MONTEREY COUNTY

WATER RESOURCES AGENCY

WATER CAPITAL FACILITIES PLAN

JULY 1991

VOLUME I REPORT

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Water Resources Agency

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VOLUME I
REPORT

July 1991

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CHAPTER 1

EXECUTIVE SUMMARY
RECOMMENDED WATER CAPITAL FACILITIES PLAN

In order to develop and describe the recommended Water Capital Facilities Plan (Plan) it is worthwhile to review the objective and specific goals for development of the Plan. These are presented below.

Objective

Develop a supplemental water supply program for the Salinas Valley area of Monterey County which is sufficiently attractive to obtain positive votes on a potential sales tax referendum or alternative financing approach.

Goals

1. Identify water demands and evaluate current viable supplemental water supply projects.
2. Establish a forum for consensus formation among Technical Advisory Committee members.
3. Conduct analysis of identified alternatives and system operations.
4. Package the most viable projects/systems into a program.
5. Obtain Technical Advisory Committee consensus of the program.

Water Capital Facilities Plan

In response to Goal No. 1, supplemental water demands are documented in Chapter 3, and supplemental water supply projects are developed in Chapter 4. The supplemental water supply needed was identified to be as follows:

	1990	2010
Salinas Valley	37,900 AF	48,200 AF
Peninsula	5,000 AF	7,000 AF
North County	4,100 AF	6,300 AF
Pajaro Valley	7,200 AF	8,000 AF
Total	54,200 AF	69,500 AF

From a list of 34 potential water supply projects, yield analyses were performed for ten alternative groupings of projects (programs) and demand conditions. The average annual project and Salinas River Basin gain ranged from 33,479 AF to 103,171 AF and 33,479 AF to 98,731 AF, respectively. The results of groundwater model analyses for two alternative programs showed that a current no-project groundwater system overdraft of 45,000 AF/yr could be reversed to a 3,000 to 4,000 AF/yr surplus in the Salinas Valley with development of the alternative programs.

Regarding Goals 3 and 4, the alternate projects and programs were analyzed and evaluated in Chapter 7 based on criteria developed in Chapter 5 (Yield Analysis), Chapter 6 (Evaluation Criteria), Chapter 8 (Financial Analysis), Chapter 9 (Environmental Issues), and the appendices. Evaluation criteria used included economic, functional, environmental, and institutional. Annual unit cost ($/AF/yr) of water yield ranged from $336 to $2,747.

Consensus Formation

Plan consensus (Goal Nos. 2 and 5) was obtained from several meetings with the Technical Advisory Committee (TAC) throughout the development of the Plan. The TAC provided valuable guidance on project details and screening. TAC Meeting No. 1 was held on April 18, 1990, to discuss the following topics: 1) Goals and Objectives, 2) Supplemental Water Demands, 3) Potential Supply Projects and Systems, and 4) Project/System Evaluations. TAC Meeting No. 2 (May 16, 1990) included the following topics: 1) Viable Projects Identification, 2) Preliminary Costs of Viable Projects, 3) Less-Viable Projects, 4) Financing Options/Strategy, 5) Computer Model Simulation Results. The TAC Meeting No. 3 was held on June 20, 1990 to discuss the following: 1) Preliminary Viable Projects Grouping, 2) Tentative Financing Plan, 3) Jerrett Dam Water Supply Project Overview, and 4) Agricultural Water Management Program Overview. In addition, various aspects of the developing Plan were discussed with representation of the Monterey County Water Advisory Commission at meetings held on June 7 and July 10, 1990. The Monterey County Board of Supervisors held a

public hearing on the Plan on September 18, 1990 and November 20, 1990 to receive and consider public comments. On December 18, 1990, the Board adopted a resolution regarding the directions for the Plan.

When the preparation of the Plan was authorized in early 1990, the study area included all of Monterey County. As a result of public hearings and action by the Board in late 1990, the study area was limited to the Salinas Valley and North County. Consequently, only projects serving the Salinas Valley and North County are included for implementation in the Plan. However, since information was already prepared for projects that also served the Pajaro Valley and Peninsula portions of Monterey County, complete project information was retained in this report.

Summary of Water Capital Facilities Plan

The elements of the recommended Plan are shown in summary form on Table 1-1. The locations of the plan units are shown on Figures 1-1 and 1-2. The water supply yield indicated on the table to be in excess of demands when the Unit II projects are implemented would be conjunctively utilized as groundwater recharge in the Salinas River. In years of below-normal rainfall when the project supplies are decreased, the groundwater basin would be utilized. See Chapter 5 for discussion of groundwater balance.

For success of the Plan, it must be attractive and cost-effective to each of the geographic regions within the Salinas Valley. The North County demand is met by projects also developed to meet the needs of the upper Salinas Valley.

Financial Analysis

The financial analysis developed in this report includes projections of four potential revenue sources which could be used in financing the water supply projects:

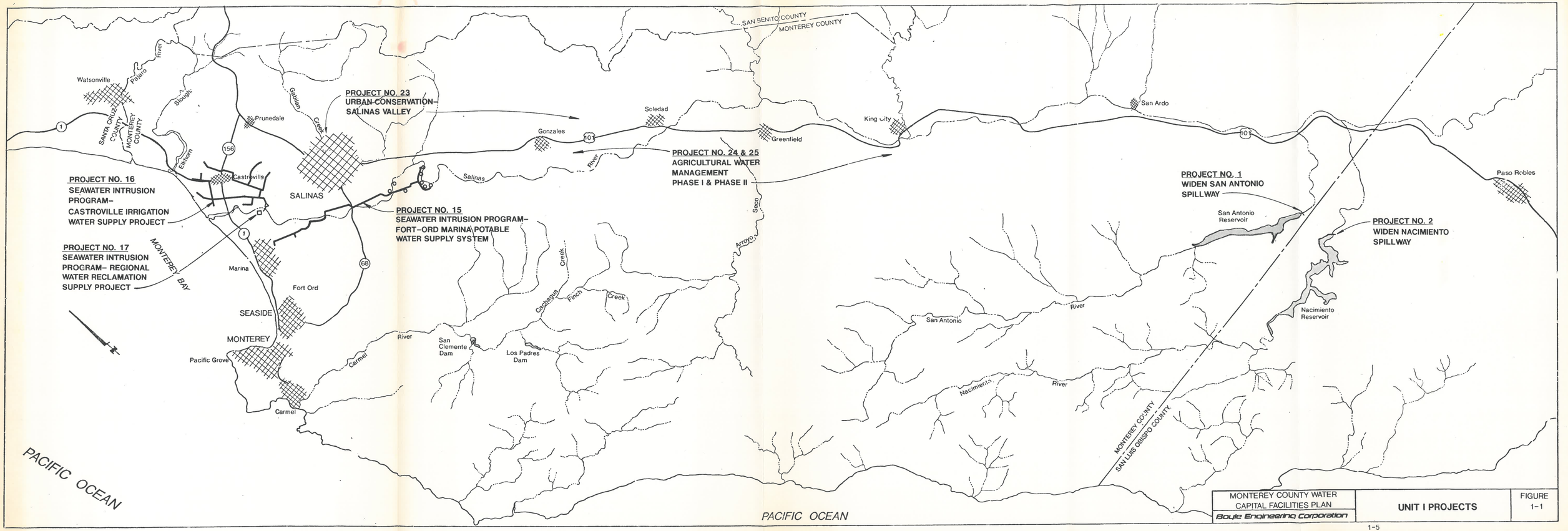
- **Acreage/Parcel Charges:** A fixed annual charge should be levied on each parcel in the Salinas Valley, either under MCWRA's assessment powers or under the county's ability to create county service areas. The charges would be based on land use and acreage, with the minimum charge per parcel equivalent to the charge for 1 acre.

TABLE 1-1

SUMMARY OF WATER CAPITAL FACILITIES PLAN

Project No.	Desig.	Description	Yield (AF/Yr)	Project Capital ($M)	Unit Capital ($/AF)	Annual Cost ($M/Yr) Capital	O&M	Total	Unit Cost ($/AF/Yr)
23	I-1	Urban Conservation - Salinas Valley	1,200	--	--	--	0.26	0.26	217
24	I-2	Agricultural Water Management - Phase I	2,000	2	1,000	0.20	0.55	0.75	375
25	I-3	Agricultural Water Management - Phase II	6,000	8	1,300	0.78	5.50	6.28	1,047
16	I-4	SWIP - Castroville Irrigation Water Supply Project	13,800	43	3,120	4.21	0.72	4.93	357
17	I-5	SWIP - Regional Water Reclamation Supply Project	19,450	20	1,030	1.96	0.93	2.89	149
15	I-6	SWIP - Fort Ord-Marina Potable Water Supply Project	0	25	--	2.45	0.90	3.35	--
1	I-7	Widen San Antonio Spillway	700	7	10,000	0.65	0.01	0.66	943
2	1-8	Widen Nacimiento Spillway[1]	0	8	--	0.80	0.01	0.81	--
		SUBTOTAL - UNIT 1	43,150	113	2,620	11.05	8.88	19.93	462
9	II-1	Arroyo Seco Dam - Greenfield Site (Low)	42,000	155	7,260	13.95	0.29	14.24	805
10	II-2	Arroyo Seco - Salinas River Conveyance Canal	(2)	7	--	0.73	0.10	0.83	--
29	II-3	Salinas Valley M&I Water Delivery Project	(2)	143	--	12.87	5.87	18.74	--
4	II-4	Nacimiento - San Antonio Interlake Tunnel[1]	20,500	32	1,560	3.15	(0.10)	3.05	149
		SUBTOTAL - UNIT II	62,500	337	5,390	30.70	6.16	36.86	590
		TOTAL - UNITS I AND II	105,650	450	4,260	41.75	15.04	56.79	538

[1]Widening of Nacimiento Spillway needs further analysis in conjunction with a Nacimiento-San Antonio Interlake Tunnel to establish feasibility.
[2]Included as part of Unit II-1.


SAN BENITO COUNTY
MONTEREY COUNTY
Watsonville
Pajaro River
Slough
SANTA CRUZ COUNTY
MONTEREY COUNTY
Prunedale
Gabilan Creek
Elkhorn
Castroville
SALINAS
Gonzales
Soledad
Greenfield
King City
San Ardo
Paso Robles
Salinas River
Arroyo Seco
San Antonio Reservoir
Nacimiento Reservoir
San Antonio River
Nacimiento River
Marina
Fort Ord
SEASIDE
MONTEREY
Pacific Grove
Carmel
Carmel River
San Clemente Dam
Los Padres Dam
Cachagua Creek
Finch Creek
MONTEREY BAY
PACIFIC OCEAN
PACIFIC OCEAN
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1
156
68
101
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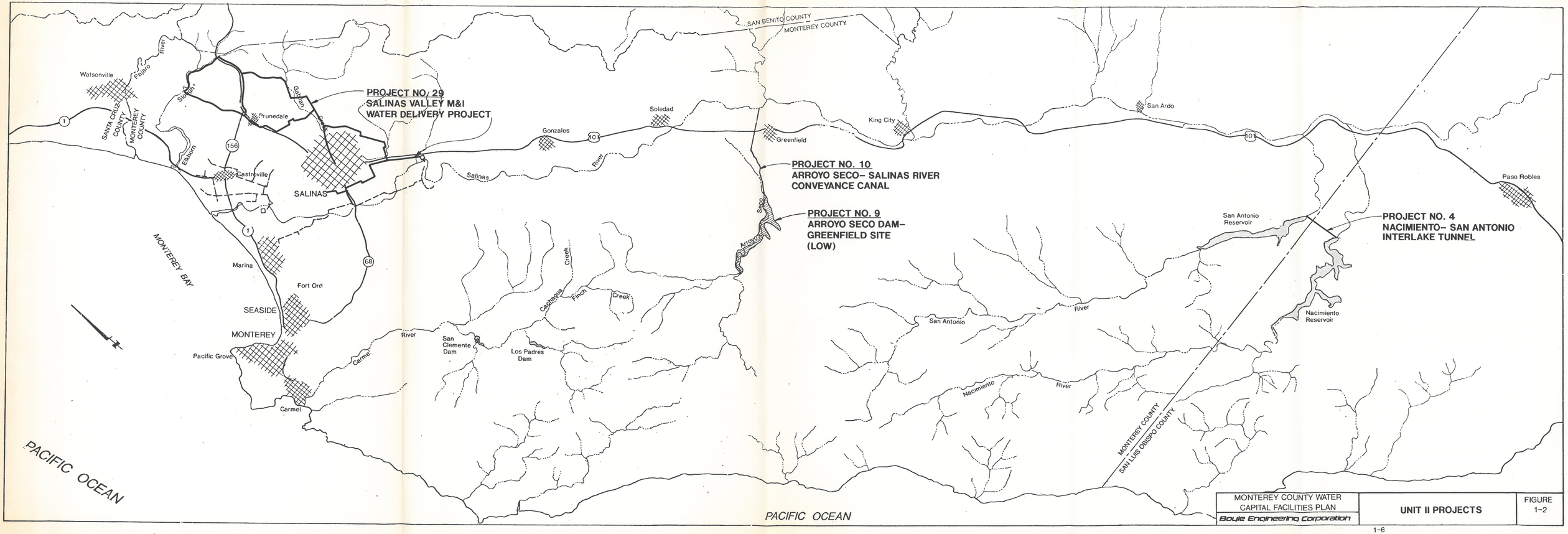
MONTEREY COUNTY WATER CAPITAL FACILITIES PLAN
Boyle Engineering Corporation
UNIT I PROJECTS
FIGURE 1-1



MONTEREY COUNTY WATER CAPITAL FACILITIES PLAN	UNIT II PROJECTS	FIGURE 1–2
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- **Water Sales Charges:** MCWRA has the power to sell water. As projects are developed which deliver water to wholesale or retail customers, MCWRA should adopt water sales charges. The rate for M&I is assumed to be three times the rate for agricultural use.
- **Reclamation Charge:** Urban water users in the Salinas Valley would pay a reclamation charge to pay the costs associated with the water reclamation project. The reclamation project recovers water which urban users now export from the groundwater basin through wastewater treatment and disposal.
- **Capital Facilities Charge:** The financing plan assumes that MCWRA will seek the authority in the future to levy a capital facilities charge on new customers served by the water supply projects.

A combination of revenues will be needed to provide sufficient funds for capital and operating expenses. Capital funds will come from a combination of loans from the Bureau of Reclamation and state of California, MCWRA borrowing, and cash.

Implementation Program

On the basis of the analysis and data presented in this report, it is recommended that Monterey County undertake the following action items leading toward implementation of the Monterey County Water Capital Facilities Plan.

1. Adopt the final report, certify the Plan as the optimum solution to the water resources deficiency in the Salinas Valley, and distribute the report to interested parties.
2. Initiate a public involvement program to result in public understanding and support of the Plan.
3. Review financing options and select the most viable combination of revenue rates to obtain financial support of the Plan.
4. Initiate feasibility studies (or predesign studies if appropriate) for the eight Unit I projects.
5. Reserve budget and initiate feasibility studies for the four Unit II projects.

CHAPTER 2

WATER RESOURCES SETTING

BACKGROUND

For several decades, water demand in Monterey County has exceeded the supply, resulting in groundwater overdraft, seawater intrusion, shortages during dry years, and increasing water cost. In addition, the municipal and industrial water demand is increasing as the population within the county increases. Recognizing that these continued water problems would create major environmental and economic damages if not corrected, the County Board of Supervisors directed the preparation of this plan.

This Water Capital Facilities Plan is intended to be an integral part of the yet-to-be-prepared Monterey County Water Resources Management Plan. Various projects designed to address certain water supply problems have been identified but none constructed since the completion of San Antonio Dam in 1967. A number of projects are presently being pursued, but none have received authorization to be developed. Various reasons have contributed to this lack of recent water supply development. One of the main reasons these projects have not moved forward has been their local scope. This has resulted in relatively high costs for the local water user or limited project alternatives to mitigate significant environmental impacts.

The objective of this planning effort is to analyze the previously identified projects plus others that may appear viable from an overall county-wide perspective. These projects are to be evaluated conceptually for technical, environmental, and financial considerations based on readily available information. For some of these projects, considerable analyses have been completed, and feasibility level information could be utilized. In other cases, studies are under way, and only preliminary reports concerning possible results are available at this time. For other identified projects, essentially no previous technical information existed and reconnaissance level analyses were conducted as part of this evaluation.

In order to proceed further with those projects determined to be viable as identified in this report, comprehensive feasibility level investigations will have to be conducted. For those projects where limited previous technical information exists, it was necessary to make certain engineering and environmental judgments. As further analyses are conducted, these projects

can be refined and more exhaustive investigations completed. During the course of this assignment, decisions had to be made relative to limiting the analyses within the authorized scope of investigation. Therefore, there may be remaining questions, particularly regarding the water supply yield and benefits of combining project features differently as a water facilities program. However, conceptually the plan presented herein is based on sufficiently valid information for purposes of proceeding to the next phases of implementation. The next step involves completion of final feasibility studies, EIR/EIS, and funding arrangements leading to construction in some cases (i.e., Seawater Intrusion Program) or to further preliminary studies of other cases (i.e., Salinas Valley M&I Water Delivery Project).

CLIMATE

Geographic location and topographic features exert strong influences on the county's climate. In turn, climate and topography and other factors affect the availability of water. The climate of Monterey County is typical of the central coastal area of California. The Mediterranean climate is characterized by year-round moderate temperatures with short, cool winter rainy seasons, and warm, dry summers. The Santa Lucia Mountains form a topographic barrier, resulting in most of the rainfall occurring in that coastal range.

The onshore winds and fog that are present most of the year exert a considerable moderating influence on temperatures throughout the county. This is reflected by relatively low mean annual temperatures and the relatively small range between mean-maximum and mean-minimum temperatures. This influence decreases farther away from the coast and from north to south down the Salinas Valley. Therefore, temperatures in the valley are more extreme: generally colder in winter and warmer in summer. The following paragraphs discuss some of the implications of climate.

Rainfall patterns are a critical factor in the management of water resources. Nearly all of the annual runoff from rivers and streams in the county is from winter rains; there is virtually no snowpack storage. This means enough water must be stored to meet needs the year round. Further, rainfall patterns change year to year. During dry years, when the need for irrigation is greatest, the available runoff is smaller. To compensate, enough water must be stored in wet years to meet the demands for dry years. This storage can occur in either natural groundwater aquifer basins or man-made reservoirs.

HYDROLOGIC UNITS

Three major water courses--the Salinas, the Pajaro, and the Carmel Rivers--drain the watershed within the county. Water supplies are obtained primarily from the groundwater resources occurring within the Salinas and Carmel River basins. Water users must also depend upon the surface supplies within the Carmel River to meet their needs.

The rainy season normally produces sufficient rainfall to saturate the upper layers of the soil and percolate into the permeable strata of aquifers. Uncontrolled runoff during this time can become excessive and cause flooding. But within weeks after the rainy season, river and stream flows recede. To alleviate flooding problems and to conserve water for use throughout the dry season, surface water storage is used to recharge groundwater basins throughout the year. The use of surface water to supplement groundwater supplies is called conjunctive use. As water use increases or periods of below normal rainfall exceed historical patterns, the need to further supplement the groundwater supplies through additional water resource development becomes critical.

Salinas River Basin - The Salinas River Basin is by far the greatest contributor to the water resources of Monterey County. Encompassing an area of 4,468 square miles, the Basin includes major parts of Monterey and San Luis Obispo Counties, with a small section in San Benito County. The Basin's most significant hydrologic feature in Monterey County is the lower Salinas River and an underlying geologic trough with water-bearing sediments up to 3,000 feet deep forming a large groundwater basin.

The Salinas River flows directly over the groundwater basin and is the primary source of recharge. Conjunctive use is possible because of permeable alluvial deposits underlying the riverbed. These begin at the upper end of the Salinas Valley near San Ardo and extend to the mouth of the valley. At the southern end of the valley, the water-bearing strata is relatively shallow. The geologic trough is deepest beneath Gonzales and Soledad, the bottom sloping gradually upward north toward Salinas and Monterey Bay.

The Salinas Valley groundwater basin is a single unit without geologic divisions. However, it has commonly been divided into four subareas for purposes of analysis: Pressure, Eastside, Forebay, and Upper Valley.

The Upper Valley Area extends from about 6 miles north of Bradley to about 7.5 miles north of King City. Major urban areas are San Ardo, San Lucas, and King City. Sargent, Pine, San

Lorenzo, and Pancho Rico Creeks are minor tributaries to the Salinas River which originate in the Diablo Mountains. The Nacimiento and San Antonio Rivers, which originate in the Santa Lucia Mountains, join the Salinas River less than 2 miles south of Bradley.

The Forebay Area extends form the northern boundary of the Upper Valley Area to about the city of Gonzales. Major urban areas are Greenfield and Soledad. The only tributary (a minor one) from the east side is Chalone Creek. Included in this area is the Arroyo Seco Cone, which is generally the area formed by the fan of Arroyo Seco and Reliz Creek. Both of these streams originate in the Santa Lucia Mountains.

The East Side Area extends from Gonzales, north to about 3 miles east of Castroville and lies generally east of Highway 101. Major urban areas are Santa Rita and eastern suburban areas of the city of Salinas. Minor tributaries to the Salinas River are Chualar, Quail, Alisal, Natividad, and Gabilan Creeks, all of which originate in the Gabilan Mountains.

The Pressure Area extends from Gonzales to Monterey Bay and lies west of Highway 101. Major urban areas are Gonzales, Chualar, Salinas, and Castroville. The only tributary to the Salinas River in this area is El Toro Creek, which originates in the Santa Lucia Mountains. Three groundwater aquifers are recognized in this area. They are the "180-foot aquifer," the "400-foot aquifer," and the "900-foot aquifer."

Mean discharge on the Salinas River ranged from 358,000 AF/yr at Bradley to 276,000 AF/yr at Spreckels for water years 1970-1981. Two major surface water projects exist in the valley--Nacimiento Reservoir and San Antonio Reservoir, with storage capacity of 350,000 AF and 335,000 AF, respectively. Nacimiento and San Antonio dams were built and are maintained entirely by funds from the property owners of the Salinas Valley. The dams are operated for the benefit of the owners through Zones 2 and 2A of the Water Resources Agency. Hydroelectric power facilities were added at Nacimiento Dam in 1985. Historically, reservoir benefits have included flood control, water conservation, and recreation. The water conservation pools are operated primary to recharge the Salinas Valley Groundwater Basin. Water conservation storage at Nacimiento Reservoir includes 17,500 AF/yr owned by San Luis Obispo County. In addition, storage below 18,750 AF at Nacimiento Reservoir can only be used by San Luis Obispo County.

Carmel River Basin - The Carmel River Basin covers about 254 square miles, or an area less than 6 percent of the Salinas River Basin. A small groundwater basin is located in the lower Carmel River Basin. The alluvium beneath the floor of the valley is generally very permeable,

containing numerous boulder zones interspersed with cobbles, gravels, sands, and silts. Its depth ranges from about 50 feet in upper valley areas to more than 180 feet in the lower valley near the coast. The alluvium receives recharge from the Carmel River and side tributaries at a relatively high rate. Following major runoff in the early part of the wet season, the small aquifer may be recharged completely. Groundwater in the aquifer flows easily down the river through highly pervious coarse sediments.

Long-term, reconstructed records for the Carmel River show significant annual and seasonal variation. Annual flows at San Clemente Dam ranged from 2,600 to 229,000 AF, with an average flow of 67,660 AF. The highest flow months are January, February, and March, with this period accounting for two-thirds of the annual flow.

Streamflow in the basin is regulated, to a minor degree, by two small reservoirs--Los Padres and San Clemente. The reservoirs are owned and operated by the California-American Water Company and have a combined annual yield of 11,200 AF. Because the combined storage capacity of the reservoirs is small and are partially filled with silt (remaining storage 5,000 AF), the reservoirs overflow during the rainy season.

Pajaro River Basin - Approximately 32 square miles of the much larger Pajaro River groundwater basin extends into the northern part of Monterey County.

CHAPTER 3

WATER DEMANDS

Introduction

The demands for supplemental water to meet water supply deficiencies in each of the four primary county subareas have been estimated for existing 1990 conditions and projected for future conditions. The planning horizon (future) has been defined in the study scope of work as the year 2010. The four primary subareas of the county are the Salinas Valley, Peninsula, North County, and Pajaro Valley.

The supplemental water demands have been developed based on the review and analysis of existing reports, communications, and other readily available information on existing and projected population, water usage, irrigated acreage, firm yield of existing water supply sources, groundwater overdraft, and groundwater quality. Supplemental water demands equal total water demands less firm yield of existing sources.

Definition of Subareas

The largest subarea by far is the Salinas Valley subarea. This subarea is defined as those lands which are dependent upon the Salinas River and the Salinas Valley groundwater basin for water supply.

The Peninsula subarea consists of those lands within the Monterey Peninsula Water Management District (MPWMD). The Pajaro Valley subarea includes the Monterey County lands within Pajaro Valley Water Management Agency (PVWMA).

U.S. Geological Survey's Water Resources Investigation Report 83-4023 titled Groundwater in North Monterey County, California, 1980 defines the boundaries of their North Monterey County study area. The North County subarea consists of that portion of the USGS study area which is not within the PVWMA.

There are numerous other water supply subareas throughout the county such as the Big Sur coastal area, El Toro, Fort Hunter Liggett Military Reservation, Lockwood, Peachtree, Priest

Valley, and Parkfield. Domestic and agricultural water demands within these areas are met by local groundwater or surface water supplies. The adequacy of these local water supplies to meet local needs is not included within the scope of work for this study.

Water Demands

Water demands for each of the four primary subareas have been estimated for the years 1990 (existing) and 2010 (projected). The development of the municipal and industrial (M&I) and agricultural components of the subarea water demands is described in the following subsections.

M&I Water Demands

Estimated population and M&I water demands for the year 1990 and 2010 are set forth in Table 3-1. Estimated municipal water demands for the Salinas Valley subarea have been developed based on Association of Monterey Bay Area Governments (AMBAG) population projections (January 13, 1988), estimates provided by MCWRA (communications December 13, 1988 and September 15, 1989), municipal demand estimates for Marina and Fort Ord by the Seawater Intrusion Committee (December 1988), population estimates by the U.S. Bureau of Census (1981), and a survey of water use conducted by MCWRA in cooperation with the County Planning Department (1984). Industrial water demands were included for the Salinas Valley subarea to account for biomass conversion plants that are currently in operation. These plants, located in King City and Soledad, are estimated to pump a constant 2,305 AF/yr (MCWRA communication March 3, 1989).

Estimated municipal water demands for the North County and Pajaro Valley subareas have been developed based on the AMBAG population projections and estimated rural domestic water use from Historical and Future Water Use, Pajaro Valley Water Management and Augmentation Study, November 1989. Commercial and industrial use for these subareas has been based on data from USGS's Water Resources Investigation Report 83-4023.

Population and M&I water demands for the Peninsula subarea have been taken from MPWMD's Technical Memorandum 89-06, dated August 8, 1989. Population and water demand estimates for existing and buildout conditions, as set forth in the memorandum, have been utilized for the years 1990 and 2010 respectively.

TABLE 3-1

ESTIMATED MUNICIPAL AND INDUSTRIAL WATER DEMANDS
YEARS 1990 AND 2010

Subarea	Community	Use Per [a] Capita (gal/day)	Year 1990 Population [b]	Year 1990 Demand (AF/yr)	Year 2010 Population [c]	Year 2010 Demand (AF/yr)
Salinas Valley	Salinas	150 [d]	102,627	17,241	145,000 [e]	24,359
	Castroville	175	5,177	1,015	6,650 [e]	1,303
	Greenfield	133	7,290	1,086	8,510 [e]	1,268
	Gonzales	154	5,180	893	6,175 [e]	1,065
	King City	165	8,581	1,586	15,700 [e]	2,901
	Soledad	99	8,090	897	9,750 [e]	1,081
	Marina [f]	N/A	21,012	3,800	37,879	6,400
	Fort Ord [f]	N/A	30,460	8,200	32,124	8,200
	San Ardo	215	460 [g]	111	550 [h]	132
	Spreckels	201	670 [g]	151	800 [h]	180
	Chualar	150	580 [g]	97	700 [h]	118
	San Lucas	148	202 [g]	33	240 [h]	40
	Unincorporated	140	30,551	4,790	42,122	6,605
	Industrial			2,305 [i]		2,305
			220,880	42,204	306,200	55,957
Peninsula [j]		N/A	104,800	21,000	140,900	26,000
North County	Domestic	150	16,700	2,806	25,600	4,301
	Commercial/Industrial			1,310 [k]		2,008
				4,116		6,309
Pajaro Valley	Domestic	156 [l]	13,500	2,359	17,800	3,110
	Commercial/Industrial			490 [m]		646
				2,849		3,756
Totals			355,880	70,169	490,500	92,022

TABLE 3-1 (continued)

Footnotes

(a) District and County Planning Department, 1984.

(b) Association of Monterey Bay Area Governments, January 13, 1988.

(c) Year 2010 population based on linear projection of AMBAG estimates for years 2000 and 2005.

(d) District communication, September 15, 1989.

(e) District communication, December 13, 1988.

(f) Seawater Intrusion Committee, December 1988.

(g) U.S. Bureau of Census, 1971.

(h) Year 2010 population based on year 1990 population plus 20 percent growth.

(i) Salinas Valley Seawater Intrusion Program, Final EIR/EIS Groundwater Analysis, revised October 1989.

(j) Monterey Peninsula Water Management District, Technical Memorandum 89-06, August 8, 1989.

(k) U.S. Geological Survey, Water Resources Investigation Report 83-4023, July 1983.

(l) Pajaro Valley Water Management Agency, November 1989.

Irrigation Demands

Estimated irrigation water demands for the years 1990 and 2010 are shown in Table 3-2. The total annual applied water demands for each subarea have been developed by multiplying estimated average unit applied water requirements times estimated irrigated acres.

The average annual unit applied water demand, irrigated acreage and total annual applied water demands for the Salinas Valley subarea, as set forth in Table 3-2, were previously estimated by Boyle Engineering in connection with the Salinas Valley Seawater Intrusion Program (see Final EIR/EIS Groundwater Analyses, as revised October 1989). Although the potential exists for additional agricultural lands to be developed, particularly in the upper valley, no increase in irrigation water demands has been projected for the year 2010. This assumes that any increase in water use attributable to the addition of new agricultural lands will be offset by land being taken out of production for urban use and improved irrigation efficiency.

It has been assumed that any irrigation water demands within the Peninsula subarea have been taken into account in the development of the municipal and industrial water demands for that subarea as presented in Table 3-1.

Water-Resources Investigations Report 83-4023, prepared by the U.S. Geological Survey, was the source of irrigated acreage (1979 conditions) for the Pajaro Valley subarea, as shown in Table 3-2. It has been assumed that the irrigated acreage in the subarea has not significantly changed since 1979; nor has any change been projected for the year 2010. These assumptions are consistent with the irrigated acreage records and projections contained in PVWMA's November 1989 report on Historical and Future Water Use, Pajaro Valley Water Management and Augmentation Study. This latter report was also the source of the estimated annual unit applied water demand of 1.7 AF/acre per year which has been used for the subarea.

Water-Resources Investigations Report 83-4023, was also the source of the irrigated acreage for the North County subarea, as shown in Table 3-2. It has been assumed that the current 1990 and projected 2010 irrigated acreages will not vary significantly from the reported 1979 acreage. It is assumed that any additional agricultural land development has been, or will be, offset by urbanization. Annual unit applied water requirements for the North County subarea have been assumed to be the same as for the neighboring Castroville area (2.5 AF/acre). The Peninsula has no significant irrigated acreage.

TABLE 3-2

ESTIMATED IRRIGATION WATER DEMANDS
YEARS 1990 AND 2010

Subarea	Annual Unit Applied Demand (AF/acre)	Year 1990 Irrigated Acreage	Year 1990 Demand (AF/yr)	Year 2010 Irrigated Acreage	Year 2010 Demand (AF/yr)
Salinas Valley [a]	2.5	205,000	511,000	205,000	511,000
Peninsula	--	--	--	--	--
North County	2.5	2,000 [b]	5,000	2,000	5,000
Pajaro Valley	1.7 [c]	10,500 [b]	17,900	10,500	17,900

(a) Salinas Valley Seawater Intrusion Program, Final EIR/EIS Groundwater Analysis, Revised October 1989.

(b) U.S. Geological Survey, Water Resources Investigation Report 83-4023, July 1983.

(c) Pajaro Valley Water Management Agency, Historical and Future Water Use, November 1989.

Supplemental Water Demands

Supplemental water demands have been estimated by comparing total water demand estimates for each subarea with the firm or safe yield of the existing water supply sources estimated to be available to that subarea. The results of the comparison are listed in Table 3-3.

Salinas Valley Subarea

The Salinas Valley groundwater model was recently utilized to estimate groundwater balances for the various units of the Salinas Valley Groundwater Basin based on "no project" conditions. The results of the computer analysis are contained in an April 2, 1990 memorandum from Boyle Engineering to Jones and Stokes Associates. The analysis used 1951 through 1985 hydrology and projected 1986 through 2020 water demands. The computer model output includes estimates of sea water intrusion and loss in groundwater storage, which in combination, quantify the need for supplemental water. This analysis was adjusted to develop the 1990 and 2010 supplemental water demands set forth in Table 3-3.

Peninsula Subarea

The supplemental water demands for the Peninsula subarea have been based on information extracted from documents provided by MPWMD.

North County Subarea

Existing water demands in the North County area are pumped from groundwater. The aquifer underlying much of the area being urbanized is reported to be of low permeability, low specific yield and limited recharge (North Monterey County Moratorium Area Groundwater Study, May 1981). Nitrate buildup in the groundwater is reported to be a significant concern relative to its long-term use as an M&I supply. Based on long-term water quality considerations, the supplemental water demands for the North County subarea have been set at the estimated M&I water demand levels for the years 1990 and 2010.

Pajaro Valley Subarea

The supplemental water requirements in the Pajaro Valley subarea have been estimated by comparing crop consumptive use (assumed at 75 percent of applied water demand) to the minimum groundwater recharge as reported in Water-Resources Investigations Report 83-4023.

TABLE 3-3

SUMMARY OF WATER DEMANDS

Subarea	Population	Irrigated Acreage	Total Water Demands M&I (1,000 AF)	Total Water Demands Irrigation (1,000 AF)	Total Water Demands Total (1,000 AF)	Safe Yield Existing Sources (1,000 AF)	Supplemental Supply Needed (1,000 AF)
Year 1990 Estimates							
Salinas Valley	220,900	205,000	42.20	511.00	553.20	515.30	37.90
Peninsula	104,800	---	21.00	---	21.00	16.00	5.00
North County	16,700	2,000	4.10	5.00	9.10	5.00	4.10
Pajaro Valley	13,500	10,500	2.80	17.90	20.70	13.50	7.20
Total	355,900	217,500	70.10	533.90	604.00	549.80	54.20
Year 2010 Estimates							
Salinas Valley	306,200	205,000	56.00	511.00	567.00	518.80	48.20
Peninsula	140,900	---	26.00	---	26.00	19.00	7.00
North County	25,600	2,000	6.30	5.00	11.30	5.00	6.30
Pajaro Valley	17,800	105,000	3.80	17.90	21.70	13.70	8.00
Total	490,500	217,500	92.10	533.90	626.00	556.50	69.50

The results from this comparison are included in Table 3-3. An alternate analysis, based on allocating the 1990 and 2010 "high side" PVWMA overdraft estimates between the Monterey County and Santa Cruz County lands in proportion to their respective total estimated water demands, produced very comparable results.

CHAPTER 4

ALTERNATIVE PROJECTS AND PROGRAMS

PROJECTS INVENTORY

Alternative projects to be evaluated were identified in the professional services agreement for this project. Based on a review of Supplement to Consultant's Scope of Work (Agreement Attachment 1) and Inventory of Monterey County Water Supply Projects (Attachment 2), a master list of 34 potential projects, including additional projects identified during this investigation, has been developed and is presented in Table 4-1. The location of each project is shown on Figure 4-1.

Each of these projects is described in detail in Appendix B. The project data are presented in seven sections:

- Project Identification/Description
- Geology/Seismicity
- Project Operations
- Environmental and Other Issues
- Hydrology/Water Demand/Yield
- Cost Estimate and Schedule
- Pros and Cons

A description of the general content of each of the seven sections is given below.

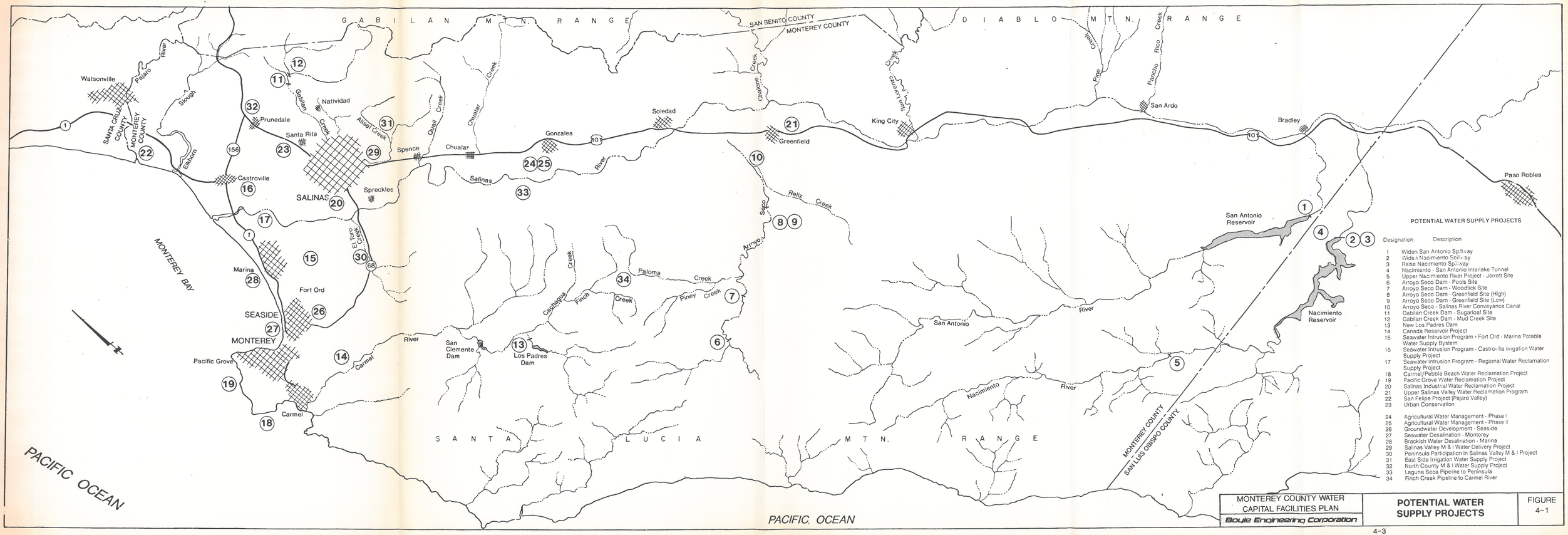
Project Identification/Description

This section provides a general description of the project, the significant elements of the project, and the purpose of the project.

TABLE 4-1

POTENTIAL WATER SUPPLY PROJECTS

Designation	Description
1	Widen San Antonio Spillway
2	Widen Nacimiento Spillway
3	Raise Nacimiento Spillway
4	Nacimiento - San Antonio Interlake Tunnel
5	Upper Nacimiento River Project - Jerrett Site
6	Arroyo Seco Dam - Pools Site
7	Arroyo Seco Dam - Woodtick Site
8	Arroyo Seco Dam - Greenfield Site (High)
9	Arroyo Seco Dam - Greenfield Site (Low)
10	Arroyo Seco - Salinas River Conveyance Canal
11	Gabilan Creek Dam - Sugarloaf Site
12	Gabilan Creek Dam - Mud Creek Site
13	New Los Padres Dam
14	Canada Reservoir Project
15	Seawater Intrusion Program - Fort Ord - Marina Potable Water Supply System
16	Seawater Intrusion Program - Castroville Irrigation Water Supply Project
17	Seawater Intrusion Program - Regional Water Reclamation Supply Project
18	Carmel/Pebble Beach Water Reclamation Project
19	Pacific Grove Water Reclamation Project
20	Salinas Industrial Water Reclamation Project
21	Upper Salinas Valley Water Reclamation Program
22	San Felipe Project (Pajaro Valley)
23	Urban Conservation
24	Agricultural Water Management - Phase I
25	Agricultural Water Management - Phase II
26	Groundwater Development - Seaside
27	Seawater Desalination - Monterey
28	Brackish Water Desalination - Marina
29	Salinas Valley M&I Water Delivery Project
30	Peninsula Participation in Salinas Valley M&I Project
31	East Side Irrigation Water Supply Project
32	North County M&I Water Supply Project
33	Laguna Seca Pipeline to Peninsula
34	Finch Creek Pipeline to Carmel River



POTENTIAL WATER SUPPLY PROJECTS

Designation	Description
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5	Upper Nacimiento River Project - Jerrett Site
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7	Arroyo Seco Dam - Woodlick Site
8	Arroyo Seco Dam - Greenfield Site (High)
9	Arroyo Seco Dam - Greenfield Site (Low)
10	Arroyo Seco - Salinas River Conveyance Canal
11	Gabilan Creek Dam - Sugarloaf Site
12	Gabilan Creek Dam - Mud Creek Site
13	New Los Padres Dam
14	Canada Reservoir Project
15	Seawater Intrusion Program - Fort Ord - Marina Potable Water Supply Bystem
16	Seawater Intrusion Program - Castroville Irrigation Water Supply Project
17	Seawater Intrusion Program - Regional Water Reclamation Supply Project
18	Carmel/Pebble Beach Water Reclamation Project
19	Pacific Grove Water Reclamation Project
20	Salinas Industrial Water Reclamation Project
21	Upper Salinas Valley Water Reclamation Program
22	San Felipe Project (Pajaro Valley)
23	Urban Conservation
24	Agricultural Water Management - Phase I
25	Agricultural Water Management - Phase II
26	Groundwater Development - Seaside
27	Seawater Desalination - Monterey
28	Brackish Water Desalination - Marina
29	Salinas Valley M & I Water Delivery Project
30	Peninsula Participation in Salinas Valley M & I Project
31	East Side Irrigation Water Supply Project
32	North County M & I Water Supply Project
33	Laguna Seca Pipeline to Peninsula
34	Finch Creek Pipeline to Carmel River

MONTEREY COUNTY WATER CAPITAL FACILITIES PLAN

Boyle Engineering Corporation

POTENTIAL WATER SUPPLY PROJECTS

FIGURE 4-1

Geology/Seismicity

This section provides a brief description of the geology and seismic issues affecting the project.

Project Operations

This section provides a general discussion of the way the project would be operated including potential significant operation requirements that might be imposed by regulatory agencies.

Environmental and Other Issues

This section presents a brief environmental overview and a general discussion of mitigation. Related costs are included in the Cost Estimate and Schedule section.

Hydrology/Water Demand/Yield

This section discussed hydrology relating to the project, water demand to be met by the project, and the water yield of the project.

Cost Estimate and Schedule

This section presents the estimated cost for constructing the project and includes 35 percent for contingencies, engineering, legal, financing fees, and administration. The first year (1990) operations and maintenance (O&M) cost is presented, as are average yearly pumping energy requirements and related pumping costs (at $.08/KWh). Average yearly power generation and related revenue (at $.03/KWh) is provided where power generation is involved. Construction cost and O&M cost includes, but is not limited to, estimates for project facilities, land acquisition, relocation, roads, recreation, fishery facilities, habitat replacement, and water quality protection. Schedule data is presented on the basis of normal scheduling and does not reflect time for litigation activities due to parties who may oppose the project.

Pros and Cons

This section presents major issues for each project for quick comparison.

PROJECT GROUPINGS

As the Water Capital Facilities Plan is further developed in later chapters, various projects listed in Table 4-1 will be grouped together into a program. For example, the Seawater Intrusion Program consists of the following:

Project No. 15 - Fort Ord/Marina Potable Water Supply Project

Project No. 16 - Castroville Irrigation Water Supply Project

Project No. 17 - Regional Water Reclamation Supply Project

Similarly, a program is formulated that combines supply Project No. 5 (Upper Nacimiento River Project - Jerrett Site) with transmission and distribution Project No. 29 (Salinas Valley M&I Water Delivery Project) and Project No. 30 (Peninsula Participation in Salinas Valley M&I Project).

Lastly, the recommended Water Capital Facilities Plan will be a combination of water supply programs and projects determined to be necessary and viable.

CHAPTER 5

YIELD ANALYSIS

APPROACH

In order to characterize yield for a project, the water demand must be specified as well as the proposed facilities. The potential projects listed in Table 4-1, combined in various programs and with various demand scenarios, confronted this study with a nearly unlimited list of logical alternatives for yield analysis. Consequently, it was necessary during the early stage of the study to select a limited number of project facilities that represented the anticipated range of potential yields. The alternative projects and programs selected are shown on Table 5-1. As the study progressed, it became apparent that yield results for other project programs would have been desirable. Budget restraints, however, did not allow further analysis at this time.

Each alternative yield analysis was operated in conjunction with a widening of the existing spillways at Nacimiento and San Antonio Reservoirs (Base Condition). The spillway widenings are necessary to meet State of California, Department of Water Resources, Division of Dam Safety minimum criteria and are therefore considered to be included with each of the alternative project programs. The approach used to evaluate each alternative was to add the proposed projects to the reservoir operation model developed as part of the Seawater Intrusion Program's EIR/EIS analysis. This model represents a general purpose reservoir operation model which has been revised to represent the unique operating criteria associated with MCWRA's historic management of surface water supplies in the Salinas Valley. Briefly, it performs continuity at each reservoir for a historical 1950 to 1985 study period in accordance with various operating criteria such as reservoir characteristics, flood control requirements, conservation demands, streamflow bypass requirements, and drought operations. For a complete discussion of the model's development and input data, refer to the report on the Salinas Valley Seawater Intrusion Program EIR/EIS Surface Water Analyses (Boyle, June 1990).

The Seawater Intrusion Program (Nos. 15, 16, and 17) and the widened spillways at Nacimiento and San Antonio Reservoirs (Nos. 1 and 2) were included as a part of each of the alternative yield analyses. Table 5-2 shows the reservoir rule curves used at Nacimiento and San Antonio for the different alternatives.

TABLE 5-1

YIELD ANALYSIS ALTERNATIVES

Alternative	Project	Demand
0*	Widened Spillways at Nacimiento and San Antonio Reservoirs (Nos. 1 and 2)	Existing and SWIP (Nos. 15, 16, and 17)
1	Raised Nacimiento Spillway (No. 3)	27,500 AF East Side Irrigation and North County M&I (Nos. 31 and 32)
2	Jerrett Site Reservoir (No. 5)	Same as Alternative 1.
3	Interlake Tunnel (No. 4)	Same as Alternative 1.
4	Raised Nacimiento Spillway and Arroyo Seco Dam-Greenfield (low) (Nos. 3 and 9)	40,500 AF East Side Irrigation and North County M&I (Nos. 31 and 32)
5	Same as Alternative 4	40,500 AF East Side Irrigation and North County M&I and Laguna Seca Pipeline to Peninsula (Nos. 31, 32, and 33).
6	Raised Nacimiento Spillway and Arroyo Seco Dam-Greenfield (high) (Nos. 3 and 8)	Same as Alternative 5.
7	Raised Nacimiento Spillway and Arroyo Seco Dam-Woodtick (Nos. 3 and 7)	40,500 AF East Side Irrigation and Finch Creek Pipeline to Carmel River (Nos. 31, 32, and 34).
8	Jerrett Site Reservoir (No. 5)	Salinas Valley M&I (No. 29).
9	Jerrett Site Reservoir (No. 5)	Salinas Valley M&I and Peninsula Participation (Nos. 29 and 30).

*Base Condition. Project facilities and demand included as a part of each of the other alternatives.

TABLE 5-2

RESERVOIR RULE CURVES
(1,000 AF)

Begin Month	Nacimiento			San Antonio	
	SWIP	Widened Spillway	Raised Spillway	SWIP	Widened Spillway
September	350	350	384	335	335
October	280	240	274	272	298
November	259	219	253	254	291
December	246	206	240	250	287
January	240	200	234	245	285
February	240	200	234	245	285
March	285	245	279	261	300
April	350	350	384	277	335
May	350	350	384	335	335

RESULTS

Summary results of the alternative yield analyses determined with the reservoir operations model are shown on Tables 5-3 and 5-4 for average annual project delivery and average annual project and Salinas River Basin yield gain, respectively. Included in Appendix C are computer printout tables presenting the annual operation results.

Alternative 0 - Base Condition

As shown in Table 5-1, Alternative 0 is a variation of existing facilities and the SWIP, which incorporates widened spillways and revised rule curves at Nacimiento and San Antonio Reservoirs. SWIP deliveries associated with this alternative are summarized in Table 5-3 along with the other alternatives. As presented, the average yield to the SWIP is 85 percent (10,253 AF/yr).

Alternative 1

Alternative 1 includes the spillway at Nacimiento Reservoir raised by 6.5 feet and adds a yearly project demand of 27,500 AF for the East Side Diversion. To analyze this alternative, the Nacimiento Reservoir area-capacity and rule curves were revised to include the additional storage associated with the raised spillway capacity. In addition, the East Side demand of 27,500 AF/yr was simulated.

The proposed alternative is not intended to significantly impact the estimated yield of SWIP. To accomplish this objective, releases to the East Side were only allowed to occur whenever the total storage in existing and proposed structures exceeded 100,000 AF. This operating rule was determined from a sensitivity analysis as the minimum storage above which the proposed additional demand would not impact the SWIP estimated study period deliveries by more than 6 percent.

As presented in Table 5-3, the average yield to the SWIP is 81 percent (9,755 AF/yr). The average yield to the East Side is 77 percent (21,102 AF/yr). The incremental basin yield gain from raising the spillway is 19,151 AF.

TABLE 5-3

AVERAGE ANNUAL PROJECT DELIVERY SUMMARY

(acre-feet)

	SWIP			East Side and North County			Peninsula			Salinas Valley M&I		
Project	Demand	Deliver	% Demand	Demand	Deliver	% Demand	Demand	Deliver	% Demand	Demand	Deliver	% Demand
SWIP	12,050	10,565	88	0	0	0	0	0	0	0	0	0
Alt. 0	12,050	10,253	84	0	0	0	0	0	0	0	0	0
Alt. 1	12,050	9,755	81	27,500	21,102	77	0	0	0	0	0	0
Alt. 2	12,050	11,019	91	27,500	23,959	87	0	0	0	0	0	0
Alt. 3	12,050	9,698	80	27,500	20,786	76	0	0	0	0	0	0
Alt. 4	12,050	10,950	91	40,500	35,880	89	0	0	0	0	0	0
Alt. 5	12,050	10,814	90	40,500	35,432	87	5,212	4,239	81	0	0	0
Alt. 6	12,050	11,086	92	40,500	36,493	90	5,212	4,440	85	0	0	0
Alt. 7	12,050	10,816	90	40,500	35,770	88	8,500	4,490	53	0	0	0
Alt. 8	12,050	10,096	84	0	0	0	0	0	0	43,700	33,226	76
Alt. 9	12,050	10,024	83	0	0	0	8,500	6,284	74	43,700	32,309	74

TABLE 5-4

AVERAGE ANNUAL PROJECT AND SALINAS RIVER BASIN GAIN (AF/YR)

	NO PROJ	SWIP	ALT 0	ALT 1	ALT 2	ALT 3	ALT 4	ALT 5	ALT 6	ALT 7	ALT 8	ALT 9
INFLOWS												
NACIMIENTO RES 1)	217832	217832	217832	217832	130699	217832	217832	217832	217832	217832	130699	130699
SAN ANTONIO RES	74708	74708	74708	74708	74708	74708	74708	74708	74708	74708	74708	74708
JERRETT RES	0	0	0	0	87133	0	0	0	0	0	87133	87133
ARROYO SECO RES	0	0	0	0	0	0	130231	130231	130231	97673	0	0
OTHER SURFACE WATER 2)	251653	251653	251653	251653	251653	251653	121422	121422	121422	153980	251653	251653
AVAILABLE WASTEWATER	19450	19450	19450	19450	19450	19450	19450	19450	19450	19450	19450	19450
SUBTOTAL SURFACE WATER	563643	563643	563643	563643	563643	563643	563643	563643	563643	563643	563643	563643
WELLS 3)	31500	1485	1797	2295	1031	2384	1099	2209	1717	1233	1954	2026
TOTAL INFLOW	595143	565128	565440	565938	564674	566027	564742	565852	565360	564876	565597	565669
OUTFLOWS												
RESERVOIR PROJ DELIVERIES	0	9968	9656	27850	31707	27371	44506	43704	44898	43601	37424	35623
OTHER SUPPLY PROJ DELIVERIES	0	597	597	3007	3271	3059	2325	2542	2681	2785	5899	6865
PENNISULA TRANSFER 4)	0	0	0	0	0	0	0	4239	4440	4490	0	6315
WASTEWATER REUSE	0	19450	19450	19450	19450	19450	19450	19450	19450	19450	19450	19450
WELL DELIVERIES	31500	1485	1797	2295	1031	2384	1099	2209	1717	1233	1954	2026
SUBTOTAL PROJECT DELIVERIES	31500	31500	31500	52602	55459	52264	67380	72144	73186	71559	64727	70279
TOTAL RES STORAGE CHANGE AF/YR	5393	3164	3162	2762	4618	2231	3188	2796	4914	2907	3631	3119
SUBTOTAL RESERVOIR NET EVAP	23870	21391	20869	20126	22567	20537	23731	23466	25853	22278	21289	21073
SAN LUIS OBISPO DELIVERIES	10214	10214	10214	10214	9967	10214	10214	10214	10214	10214	9860	10097
CONSERVATION (GW RECHAGE)	221720	227185	227727	226674	230647	229045	241637	240344	253901	232822	230905	228583
WASTE TO OCEAN 8)	302446	271674	271968	253560	241416	251736	218592	216888	197292	225096	235185	232518
TOTAL OUTFLOW	595143	565128	565440	565938	564674	566027	564742	565852	565360	564876	565597	565669
INTERPETATION												
RESERVOIR DEMAND	0	12050	12050	39550	39550	39550	52550	57762	57762	52550	55750	64250
SURFACE WATER USE 5)	237327	270578	270806	289957	299660	291370	321320	323289	340498	316269	307169	310052
PROJECT GAIN 6)	0	33251	33479	52630	62333	54043	83993	85962	103171	78942	69842	72725
SALINAS RIVER BASIN GAIN 7)	0	33251	33479	52630	62333	54043	83993	81723	98731	74452	69842	66410

1) INFLOW TO NACIMIENTO RESERVOIR FROM JERRETT RESERVOIR, AN UPSTREAM SITE ACCOUNTED SEPERATELY.
2) OTHER SURFACE WATER = SALINAS RIVER ABOVE BRADLEY + SAN LORENZO CREEK AND PORTION OF ARROYO SECO NOT CONTROLLED BY A RESERVOIR.
3) WELLS ARE USED TO SUPPLY DEMAND NOT MET BY SURFACE WATER.
4) PENNISULA TRANSFER INCLUDES PENNISULA, LAGUNA SECA AND FINCH CREEK DIVERSIONS.
5) SURFACE WATER USE = SUBTOTAL PROJECT DELIVERIES - WELL DELIVERIES + SAN LUIS OBISPO DELIVERIES + CONSERVATION (GW RECHARGE) + RES STORAGE CHANGE.
6) PROJECT GAIN = ALTERNATIVE SURFACE WATER USE - NO PROJECT.
7) SALINAS RIVER BASIN GAIN = PROJECT GAIN - PENNISULA TRANSFER.
8) WASTE TO OCEAN = ESTIMATED STREAMFLOW BELOW PROPOSED BLANCO ROAD DIVERSION. FOR THE NO PROJECT, IT INCLUDES UNUSED AVAILABLE WASTEWATER (19,450 AF/YR).

Alternative 2

Alternative 2 includes the Jerrett Reservoir site (135,000 AF usable capacity) and an East Side Diversion demand of 27,500 AF/yr. To analyze this alternative, the Jerrett Reservoir, which is located above Nacimiento, was operated in conjunction with the existing Nacimiento and San Antonio Reservoirs. It can be shown that reservoirs in series, such as Jerrett Reservoir and Nacimiento Reservoir, operate most efficiently when water is stored preferentially in the upper reservoir. This efficient operation occurs because upper reservoir spills can be captured and stored in the lower reservoir.

To mitigate fishery impacts at both reservoirs, Nacimiento's portion of the East Side demands were released from Jerrett Reservoir in even years and from Nacimiento Reservoir in odd years. This preferred operating procedure is over-ridden whenever there is a shortage. Similar to Alternative 1, releases to the East Side were only allowed to occur when total storage in existing and proposed structures exceeded 100,000 AF. The inflow to Nacimiento has been reduced by 40 percent to account for the portion of flow which goes to Jerrett. The inflow to Jerrett added to the inflow to Nacimiento is equal to the inflow to Nacimiento when Jerrett is not considered.

Project deliveries associated with this alternative are summarized in Table 5-3. As presented, the average yield to the SWIP is 91 percent (11,019 AF/yr). The average yield to the East Side is 87 percent (23,959 AF/yr). The Jerrett Reservoir increased the basin yield by 28,854 AF.

Alternative 3

Alternative 3 includes a 10-foot-diameter interlake tunnel to transmit water from Nacimiento Reservoir to San Antonio Reservoir, and an East Side diversion demand of 27,500 AF/yr.

Historically, Nacimiento Reservoir makes flood releases more often than San Antonio Reservoir. The interlake tunnel will allow water to be transferred to San Antonio Reservoir for storage purposes that would otherwise be released from Nacimiento Reservoir. The effects of the interlake tunnel were estimated by transferring water from Nacimiento to San Antonio whenever the water level in Nacimiento is within five feet of the minimum flood pool elevation. This elevation is 762 and the corresponding storage at Nacimiento is 181,500 AF. In addition, interlake transfers were limited to available conservation storage in San Antonio and the hydraulic capacity of the proposed interlake tunnel. Similar to Alternative 1, releases to the East Side were only allowed to occur when total storage in existing and proposed structures exceeded 100,000 AF.

Project deliveries associated with this alternative are summarized in Table 5-3. As presented, the average yield to the SWIP is 80 percent (9,698 AF/yr). The average yield to the East Side is 76 percent (20,786 AF/yr). The Interlake Tunnel Project resulted in a basin yield gain of 20,564 AF.

Alternative 4

Alternative 4 includes the spillway at Nacimiento Reservoir raised by 6.5 feet, the Arroyo Seco Greenfield Dam site (100,000 AF usable capacity) and a yearly project demand of 40,500 AF/yr for the East Side Diversion. To analyze this alternative, the Nacimiento Reservoir area capacity and rule curves were revised to reflect the raised spillway. The Arroyo Seco Greenfield Dam site was included in the model and the East Side demand simulated. Similar to Alternative 1, releases to the East Side were only allowed to occur when the total storage in existing and proposed structures exceeded 100,000 AF.

Project deliveries associated with this alternative are summarized in Table 5-3. As presented, the average yield to the SWIP is 91 percent (10,950 AF/yr). The average yield to the East Side is 89 percent (35,880 AF/yr). The combination of the raised spillway at Nacimiento and Arroyo Seco Dam resulted in an increase in yield of 50,514 AF for the 40,000 AF East Side demand.

Alternative 5

Alternative 5 includes the raised spillway at Nacimiento Reservoir, the Arroyo Seco 100,000 AF Greenfield site, an East Side Diversion demand of 40,500 AF/yr and the Laguna Seca Pipeline to the Peninsula. To analyze this alternative, the Nacimiento Reservoir area capacity and rule curves were revised to reflect the raised spillway. The Arroyo Seco 100,000 AF Greenfield Dam site was included in the model and both the East Side demand of 40,500 AF/yr and the Laguna Seca Pipeline demand were simulated. The pipeline runs from the Salinas River near Highway 68 and has a maximum capacity of 20 cfs. The Laguna Seca demand varies each year and averages 5,212 AF/yr from 1951 to 1985. The Laguna Seca demand was simulated as a combination of 1) water imported from Arroyo Seco via Laguna Seca, 2) Cal-Am pumping from Seaside Aquifer and 3) production from desalination, as delineated in CVSIM Model Run 10 (Monterey Peninsula Water Management District correspondence, 5/29/90).

Project deliveries associated with this alternative are summarized in Table 5-3 along with the other alternatives. As presented, the average yield to be SWIP is 90 percent (10,814 AF/yr).

The average yield to the East Side is 87 percent (35,432 AF/yr). The average yield to the Laguna Seca Pipeline is 81 percent (4,239 AF/yr). The project gain was 52,483 AF. The gain to the Salinas Basin was 48,244 AF.

Alternative 6

Alternative 6 includes the raised spillway at Nacimiento Reservoir, the Arroyo Seco 200,000 AF Greenfield site, an East Side Diversion demand of 40,500 AF/yr and the Laguna Seca Pipeline to the Peninsula. To analyze this alternative, the Nacimiento Reservoir area capacity and rule curves were revised to reflect the raised spillway. The Arroyo Seco 200,000 AF Greenfield site was included in the model and both the East Side demand of 40,500 AF/yr and the Laguna Seca Pipeline demand were simulated. The Laguna Seca Pipeline demand of 5,212 AF/yr was the same as Alternative 5.

Project deliveries associated with this alternative are summarized in Table 5-3. As presented, the average yield to the SWIP is 92 percent (11,086 AF/yr). The average yield to the East Side is 90 percent (36,493 AF/yr). The average yield to the Laguna Seca Pipeline is 85 percent (4,440 AF/yr). The project gain and Salinas Basin gain were 69,692 AF and 65,252 AF, respectively.

Alternative 7

Alternative 7 includes the raised spillway at Nacimiento Reservoir, the Arroyo Seco 100,000 AF Woodtick site, an East Side Diversion demand of 40,500 AF/yr and the Finch Creek Pipeline to the Carmel River. To analyze this alternative, the Nacimiento Reservoir area capacity and rule curves were revised to reflect the raised spillway. The Arroyo Seco 100,000 AF Woodtick site was included in the model and both the East Side demand of 40,500 AF/yr and the Finch Creek demand (pipe capacity of 20 cfs) were simulated. The Finch Creek demand varies each year and averages 8,550 AF/yr from 1951 to 1985. The Finch Creek demand used was the Arroyo Seco via Cachagua demand CVSIM Model Run 11 (Monterey Peninsula Water Management District correspondence 5/29/90). The diversion was directly from the Arroyo Seco Reservoir and not subject to conveyance losses associated with Salinas River diversions.

Project deliveries associated with this alternative are summarized in Table 5-3. As presented, the average yield to the SWIP is 90 percent (10,816 AF/yr). The average yield to the East Side is 88 percent (35,570 AF/yr). The average yield for the Finch Creek Pipeline is 53 percent

(4,490 AF/yr). The project gain and Salinas Basin Gain were 45,463 AF and 40,973 AF, respectively.

Alternative 8

Alternative 8 includes the Jerrett Reservoir site (135,000 AF) and a Salinas Valley Municipal and Industrial (M&I) demand of 43,700 AF/yr. To analyze this alternative, Jerrett Reservoir was operated in conjunction with the Nacimiento and San Antonio Reservoirs. As with Alternative 2, to mitigate fishery impacts at both Nacimiento and Jerrett Reservoirs, the M&I demands were released from Jerrett Reservoir in even years and Nacimiento Reservoir in odd years. Again, this preferred operating procedure is over-ridden whenever there is a shortage. To reduce the M&I demands impact on SWIP deliveries, releases for M&I were only allowed to occur when total storage in all existing and proposed structures exceeded 100,000 AF. As with Alternative 2, the inflow to Nacimiento has been reduced by 40 percent to account for the portion of flow which goes to Jerrett.

Project deliveries associated with this alternative are summarized in Table 5-3. As presented, the average yield from the Salinas River to the SWIP is 84 percent (10,096 AF/yr). The average yield from the Salinas River for M&I deliveries is 76 percent (33,227 AF/yr). The Salinas Basin Gain for the Jerrett Reservoir and the Salinas Valley M&I demand was 36,363 AF.

Alternative 9

Alternative 9 includes the Jerrett Reservoir site (135,000 AF), a Salinas Valley M&I demand of 43,700, and a Peninsula demand of 8,500 AF/yr. To analyze this alternative, Jerrett Reservoir was operated in conjunction with the Nacimiento and San Antonio Reservoirs. Again, to mitigate fishery impacts at both Nacimiento and Jerrett Reservoirs, the M&I demands were released from Jerrett Reservoir in even years and from Nacimiento Reservoir in odd years. This preferred operating procedure is over-ridden whenever there is a shortage. To reduce the M&I and Peninsula demand impacts on the SWIP deliveries, releases for M&I and the Peninsula were only allowed to occur when total storage in existing and proposed structures exceeded 100,000 AF. As with Alternatives 2 and 8, the inflow to Nacimiento has been reduced by 40 percent to account for the portion of flow which goes to Jerrett.

Project deliveries associated with this alternative are summarized in Table 5-3. As presented, the average yield to the SWIP is 83 percent (10,024 AF/yr). The average yield for both the M&I

and Peninsula is 74 percent (32,309 AF/yr to M&I and 6,284 AF/yr to the Peninsula). The project and Salinas Basin Gain were 39,246 AF and 32,931 AF, respectively

Summary

The following discussion is provided to assist in the review and interpretation of the results presented herein:

- The proposed project deliveries are relatively insensitive to the impact on the SWIP which is controlled by specifying a minimum storage required in all reservoirs before other releases are allowed to occur. When the model was allowed to deliver the maximum available to the East Side for Alternative 1 (78 percent of the demand), the impact on the SWIP was 6 percent. The selected total storage in existing reservoirs of 100,000 AF before other releases are allowed, resulted in an impact of 3 percent on the SWIP and an East Side delivery of 21,102 AF/yr (77 percent of the demand).
- Alternative 1, which includes the raised spillway at Nacimiento resulted in less SWIP delivery than Alternative 0 (Base Condition) due to the addition of the East Side demand (27,500 AF/yr).
- Alternative 2, which includes Jerrett Reservoir, provides more yield to both the SWIP and the East Side than Alternative 1. The Jerrett Reservoir increases the storage capacity of the Nacimiento drainage more than the raised spillway at Nacimiento. The available capacity of Jerrett Reservoir is 135,000 AF.
- Alternative 3, which includes the interlake tunnel between Nacimiento and San Antonio Reservoirs, does not add new capacity and therefore provides less firm yield to both the SWIP and the East Side then Alternative 1 but results in slightly more Salinas River Basin Gain resulting from higher conservation releases (groundwater recharge).
- Alternative 4, which includes the 100,000 AF Arroyo Seco Greenfield dam site and the raised spillway at Nacimiento, provides more yield to both the SWIP and the East Side than Alternative 1. The Greenfield Reservoir increases the available storage capacity of the system by 115,500 AF by allowing the Arroyo Seco drainage to be regulated. The resultant yield is greater than Alternative 2, Jerrett Reservoir, because the Greenfield Dam allows the Arroyo Seco drainage to be

regulated, when it previously was not. The higher East Side demand (40,500 versus 27,500) also contributes to the higher yields.

- Alternative 5, which includes the 100,000 AF Arroyo Seco Greenfield dam site and the raised spillway at Nacimiento, provides less yield to both the SWIP and the East Side then Alternative 4 due to the addition of the Laguna Seca Pipeline demand.

- Alternative 6, which includes the 200,000 AF Arroyo Seco Greenfield dam site and the raised spillway at Nacimiento, provides more yield to the SWIP, the East Side and Laguna Seca than Alternatives 4 and 5. This alternative added an extra 100,000 AF of reservoir capacity to the system.

- Alternative 7, which includes the 100,000 AF Arroyo Seco Woodtick site and the raised spillway at Nacimiento, provides slightly more yield to the SWIP and the East Side then the 100,000 AF Greenfield site in Alternatives 4 and 5. This alternative cannot deliver as high a percent of the Finch Creek demand as Alternative 5 provides for the Laguna Seca demand. When an Arroyo Seco site is considered, all the SWIP demand is placed on Arroyo Seco, and Nacimiento and San Antonio Reservoirs are used as they have historically unless the Arroyo Seco Reservoir is short. Because the Finch Creek demand is taken directly out of the Arroyo Seco Reservoir, when Arroyo Seco is short, Finch Creek is short. However, the Laguna Seca demand can be met with water from Nacimiento and San Antonio Reservoirs when required. A different priority system might be expected to result in different delivery estimates. The difference in simulated demand conditions (Carmel River versus Cal-Am shortages) may also have an influence.

- Alternative 8, which includes Jerrett Reservoir, provides less firm yield to the SWIP and the M&I than Alternative 2 which also includes Jerrett Reservoir. The 43,700 AF/yr M&I demand is significantly greater than the 27,500 AF/yr East Side demand in Alternative 2. The Salinas River Basin Gain, however, is greater by 7,500 AF for Alternate 8, indicating the benefits of a conjunctive use program.

- Alternative 9, which includes Jerrett Reservoir, provides slightly less firm yield to the SWIP and M&I demand than Alternative 8. This is due to the addition of the Peninsula demand. The M&I and Peninsula demands each vary monthly. They were analyzed as a combined demand with equal priorities. The percent supplied to each demand, presented in Table 5-3, was estimated using the

yearly ratio of the demands, not the actual monthly demands. This assumption may impact delivery estimates to each source but does not impact reservoir yields.

GROUNDWATER MODEL RESULTS

Alternatives 4 and 9 were selected to conduct an analysis of the increased project yield upon the Salinas Valley Groundwater Basin. The approach used to estimate the potential impact of Alternatives 4 and 9 was to revise the existing groundwater analyses previously performed (Boyle, June 1989) to include the additional management actions associated with Alternatives 4 and 9.

Alternative 4

To analyze this alternative's potential impact on the Salinas Valley groundwater system, the following revisions were made to Analysis 3A for the SWIP.

- Reservoir releases associated with Alternative 4's demands and their impact on SWIP project deliveries were included.
- Municipal pumping associated with Alternative 4 was revised to reflect surface water deliveries when available. When surface water deliveries were unavailable, groundwater was pumped.
- Agricultural pumping associated with Alternative 4 was revised to reflect surface water deliveries when available. When surface water deliveries were unavailable, groundwater continued to be pumped from the East Side and SWIP project areas.

The annual groundwater balance summary of the model results are shown on Table 5-5. The average groundwater basin overdraft is calculated as the total seawater intrusion (-1,697) minus the inflow-outflow (+2,601), or -4,298 AF. The values indicate that, on the average, there is no overdraft, and there is a gain in aquifer storage over the 1951-85 simulation period. A plot of the annual overdraft is presented in Figure 5-1.

TABLE 5-5

GROUNDWATER BALANCE SUMMARY
ALTERNATIVE 4 - ARROYO SECO RESERVOIR
(AF/yr)

WATER YEAR	STREAM RECH	APPLIED RECH	BOUNDRY	SEAWATER INTRUSION LAYER 1	SEAWATER INTRUSION LAYER 2	SEAWATER INTRUSION LAYER 3	SEAWATER INTRUSION TOTAL	TOTAL INFLOW	PUMPING LAYER 1	PUMPING LAYER 2	PUMPING LAYER 3	PUMPING TOTAL	TOTAL BOUNDRY OUTFLOW	TOTAL OUTFLOW	INFLOW-OUTFLOW
1951	231111.	181664.	61603.	4152.	2644.	617.	7413.	481791.	442755.	93216.	17.	535988.	3.	535991.	-54200.
1952	334254.	200344.	63947.	165.	799.	99.	1063.	599608.	392922.	86096.	0.	479018.	110.	479128.	120480.
1953	307776.	159185.	43506.	-1.	469.	-49.	419.	510886.	404541.	88761.	0.	493302.	164.	493466.	17420.
1954	271057.	168265.	52545.	411.	640.	-102.	949.	492816.	402207.	88689.	0.	490896.	176.	491072.	1744.
1955	155100.	182642.	58211.	529.	767.	-80.	1216.	397169.	415490.	91771.	95.	507356.	171.	507527.	-110358.
1956	347229.	185418.	53982.	-1718.	-324.	-203.	-2245.	584384.	396230.	88155.	0.	484385.	229.	484614.	99770.
1957	277676.	165019.	56364.	-548.	53.	-210.	-705.	498354.	403235.	89664.	0.	492899.	235.	493134.	5220.
1958	234091.	220571.	83900.	-1972.	-451.	-294.	-2717.	535845.	387667.	87404.	0.	475071.	311.	475382.	60463.
1959	273097.	165353.	46303.	-487.	-37.	-281.	-805.	483948.	403528.	90178.	0.	493706.	300.	494006.	-10058.
1960	278392.	154658.	42640.	-641.	-94.	-283.	-1018.	474672.	408468.	91270.	0.	499738.	302.	500040.	-25368.
1961	132821.	163199.	49337.	-98.	348.	-224.	26.	345383.	436183.	94687.	68.	530938.	247.	531185.	-185802.
1962	349781.	173405.	53150.	14.	378.	-157.	235.	576571.	391741.	89094.	0.	480835.	189.	481024.	95547.
1963	291324.	191623.	70604.	-1473.	-310.	-210.	-1993.	551558.	397296.	90128.	0.	487424.	233.	487657.	63901.
1964	273822.	164417.	57537.	-455.	114.	-223.	-564.	495212.	405588.	91839.	0.	497427.	246.	497673.	-2461.
1965	267463.	177479.	66744.	-1389.	-389.	-303.	-2081.	509605.	401991.	91481.	0.	493472.	320.	493792.	15813.
1966	236283.	170767.	46955.	-2157.	-752.	-374.	-3283.	450722.	412589.	92739.	0.	505328.	386.	505714.	-54992.
1967	287354.	204857.	71366.	-2742.	-868.	-390.	-4000.	559577.	404491.	92292.	0.	496783.	401.	497184.	62393.
1968	277186.	150231.	49772.	-921.	-160.	-299.	-1380.	475809.	412752.	94334.	0.	507086.	316.	507402.	-31593.
1969	257180.	200643.	67580.	-3165.	-1128.	-418.	-4711.	520692.	393075.	91234.	0.	484309.	428.	484737.	35955.
1970	266339.	170647.	57078.	-1471.	-459.	-371.	-2301.	491763.	416347.	95612.	0.	511959.	384.	512343.	-20580.
1971	277896.	173211.	53710.	-2378.	-846.	-388.	-3612.	501205.	404302.	93816.	0.	498118.	400.	498518.	2687.
1972	264710.	148858.	37647.	-962.	-196.	-323.	-1481.	449734.	419350.	96093.	0.	515443.	339.	515782.	-66048.
1973	269508.	214610.	70860.	-2833.	-951.	-387.	-4171.	550807.	393370.	92494.	0.	485864.	399.	486263.	64544.
1974	249157.	205191.	77634.	-3307.	-1218.	-433.	-4958.	527024.	404599.	94770.	0.	499369.	445.	499814.	27210.
1975	253214.	182924.	62922.	-1937.	-653.	-430.	-3020.	496040.	402141.	94643.	0.	496784.	442.	497226.	-1186.
1976	287160.	150815.	52325.	-763.	-169.	-337.	-1269.	489031.	413100.	96862.	0.	509962.	353.	510315.	-21284.
1977	131055.	152748.	43204.	825.	852.	-175.	1502.	328509.	442245.	103515.	127.	545887.	206.	546093.	-217584.
1978	382917.	220506.	66541.	-2229.	-451.	-208.	-2888.	667076.	393116.	93884.	0.	487000.	232.	487232.	179844.
1979	274948.	176965.	59059.	-745.	-85.	-253.	-1083.	509889.	405328.	96441.	0.	501769.	274.	502043.	7846.
1980	272366.	186963.	71698.	-1928.	-458.	-313.	-2699.	528328.	402099.	96190.	0.	498289.	330.	498619.	29709.
1981	278789.	159506.	46406.	-778.	-153.	-292.	-1223.	483478.	411893.	98200.	0.	510093.	310.	510403.	-26925.
1982	257646.	205058.	79170.	-2697.	-842.	-365.	-3904.	537970.	406347.	97539.	0.	503886.	378.	504264.	33706.
1983	241975.	223538.	90221.	-5501.	-1983.	-539.	-8023.	547711.	390448.	95076.	0.	485524.	545.	486069.	61642.
1984	260528.	156270.	48578.	-2462.	-949.	-503.	-3914.	461462.	413663.	99422.	0.	513085.	510.	513595.	-52133.
1985	282084.	163744.	53368.	-1404.	-398.	-369.	-2171.	497025.	411570.	99362.	0.	510932.	383.	511315.	-14290.
AVG.	266665.	179180.	59042.	-1230.	-207.	-259.	-1697.	503190.	406933.	93341.	9.	500284.	306.	500589.	2601.

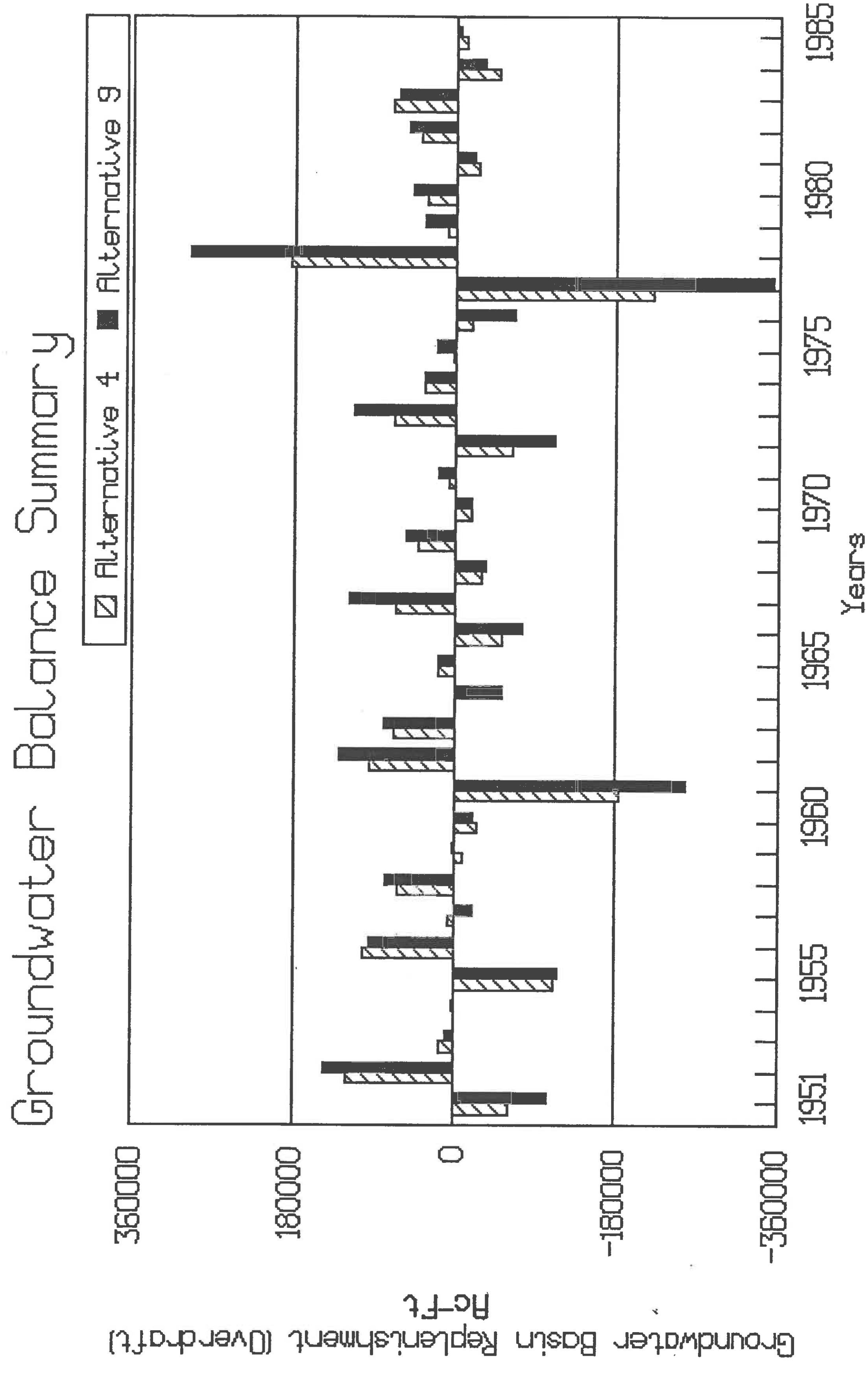
Groundwater Balance Summary
Alternative 4
Alternative 9
Groundwater Basin Replenishment (Overdraft)
Ac-Ft
360000
180000
0
-180000
-360000
1951
1955
1960
1965
1970
1975
1980
1985
Years

FIGURE 5-1

Alternative 9

The following revisions were made to the SWIP Analysis 3A for analyzing this alternative's potential impact:

- Reservoir releases associated with Alternative 9's demands and their impact on SWIP project deliveries were included.
- Municipal pumping associated with Alternative 9 was revised to reflect surface water deliveries when available. When surface water deliveries were unavailable to any of Alternative 9's municipal demands (Marina, Fort Ord, Salinas, East Side North County, and the Peninsula), groundwater was pumped.
- Agricultural pumping associated with Alternative 9's impact on the SWIP was revised to reflect surface water deliveries when available. When surface water deliveries were unavailable, groundwater continued to be pumped from the SWIP project area.

Shown on Table 5-6 is the model annual groundwater balance summary. On the average, the basin overdraft was eliminated with a 3,364 AF replenishment. The annual overdraft is also plotted on Figure 5-1 for Alternative 9.

Summary

The impact of Alternatives 4 and 9 on seawater intrusion for years 1951-85 is summarized and compared to the No Project and SWIP in Table 5-7. As presented, both Alternatives 4 and 9 eliminate seawater intrusion and Salinas River groundwater basin overdraft by reducing pumping through better utilization of surface water supplies.

TABLE 5-6

GROUNDWATER BALANCE SUMMARY
ALTERNATIVE 9 - JERRETT RESERVOIR
(AF/YR)

WATER YEAR	STREAM RECH	APPLIED RECH	BOUNDRY	SEAWATER INTRUSION LAYER 1	SEAWATER INTRUSION LAYER 2	SEAWATER INTRUSION LAYER 3	SEAWATER INTRUSION TOTAL	TOTAL INFLOW	PUMPING LAYER 1	PUMPING LAYER 2	PUMPING LAYER 3	PUMPING TOTAL	BOUNDRY	TOTAL OUTFLOW	INFLOW-OUTFLOW
1951	206308.	186007.	61847.	2323.	1940.	514.	4777.	458939.	459602.	98953.	89.	558644.	30.	558674.	-99735.
1952	371276.	207552.	64686.	-804.	366.	32.	-406.	643108.	416933.	80582.	0.	497515.	128.	497643.	145465.
1953	307223.	167983.	43679.	-366.	275.	-87.	-178.	518707.	431287.	80190.	0.	511477.	172.	511649.	7058.
1954	289359.	175958.	52562.	272.	627.	-79.	820.	518699.	428562.	86026.	0.	514588.	161.	514749.	3950.
1955	166084.	185219.	58617.	-384.	441.	-93.	-36.	409884.	425729.	98847.	75.	524651.	168.	524819.	-114935.
1956	352041.	192889.	53621.	-1542.	-208.	-152.	-1902.	596649.	419772.	84083.	0.	503855.	185.	504040.	92609.
1957	261846.	173450.	56567.	-902.	0.	-170.	-1072.	490791.	429121.	82529.	0.	511650.	200.	511850.	-21059.
1958	259123.	227512.	84491.	-2429.	-553.	-262.	-3244.	567882.	411809.	83825.	0.	495634.	279.	495913.	71969.
1959	291905.	173327.	46135.	-637.	68.	-213.	-782.	510585.	429072.	80415.	0.	509487.	236.	509723.	862.
1960	290003.	162094.	43399.	-1418.	-322.	-254.	-1994.	493502.	434255.	82084.	0.	516339.	273.	516612.	-23110.
1961	77128.	164911.	49247.	361.	748.	-133.	976.	292262.	435553.	112262.	84.	547899.	174.	548073.	-255811.
1962	395692.	180428.	52988.	246.	607.	-40.	813.	629921.	413665.	86861.	0.	500526.	116.	500642.	129279.
1963	316439.	199794.	69808.	-1107.	58.	-75.	-1124.	584917.	421700.	84166.	0.	505866.	138.	506004.	78913.
1964	240343.	173403.	58404.	-1322.	-181.	-193.	-1696.	470454.	430567.	92658.	0.	523225.	219.	523444.	-52990.
1965	281170.	186581.	66647.	-1478.	-263.	-205.	-1946.	532452.	426521.	88887.	0.	515408.	228.	515636.	16816.
1966	224402.	177418.	46698.	-1981.	-535.	-273.	-2789.	445729.	430367.	93163.	0.	523530.	289.	523819.	-78090.
1967	345686.	212912.	70806.	-2465.	-597.	-283.	-3345.	626059.	427132.	84521.	0.	511653.	299.	511952.	114107.
1968	284836.	158961.	48880.	-322.	229.	-180.	-273.	492404.	437644.	88180.	0.	525824.	209.	526033.	-33629.
1969	280021.	209092.	67103.	-3020.	-891.	-314.	-4225.	551991.	416080.	84580.	0.	500660.	328.	500988.	51003.
1970	271794.	178780.	56447.	-1205.	-187.	-290.	-1682.	505339.	441171.	83838.	0.	525009.	307.	525316.	-19977.
1971	293127.	180758.	53340.	-2214.	-685.	-309.	-3208.	524017.	427925.	81860.	0.	509785.	325.	510110.	13907.
1972	234207.	155978.	37708.	-1013.	-116.	-275.	-1404.	426489.	440219.	97892.	32.	538143.	292.	538435.	-111946.
1973	320802.	220728.	70372.	-2627.	-711.	-313.	-3651.	608251.	415595.	82588.	0.	498183.	328.	498511.	109740.
1974	254008.	210285.	78240.	-3887.	-1303.	-413.	-5603.	536930.	427759.	82268.	0.	510027.	423.	510450.	26480.
1975	271593.	190001.	64204.	-2972.	-1043.	-410.	-4425.	521373.	424927.	81959.	0.	506886.	421.	507307.	14066.
1976	263928.	161743.	52668.	-1320.	-175.	-314.	-1809.	476530.	436883.	107431.	53.	544367.	329.	544696.	-68166.
1977	22641.	155259.	43274.	3482.	2453.	84.	6019.	227193.	441092.	134248.	249.	575589.	83.	575672.	-348479.
1978	500720.	230103.	65431.	-1398.	57.	36.	-1305.	794949.	412642.	87670.	0.	500312.	90.	500402.	294547.
1979	302535.	185115.	58149.	-119.	417.	-89.	209.	546008.	427709.	82988.	0.	510697.	146.	510843.	35165.
1980	287741.	193338.	71237.	-1772.	-269.	-184.	-2225.	550091.	424030.	82544.	0.	506574.	211.	506785.	43306.
1981	287258.	165775.	45500.	-341.	246.	-194.	-289.	498244.	434507.	84370.	0.	518877.	219.	519096.	-20852.
1982	273612.	211651.	78578.	-2439.	-599.	-262.	-3300.	560541.	428321.	83525.	0.	511846.	280.	512126.	48415.
1983	239954.	226653.	90336.	-5616.	-2028.	-502.	-8146.	548797.	410887.	80879.	0.	491766.	507.	492273.	56524.
1984	278630.	164071.	48063.	-2208.	-745.	-439.	-3392.	487372.	435943.	85041.	0.	520984.	449.	521433.	-34061.
1985	287279.	171692.	54281.	-2142.	-706.	-373.	-3221.	510031.	433507.	84798.	0.	518305.	387.	518692.	-8661.
AVG.	275163.	186212.	58972.	-1279.	-102.	-192.	-1573.	518774.	428243.	88477.	17.	516737.	247.	516983.	1791.

NOTE: 1) BOUNDARY FLOW DOES NOT INCLUDE SEA WATER INTRUSION; 2) 180-FOOT PUMPING INCLUDES THE UNCONFINED; 3) APPLIED RECHARGE IS FROM RAIN AND AGRICULTURAL RETURN FLOW

TABLE 5-7

IMPACT ON SEAWATER INTRUSION[1]

Alternative Analysis	Description	Average Seawater Intrusion (AF/yr)[2,3] 180-foot	400-foot	Deep	Total	% Decrease[4]	System Overdraft (AF/yr)[5]
	No Project	14,901	10,526	3,407	28,834	0.0	44,932
	SWIP	2,309	2,034	326	4,669	84	15,725
4	Arroyo Seco Greenfield Site and 40,500 AF/yr East Side Demand	-1,230	-207	-259	-1,697	106	-4,298
9	Jerrett Reservoir 43,750 M&I and 8,500 Peninsula Demand	-1,279	-102	-192	-1,573	105	-3,364

[1]Significant figures presented to nearest acre-foot for consistency between tables only.

[2]Average years 1951-85.

[3]Negative values indicate flow from the groundwater basin to the sea.

[4]% Decrease = (total seawater intrusion for Analysis 1-Analysis n) / (total seawater intrusion for Analysis 1) x 100.

[5]Does not include replenishment by seawater intrusion.

CHAPTER 6

EVALUATION CRITERIA

One of the purposes of this planning study is the development of information which will permit a systematic evaluation of alternative water supply projects and project groupings in order to meet the objective of satisfying county-wide supplemental water needs. The Water Capital Facilities Plan consists of those alternatives or combinations of alternatives which are the most technically feasible, have less severe environmental impacts and developmental constraints, are reasonably cost effective, and offer a high degree of reliability.

Factors to be considered in alternative project evaluation fall into four categories as listed in Table 6-1.

Economic Evaluation

Construction and Capital Costs

Construction cost data are developed on the basis of present-day cost levels (San Francisco ENR Construction Cost Index of approximately 5800). Capital costs include construction costs plus a 35 percent allowance for contingencies, engineering, legal, financing and administration. Inflation and interest factors are considered later in Chapter 8 (Financial Analysis).

Operation and Maintenance Costs

O&M costs are comprised of all costs of operation and maintenance, including expenditures for labor repair, power, chemicals, supplies, and administration. O&M costs are also based on an ENR CCI of 5800.

Total Annual Cost

Total annual costs include the sum of operating costs and the annual cost of capital recovery. The total of these costs is presented for the year 2010. Interest rate is assumed to be 7.5 percent, and the economic recovery period is assumed at 20 years (25 years for projects with a capital cost greater than $50 million).

TABLE 6-1

PROJECT EVALUATION CRITERIA

A) ECONOMIC CRITERIA
- Construction and Capital Costs
- Operation and Maintenance Costs
- Total Annual Cost
- Present Worth
- Unit Water Cost
- Unit Capital Cost

B) FUNCTIONAL CRITERIA
- Response to Critical Demand
- Technical Feasibility (established, problems, constraints)
- Reliability of Supply (high, moderate, low)
- Flexibility and Independence (high, moderate, low)
- Implementation Period (1-10 years)
- Direct Benefits (definite, problems, questionable)
- Water Quality (excellent, good, acceptable)

C) ENVIRONMENTAL CRITERIA
- Critical Impacts (e.g. fisheries, recreation)
- Mitigation Requirements/Opportunities
- Endangered Species Protection
- Growth Inducement/Accommodation
- Land Use Constraints

D) INSTITUTIONAL CRITERIA
- Regional Benefits
- Cost-Effectiveness
- Public Perception and Acceptance
- Implementing Agencies

Present Worth

In order to account for the reduced present value of deferred construction, and to compensate for varying project lives, present worth is computed for all costs of the Water Capital Facilities Plan through the year 2010. Present worth of a plan is the amount of funds at 1990 price levels which would be invested initially in order to meet all the financial needs of the project, including operating costs, as they occur from year to year.

Unit Water Cost

Unit water costs are derived by dividing the total annual cost of each project by the fully operating annual project yield, and are expressed in units of $/acre-foot ($/AF).

Unit Capital Cost

Another important economic evaluation criteria is the unit capital cost, calculated by dividing a project's capital cost by the corresponding project yield, expressed as $/AF/yr. This criterion is an indicatory of the relative value of capital outlay and resulting supplemental water supply among various projects.

Functional Evaluation

Assuming that the water entities in the county can afford the capital and operating costs of a project, factors other than cost may determine the most suitable water resources management plan. These factors include: response to critical demand, technical feasibility, reliability, implementation period, direct benefits, and water quality.

Environmental Evaluation

Any water supply project must consider environmental criteria as a critical element of project implementation. Evaluation of impacts of each project is included in Appendix B, and environmental and permitting requirements are delineated in Appendix A. Environmental issues are summarized in Chapter 9.

Institutional Evaluation

Another critical element leading to successful development of the Water Capital Facilities Plan is institutional implementation. Consideration is given to regional benefits of the Plan, cost-effectiveness of projects, programs, and the overall plan, public perception and acceptance, and determination of implementing agencies.

CHAPTER 7

PROJECTS SCREENING

Analysis of Alternative Projects

The potential water supply projects listed in Table 4-1 have been analyzed by applying the various evaluation criteria discussed in Chapter 6. In order to prioritize and determine the more viable projects for inclusion in the Water Capital Facilities Plan, these projects are screened according to economic and noneconomic factors, such as functional, environmental, and institutional issues.

The economic analysis of alternative projects is summarized in Table 7-1, which delineates each of the 34 projects, corresponding project yields as discussed in Chapter 5, and the following economic evaluation factors: capital cost, unit capital cost, capital recovery, operation and maintenance costs, total annual costs, and unit water costs. To properly evaluate the costs of new water supplies, certain projects must be grouped together to form various programs. This is demonstrated in Table 7-2 for the following programs:

A - Seawater Intrusion Program

B - Arroyo Seco Program (Greenfield-Low) - East Side and North County M&I, and Peninsula

C - Arroyo Seco Program (Pools) - East Side, North County M&I, and Peninsula

D - Arroyo Seco Program (Greenfield-Low) - East Side, North County M&I, and Peninsula

E - Arroyo Seco Program (Greenfield-High) - East Side, North County M&I, and Peninsula

F - Arroyo Seco Program (Woodtick) - East Side, North County M&I, and Peninsula

G - Raise Nacimiento Spillway Program - East Side and North County M&I

H - Upper Nacimiento Program - Jerrett, East Side, and North County M&I

I - Interlake Tunnel Program - East Side and North County M&I

J - Widen San Antonio and Nacimiento Spillways Program

K - Upper Nacimiento Program - Jerrett and Salinas Valley M&I

L - Upper Nacimiento Program - Jerrett, Salinas Valley M&I, and Peninsula

M - Arroyo Seco Program (Greenfield-Low) - Salinas Valley M&I

TABLE 7-1

SUMMARY OF ECONOMIC ANALYSIS

Potential Project			Capital Cost		Annual Cost ($M/Yr)			
Project Number	Description	Project Yield (AF/yr)	Project Capital ($M) [a]	Unit ($/AF) [b]	Capital Recovery [c]	O&M	Total [d]	Unit Water Cost ($/AF/yr) [e]
1	Widen San Antonio Spillway	700	7	21,400 [q]	0.65	0.01	0.66	2,130 [q]
2	Widen Nacimiento Spillway	--- [p]	8	21,400 [q]	0.82	0.01	0.83	2,130 [q]
3	Raise Nacimiento Spillway	19,150 [v]	9	4,180 [q]	0.88	0	0.88	527 [q]
4	Nacimiento - San Antonio Interlake Tunnel [f]	20,500 [v]	32	5,020 [q]	3.15	(0.10)	3.05	599 [q]
5	Upper Nacimiento River Project - Jerrett Site [g]	36,400 [h]	71	5,880 [q]	6.39	0.27	6.66	698 [q]
6	Arroyo Seco Dam - Pools Site	45,500 [i]	87	4,620 [q]	7.83	(0.20)	7.63	531 [q]
7	Arroyo Seco Dam - Woodtick Site	45,000 [i]	156	6,130 [q]	14.04	(0.01)	14.03	673 [q]
8	Arroyo Seco Dam - Greenfield Site (High)	69,700 [j]	212	5,350 [q]	19.08	0.15	19.23	557 [q]
9	Arroyo Seco Dam - Greenfield Site (Low)	50,500 [k]	155	4,990 [q]	13.95	0.29	14.24	529 [q]
10	Arroyo Seco - Salinas River Conveyance Canal [t]	--	10 7	[u]	0.98 0.73	0.20 0.10	1.18 0.83	[u]
11	Gabilan Creek Dam - Sugarloaf Site	1,300	20	15,400	1.96	0.10	2.06	1,584
12	Gabilan Creek Dam - Mud Creek Site	1,300	19	14,600	1.86	0.10	1.96	1,507
13	New Los Padres Dam	5,200	113	21,700	10.17	0.82	10.99	2,113
14	Canada Reservoir Project	5,300 7,600	143 159	27,000 20,900	12.78 14.22	1.78 2.30	14.56 16.52	2,747 2,174

TABLE 7-1 (continued)

Potential Project			Capital Cost		Annual Cost ($M/Yr)			
Project Number	Description	Project Yield (AF/yr)	Project Capital ($M) [a]	Unit ($/AF/yr) [b]	Capital Recovery [c]	O&M	Total [d]	Unit Water Cost ($/AF) [e]
15	Seawater Intrusion Program - Fort Ord - Marina Potable Water Supply System	---	25	---	2.45	0.90	3.35	---
16	Seawater Intrusion Program - Castroville Irrigation Water Supply Project	13,800	43		4.21	0.72	4.93	
17	Seawater Intrusion Program - Regional Water Reclamation Supply	19,450	20		1.96	0.93	2.89	
Subtotal - SWIP [l]		33,250	88	2,650 [q]	8.62	2.55	11.17	336 [q]
18	Carmel/Pebble Beach Water Reclamation Project	690	14	20,300	1.37	0.21	1.58	2,290
19	Pacific Grove Water Reclamation Project	100	2	20,000	0.20	0.02	0.22	2,200
20	Salinas Industrial Water Reclamation Project	---	---	---	---	---	---	---
21	Upper Salinas Valley Water Reclamation Program	---	--	---	---	---	---	---
22	San Felipe Project (Pajaro Valley)	8,000	36	4,500	3.53	0.52	4.05	506
23	Urban Conservation - Peninsula	500	---	---	---	0.81	0.81	1,620
	Salinas and Pajaro Valleys	1,200	---	---	---	0.26	0.26	217
24	Agricultural Water Management - Phase I	2,000	2	1,000	0.20	0.55	0.75	375
25	Agricultural Water Management - Phase II	6,000	8	1,300	0.78	5.50	6.28	1,047
26	Groundwater Development - Seaside	1,200	1	800	0.10	0.10	0.20	167

TABLE 7-1 (continued)

Potential Project			Capital Cost		Annual Cost ($M/Yr)			
Project Number	Description	Project Yield (AF/yr)	Project Capital ($M) [a]	Unit ($/AF/yr) [b]	Capital Recovery [c]	O&M	Total [d]	Unit Water Cost ($/AF) [e]
27	Seawater Desalination - Monterey	2,000 [o]	17	8,500	1.67	3.40	5.07	2,535
28	Brackish Water Desalination - Marina	1,000	2	2,000	0.20	0.47	0.67	670
29	Salinas Valley M & I Water Delivery Project	42,000 [q]	143	7,260 [q]	12.87	5.87	18.74	805 [q]
30	Peninsula Participation in Salinas Valley M & I Project	8,500 [m]	34	6,320 [q]	3.33	1.73	5.06	776 [q]
31	East Side Irrigation Water Supply Project	21,000 34,000 [m]	33 43 [r]	(u) (u)	3.23 4.21	1.05 1.59	4.28 5.80 [s]	(u)
32	North County M & I Water Supply Project	6,500 [m]	38	(u)	3.72	1.22	4.94	(u)
33	Laguna Seca Pipeline to Peninsula [n]	(u)	64	(u)	5.76	1.41	7.17	(u)
34	Finch Creek Pipeline to Carmel River	(u)	23	(u)	2.25	1.46	3.71	(u)

TABLE 7-1 (continued)

Footnotes

(a) Does not include financial costs or inflation adjustment, which will be included in financial analysis.
(b) Capital cost divided by annual yield.
(c) Based on 7.5% interest, 20-year recovery (25 years for projects with capital cost greater than $50 million).
(d) Capital recovery plus operation and maintenance.
(e) Total annual cost divided by annual yield.
(f) Tunnel above Dams Alternative.
(g) Development of the Pebblestone site or the San Migelito site are not considered viable; refer to Project No. 5 description in Appendix B.
(h) Program yield with Project 29.
(i) Program yield with Projects 3, 10, 31, 32, and 34.
(j) Program yield with Projects 3, 10, 31, 32, and 33.
(k) Program yield with Projects 3, 10, 31, and 32.
(l) Program yield with Projects 15, 16, and 17.
(m) Conveyance delivery rate only.
(n) 20 cfs capacity.
(o) Based on 60% operational load factor; plant product water capacity is 3,400 AFY (3 mgd).
(p) Corrects a deficiency to maintain present yield.
(q) Program cost as shown on Table 7-2.
(r) In conjunction with Projects 7, 8, or 9; $33 million in conjunction with Projects 3, 4, or 5.
(s) In conjunction with Projects 7, 8 or 9; $4.23 million/year in conjunction with Projects 3, 4, or 5.
(t) With and without fishery provisions.
(u) Varies by program.
(v) Program yield.

TABLE 7-2

PROGRAM SUMMARY

	Program/Project No.	Program Yield (AF/Yr)	Capital Cost Project ($M)	Capital Cost Unit ($/AF)	Annual Cost Total ($M/Yr)	Annual Cost Unit ($/AF/Yr)
A.	Seawater Intrusion Program	33,250	88	2,650	11.17	336
	15		25		3.35	
	16		43		4.93	
	17		20		2.89	
B.	Arroyo Seco-Greenfield (Low)	50,500	252	4,990	26.69	529
	3		9		0.88	
	9		155		14.24	
	10		7		0.83	
	31		43		5.80	
	32		38		4.94	
C.	Arroyo Seco - Pools	45,500	210	4,620	24.14	531
	3		9		0.88	
	6		87		7.63	
	10		10		1.18	
	31		43		5.80	
	32		38		4.94	
	34		23		3.71	
D.	Arroyo Seco - Greenfield (Low)	52,500	316	6,020	33.86	645
	3		9		0.88	
	9		155		14.24	
	10		10		1.18	
	31		43		5.80	
	32		38		4.94	
	33		64		7.17	
E.	Arroyo Seco - Greenfield (High)	69,700	373	5,350	38.85	557
	3		9		0.88	
	8		212		19.23	
	10		7		0.83	
	31		43		5.80	
	32		38		4.94	
	33		54		7.17	

TABLE 7-2

	Program/Project No.	Program Yield (AF/Yr)	Capital Cost Project ($M)	Capital Cost Unit ($/AF)	Annual Cost Total ($M/Yr)	Annual Cost Unit ($/AF/Yr)
F.	Arroyo Seco - Woodtick	45,500	279	6,130	30.60	673
	3		9		0.88	
	7		156		14.08	
	10		10		1.18	
	31		43		5.80	
	32		38		5.00	
	34		23		3.71	
G.	Raise Nacimiento Spillway	19,150	80	4,180	10.10	527
	3		9		0.88	
	31		33		4.28	
	32		38		4.94	
H.	Upper Nacimiento - Jerrett	28,850	142	4,920	15.88	550
	5		71		6.66	
	31		33		4.28	
	32		38		4.94	
I.	Interlake Tunnel	20,500	103	5,020	12.27	599
	4		32		3.05	
	31		33		4.28	
	32		38		4.94	
J.	Widen Spillways	700	15	21,400	1.49	2,130
	1		7		0.66	
	2		8		0.83	
K.	Upper Nacimiento - Jerrett and SV	36,400	214	5,880	25.40	698
	5		71		6.66	
	29		143		18.74	
L.	Upper Nacimiento - Jerrett, SV&P	39,250	248	6,320	30.46	776
	5		71		6.66	
	29		143		18.74	
	30		34		5.06	
M.	Arroyo Seco - Greenfield (Low)	42,000	305	7,260	33.81	805
	9		155		14.24	
	10		7		0.83	
	29		143		18.74	

The three most significant economic evaluation criteria are unit capital cost, total annual cost, and unit water cost. The projects and programs have been ranked in order of increasing unit capital cost in Table 7-3, increasing total annual cost in Table 7-4, and increasing unit water cost in Table 7-5. As indicated, there is a wide range of costs among the particular projects/programs. Unit capital costs range between a low of $800/AF/yr to a high of $27,000/AF/yr. Total annual costs range between $0.2M/year and $38.85M/year. Unit water costs have a broad range between $167/AF and $2,747/AF.

For those alternative projects located within Salinas Valley and North County, evaluation by noneconomic factors is summarized in Table 7-6, which also indicates a general costs rating. Projects are rated according to: 1) technical feasibility (established, constraints, problems); 2) reliability of supply (high, moderate, low); 3) flexibility and independence (high, moderate, low); 4) environmental impacts (very high, high, moderate, minimal, beneficial); 5) probable benefits (direct, average, little, questionable); 6) water quality (excellent, good, acceptable); 7) public perception and acceptance (strong, average, weak). Project economics are rated in accordance with the criteria in Table 7-7.

Selection of Viable Projects

The water demands delineated in Chapter 3 indicate that a supplemental demand of 42,000 AF/yr presently exists within the Salinas Valley and North County. The supplemental demand will be 54,500 AF/yr by the year 2010. Development of potential water resources in the Salinas Valley would exceed an additional yield of over 150,000 AF/yr, with corresponding capital costs approaching $700 million. It is clear that only the most viable alternatives needed to meet the supplemental demands should be pursued to meet the needs of the Salinas Valley.

In order to determine the most viable water supply projects and programs, the economic analysis and summary evaluation of alternative projects has been reviewed. The screening process has resulted in the determination of several less viable projects. These projects are listed on Table 7-8, together with the principal factor(s) limiting the viability of each project. It should be noted that several of these less viable options do have merit, but have not successfully met the overall screening criteria.

Those projects within the jurisdiction of either the Monterey Peninsula Water Management District or the Pajaro Valley Water Management Agency were not considered further in this

TABLE 7-3

PROGRAM/PROJECT RANKING - UNIT CAPITAL COST

Ranking Number	Program/ Project Number(s)	Project Description	Unit Capital Cost ($/AF)
1	26	Groundwater Development - Seaside	800
2	24	Agricultural Water Management - Phase I	1,000
3	25	Agricultural Water Management - Phase II	1,300
4	28	Brackish Water Desalination - Marina	2,000
5	A - 15, 16, 17	Seawater Intrusion Program	2,650
6	G - 3, 31, 32	Raise Nacimiento Spillway Program - East Side and North County M&I	4,180
7	22	San Felipe Project (Pajaro Valley)	4,500
8	C - 3, 6, 10, 31, 32, 34	Arroyo Seco Program (Pools) - East Side, North County M&I, and Peninsula	4,620
9	H - 5, 31, 32	Upper Nacimiento Program - Jerrett, East Side, and North County M&I	4,920
10	B - 3, 9, 10, 31, 32	Arroyo Seco Program (Greenfield-Low) - East Side and North County M&I	4,990
11	I - 4, 31, 32	Interlake Tunnel Program - East Side and North County M&I	5,020
12	E - 3, 8, 10, 31, 32, 33	Arroyo Seco Program (Greenfield-High) - East Side, North County M&I, and Peninsula	5,350
13	K - 5, 29	Upper Nacimiento Program - Jerrett and Salinas Valley M&I	5,880
14	D - 3, 9, 10, 31, 32, 33	Arroyo Seco Program (Greenfield-Low) - East Side, North County M&I, and Peninsula	6,020

TABLE 7-3 (continued)

Ranking Number	Project Number(s)	Project Description	Unit Capital Cost ($/AF)
15	F - 3, 7, 10, 31, 32, 34	Arroyo Seco Program (Woodtick) - East Side, North County M&I, and Peninsula	6,130
16	L - 5, 29, 30	Upper Nacimiento Program - Jerrett, Salinas Valley, and Peninsula M&I	6,320
17	M - 9, 10, 29	Arroyo Seco Program (Greenfield-Low) - Salinas Valley M&I	7,260
18	27	Seawater Desalination - Monterey	8,500
19	12	Gabilan Creek Dam - Mud Creek Site	14,600
20	11	Gabilan Creek Dam - Sugarloaf Site	15,400
21	19	Pacific Grove Water Reclamation Project	20,000
22	J - 1, 2	Widen San Antonio and Nacimiento Spillways Program	21,400
23	13	New Los Padres Dam Project	21,700
24	14	Canada Reservoir Project	27,000

TABLE 7-4

PROGRAM/PROJECT RANKING - TOTAL ANNUAL COST

Ranking Number	Program/ Project Number(s)	Project Description	Total Annual Cost ($M/Yr)
1	26	Groundwater Development - Seaside	0.20
2	19	Pacific Grove Water Reclamation Project	0.22
3	28	Brackish Water Desalination - Marina	0.67
4	24	Agricultural Water Management - Phase I	0.75
5	23	Urban Conservation - Peninsula, Salinas and Pajaro Valleys	1.07
6	J - 1, 2	Widen San Antonio and Nacimiento Spillways Program	1.50
7	12	Gabilan Creek Dam - Mud Creek Site	1.96
8	11	Gabilan Creek Dam - Sugarloaf Site	2.06
9	22	San Felipe Project (Pajaro Valley)	4.05
10	27	Seawater Desalination - Monterey	5.07
11	25	Agricultural Water Management - Phase II	6.28
12	G - 3, 31, 32	Raise Nacimiento Spillway Program - East Side and North County M&I	10.10
13	12	New Los Padres Dam Project	10.99
14	A - 15, 16, 17	Seawater Intrusion Program	11.17
15	I - 4, 31, 32	Interlake Tunnel Program - East Side and North County M&I	12.27
16	13	Canada Reservoir Project	14.56
17	H - 5, 31, 32	Upper Nacimiento Program - Jerrett, East Side, and North County M&I	15.88

TABLE 7-4 (continued)

Ranking Number	Project Number	Project Description	Total Annual Cost ($M/Yr)
18	C - 3, 6, 10, 31, 32, 34	Arroyo Seco Program (Pools) - East Side, North County M&I, and Peninsula	24.14
19	K - 5, 29	Upper Nacimiento Program - Jerrett and Salinas Valley M&I	25.40
20	B - 3, 9, 10, 31, 32	Arroyo Seco Program (Greenfield-Low) - East Side and North County M&I	26.69
21	L - 5, 29, 30	Upper Nacimiento Program - Jerrett, Salinas Valley M&I, and Peninsula	30.46
22	F - 3, 7, 10, 31, 32, 34	Arroyo Seco Program (Woodtick) - East Side, North County M&I, and Peninsula	30.60
23	M - 9, 10, 29	Arroyo Seco Program (Greenfield-Low) - Salinas Valley M&I	33.81
24	D - 3, 9, 10, 31, 32, 33	Arroyo Seco Program (Greenfield-Low) - East Side, North County M&I, and Peninsula	33.86
25	E - 3, 8, 10, 31, 32, 34	Arroyo Seco Program (Greenfield-High) - East Side North County M&I, and Peninsula	38.85

TABLE 7-5

PROGRAM/PROJECT RANKING - UNIT ANNUAL COST

Ranking Number	Program Project Number(s)	Project Description	Unit Annual Cost ($/AF/Yr)
1	26	Groundwater Development - Seaside	167
2	23	Urban Conservation - Salinas and Pajaro Valleys	217
3	A - 15, 16, 17	Seawater Intrusion Program	336
4	24	Agricultural Water Management - Phase I	375
5	21	San Felipe Project - Pajaro Valley	479
6	G - 3, 31, 32	Raise Nacimiento Spillway Program - East Side and North County M&I	527
7	B - 3, 9, 10, 31, 32	Arroyo Seco Program (Greenfield-Low) - East Side and North County M&I	529
8	C - 3, 6, 10, 31, 32, 34	Arroyo Seco Program (Pools) - East Side, North M&I, and Peninsula	531
9	H - 5, 31, 32	Upper Nacimiento Program - Jerrett, East Side, and North County M&I	550
10	E - 3, 8, 10, 31, 32, 34	Arroyo Seco Program (Greenfield-High) - East Side, North County M&I, and Peninsula	557
11	I - 4, 31, 32	Interlake Tunnel Program - East Side, and North County M&I	599
12	23	Urban Conservation - Peninsula and Salinas and Pajaro Valleys	629
13	D - 3, 9, 10, 31, 32, 33	Arroyo Seco Program (Greenfield-Low) - East Side, North County M&I, and Peninsula	645
14	28	Brackish Water Desalination - Marina	670
15	F - 3, 7, 10, 31, 32, 34	Arroyo Seco Program (Woodtick) - East Side, North County M&I, and Peninsula	673

TABLE 7-5 (continued)

Ranking Number	Program Project Number(s)	Project Description	Unit Annual Cost ($/AF/Yr)
16	K - 5, 29	Upper Nacimiento Program - Jerrett and Salinas Valley M&I	698
17	L - 5, 29, 30	Upper Nacimiento Program - Jerrett, Salinas Valley, and Peninsula M&I	776
18	M - 9, 10, 29	Arroyo Seco Program (Greenfield-Low) - Salinas Valley M&I	805
19	25	Agricultural Water Management - Phase II	1,047
20	12	Gabilan Creek Dam - Mud Creek Site	1,507
21	11	Gabilan Creek Dam - Sugarloaf Site	1,584
22	13	New Los Padres Dam Project	2,113
23	J - 1, 2	Widen San Antonio and Nacimiento Spillways Program	2,130
24	19	Pacific Grove Water Reclamation Project	2,200
25	27	Seawater Desalination - Monterey	2,535
26	13	Canada Reservoir Project	2,747

TABLE 7-6

SUMMARY OF ALTERNATIVE PROGRAMS/PROJECTS EVALUATION

Program/ Project No.	Description	Evaluation Criteria: Technical Feasibility	Reliability of Supply	Flexibility/ Independence	Environmental Impacts	Public Probable Benefits	Water Quality	Perception/ Acceptance	Costs Rating
Programs									
A	Seawater Intrusion Program	Established	High	High	Beneficial	Direct	Good	Strong	Low
B	Arroyo Seco Dam Program (Greenfield-Low) - East Side and North County M&I	Established	Moderate	Low	High	Average	Good	Average	Moderate
C	Arroyo Seco Program (Pools) - East Side, North County M&I and Peninsula	Established	Moderate	Low	Very High	Average	Good	Weak	Moderate
G	Raise Nacimiento Spillway Program - East Side and North County M&I	Established	Moderate	Low	Low	Average	Good	Strong	Low
I	Interlake Tunnel Program - East Side and North County M&I	Established	Moderate	Moderate	Moderate	Average	Good	Average	Moderate
J	Widen San Antonio and Nacimiento Spillways Program	Established	High	High	Minimal	Little	Good	Strong	High
K	Upper Nacimiento River Program - Jerrett, Salinas Valley M&I and Peninsula	Established	Moderate	Moderate	Moderate	Direct	Good	Average	High
M	Arroyo Seco Program (Greenfield-Low) - Salinas Valley M&I	Established	Moderate	Moderate	High	Average	Good	Strong	High

TABLE 7-6 (continued)

Program/ Project No.	Description	Evaluation Criteria: Technical Feasibility	Reliability of Supply	Flexibility/ Independence	Environmental Impacts	Public Probable Benefits	Water Quality	Perception/ Acceptance	Costs Rating
Projects									
11	Gabilan Creek Dam - Sugarloaf Site	Established	Low	High	Moderate	Little	Good	Average	Very High
12	Gabilan Creek Dam - Mud Creek Site	Established	Low	High	Moderate	Little	Good	Average	Very High
20	Salinas Industrial Water Reclamation Project	Established	Moderate	Moderate	Moderate	Little	Good	Weak	---
21	Upper Salinas Valley Water Reclamation Program	Established	Low	Low	Minimal	Questionable	Good	Average	---
23	Urban Conservation - Salinas and Pajaro Valleys	Established	Moderate	Moderate	Beneficial	Average	Good	Strong	Moderate
24	Agricultural Water Management - Phase I	Established	High	Moderate	Beneficial	Direct	Good	Average	Moderate
25	Agricultural Water Management - Phase II	Established	Moderate	Moderate	Beneficial	Average	Good	Average	High

TABLE 7-7

ECONOMIC EVALUATION CRITERIA

Rating	Unit Capital Cost ($/AF/Yr)	Unit Water Cost ($/AF)	Total Annual Cost ($M/Yr)
Very Low	<1,000	<100	<3
Low	1,000 - 3,000	100 - 300	3 - 7.5
Moderate	3,000 - 6,000	300 - 600	7.5 - 15
High	6,000 - 10,000	600 - 1,000	15 - 30
Very High	>10,000	>1,000	>30

TABLE 7-8

LESS VIABLE WATER SUPPLY PROJECTS

Project No.	Description	Viability Screening Factor(s)
3	Raise Nacimiento Spillway	- Potential water rights constraints
6	Arroyo Seco Dam Pools Site	- Reservoir encroachment into Ventana Wilderness and proposed Wild and Scenic Rivers Area - Significant adverse environmental impacts
8	Arroyo Seco Dam - Greenfield Site (High)	- High capital and total annual costs - Existing housing
11	Gabilan Creek Dam - Sugarloaf Site	- Nominal project yield - High unit capital cost
12	Gabilan Creek Dam - Mud Creek Site	- Nominal project yield - High unit capital cost
19	Salinas Industrial Wastewater Reclamation Project	- Industrial project not beneficial
20	Upper Salinas Valley Wastewater Reclamation Program	- Discharge already passively reclaimed by downstream groundwater extractions
31	East Side Irrigation Water Supply Project	- Agricultural economic constraint
32	North County M & I Water Supply Project	- Included in another viable project (29)

evaluation. Determination of whether these projects are viable will be made by those agencies having responsibility for water supply.

Water Management Plan Development

In order to meet the supplemental water needs of the Salinas Valley and North County, the alternative projects and programs that have passed the screening process, and therefore determined to be viable, were considered for inclusion in the Water Capital Facilities Plan. These alternatives are summarized in Table 7-9.

Each of the viable projects have different durations for project implementation, in addition to the lead time required for initiation of construction. In order to meet the increasing requirements for supplemental water, and also attempt to minimize cash flow requirements for the financing program, the projects/programs in the plan have been allocated into two groups. Group I projects can be initiated relatively quickly, and hopefully could all be completed within five years. Group II projects require more lead time and longer implementation periods, and hopefully could be completed before the year 2010.

Project information for both groups of the plan are delineated on Table 7-10. Unit I consists of eight separate projects/programs which are expected to provide a total of 43,150 AF/yr of supplemental water at a capital cost of $113 million. The unit capital cost of the Unit I program is $2,620/AF/yr, and would supply water at a unit water cost of approximately $462/AF. Unit II consists of four additional projects/programs which should produce an additional average annual supply of 62,500 AF/yr at a capital cost of $337 million. Unit II program unit capital cost is estimated at $5,390/AF/yr, and unit water costs are projected at slightly less than $600/AF. The overall Water Capital Facilities Plan would provide water in excess of 2010 supplemental needs at a total capital cost of $450 million. The water in excess of demands would be used to replenish the Salinas Valley groundwater basin. Equivalent unit capital cost of the plan is $4,260/AF/yr, and the plan would result in a unit water cost of approximately $540/AF.

TABLE 7-9

VIABLE WATER SUPPLY PROGRAM/PROJECTS

Viable Program/ Project No.	Description[1]
A	Seawater Intrusion Program
15	- Fort Ord/Marina Potable Water Supply System
16	- Castroville Irrigation Water Supply Project
17	- Regional Water Reclamation Supply Project
J	Widened Spillway Program
1	- Widen San Antonio Spillway
2	- Widen Nacimiento Spillway[2]
L	Upper Nacimiento River Program[3]
5	- Jerrett Dam Project
29	- Salinas Valley M & I Water Delivery Project
M	Arroyo Seco Program[4]
7 or 9	- Woodtick or Greenfield (Low) Dam Sites
10	- Conveyance Canal
29	- Salinas Valley M&I Water Delivery Project
4	Nacimiento-San Antonio Interlake Tunnel
23	Urban Conservation - Salinas and Pajaro Valleys
24	Agricultural Water Management - Phase I
25	Agricultural Water Management - Phase II

[1]Programs L and M are alternative programs.

[2]Nacimiento spillway widening may not be necessary if Nacimiento-San Antonio Interlake Tunnel (Project No. 4) is constructed.

[3]Water rights issue needs resolution.

[4]Fishery concerns needs resolution.

TABLE 7-10

SUMMARY OF WATER CAPITAL FACILITIES PLAN

Project No.	Desig.	Description	Yield (AF/Yr)	Project Capital ($M)	Unit Capital ($/AF)	Annual Cost ($M/Yr) Capital	O&M	Total	Unit Cost ($/AF/Yr)
23	I-1	Urban Conservation - Salinas Valley	1,200	--	--	--	0.26	0.26	217
24	I-2	Agricultural Water Management - Phase I	2,000	2	1,000	0.20	0.55	0.75	375
25	I-3	Agricultural Water Management - Phase II	6,000	8	1,300	0.78	5.50	6.28	1,047
16	I-4	SWIP - Castroville Irrigation Water Supply Project	13,800	43	3,120	4.21	0.72	4.93	357
17	I-5	SWIP - Regional Water Reclamation Supply Project	19,450	20	1,030	1.96	0.93	2.89	149
15	I-6	SWIP - Fort Ord-Marina Potable Water Supply Project	0	25	--	2.45	0.90	3.35	--
1	I-7	Widen San Antonio Spillway	700	7	10,000	0.65	0.01	0.66	943
2	1-8	Widen Nacimiento Spillway[1]	0	8	--	0.80	0.01	0.81	--
		SUBTOTAL - UNIT 1	43,150	113	2,620	11.05	8.88	19.93	462
9	II-1	Arroyo Seco Dam - Greenfield Site (Low)	42,000	155	7,260	13.95	0.29	14.24	805
10	II-2	Arroyo Seco - Salinas River Conveyance Canal	(2)	7	--	0.73	0.10	0.83	--
29	II-3	Salinas Valley M&I Water Delivery Project	(2)	143	--	12.87	5.87	18.74	--
4	II-4	Nacimiento - San Antonio Interlake Tunnel[1]	20,500	32	1,560	3.15	(0.10)	3.05	149
		SUBTOTAL - UNIT II	62,500	337	5,390	30.70	6.16	36.86	590
		TOTAL - UNITS I AND II	105,650	450	4,260	41.75	15.04	56.79	538

[1]Widening of Nacimiento Spillway needs further analysis in conjunction with a Nacimiento-San Antonio Interlake Tunnel to establish feasibility.
[2]Included as part of Unit II-1.

CHAPTER 8

FINANCIAL ANALYSIS

Water Supply Projects

The engineering analysis has reviewed potential water supply projects and developed a list of the most viable projects as shown in Table 7-10. The projects are divided into two groups. Unit I includes projects which can be developed and completed within a five-year period. Unit II projects require a longer development period, and could not be completed in the next five years.

Table 8-1 lists the combination of viable projects which will provide sufficient additional water supply to meet the county's needs. The table shows the project, its estimated year of construction, and the capital and annual operation and maintenance (O&M) costs in 1990 dollars. Together, Unit I projects total $113 million in capital costs. The costs of Unit II projects are estimated at $337 million in 1990 dollars, for a grand total of $450 million. Unit I projects have a combined yield of 43,150 AF/yr. The addition of Unit II projects brings the combined yield to 105,650 AF/yr.

The viable projects are described briefly below.

Name	Project No.
Unit I Projects	
Urban Conservation - Salinas Valley	23
Agricultural Water Management:	
Phase I	24
Phase II	25
Seawater Intrusion Program	
Castroville Irrigation Water Supply Project	16
Regional Water Reclamation Supply Project	17
Ft. Ord-Marina Potable Water Supply Project	15
Widen San Antonio Spillway	1
Widen Nacimiento Spillway	2
Unit II Projects	
Arroyo Seco Dam - Greenfield Site (low)	5
Arroyo Seco-Salinas River Conveyance Canal	10
Salinas Valley M&I Water Delivery Project	29
Nacimiento-San Antonio interlake Tunnel	4

TABLE 8-1

CAPITAL PROJECTS
(COSTS IN 1990 DOLLARS - $1,000,000)

Project	Year of Construction	Capital Cost ($)	Annual O&M ($)
Urban Conservation - Salinas Valley	1992		0.26
Agricultural Water Management - Phase I	1992	2.00	0.55
Agricultral Water Management - Phase II	1996	8.00	5.50
SWIP-Castroville Irrigation Water Supply	1993	43.00	0.72
SWIP-Reg. Water Reclamation Supply	1993	20.00	0.93
SWIP-Fort Ord Potable Water Supply	1993	25.00	0.90
Widen San Antonio Spillway	1992	7.00	0.01
Widen Nacimiento Spillway	1992	8.00	0.01
Subtotal - Unit I		113.00	8.88
Arroyo Seco Dam-Greenfield Site (Low)	1999	155.00	0.29
Arroyo Seco-Salinas River Canal	1999	7.00	0.10
Salinas Valley M&I Water Delivery Project	1999	143.00	5.87
Nacimiento-San Antonio Interlake Tunnel	1999	32.00	(0.10)
Subtotal - Unit II		337.00	6.16
Total - Units I and II		450.00	15.04

Project Phasing

As indicated in Table 8-1 and above, the proposed projects would be phased in over a number of years. Table 8-2 demonstrates the assumed project phasing and shows the effect of inflation on the 1990 costs. Inflation is included at 4 percent per year from 1990 to the year of construction shown in Table 8-1, based on recent trends in the ENR Construction Cost Index. All Phase II projects are based on construction in 1999 for purposes of this report.

As shown in Table 8-2, the total costs of the projects increase from $450 million in 1990 dollars to $591.37 million at the time of construction. If construction is slower than the schedule shown in Table 8-2, or inflation greater than 4 percent per year, project costs may increase further.

Operation and Maintenance Costs

Table 8-3 projects O&M costs for the viable projects. The costs in Table 8-3 add inflation at 4 percent per year to the O&M cost estimates shown in Table 8-1. The projected O&M costs are shown at five-year intervals. O&M costs are expected to increase gradually over time, both from the completion and operation of new projects and from inflation.

Sources of Capital Funds

To proceed with the projects, the Agency and Monterey County will need to provide funds to meet the capital costs of constructing the projects as well as the ongoing operation and maintenance costs. Capital funds for the projects can come from a variety of sources, discussed below:

- Cash derived from all of the revenue sources
- Borrowing through Agency's or County's ability to borrow on its own or from other governmental loan programs
- Outside sources, including funds from other agencies.

Cash

The financing of the water supply projects will require that the Agency and County institute a variety of ongoing revenues not currently in place. These revenues can be used for cash construction of the projects, to the extent available, as well as for ongoing expenses for operation and maintenance and debt service on any borrowing. Cash can be spent as

TABLE 8-2

PROJECT COSTS ESCALATED TO YEAR OF CONSTRUCTION
(COSTS IN 1990 DOLLARS - $1,000,000)

(Assumed Inflation at 4% Per Year to Year of Construction)

Project	Fiscal Year Ending								
	1992	1993	1994	1995	1996	1997	1998	1999	Total
Capital Projects									
Urban Conservation - Salinas Valley	0								0.00
Agricultural Water Management - Phase I	2.08								2.08
Agricultral Water Management - Phase II					9.73				9.73
SWIP-Castroville Irrigation Water Supply		46.51							46.51
SWIP-Reg. Water Reclamation Supply		21.63							21.63
SWIP-Fort Ord Potable Water Supply		27.04							27.04
Widen San Antonio Spillway	7.28								7.28
Widen Nacimiento Spillway	8.32	7.57							15.89
Subtotal - Unit I	17.68	102.75	0.00	0.00	7.93	0.00	0.00	0.00	130.16
Arroyo Seco Dam-Greenfield Site (Low)								212.13	212.13
Arroyo Seco-Salinas River Canal								9.58	9.58
Salinas Valley M&I Water Delivery Project								195.71	195.71
Nacimiento-San Antonio Interlake Tunnel								43.79	43.79
Subtotal - Unit II	0.00	0.00	0.00	0.00	0.00	0.00	0.00	461.21	461.21
Total - Units I and II	17.68	102.75	0.00	0.00	9.73	0.00	0.00	461.21	591.37

TABLE 8-3

O&M COSTS
(COSTS IN 1990 DOLLARS - $1,000,000)

(Includes Inflation of 4% Per Year from 1990)

Project	Fiscal Year Ending 1995	2000	2005	2010
Unit I Projects				
Urban Conservation - Salinas Valley	0.30	0.37	0.45	0.55
Agricultural Water Management - Phase I	0.64	0.78	0.95	1.16
Agricultral Water Management - Phase II		7.83	9.52	11.59
SWIP-Castroville Irrigation Water Supply	0.84	1.02	1.25	1.52
SWIP-Reg. Water Reclamation Supply	1.09	1.32	1.61	1.96
SWIP-Fort Ord Potable Water Supply	1.05	1.28	1.56	1.90
Widen San Antonio Spillway	0.01	0.01	0.02	0.02
Widen Nacimiento Spillway	0.01	0.01	0.02	0.02
Subtotal - Unit I				
Arroyo Seco Dam-Greenfield Site (Low)				
Arroyo Seco-Salinas River Canal				
Salinas Valley M&I Water Delivery Project				
Nacimiento-San Antonio Interlake Tunnel				
Subtotal - Unit II	—			
Total - Units I and II				

generated, or can be accumulated for the construction of subsequent projects. The Agency has no cash balances currently available for these projects. If revenues are established prior to the need for funds for project construction, some cash may be available when needed for project costs.

Borrowing

Both the Agency and the County have a variety of ways to borrow on their own, as well as the potential ability to borrow from the state and federal governments for some of the projects. The following sections discuss a variety of borrowing methods which could be used for the water supply projects.

General Obligation Bonds

General obligation bonds are the most basic form of public borrowing. They are secured by the ability of the issuing public agency to levy property taxes without limitation as to rate or amount for the payment of debt service. Any revenues can actually be used for the payment of general obligation bond debt service, but they derive their security from the unlimited taxing power. Because of the availability of the unlimited taxing power, general obligation bonds bear interest at the lowest rate of any form of municipal borrowing.

Under Section 26 of the Agency Act, the Agency has the power to authorize and issue general obligation bonds for one or more zones. "The board may, by resolution, determine and declare the respective amounts of bonds necessary to be issued in each zone or zones, in order to raise the amount of money necessary for each work or improvement...." The Agency Act requires the Agency general obligation bonds to be approved by majority vote in each participating zone. This majority vote requirement is probably superseded by the Constitutional requirement of a two-thirds vote for approval of local government general obligation bonds.

Because of their low cost relative to other forms of public borrowing, the Agency may want to consider the use of general obligation bonds for major water supply projects included in the Unit II projects or other major dam or reservoir projects in the future. The voter approval requirement is greater than the 50 percent vote required for a revenue bond or the issuance procedure for lease bonds. However, the cost of borrowing with general obligation bonds may be significantly lower than with either of those methods.

For example, the Agency's Zone 2A had a total assessed valuation in 1989/90 of over $4.9 billion. A $100 million general obligation bond issue in today's bond market would require an annual debt service payment of about $8 million (based on a 25-year term and interest at 7 percent). Such an issue would require a tax rate in Zone 2A of $0.16 per $100 of assessed valuation based on the 1989/90 assessed valuation. The taxes on a $200,000 home would be about $327 per year.

Revenue Bonds

Revenue bonds are secured by the revenues from an enterprise. The Agency is authorized by Section 10 of its Act to issue revenue bonds pursuant to the Revenue Bond Law of 1941 (Chapter 6, Part 1, Division 2, Title 5 of the Government Code). This is the general revenue bond authority in the State of California. Revenue bonds under the 1941 act require approval by majority vote.

Revenue bonds automatically allocate the costs of a project to those who use it. Because the bonds are secured only by revenues of the enterprise, bond purchasers require assurances that: (1) revenues of the enterprise are sufficient to meet all expenses; (2) annual bond service has a lien on the revenue of the enterprise; and (3) future revenue bond issues will not reduce the security of prior issues.

A revenue bond's underlying security is the issuer's promise to operate its system in a way that will provide sufficient net revenues, after payment of operation and maintenance expenses, to meet annual debt service. Revenue bonds generally require a minimum coverage pledge. Coverage is the ratio of net revenue (i.e., gross revenues less maintenance and operating expenses) to annual bond service. To enhance marketability, revenue bond issuers normally pledge to maintain net revenues of 1.1 to 1.3 times annual bond service, depending on the types of charges which will provide debt service and their method of collection. As a result, the issuer must set fees and charges at a level 10 to 30 percent above that required to meet debt payments.

While the Agency could issue revenue bonds for the projects, general obligation bonds or lease bonds (joint powers authority or certificates of participation, discussed below) would be a stronger financing method for any needed borrowing.

Lease Bonds

Lease bonds are very commonly used to finance capital projects in California, and include such financing methods as nonprofit corporation bonds, joint powers authority bonds, and certificates of participation. These financing methods are all based on the issuer's ability to enter into a lease or a contract for the purchase and use of a facility.

Monterey County and the Agency's predecessor district created a joint powers authority (the Monterey County Power Authority) and issued lease bonds in 1985 for the construction of hydroelectric facilities at the Nacimiento Reservoir. The project was leased to the County, which contracted with the Agency for operation of the project. A similar joint powers authority could be created and lease bonds could be issued for the water supply projects. Projects could be leased to the County, the Agency, or both entities. All of the revenue sources discussed in this report could be used to secure any type of lease bonds for these projects.

Certificates of participation are probably the most common form of financing for major improvements for California public agencies today. The Agency could issue installment purchase certificates, under which the Agency enters into an installment purchase agreement and agrees to make a stream of payments in return for a given facility or project. The Agency could make these payments from any source of legally available funds. Property taxes could not be levied for lease payments. As with a joint powers authority, the parties to the installment purchase agreement could be the Agency, the County, or both.

Borrowing from the State and Federal Governments

In addition to local funding sources, state loan programs have been established to provide loans to California water agencies. Many of the loan programs call for loans to local agencies in amounts of up to $5 million at an interest rate of one-half the state's general obligation bond rate (currently 3 to 3.5 percent). Table 8-4 summarizes the various State Department of Water Resources (DWR) general obligation bond programs. However, the DWR is no longer accepting new applications for those loan programs, and with the defeat of a new state issue on the November 1990 ballot, no new general obligation bonds were authorized. The state does intend future issues, for which the Agency may qualify.

The Agency has been negotiating with the state and federal governments for low-interest loans for certain of the projects already under development. The projects for which the Agency anticipates receiving such financing are as follows:

TABLE 8-4

STATE DEPARTMENT OF WATER RESOURCES
GENERAL OBLIGATION BOND PROGRAMS

	Bond Law	Principal Amount Remaining	Description
1.	California Water Resources Development Bond Act (Burns-Porter) (Davis-Grunsky Act), 11/8/60	$3,500,000	Loans and grants for local water projects.
2.	Safe Drinking Water Programs		
	a. Safe Drinking Water Bond Law of 1976 (Proposition 3)	9,300,000	Loans and grants to bring domestic water systems up to drinking water standards.
	b. Safe Drinking Water Bond Law of 1984 (Proposition 28)	3,200,000	Same as Proposition 3.
	c. Safe Drinking Water Bond Law of 1986 (Proposition 55)	60,400,000	Same as Proposition 3.
	d. Safe Drinking Water Bond Law of 1988 (Proposition 81)	75,000,000	Same as Proposition 3.
3.	Water Conservation Account, Clean Water Bond Law of 1984	3,500,000	Loans for cost-effective capital outlay water conservation projects.
4.	Water Conservation and Water Quality Bond Law of 1986 (Proposition 44)	60,600,000	Loans up to $5,000,000 for water conservation and groundwater recharge projects. Also feasibility study loans up to $100,000 each.
5.	Water Conservation Bond Law of 1988 (Proposition 82)	60,000,000	Extends funding for Proposition 44, loans for same purposes; provides loans for new local water supply.

- o U.S. Bureau of Reclamation loan for the Castroville Irrigation system and water reclamation portions of the Seawater Intrusion Program (estimated to total about $49 million).
- o California State Water Resources Control Board loan for $5 million of the water reclamation portion of the Seawater Intrusion Program.

The Agency and the Monterey Regional Water Pollution Control Agency are seeking loans for two parts of the Seawater Intrusion Program from the U.S. Bureau of Reclamation under PL84-984, the Small Reclamation Projects Act of 1956. Under this program, the portion of the loan related to agricultural water use by owners of less than 320 acres is interest free. The balance of the loan, for municipal and industrial water and for agricultural parcels in excess of 320 acres, bear interest as provided in the contract with the USBR.

The State of California has a number of loan programs for water reclamation projects. In general, the amount of a loan for any one project is limited to $5 million. Such loans bear interest at one-half the interest rate on state general obligation bonds (currently about 3 to 3.5 percent).

Outside Sources

Some of the projects involve other agencies, which would provide a portion of the funding. The Seawater Intrusion Program includes a new water supply for Fort Ord and Marina County Water District. Fort Ord is expected to pay its share of the project costs in cash. Fort Ord and Marina CWD are also expected to pay an annexation charge to annex to Zones 2 and 2A. Part or all of these annexation charges may be included in the Agency's financing and repaid by Marina CWD and Fort Ord, as applicable, or may be paid as a lump sum to the Agency.

Revenue Sources

Financing the construction and operation of the water supply projects will require the identification and development of a variety of ongoing revenue sources. A number of revenue sources are commonly used to finance the construction and operation of water projects. This section discusses a number of potential revenue sources which may be applicable to the water supply projects. Some of these revenue sources are in use or available to the Agency or the County. Others would require future legislative authority. Table 8-5 summarizes basic information on existing and potential revenue sources.

TABLE 8-5

EXISTING AND POTENTIAL REVENUE SOURCES

Revenue Source	Available To	Comments
Property taxes	Agency	Agency receives operating and debt service taxes. No authority to levy additional taxes for operations.
	Agency	Available for debt service with voter approval of GO bonds.
Standby charges	Agency	Limited to $15/acre per zone.
Benefit assessments	Agency	Applicable to flood control only.
Water sales	Agency	Agency has authority to sell water. Applicable to metered deliveries.
	Water retailers	Private water company rates regulated by CPUC.
Assessments	Agency	May be levied on basis other than property value, such as land use and area.
Sales tax	County	Under Revenue and Taxation Code, with voter approval.
Parcel or acreage charges	County Agency	Under county service area. See "assessments."
Capital facilities charges	Public retailers	Not available to private water companies. No current Agency authority.
Water reclamation charge	Agency	Agency has authority to impose charge to cover costs of reclamation.
Groundwater or replenishment charges	Agency	No statutory authority for Agency or County.

The Agency's primary revenue sources currently are property taxes, standby charges, and benefit assessments. A review of the Agency's existing revenue sources, as discussed in subsequent sections of this chapter, indicates that little if any revenue from these sources will be available for the costs of the water supply projects. Therefore, the Agency must identify additional sources of revenue for all expenses related to the projects, both capital and operating.

The County has different financial powers from those of the Agency. Several potential revenue sources could be used for water supply projects, including sales taxes, parcel or acreage charges, and perhaps impact charges on new development. The County's financing powers could be used for the joint development and financing of projects, such as through a joint exercise of powers agreement.

The section entitled "Revenue Projections" develops revenues from several sources sufficient to finance the water supply projects. Detailed projections of the revenues are included in that section.

The Agency's Statutory Authority

The Agency was originally organized under Chapter 699 of the Water Code Appendix as the Monterey County Flood Control and Water Conservation District. The Act was amended in 1990, and the Agency's name changed to Monterey County Water Resources Agency as of January 1, 1991. The Act is similar to flood control district acts which exist for most California counties. Flood control districts have traditionally been funded with property taxes, and the enabling statutes reflect this emphasis. The acts traditionally allow the districts to establish and impose "taxes or assessments" to carry out the purposes of the act, and provide little in the way of other revenue-generating powers. The 1990 amendments to the Agency Act authorize some additional financial powers.

While the Agency Act retains language authorizing the use of property taxes, the Agency's ability to levy taxes has been largely lost, as discussed below, due to amendments to the California State Constitution limiting property taxes. The Agency Act does allow certain financial powers in addition to the power to levy property taxes. The enumeration of the Agency's powers allows the Agency "to buy, provide, sell and deliver water" (Section 9, Paragraph m). This power is further developed in Section 23. Section 12 of the Agency Act provides an ability to levy water standby or availability charges. These charges are limited to

$15 per year per parcel or acre, unless imposed under the Uniform Standby Charges Procedures Act (Government Code §54984), and are to be used only for ongoing maintenance and operation of zones and retirement of any bonded indebtedness attributable to each zone.

Section 22 of the Agency Act provides the Agency with additional powers in conjunction with the study, cessation and prevention of seawater intrusion and development of a substitute surface water supply. This section provides that "The board shall apportion the costs of installation, maintenance, and operation of the facilities required to furnish that substitute surface supply in an equitable manner among all those benefited by the substitute supply, and by the cessation of groundwater extraction, through appropriate standby charges, water tolls, or subsidies."

Property Taxes

Since the approval by the voter of Article XIIIA of the California Constitution (Proposition 13) in June 1978, local agencies have lost the ability to levy property taxes for operating revenues. Monterey County, as all California counties, levies a property tax in the amount of 1 percent of the assessed valuation of taxable property in the County. The property tax revenue is allocated to the County and local agencies within the County in accordance with state law, based in part on the property taxes levied by agencies prior to the adoption of Proposition 13. Agencies can levy property taxes over and above the 1 percent general levy for debt service on general obligation bonds and certain other obligations approved by the voters.

The Agency receives a share of the 1 percent general county tax. The Agency also levies a property tax over the 1 percent tax for debt service on its outstanding general obligation bonds issued for construction of the San Antonio and Nacimiento dams. The Agency cannot increase revenues from property tax for operating purposes.

The Agency can seek voter approval to issue general obligation bonds and levy a tax for debt service on such bonds. Such bonds could be authorized by the Agency as a whole or by one or more zones, depending on the benefit from the project to be financed.

Standby Charges

The Agency levies standby or availability charges under the authority provided in Section 12 of the Agency Act to pay the operation and maintenance costs of zones and retirement of any

bond service attributable to a particular zone. These standby charges are limited to $15 per acre or parcel.

The Agency's 1991/92 standby charges for most property (irrigated agriculture, commercial, and residential) are $11.44/acre in Zone 2A and $1.10 for Zone 2. The charges for industrial land are $15.00 for Zone 2A and $2.20 for Zone 2. The Agency could consider increasing those standby charges that are now below the maximum and using the additional revenue for new water projects, provided that such a purpose falls within the statutory authority for the standby charge.

Benefit Assessments

The other major source of revenue to the Agency currently is benefit assessments for flood control, which are levied in a number of zones under provisions of the Benefit Assessment Act of 1982 (Government Code 54703). This act was adopted by the state legislature after the passage of Proposition 13 to provide a source of funds to replace property tax revenues for drainage, flood control, street lighting and maintenance of streets, roads and highways. It is not applicable to water supply projects.

Under the 1982 Act, the Agency Board adopts a resolution or ordinance determining an annual assessment on each parcel of real property not owned by another governmental agency. Zones may be established based on areas of benefit. In the case of a benefit assessment for flood control, the benefit assessment may be levied on the basis of proportionate storm water runoff from each parcel. The proposed assessment must be approved by majority vote. After such voter approval, the Board may annually thereafter determine the cost of the service which is financed by the assessment and, by ordinance or resolution, determine and impose the assessment.

Water Sales

The Agency has the power to buy, provide, sell, and deliver water. This power may be applicable to certain of the proposed water supply projects. In order to sell water and generate revenue, the Agency needs to be able to control and measure the delivery of water. Water delivered through a distribution system, either wholesale to retail water agencies or directly to agricultural or municipal and industrial users can be measured and a charge assessed for the quantity of water used. Water delivered by groundwater recharge or river flow cannot be

controlled and measured, and therefore cannot be "sold." To date none of the Agency's projects have delivered water through a distribution system amenable to control and metering.

A number of the proposed projects would distribute water in a manner in which it could be metered and sold. The Seawater Intrusion Program includes distribution of water both to Castroville irrigation customers and to Marina County Water District and Fort Ord for M&I use. Water sales, and associated water sales revenue, could provide a revenue source to support this program. Such water sales would most likely be on an acre-foot basis, and would require that water taken by agricultural customers and Marina CWD and Ft. Ord be metered at turnouts from the Agency's distribution pipelines.

Unit II projects may also deliver water to water retailers and customers through distribution systems. The Agency can impose rates and charges for water delivered from these projects.

The ability to generate revenue from water sales in the amounts needed to support the water supply projects requires not only the ability to deliver and measure water but also the ability to regulate the use of water from other sources. The Agency will need to require that water users purchase water from its water supply projects, rather than continuing to pump groundwater after new sources of supply are developed. The Agency has the power to prohibit the extraction of groundwater in the event of seawater intrusion, provided it develops an alternate water supply. Specific projections of water sales and revenue related to the Seawater Intrusion Program are included elsewhere in this chapter, under the heading "Revenue Projections."

Acreage Assessments

An acreage assessment is a fixed charge, established annually, and collected on the property tax roll in conjunction with the county taxes. Acreage charges may be uniform or may vary based on location, land uses, benefit from the project, or similar factors.

The Agency has the authority under Section 24 of its enabling act to levy assessments on property within the agency to pay a variety of costs. Section 24 authorizes the board to levy three categories of acreage assessments:

- *...assessments upon all property in the agency to pay the general administrative costs and expenses of the agency, and to carry out any of the objects or purposes of this act of common benefit to the agency. (Section 24[a]).*

- *... assessments ... to pay the costs and expenses of carrying out, constructing, maintaining operating, extending, repairing, or otherwise improving any or all works or improvements established or to be established, according to the benefits derived or to be derived ... by a levy or assessment upon all property within a zone .... It is declared that for the purposes of any ... assessment under this subdivision, the property so ... assessed within a given zone is equally benefitted. (Section 24[b]).*

- *... assessments authorized by subdivision, (b in each or any of the zones, according to the special benefits derived or to be derived by the specific properties therein, to pay the cost and expenses of carrying out any of the objects or purposes of this act of special benefit to the zone ... including the constructing, maintaining, operating, extending, repairing, or otherwise improving any or all works of improvement established or to be established within or on behalf of the respective zone.... The board may by ordinance adopt formulas to determine differential rates within a zone based on special benefits, parcel size, land use, and any other pertinent factor or combination of factors.* (Section 24[c]).

Sales Taxes

Under state law, counties can seek voter approval to levy local sales taxes, and such a tax is a potential source of revenues for the water supply projects. A local sales tax is a tax at a specified percentage (usually one-half cent) on all retail sales and taxable transactions within the area authorizing the tax, presumably the entire county. The general state law defines which transactions are subject to sales tax.

In November 1989, Monterey County submitted a sales tax measure to the voters. This measure, referred to as Measure B, sought approval of a half-cent sales tax for a 20-year period. The proceeds of the tax were to be used for a variety of projects, including road and highway, hospital, and library projects. Measure B was approved by the voters and has subsequently been challenged in court.

A sales tax offers the advantage of a steady, ongoing source of revenue and would provide a substantial financial resource. A sales tax at the rate of one-half cent in Monterey County is estimated to generate about $13.4 million in 1990, based on projections of sales tax revenue developed by the County treasurer in conjunction with Measure B. Use of sales tax for water

projects has been discussed in Monterey County. However, it does involve certain questions, such as:

- The legal questions raised in the approval of Measure B, and the subject of subsequent litigation. The basis of the legal challenge to Measure B was procedural, and a new sales tax measure could conceivably be challenged on similar grounds, depending on the scope of the court decision on Measure B.
- The lack of direct correlation between the payment of sales taxes and benefit from water supply projects. While the geographic distribution of sales taxes generated and the geographic benefit from water supply projects may correspond, there is no correlation between the cost and benefit to an individual taxpayer or water user. This question is compounded by the fact that the water supply projects do not benefit the entire county, but are primarily related to the Salinas Valley. It would be difficult either to impose a sales tax on less than the entire county or to justify a countywide tax for projects with no countywide benefit.
- A half-cent sales tax would not on its own provide the funds necessary for all the needed water supply projects. Overall, a countywide sales tax would provide 20 to 30 percent of the necessary funds. Additional revenue sources would be needed.
- If a sales tax measure has a termination date, such as Measure B does, it will generate a finite amount of money. These funds should be used for capital expenditures for the projects described in this report, which are projected to occur over a 15 to 20 year schedule. Sales tax revenue should not be used for operating expenses, which will continue long after the termination of the sales tax authority. The maximum benefit from the sales tax revenue would come from using such revenues for pay-as-you-go financing of capital costs, rather than for debt service.
- The requirement that a sales tax measure be approved by either a majority or two-thirds vote, depending upon the circumstances. If such an approval is sought and not received, other revenue sources must be implemented to replace the sales tax revenues.

Parcel or Acreage Charges

A prior section of this chapter (Acreage Assessments, page 8-15) discussed the ability of the Agency to impose acreage assessments, based on its statutory authority.

The County also has the power to impose charges on a parcel or acreage basis under the County Service Area provisions of the Government Code (beginning with Section 25210). These provisions give the County the authority to provide extended services within a specified area, which may be countywide, and to fix and collect charges for such extended services. Miscellaneous extended service for which county service areas can be established include "water service, including the acquisition, construction, operation, replacement, maintenance, and repair of water supply and distribution systems, including land, easements, rights-of-way, and water rights."

A county service area can be established by the Board of Supervisors on its own initiative. It is created by a notice and hearing process or by election. County service area charges are established by ordinance and may be collected on the tax roll in the same manner and time as ad valorem property taxes.

Capital Facilities Charge

Public water systems typically impose a capital facilities charge or capacity charge on new customers connecting to the water system. This charge reflects the fact that the existing customers and taxpayers have incurred capital expenses to build facilities which have capacity to serve future as well as current customers. Private water companies regulated by the California Public Utilities Commission (except certain systems with fewer than 2,000 connections) cannot impose such a charge.

The water supply projects include capacity to serve growth and new development, and new development should pay an initial fee which helps to recover some of the costs advanced on its behalf. There is currently no clear legal authority for the Agency to impose such a charge. The Agency may wish to include such an authority in future amendments to its act.

Water Reclamation Charge

The Agency Act authorizes the Agency to impose a water reclamation charge on persons who extract groundwater from the Salinas Valley groundwater basin or any portion thereof. This

charge is intended to finance the water reclamation element of the Seawater Intrusion Program. The reclamation charge is based on two concepts. First, water used for municipal and industrial purposes is discharged to the ocean through the wastewater treatment and disposal system and consequently is not available for reuse within the groundwater basin. Secondly, reclamation produces new water supply which benefits all water users in the basin.

The water reclamation charge can be used only to pay the costs associated with the planning, design, capital, and operating costs of water reclamation facilities. It is adopted by ordinance, and may be collected on the property tax bill or billed to the diverter.

The water reclamation element of the Seawater Intrusion Program consists of facilities to reclaim wastewater treated at the Monterey Regional Water Pollution Control Agency's regional treatment plant. The reclaimed water would then be used for agricultural irrigation in the Castroville area. This use of reclaimed water in combination with the Castroville irrigation system will reduce the use of groundwater for irrigation in the Castroville area and the seawater intrusion caused by such groundwater use. All water users in the Salinas Valley will benefit from the reduction of seawater intrusion. Therefore, the reclamation charge would be imposed throughout the Salinas Valley.

The financial analysis calculates a water reclamation charge for M&I water users in the Salinas Valley based on annual water production.

Replenishment Assessment or Groundwater Charge

A replenishment assessment or groundwater charge is a charge levied on water users, either retail water purveyors or individual water users, which extract groundwater. Such a charge ultimately requires that meters be installed on all wells, public and private, and the amount of water pumped from each well be reported to the Agency.

A replenishment assessment can be an important charge as a part of an overall water basin management approach. Varying the magnitude of a groundwater charge helps to influence the cost, and therefore the use, of groundwater relative to water from other sources.

Neither the Agency nor the County currently has the power to establish a replenishment assessment, and no such power is contemplated. In the future, such a charge may be necessary. The Agency does have a regulatory authority through its ability to prohibit

extraction of groundwater to prevent seawater intrusion once an alternate water supply is provided.

Revenue Projections

This section develops projections of various revenue sources potentially applicable to the water supply projects. The revenue sources were identified earlier in this chapter. This section develops specific projections of the following revenue sources:

- Sales tax
- Acreage assessments
- Water sales
- Water reclamation charges
- Connection charges

The revenue projections herein are intended to provide examples. Prior to proceeding with each specific project, the Agency will need to adopt a specific financing plan for the project and enact the appropriate rates and charges, which are expected to differ from the examples shown here.

Sales Taxes

Table 8-6 presents the projected revenue from a half-cent sales tax, prepared by the Monterey County Treasurer in connection with Measure B. Revenues from sales taxes are projected at $13 million in 1990, and increase by 3 percent per year.

Table 8-7 summarizes a history of taxable sales for the five years from 1984 through 1988 for the cities and unincorporated area in Monterey County. In the years shown, taxable sales have increased at an average rate of 5.7 percent per year.

Table 8-7 also calculates the distribution of taxable sales throughout the County's cities. As shown in the table, about 38 percent of the taxable sales recorded in the cities of the Monterey Peninsula, 3 percent in the North County cities, and 40 percent in the cities of the Salinas Valley. The remaining 19 percent of taxable sales were recorded in unincorporated areas of the County. Sales taxes are a potential source of revenue for water projects. Two potential problems would need to be addressed in seeking a special sales tax authorization--the lack of correlation between taxable sales and water use, and the difficulty of imposing such a tax on only that part of the county which benefits from the water supply projects.

TABLE 8-6

ESTIMATES OF MEASURE B SALES TAX RECEIPTS MONTEREY COUNTY PUBLIC REPAIR AND IMPROVEMENTS PROJECT AUTHORITY

Year	Amount	Year	Amount
1990	$13,000,000	2000	$17,471,000
1991	13,390,000	2001	17,995,000
1992	13,792,000	2002	18,535,000
1993	14,205,000	2003	19,091,000
1994	14,632,000	2004	19,664,000
1995	15,071,000	2005	20,254,000
1996	15,523,000	2006	20,861,000
1997	15,988,000	2007	21,487,000
1998	16,468,000	2008	22,132,000
1999	16,962,000	2009	22,796,000
Total	$349,317,000		

Notes: 1990 half-cent sales tax revenue.
3% growth rate of sales tax revenue.

Source: Monterey County Treasurer; Measure B sales tax financing model.

TABLE 8-7

DISTRIBUTION OF TAXABLE SALES
MONTEREY COUNTY

City	Millions of Dollars					Percent of Total
	1984	1985	1986	1987	1988	
Carmel	111,354	125,057	135,293	151,366	156,867	6.09
Monterey	352,825	386,312	399,493	417,474	427,294	17.80
Pacific Grove	77,945	81,823	79,685	87,793	105,453	3.88
Seaside	210,455	233,506	214,109	223,891	227,732	9.96
Total, Peninsula	752,579	825,678	828,580	880,524	917,346	37.74
Del Rey Oaks	8,889	6,605	7,170	10,732	10,141	0.39
Marina	32,732	34,879	32,825	43,142	47,169	1.71
Sand City	14,809	16,023	16,834	17,334	17,277	0.73
Total, North County	56,430	57,507	56,429	71,208	74,587	2.84
Gonzales	6,608	8,555	9,096	70,791	11,136	0.41
Greenfield	16,321	16,341	15,103	16,718	18,154	0.74
King City	43,212	43,681	44,103	48,040	49,605	2.05
Salinas	757,401	787,260	773,051	841,663	885,837	36.30
Soledad	11,253	12,229	11,924	13,704	15,984	0.58
Total, Salinas Valley	834,795	868,066	853,277	930,916	980,716	40.10
Unincorporated	370,873	400,279	389,223	449,162	544,315	19.33
County Total	2,014,677	2,151,530	2,127,509	2,331,810	2,516,964	100.00

Acreage Assessments

Acreage or parcel assessments are expected to be one of the primary revenue sources for the water supply projects. Table 8-8 summarizes land use in the County as a whole and with the exclusion of the Monterey Peninsula and coastal areas (called for convenience the "Greater Salinas Valley" in this section). Land use is divided into three general categories:

- Improved: All incorporated land plus all unincorporated land categorized as residential, commercial, or industrial. Improved land totals about 55,000 acres countywide and 28,300 acres in the Greater Salinas Valley. All improved land in the Greater Salinas Valley would be subject to assessments. Assessments should be levied per acre or per parcel, with the minimum assessment on improved land equal to the one-acre charge. The County had approximately 76,000 improved parcels as of March 1987. Parcels in the Greater Salinas Valley are assumed to total about 39,200, based on the countywide ratio of improved acreage to the number of parcels. The number of improved parcels in the Greater Salinas Valley is assumed to increase by 500 per year.
- Agricultural: Irrigated agriculture and grazing land. Agricultural land totals over 1.2 million acres, over half of the County's land area. About 217,500 is irrigated agriculture. Only irrigated agriculture would be subject to the acreage assessment. The amount of irrigated acreage is assumed to remain constant and to be entirely in the Greater Salinas Valley.
- Other: All publicly owned land, streets and highways, water bodies, and all other land uses. All land in this category would be exempt from acreage assessments.

Table 8-9 shows the estimated revenue that would result from acreage/parcel charges of $25, $50, and $100 per year.

Water Sales

The Agency will initially have the ability to sell water delivered through the facilities of the Seawater Intrusion Program. Both water delivered in the area served by the Castroville irrigation project and water delivered to Marina CWD and Fort Ord through the potable water supply project can be metered and sold. Table 8-10 calculates the revenue from projected water sales related to the Seawater Intrusion Program at various rates per acre-foot.

TABLE 8-8

MONTEREY COUNTY LAND USE ACREAGE

	Entire County	Greater Salinas Valley
Unincorporated		
Residential	14,055	8,631
Commercial	560	336
Industrial	7,227	7,007
Incorporated	32,844	12,382
Total Improved	54,686	28,356
Agricultural		
Irrigated Agricultural	217,500	
Grazing	993,439	
Total Agricultural	1,210,939	1,160,331
Other		
Educational	2,347	2,160
Facilities	1,933	1,315
Military	199,865	170,758
Natural Resource Management	380,854	190,999
Recreational/Cultural	17,825	6,711
Streets, Highways, and Railroads	14,213	11,564
Unimproved Lands/Watershed Areas	237,127	146,536
Major Water Bodies	7,571	7,516
Total Other	861,735	537,559
GRAND TOTAL	2,127,360	1,726,246

Sources:

1. Monterey County Planning Department, "Monterey County Facts & Figures," 1980 Existing County Land Use by Planning Area.
2. Boyle Engineering Corporation, "Preliminary Water Demands," Attachment 2 (May 29, 1990) to Status Report No. 2 to Flood Control District.
3. Bartle Wells Associates, total agricultural for the county less Boyle's estimate for irrigated agricultural.
4. Certain estimates made by Bartle Wells Associates.

TABLE 8-9

REVENUE FROM PARCEL/ACREAGE CHARGES

	Acres or Parcels	Charge per Acre or Parcel ($)		
		$25	$50	$100
Improved parcels	39,200	980,000	1,960,000	3,920,000
Additional parcels	8,500	12,500	25,000	50,000
Agricultural acres	217,500	5,437,500	10,870,000	21,750,000
Total annual revenue		6,430,000	12,855,000	25,720,000

TABLE 8-10

WATER SALES REVENUE

Rate per AF ($)		Annual Water Revenue ($)		
Agricultural	M&I	Agricultural 3,500 AF	M&I 12,000 AF	Total Revenue
25	75	787,500	900,000	1,687,500
50	150	1,575,000	1,800,000	3,375,000
100	300	3,150,000	3,600,000	6,750,000
150	450	4,725,000	5,400,000	10,125,000

The table assumes that the rate for M&I water is three times the rate for agricultural water. Traditionally water in California has been sold to agricultural users at a lower cost per acre-foot than M&I water. The 3:1 ratio was used as an assumption based on the ratios in nearby areas. San Benito County Water District's enabling legislation specifies that the rate for agricultural water should not exceed one-third of the rate for all water other than agricultural. The ratio of M&I water rates to agricultural water rates in Santa Clara Valley Water District's rates is about 4:1 for groundwater and ranges from 2:1 to 3.4:1 for surface water, depending on area of the county. Before the Agency adopts any specific water rates for any category of water use, it will need to determine the appropriate rate policy, which may differ from the assumption used in this water capital facilities plan.

The water sales revenue is based on agricultural water deliveries of 31,500 AF/yr and M&I water deliveries of 12,000 AF/yr. M&I deliveries are expected to increase over time, both from the Seawater Intrusion Program and from future water supply projects.

Water Reclamation Charges

The Agency has the authority to impose a water reclamation charge on water consumed in the Salinas Valley to recover the annual cost of reclaiming water. These costs are estimated at $1.98 million in 1995, as shown below:

USBR loan payment	$0.68 million
SWRCB loan payment	0.37 million
Operation and maintenance	0.93 million
Total	$1.98 million

The operation and maintenance costs will increase over time due to inflation, while the loan payments will be fixed.

Water demand in the Salinas Valley is estimated at 42,900 AF in 1990 and projected to increase to 56,000 AF in 2010. The annual water reclamation charge, based on the estimated water demand would be $43 per AF in 1995, when the Agency begins to incur debt service and operating costs for the reclamation project and would gradually increase as water use increases, to an estimated $50 in 2010, as shown in Table 8-11.

TABLE 8-11

WATER RECLAMATION CHARGE

Fiscal Year Ending	Acre-Feet of Water Demand in Salinas Valley	Charge Per Acre-Foot ($)	Revenue: Reclamation Charge ($)
1994	45,000	23	1,050,000
1995	46,200	43	1,980,000
1996	46,800	43	2,020,000
1997	47,900	43	2,060,000
1998	48,100	44	2,100,000
1999	48,800	44	2,140,000
2000	49,400	44	2,180,000
2001	50,100	44	2,230,000
2002	50,700	45	2,270,000
2003	51,400	45	2,320,000
2004	52,000	46	2,370,000
2005	52,700	46	2,430,000
2006	53,300	47	2,480,000
2007	54,400	47	2,540,000
2008	54,600	49	2,660,000
2009	55,200	49	2,720,000
2010	56,000	50	2,790,000

Capital Facilities Charges

Table 8-12 shows a history (1983-1989) of dwelling units authorized in various Monterey County cities and in the unincorporated area of the County. It also shows an average of 2,191 new units authorized for 1983 through 1989. About half of new units are in incorporated cities in the Salinas Valley.

If a capital facilities charge were imposed for the water supply projects, it should apply to the Salinas Valley and Marina CWD. A charge of $500 per unit would raise about $600,000 to $800,000 per year based on average construction activity. The revenues resulting from a capital facilities charge can be used for capital purposes only.

Conclusions

The Agency, on its own or in conjunction with the County, can raise revenues through a variety of methods. The actual mix of revenues can vary significantly, depending on the emphasis that the Agency elects to place on each revenue source. A lower acreage charge will require a higher water charge, and so on.

Table 8-13 calculates the level of each potential revenue source, except sales taxes, needed to produce $1 million per year. The impact of the costs of the projects on water uses and residents of the Agency will depend on the actual revenue sources adopted by the Agency, actual project costs, and its customers' water use and/or property ownership.

TABLE 8-12

MONTEREY COUNTY
HISTORY OF DWELLING UNITS AUTHORIZED

Cities	1983	1984	1985	1986	1987	1988	1989	Average
PENINSULA								
Carmel	10	34	19	13	25	67	38	29
Monterey	217	269	166	104	89	116	50	144
Pacific Grove	35	45	43	97	16	32	31	43
Total, Peninsula	262	348	228	214	130	215	119	217
NORTH COUNTY								
Del Rey Oaks	--	--	--	--	150	--	--	150
Sand City	--	--	--	--	--	--	--	--
Marina City	71	39	222	318	310	38	218	174
Seaside	10	30	67	101	151	69	35	66
Total, North County	81	69	289	419	611	107	253	390
SALINAS VALLEY								
Gonzales	--	58	140	6	1	38	73	53
Greenfield	--	19	226	91	91	85	168	113
King City	16	35	55	107	11	5	42	39
Salinas	599	1,072	1,227	1,347	383	443	712	826
Soledad	5	39	33	83	4	6	136	44
Total Salinas Valley	620	1,223	1,681	1,634	490	577	1,131	1,075
Total Cities	963	1,640	2,198	2,267	1,231	899	1,503	1,681
Unincorporated	452	419	456	447	487	583	728	510
Total County	1,412	2,059	2,654	2,714	1,718	1,482	2,231	2,191

TABLE 8-13

CHARGES TO GENERATE $1 MILLION

ACREAGE ASSESSMENT (Greater Salinas Valley)	
Improved parcels	$26.18/parcel
Agricultural acreage	4.60/acre
WATER SALES	
Agricultural (Castroville)	$31.75/AF
M&I - 12,000 AF	83.33/AF
M&I - 16,000 AF	62.50/AF
WATER RECLAMATION CHARGE	
Water demand:	
45,000	$22.22/AF
50,000	20.00/AF
55,000	18.18/AF
CAPITAL FACILITIES CHARGE	
New units:	
1,000	$1,000.00/unit
1,200	833.33/unit
1,500	666.67/unit

CHAPTER 9

ENVIRONMENTAL ISSUES

General Background

Monterey County has been a major agricultural area for many decades. Beginning in the 1970s, urban population growth in the coastal area and recently in the inland area (Salinas) began to become an important factor. These two elements have had a significant effect on increasing water demand in the county. Also of increasing importance is the matter of water quality--a factor that is just beginning to influence water supply planning.

Monterey County agricultural and urban areas have utilized the extensive groundwater basins in the Salinas Valley and Pajaro Valley. The limited groundwater basin in the Carmel River has also been extensively utilized for urban water supply in the Monterey Peninsula area. As the limits of the natural recharge of the groundwater basins were reached, reservoirs were constructed; San Clemente Reservoir in 1921 and Los Padres Reservoir in 1949 in the Carmel River basin, and Nacimiento Reservoir in 1958 and San Antonio Reservoir in 1967 in the upper Salinas River basin. A number of reservoirs were constructed in the upper reaches of the Pajaro River basin for use in the upper river basin areas for agricultural and urban purposes.

However, even with these reservoirs, seawater intrusion of the lower Salinas and Pajaro groundwater basins continued. In addition, serious overdrafting of the East Side subunit of the Salinas Valley groundwater basin and the Carmel Valley groundwater basin have occurred. Further loss of water supply is occurring as wells are shut down in the Salinas Valley and North County area due to nitrate concentrations near or in excess of the domestic drinking water standard. In essence, the water demand has exceeded the natural rate of supply even when augmented by existing reservoirs, and there is a further loss of the water supply due to contamination.

The state of California has notified Monterey County that the seawater intrusion of the groundwater basins must be curtailed or the state may adjudicate the water supply. The county has taken action to address the issue by proceeding with various studies and planning efforts.

Water Supply Planning

This present planning effort was initially county-wide in scope and later modified to include the Greater Salinas Valley and is to identify realistic sources of water no matter what the cost or environmental impact. Review of many previous and ongoing studies is included. The projects were to be ranked on the basis of practicality, cost, environmental impact, and various other factors, taking into account the present (1990) serious water supply shortfall and to estimate, over a fairly short planning horizon, the water demand to the year 2010 and to consider contamination problems in arriving at a solution.

The county and its cities have complied with various requirements for general planning (i.e., general plans, air quality plans, transportation plans, etc.). This report is prepared on the basis that the growth projections provided by the various general plans are approved. Only if water supplies could not be found to meet the projected water demand, or a no project alternative was adopted, would the growth plans need to be revised downward. Such is not the case regarding supply; adequate water supplies are available. However, water supply development larger than needed may be considered growth inducing.

All projects (or the no project alternative) have environmental, social, or economic impacts. Implementation of new water supply projects entails complying with many rules and regulations of numerous agencies. Appendix A describes the various environmental impacts usually encountered and the various agencies involved in permitting a project. Each project in Appendix B has a discussion of environmental issues and possible mitigation measures.

Major Inputs from Various Parties

The various evaluations of the different situations affecting the county and the potential water supply options drew clear implications.

1. Carmel Valley-Peninsula - A strong community antipathy toward major projects. A strong fishery agency desire to protect the steelhead trout. A desire to rely on the Carmel River and other Peninsula water sources rather than Salinas River sources.

2. Salinas Valley - A demand by lower Salinas Valley water users to stop seawater intrusion. A need to stop overdrafting of the East Side groundwater basin subunit and to recharge the subunit. Strong negative reactions by various agencies to developing a dam on the Arroyo Seco, particularly if other options

existed. A strong fishery agency desire to protect the steelhead trout. Desire to retain Salinas River water resources within the Salinas Valley, i.e., no transbasin transfer to the Carmel Valley-Peninsula area. Objections from San Luis Obispo County landowners near Nacimiento Reservoir to authorized lower reservoir levels. A concern for groundwater contamination by nitrates.

3. Pajaro Valley - A need to stop seawater intrusion. Possible reliance on the federal San Felipe Project or development of local supplies depending on water demand studies yet to be completed.

Environmental, Water Yield, and Cost Evaluations

The identification of a water supply program must take into account the major issues and constraints. The two usual major issues and constraints are environmental matters and costs. It was important from an environmental viewpoint to assure that all other prudent ways of meeting the water demands were considered as part of any water supply program. The following types of water supply options are included in the program:

- o Urban water conservation
- o Agricultural water management
- o Use of treated reclaimed water
- o Desalination
- o Full utilization of existing reservoirs

When these options were considered, there was still a shortfall, even for the present (1990) demand. Consequently, new surface water sources needed to be identified and one or more selected for the program.

Environmental issues were generally assessed in parallel with project water yield studies. The goal was to compare water yield from the various possible sources with the demand from various areas in the county while at the same time assessing the environmental impacts of the associated projects. It became clear that maximizing the use of the Nacimiento River basin, still underdeveloped from a hydrologic viewpoint, resulted in the lowest environmental impact of all the programs. All other programs involved development of the Arroyo Seco River, the Carmel River, and possibly Gabilan Creek, and a separate Pajaro Valley program. The Pajaro Valley is always considered separately in this report due to its geographic location.

Nacimiento River Projects

Studies were made to further develop the Nacimiento River basin. Increasing storage at Nacimiento Reservoir and San Antonio Reservoir were studied. Development of a dam on the upper Nacimiento River, as depicted by Jerrett Dam, was also studied. These options can provide water to all areas of the county except the Pajaro Valley. All distribution systems to bring the stored water to various areas of the county are discussed later under the heading Distribution Systems.

An upper Nacimiento River project, such as Jerrett Dam, minimizes environmental impacts as compared to an Arroyo Seco development. Even less environmental impacts would occur by raising the spillway crest at Nacimiento Dam or constructing a large interlake tunnel, but these individually do not provide adequate water yield. Additional study is warranted because together they may provide adequate water yield with a minor environmental impact and less cost.

Environmental issues for a dam at the Jerrett (or other upper Nacimiento River sites) are typical, as discussed in Appendices A and B. Fisheries and wetland/riparian habitat will be the prime focus and will include impacts on the Salinas River. The California Department of Fish and Game may attempt to obtain fishery benefits not obtained when Nacimiento and San Antonio Reservoirs were constructed. Obtaining property from the Department of Defense may require Congressional approval. Adverse impacts due to already authorized lower levels of Nacimiento Reservoir will be subject to criticism from San Luis Obispo County landowners adjacent to the reservoir. San Luis Obispo County may attempt to gain some water rights. None of these issues appear to represent an insurmountable obstacle to project implementation. All of these issues must be considered in future studies of further development of the Nacimiento River.

Arroyo Seco Dam Alternatives

The three dam sites and four dams studied on the Arroyo Seco River each have benefits and adverse impacts, some common to all and some unique. However, even for a common impact such as the fishery issue, there are differences in mitigation proposals for the different sites. The significant data for the four dams are summarized in Table 9-1.

The data indicates that many issues are involved--from not affecting the Ventana Wilderness by use of a downstream dam site at an additional cost of $68,000,000, to providing an opportunity to improve the steelhead trout run in the river gorge in natural conditions versus use of a

TABLE 9-1

ARROYO SECO DATA SUMMARY

	Pools	Woodtick	Greenfield (High)	Greenfield (Low)
Issues				
Land	Ventana Wilderness USFS land Proposed Wild and Scenic River 1,000 acres --	-- USFS land Proposed Wild and Scenic River 1,500 acres 70 homes	-- -- -- 3,000 acres 60 homes	-- -- -- 2,000 acres 50 homes
Fishery	Possible natural river gorge spawning below dam (16 miles) Special canal	Possible natural river gorge spawning below dam (12 miles) Special canal	Fish hatchery or collection faciliites	Fish hatchery or collection facilities
Habitat	Probably mitigate Downstream and on tributaries	Probably mitigate Downstream and on tributaries	Probably mitigate Upstream and on tributaries	Probably mitigate Upstream and on tributaries
Project Data				
Usable Storage Reservoir Area (Max) Reservoir Area (Min)	90,000 AF 750 acres 100 acres	100,000 AF 910 acres 235 acres	200,000 AF 2,230 acres 440 acres	100,000 AF 1,600 acres 440 acres
Fishing	Reservoir and 16 miles of river	Reservoir and 12 miles of river	Reservoir only	Reservoir only
Recreation	Minor facilities	Medium facilities	Major facilities	Major facilities
Construction Cost	$87,440,000	$155,750,000	$211,950,000	$155,430,000

hatchery or collection facilities, to providing limited or major recreation facilities near the growing urban area of the county.

Before a decision is made regarding the selection of a site or reservoir size on Arroyo Seco, a complete engineering and environmental analysis of all reasonable sites and sizes should be conducted. Of particular importance is the fishery issue which needs to be evaluated for significance and for acceptable mitigation measures. It appears that decisions are being made regarding the Arroyo Seco River in a piecemeal fashion. Even if a reservoir on the Arroyo Seco River is not needed now, protection of the Arroyo Seco River watershed for future water supply purposes appears warranted. (After the Nacimiento River is fully developed, the Arroyo Seco River is a significant undeveloped water source in the county.) Further residential and commercial development should be curtailed and property should be acquired in the Arroyo Seco Basin as it becomes available. Funds should be provided in the adopted program for studies and property acquisition.

Carmel River Alternatives

Many alternative projects have been evaluated on the Carmel River. The two alternatives being considered on the Carmel River, the New Los Padres Dam and the Canada Project are very different in type.

The New Los Padres Dam, proposed by the MPWMD, would be an enlargement of the existing Los Padres Dam, owned by Cal-Am. The major impact of this action is on the passage of steelhead trout. The existing dam employs a collection system for upstream fish passage and uses the spillway for downstream fish passage. The present facilities and results are not acceptable to the California Department of Fish and Game (CDF&G). The CDF&G is not convinced that the new collection facilities proposed for the New Los Padres Dam, estimated to cost about $13,000,000, will be satisfactory. However, if New Los Padres Dam is not built, CDF&G desires improvements to the existing fish collection facilities.

On the other hand, a major portion of the storage in the new reservoir is allocated to downstream fish flows during moderate drought years. Furthermore, groundwater pumping would be eliminated except during severe drought years. But CDF&G is willing to let the fishery be exposed to natural conditions as the preferred approach to the fishery issue.

The New Los Padres Reservoir also affects 4 acres of Ventana Wilderness. However, a property exchange is being pursued to eliminate this conflict.

A new water treatment plant would replace the existing Cal-Am plant below San Clemente Dam to meet new water quality requirements.

The Canada Project proposed by Cal-Am is defined as an off-stream storage project. A small diversion dam would be placed in the Carmel River, and pumps would lift up to 100 cfs of water into the main reservoir, which would be located in a side canyon about 1 mile from the river. The diversion dam would have a deflatable rubber barrier which would be lowered when the river flows are high, a condition normally coincident with steelhead trout migration. Pumping would only occur when adequate flows were being passed downstream. Groundwater pumping would be eliminated except during critical drought years.

The project complies with the CDF&G desire to allow natural conditions to prevail regarding fishery issues. However, fish facilities at existing Los Padres Dam would have to be improved to meet CDF&G requirements.

The dam site is overlain by major landslides. The shale material proposed to be used in the dam embankment is a very light material. While these factors can be resolved from an engineering viewpoint, dam costs will be higher. The Canada Project also would include a new treatment plant and related facilities.

Gabilan Creek Dam Project

The two alternative dam sites on Gabilan Creek (Sugarloaf and Mud Creek) are very similar and both have similar overall, but relatively minor, environmental impacts. Both sites should be evaluated further if a dam on Gabilan Creek is to be utilized.

Pajaro Valley Project

Two alternatives are being considered for the Pajaro Valley--imported federal San Felipe Project water and small local projects. The choice of which alternative to implement may depend upon the final determination of the water demand.

Use of imported water would appear to have minor impacts on the environment. Use of local projects (other than water reuse) could have significant impacts on the environment, again

focusing on steelhead trout. In addition, other agencies upstream on the Pajaro River system are also considering new dams or enlargement of existing dams. Basinwide studies appear to be necessary. The size of the water demand will have a major impact on the selection of the water supply program.

Distribution Systems

A number of distribution systems are required to convey the water from the storage reservoir or river to the points of use. Table 9-2 presents data regarding origin of storage, distribution system, and service area or avoided project.

The distribution systems themselves all have minor impacts on the environment. Small diversion facilities have an impact on wetlands and riparian habitat which, in general, can be replaced. Fish passage facilities are included. The Finch Creek and Arroyo Seco Canal facilities will require very careful study in regard to effectiveness for fishery mitigation.

Fishery Issues

Fishery issues play an important role in the selection of project elements. The presence of steelhead trout in all three rivers under study represents a severe constraint. The CDF&G is making a major effort to maintain the steelhead trout in California and will impose major requirements on proposed projects. Consequently, the viability of some projects must be carefully studied before they can proceed. The Jerrett Project results in the least impact on the steelhead trout. The acceptability of a fish hatchery for the Greenfield site on the Arroyo Seco River is not known.

Water Quality

Water quality in general is an area of growing interest and concern. The primary water quality problems relating to the present study is nitrate contamination of the groundwater. Water supply options utilizing surface water will have less nitrate content than most groundwater supplies. All water in municipal treatment systems is being subject to higher treatment requirements.

TABLE 9-2

DISTRIBUTION SYSTEM DATA

Storage Location	Distribution System	Service Area or Avoided Project
Nacimiento-San Antonio	Diversion Dam at Blanco	
	Pipeline to Marina-Fort Ord	Eliminates pumping in seawater intrusion area
	Pipeline to Castroville	Eliminates pumping in seawater intrusion area
	Water Reclamation	Used to supplement pipeline to Castroville
Jerrett	Diversion Dam at Spence	
	Pipeline to Salinas and North County	Reduces East Side pumping and provides water supply to Salinas and North County areas
	Pipeline to Peninsula	Eliminates need for a Carmel River project
Arroyo Seco and Arroyo Seco Canal	Pipeline to Finch Creek	Eliminates need for a Carmel River project
	or	
	Pipeline to Laguna Seca	Eliminates need for a Carmel River project
	Diversion Dam at Spence	Reduces East Side Pumping and provides water supply to Salinas and North County area
	Pipeline to Salinas and North County	
San Felipe Import	Pipeline to Pajaro River	Curtails seawater intrusion in Pajaro Valley