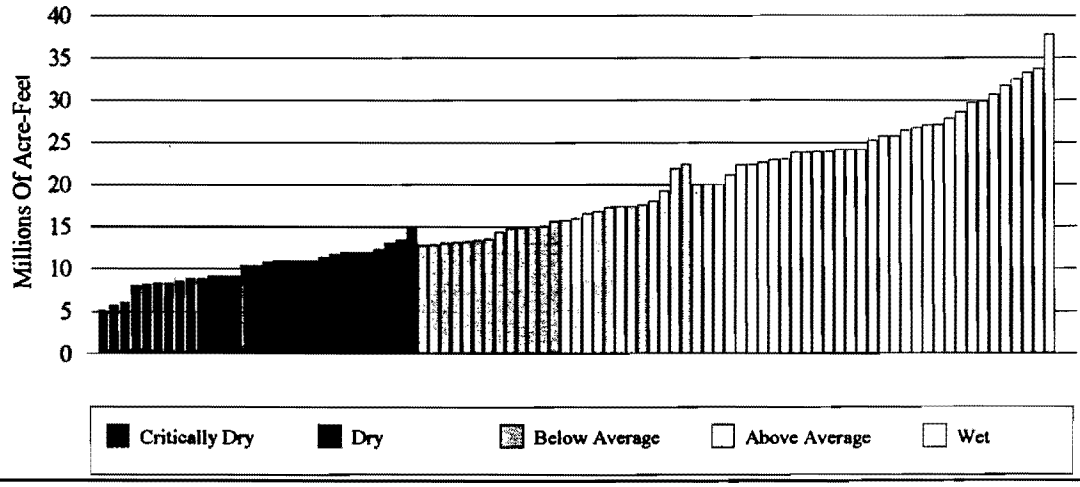
The SWP's main source of water is runoff from the Feather River and the unregulated flow into the Delta. Notwithstanding the efficacy of cloud seeding, the timing and amount of this runoff is at the whim of nature. And as shown in Figure F.3, nature's whim is largely unpredictable. Since 1906, water-years for the Sacramento River Basin[4] have been somewhat evenly divided between wet (33), above or below average (25), and dry or critically dry (30). However, recovery from a dry or critically dry year has not been as balanced. Dry or critically dry years were less likely to be followed by a wet year (7 times) than by an above or below average year (12 times) or even another dry or critically dry year (10 times). All this means that although you can predict runoff *on average* fairly well, the pattern for any particular set of years is not predictable.

[4] The Sacramento River Index is used here for illustration only. Total inflow into Oroville is one of the components of the index. However, the index does not correlate perfectly with inflows into Oroville.

Figure F.3
Sacramento River Basin
Flows By Year



Flows By Type of Water Year



BEGINNING RESERVOIR STORAGE

The only portion of supply the DWR does exert any control over is carry-over storage in its reservoirs -- and that control was exercised the previous year. The majority of the SWP reservoirs regulate flows along the aqueducts. (See Appendix A.) Since the DWR holds water in these reservoirs at a fairly constant level, their storage is not a source of annual water. However, two reservoirs, Lake Oroville and San Luis Reservoir, do carry a significant amount of water from one year to the next; potentially, as much as 3.8 million acre-feet.[5] However, since the DWR made the decisions that resulted in carry-over storage in the previous year, beginning reservoir storage for any year is essentially a given.

[5] Excludes flood control storage of 750,000 acre-feet at Oroville. Only following an extremely wet year would carryover storage in Oroville and San Luis be as large as 3.8 maf.

(We discuss the decision process the DWR uses to determine carry-over storage later in this chapter).

FLOOD MANAGEMENT[6]

Three SWP reservoirs, Lake Oroville, Lake Del Valle, and Los Banos Detention Reservoir, serve flood control purposes. Of these, only Lake Oroville is a conservation facility. On the basis of rules and regulations established by the U.S. Army Corps of Engineers, the DWR reserves up to 750,00 acre-feet of Oroville's storage for flood control. The amount of storage the DWR reserves is not constant. For much of the year, none of the lake is reserved for flood control. However, beginning in September and running into June, the Army Corps requires a certain amount of storage be reserved for flood control. When the lake receives more water than allowed, the Army Corps requires the DWR to release that water, which then flows to the Delta. If the DWR cannot pump the water out of the Delta, either because of lack of pumping capacity or Delta operational requirements, that water is lost (from a SWP supply perspective).

DELTA WATER QUALITY

As discussed in Appendix C, the SWRCB established water quality standards for the Delta in its Decision 1485. These standards control maximum salinity and minimum water flow levels, and vary depending on the water-year type. SWRCB requires the DWR and the USBR, under conditions of their water-rights permits, to meet those standards. The main tools the DWR and the USBR have for meeting the standards are releasing additional water from dams and decreasing export pumping in the Delta.

The DWR and the USBR release water on the basis of provisions in their coordinated operating agreement.[7] When conditions require additional releases from the reservoirs, the coordinated agreement generally requires 75 percent of the release to come from CVP operations, and 25 percent from SWP operations.

Both the USBR and the DWR have conducted numerous detailed hydrological studies on the Delta.[8] Consequently, they both have a reasonable idea of how much water they need to release to meet the standards under the different water-year types. The wild card is the protection of endangered species.

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6 This section is drawn from Department Of Water Resources, 'California Flood Management: An Evaluation Of Flood Damage Prevention Programs", Bulletin 199, (Sacramento: The Department, September 1980).

7 U.S. Bureau of Reclamation and California Department Of Water Resources, "Agreement Between The Unites States Of America And The State Of California For Coordinated Operation Of The Central Valley Project And The State Water Project", November 24, 1986.

8 See, for example: U.S. Bureau of Reclamation and California Department Of Water Resources, 'Technical Report On Determination Of Annual Water Supplies For Central Valley Project And State Water Project, (Sacrament: The Department, March 1984).

The United States Marine Fisheries Service (USMFS) has upgraded its listing of the winter run chinook salmon from *threatened* to *endangered.* The United States Fish And Wildlife Service has also recently listed the Delta smelt as *threatened,* and has proposed listing the California splittail smelt as *threatened* as well. It is not clear yet precisely what the upgrading of the winter run salmon to endangered and the listing of the two smelts will mean to SWP operations. However, we do know how rules protecting the *threatened* winter run salmon affected the SWP.

The USMFS establishes *incidental take limits* for the winter run salmon. These take limits place a ceiling on how many fish can be *taken*[9] during normal project operations. When the DWR exceeds the take limit, the DWR must shut down pumping operations, such as happened in 1993.

The operational restrictions on SWP because of the winter run salmon are especially a problem, because the winter run occurs during the prime water exporting season. Indeed, the underlying premise of the SWP was to export water during the winter runoff period when there was more water than needed for habitat maintenance or water quality. Listing of the delta smelt will further complicate SWP operations, as the smelt spends its entire life cycle in the Delta. Presumably, the upgrading of the winter run salmon and listing of delta smelt will only make it more difficult to export water south from the Delta.

SWP FORECASTS[10]

The water service contracts require the DWR to give the contractors the initial water delivery schedule for the following year by December 1 each year. Given that the DWR has little control over the annual supply of water, and given that the water-year begins October 1, the reader may wonder how it does that?

Since 1978, the DWR has based its forecasts and operational decisions on an annual analysis of the risk of delivering water instead of storing it for future needs. The DWR designed "the Rule Curve" to assure a high probability of meeting delivery schedules for the current and future year. The procedure has three essential parts:

1. Using beginning storage, targeted carry-over storage, and historical hydrology, the DWR plots annual SWP delivery capability against an index of the unimpaired runoff of the Sacramento river basin.

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9 "Take" is broadly defined to include the following: harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect, or to attempt to engage in any of preceeding actions. 16 USC §1532(19), 50 CFR §17.3.

10 This section draws heavily on: Department Of Water Resources, Management Of The State Water Project", Bulletin 132-90, (Sacramento: The Department, September 1990), pp. 86-87.

2. Using the chart from part 1 and periodic forecasts of runoff, the DWR calculates the capacity of the SWP to deliver water. The DWR bases its calculation on probability estimates, typically set at the 99 percent exceedence level. At that level, the odds are 99 to 1 that the actual capability to deliver water is larger than the calculated amount.
3. Using a complete operations study, the DWR allocates the calculated water delivery capacity to the contractors. If the operation study shows a problem, the DWR adjusts deliveries as necessary.

During the first years the DWR used the Rule Curve, the analysis was only for the current and following year. In addition, the DWR's Rule Curve analysis assumed a water supply equivalent to that of the two driest years on record. Consequently, the analysis failed to address how the DWR should manage storage over an extended dry period of more than two years. What was more important, from the contractors' viewpoint, was that the DWR's analysis required targeting a high amount of water for carry-over storage. This led the DWR to hold water in the reservoirs that might otherwise have been delivered to contractors, had the DWR used less restrictive assumptions.

By the mid 1980's, the DWR's use of the Rule Curve had become fairly deterministic. That is, it dropped in its the assumptions, and a fairly reliable version of "truth" rolled out. Beginning with the 1986 Rule Curve, the DWR adopted a schedule for targeted carry-over storage. This schedule decreased targeted carry-over storage each year by equal amounts, reaching a minimum after seven years. The target selected each year depended on the beginning storage and the previous year's target storage. The DWR lowered the target storage schedule in 1987, and beginning in 1988 the DWR based target carry-over storage solely on beginning storage.

In 1989, the Rule Curve was retitled the "Water Delivery Risk Analysis" (WDRA). The basic criteria remained the same as in 1988, but the DWR changed the probability criteria. Instead of basing the initial allocation on a 99 percent exceedence criterion, the DWR changed the criterion to a 90 percent exceedence level.

In 1992, the DWR retitled the WDRA the "Water Budget". Because of the changing environmental restrictions, it had become more difficult for the DWR to predict with certainty annual SWP delivery capability. The DWR changed the title to the Water Budget to better reflect the more subjective nature of forecasting SWP delivery capability. The budget concept better reflected the need to reserve additional carryover storage in Lake Oroville for use as a potential contingency fund of water.

The DWR's initial commitment to deliver 1.56 million acre-feet in 1994 was based primarily on two things.

- The amount of water stored in San Luis Reservoir south of the Delta, and
- The amount of water the DWR would be able to pump out of the Delta assuming a critically dry year.

As the water-year becomes better known, the DWR intends to review the allocations and revise them as appropriate.

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