APPROPRIATE QUANTITY OF SUPPLEMENTAL WATER FROM THE STATE WATER PROJECT

FOR

CAL CITIES WATER, SANTA MARIA SERVICE AREA

JUNE 15, 1992

LAWRANCE, FISK & McFARLAND, INC.

CONSULTING CIVIL & ENVIRONMENTAL ENGINEERS

928 GARDEN STREET, SUITE 1 - SANTA BARBARA CA. 93101

LAWRANCE, FISK & McFARLAND, INC.
CONSU .G ENGINEERS • SANTA BARBARA • O .E

Santa Barbara Main Office
928 Garden Street, Suite 1
Santa Barbara, California 93101
Phone (805) 564-2441
FAX (805) 564-8575

June 15, 1992

California Cities ater
4854-F S. Bradley oad
Santa Maria, CA 93455

Attn: Mr. Roger W. Brett, District Superintendent

Subject: LFM Report on Appropriate Quantity of State Water Project Water for Santa Maria Service Area

Gentlemen:

This Report by Lawrance, Fisk & McFar nd, . (LFM) is pursuant to the January 9, 1992 Agreement between Sou hern alifornia Water Company and LFM for preparation of a Consultant Report to assist California Cities Water in determining the appropriate amount of State Water Project water to be obtained for the Santa Maria District.

The attached Report is prefaced by an Executive Summary. This is intended to facilitate familiarity with the Report contents by interested parties, including Southern California Water Company management and also Commissioners and Staff of the State of California, Public Utilities Commission.

The undersigned will be happy to answer any uestions that you may have concerning the study and report. We also re prepared to assist Cal Cities Water as may be requested in forthcoming proceedings with the Public Utilities Commission. We greatly appreciate having had this opportunity of serving Cal Cities Water in this important assignment.

Respectfully submitted,

LAWRANCE, FISK & McFARLAND, INC.

Charles H. Lawrance, P.E.
Vice President

Att: Report

TABLE OF CONTENTS

		Page
E -	EXECUTIVE SUMMARY OF REPORT	E - 1
I -	INTRODUCTION	I - 1
	NATURE OF CAL CITIES WATER	I - 1
	WATER SUPPLY FOR CAL CITIES WATER	I - 1
	REASONS FOR SWP IMPORTATION	I - 2
	GROUNDWATER BASIN OVERDRAFT	I - 2
	MINERAL QUALITY IMPROVEMENT	I - 3
	STUDY APPROACH	I - 4
II -	PROJECTIONS OF FUTURE WATER DEMANDS OF WATER SYSTEMS	II - 1
	RURAL SYSTEMS IN SANTA BARBARA COUNTY	II - 1
	Sisquoc System	II - 1
	Lake Marie System	II - 2
	SUBURBAN SYSTEMS IN SANTA BARBARA COUNTY	II - 2
	Population and Land Use, General Orcutt Area	II - 2
	Population Projections	II - 3
	Mutual Targets for Service Area Extension	II - 4
	Tentative Demarcation of Areas for Future Water Service	II - 5
	Future Land Development Possibilities	II - 6
	Water Demand Projections	II - 7
	VISTA SYSTEM, SAN LUIS OBISPO COUNTY	II - 8
	SUMMARY OF PROJECTED WATER DEMANDS FOR ALL CCW SYSTEMS	II -12
III -	SWP SUPPLEMENTAL SUPPLY TO MEET GROWTH DEMANDS	III - 1
IV -	GROUNDWATER BASIN OVERDRAFT AND MITIGATION	IV - 1
	SANTA MARIA GROUNDWATER BASIN	IV - 1
	CURRENT ASSESSMENT OF BASIN OVERDRAFT	IV - 1
	ALLOCATION OF BASIN OVERDRAFT	IV - 3
	NIPOMO MESA SUB-AREA GROUNDWATER	IV - 4
	CURRENT GROUNDWATER CONDITIONS	IV - 6
	SWP IMPORTATION PLANS ON NIPOMO MESA	IV - 7
	CCW SUPPLEMENTAL WATER REQUIREMENTS TO OFFSET OVERDRAFTS	IV - 8
V -	SWP WATER FOR GROWTH AND BASIN OVERDRAFT REDUCTION	V - 1

VI - MINERAL WATER QUALITY CONSIDERATIONS VI - 1
MINERAL QUALITY OF SWP IMPORTED WATER VI - 1
MINERAL QUALITY OF LOCAL GROUNDWATER SUPPLYING CCW VI - 1
INDIRECT WATER CONSUMER BENEFITS OF SWP VI - 1
WATER HARDNESS AND WATER SOFTENING CONSIDERATIONS VI - 2
Lompoc Area Study by DWR VI - 2
Earlier Consultant Study VI - 2
APPROXIMATE QUANTIFICATION OF HARDNESS PENALTIES VI - 3
TREATMENT PLANT EFFLUENT DISPOSAL CONSIDERATIONS VI - 3
LAGUNA COUNTY SANITATION DISTRICT CONCERNS VI - 4
POTENTIAL WASTEWATER QUALITY BENEFITS FOR LAGUNA CSD VI - 6
GENERAL EFFLUENT DISPOSAL CONSIDERATIONS VI - 9
WASTEWATER RECLAMATION POTENTIAL CONSIDERATIONS VI -10

VII - TOTAL SUITABLE SWP IMPORTATION QUANTITIES VII - 1
GENERAL CONSIDERATIONS JUSTIFYING SWP IMPORTATION VII - 1

* * * * *

LIST OF TABLES

	Description	Page No
1	Population Projections for Cal Cities Water Suburban Area and City of Santa Maria Area	II - 3
2	Urban Water Demand Projections for CCW and Santa Maria Areas	II - 7
3	Recent and Projected Service Connections and Annual Deliveries for the Vista System	II - 8
4	Comparison of Dau-70 Santa Maria Population Projections of San Luis Obispo County and California Department of Finance	II -10
5	San Luis Obispo County Department of Planning and Building Population Data for Portions of South County	II -10
6	LFM Projections of Population and Demand for Vista System	II -11
7	Summary of LFM Projected Water Demands for CCW Water Systems	II -12
8	Incremental Water Supply to Meet Incremental Demands, CCW	III - 1
9	Groundwater Conditions Shown in SBCWA Report for Dau 71 Santa Maria	IV - 2
10	Existing and Project Safe Yield Supply Versus Demand and Resulting Deficits, after DWR's EIR, Table 6, as updated	IV - 3
11	Excerpt from DWR's EIR Regarding DAU 70 Santa Maria Groundwater Use and Overdraft (Table 9-1)	IV - 5
12	Summary of Estimated Supplemental Water Requirements of CCW Systems to Offset Allocated Groundwater Basin Overdrafts in Both Santa Barbara and San Luis Obispo Counties	IV - 8
13	Imported Water Requirements to Sustain Growth and Mitigate Current Allocated Groundwater Basin Overdraft Conditions	V - 1

14	Representative Mineral Characteristics of CCW Domestic Water	VI - 1
15	Effluent Limitations of Regional Water Quality Control Board Under Order No. 87-43 for Laguna County Sanitation District Concerning Mineral Content with Respect to Groundwater Areas	VI - 4
16	Allowable Mineral Pickup of Supply Water from CCW Within Laguna CSD Relative to Compliance with RWQCB Order No. 87-43	VI - 5
17	Illustration of Mineral Water Quality Impacts of Importation of SWP Supplemental Supply to the Tanglewood/Orcutt Systems for an Assumed Buildout Combined Water Demand of 10,000 AFY	VI - 6
18	General Conditions Prevailing in CCW Systems with SWP Importation to Sustain Approved Growth and Offset Overdrafts	VII - 1
19	Recommended SWP Importation Levels for CCW Systems	VII - 4

* * * * *

FIGURES

Map: "Cal Cities Water - Existing and Expanded Service Areas"

Located in Map Pocket at End of Report

* * * * *

APPROPRIATE QUANTITY OF SUPPLEMENTARY WATER FROM THE STATE WATER PROJECT FOR CAL CITIES WATER, SANTA MARIA SERVICE AREA

EXECUTIVE SUMMARY OF REPORT

by

Lawrance, Fisk & McFarland, Inc.

June 15, 1992

This is an Executive Summary of the Final Report to Cal Cities Water by Lawrance, Fisk & McFarland, Inc. pursuant to consultation on determining the appropriate quantity of supplemental water supply from the State Water Project for Cal Cities Water, the Santa Maria Service Area of Southern California Water Company. The Final Report, following this Executive Summary, presents pertinent information on the supply and demands of the Cal Cities Water Systems, including recommendations for commitment for a quantity of supplemental supply from the State Water Project. The Appendices contain supporting data and analyses.

This Executive Summary employs a Question-and-Answer format. The summary presents the salient aspects of the issue to facilitate familiarity with the contents of the report by readers, including Commissioners and Staff of the State of California Public Utilities Commission.

1) **How is Cal Cities Water presently supplied and how is the supplemental water proposed to be supplied?**

Cal Cities Water has five separate systems in the Santa Maria Area, each of which obtains its supply exclusively by wells drawing from the Santa Maria Groundwater Basin. Three of the four systems in Santa Barbara County (Orcutt, Tanglewood, and Lake Marie) are sufficiently close to a turnout from the Mission Hills Extension of the Coastal Branch Phase II to accept imported water from the State Water Project (SWP) into their distributions systems. (It is planned that these distribution systems eventually be linked by pipelines.) The Sisquoc System is a small, rural system which is located in the most remote part of the basin, so it will be impractical to extend a pipeline to that System.

Within San Luis Obispo County, the Vista System is proposed to receive supplemental SWP water supply via a turnout from the Coastal Branch Phase II located about 7,000 feet southeasterly of the current distribution system. A pipeline would be constructed from the distribution system to the turnout.

2) **What are the purposes of supplying supplemental water?**

The two primary purposes of supplying supplemental water are: (a) to reduce overdraft in the Santa Maria Groundwater Basin; and (b) to permit reasonable future growth of the individual Systems, compatible with adopted General Plan guidelines. The primary purposes of the supplemental SWP supply have been considered as a common basis for other participating water purveyors in the importation project.

3) **Is there a secondary purpose of supplying SWP supplemental water and, if so, what is it?**

Yes, a secondary purpose is to improve the mineral quality of the water supplied to consumers., This has also been considered by most water purveyors as an important justification for the importation.

4) **Is it possible to accomplish the primary objectives reasonably?**

Yes, because all Systems draw from a common groundwater supply. Although the Sisquoc System is too small and too remote to justify construction of a connecting pipeline from the Aqueduct, its proportionate contributions to the basin overdraft as well as requirements to sustain moderate future growth will be mitigated by increasing the supplemental SWP water deliveries to be taken into the four other systems.

5) **Can the secondary importation objective, that of mineral water quality improvement, be accomplished reasonably?**

For Vista, Orcutt, Tanglewood, and Lake Marie Systems, this will be possible, inasmuch as most if not all consumers within these systems will be able to enjoy the benefits of the SWP deliveries as blended with local groundwater. However, for the remote Sisquoc System it will not be economically feasible to extend a pipeline for SWP water.

6) **How does Cal Cities Water propose to commit for SWP supplemental water?**

Cal Cities Water proposes to commit to SWP supplemental water in a single bloc, representing the aggregate of the requirements of the individual Systems in both Santa Barbara and San Luis Obispo Counties, within each of which there is to be a single turnout. The commitment within Santa Barbara County will be made to the Central Coast Water Authority. The commitment within San Luis Obispo County will be made to San Luis Obispo County Flood Control and Water Conservation District. Cal Cities Water proposes to request annual entitlements and turnout capacity capabilities within these two respective counties on behalf of the Systems located therein and on the basis of its best engineering judgment.

7) **How is the proportionate basis of entitlement commitments for the each of the five Cal Cities Water Systems calculated?**

The methodology follows that which was used in the May, 1991 "Final Environmental Impact Report Volume One, State Water Project, Coastal Branch, Phase II and Mission Hills Extension," authored by the State of California, Department of Water Resources (DWR) and also in the September 28, 1991 Revision of the Report: "Santa Barbara County Growth Inducement Potential of State Water Importation," co-authored by Santa Barbara County Water Agency (SBCWA) and consultant Pamela Gene Cosby. The methodology involves a calculation of the proportion of the overdraft of the basin that is caused by each of the categories of pumpers from the basin, including the group of Cal Cities Systems in Santa Barbara County. (In San Luis Obispo County, the Vista System is lumped with other urban demand data rather being shown as a segregated item.)

The data employed in the calculations involve both consumptive use basin overdraft and consumptive use type of demand, that is, pumpage that is used consumptively and cannot return to the basin. Total consumptive demands for individual types of pumpers, public and private, municipal, industrial, and agricultural, are calculated for current conditions and projected future conditions, under assumptions stated. The allocated consumptive use basin overdraft of an individual class or category of pumper is calculated by multiplying the total basin overdraft by the individual pumper's proportionate share of the total consumptive use demand being exerted on the basin at the specified time.

8) **Does the methodology allow for mitigating both current overdrafts and also future overdrafts that may increase over present levels due to growth within the framework of approved General Plans?**

Yes, it does. The current overdraft conditions calculations utilize historical conditions and resulting analyses by DWR and Santa Barbara County Water Agency (SBCWA) and its consultant (Cosby). The future conditions, as projected, automatically include increases in demand within the guidelines of population growth of adopted General Plans.

9) **What are the future projected water demands for Cal Cities Water, how were they made, and how do they differ from those made by others?**

The future water demand projections for Cal Cities Water Systems were made by our Water Consultant Lawrance, Fisk & McFarland, Inc. (LFM) and are the combined result of projected populations and unit per capita demands as indicated below.

Item	1990	2000	2010
Sisquoc System:			
Population	213	240	270
AFY/capita	0.155	0.155	0.155
AFY System	33	38	42
Lake Marie System:			
Population	603	900	1,200
AFY/capita	0.534	0.534	0.534
AFY System	322	481	641
Tanglewood System:			
Population	1,353	1,800	1,950
AFY/capita	0.412	0.39	0.37
AFY System	557	702	722
Orcutt System:			
Population	29,451	38,400	43,500
AFY/capita	0.286	0.27	0.25
AFY System	8,433	10,368	10,875
Vista System:			
Population	3,456	4,800	5,700
AFY/capita	0.779	0.779	0.779
AFY System	921	1,246	1,480
Cal Cities Water:			
Population	35,076	46,140	52,620
AFY/capita	0.293	0.278	0.261
AFY Systems	10,266	12,835	13,760
ROUND OFF, AFY	10,266	12,800	13,800*

***General Plan Buildout Condition is assumed to occur a relatively few years after year 2010, during which time a modest increase of 200 AFY is allowed for, making the basic demand for General Plan Buildout Conditions equal to some 14,000 AFY.**

These projections do not differ greatly from the latest updates of previous DWR work made jointly by SBCWA and Cosby and incorporating the results of the 1990 decennial census. These LFM projections allow for a reasonable overall average of 10 percent consumer conservation by the time of General Plan Buildout as a result of normal developments in changing habits of urban water users and withholding a greater conservation potential for temporary "drought reserve," when necessary.

10) **What is the methodology used for determining the secondary importation benefit of improved mineral water quality by the proposed SWP supplemental water importation?**

The methodology is one which relates the average total dissolved solids (TDS) or average total hardness (TH) of the delivered water to customers to certain reference values. Data from past studies by the State of California, Department of Water Resources (DWR) and other investigators have indicated that as the delivered water becomes less salinized (and less hard) within normal limits, the indirect monetary benefit to consumers for such improved mineral quality is in the order of $30/AF/100 mg/l TDS. Using this number, and for an "average" household consuming about 0.4 AFY, this would correspond to about $1/month average benefit per 100 mg/l average TDS improvement. Thus, for example, an improvement of, say, 300 mg/l TDS of blended water supplied to a consumer under these circumstances might be worth about $3/month, which would help offset the allocated consumer costs of the water importation.

11) What are the other secondary benefits, if any, and how do they arise?

The other secondary benefits include both water quality and water quantity benefits, indirectly affecting the groundwater basin. Improved mineral quality in water delivered to customers will, in turn, improve the mineral quality of the municipal wastewater ultimately requiring disposal by evapotranspiration and/or percolation in lands overlying the groundwater basin.

Improved mineral quality will permit reduced home softening and commercial softening, thereby reducing the mineral contributions to the wastewater by these operations and facilitating proper disposal (and reclamation) of municipal wastewater treatment plant effluent. Additionally, landscape irrigation water will be of improved mineral quality (reduced TDS) with imported supply to a municipal system, and the portions of this applied water that return to the basin should be correspondingly less mineralized.

The imported water components of the returns to the basin from both effluent and landscape irrigation augment the yield of the basin. This quantity benefit to the basin and the indirect water quality benefit to consumers come about from the importation, whether it be intended for groundwater basin mitigation, support of moderate future growth, or improvement of mineral quality delivered to consumers. The degree of this latter betterment will depend upon the relative proportions of local groundwater and imported SWP being supplied.

12) Should there be additional moderate importation of SWP supply beyond the calculated values to offset basin overdrafts and allow for reasonable growth?

Yes, as a matter of prudence. Notwithstanding the significant SWP water importation by participating purveyors, there will still be a substantial unmitigated basin overdraft, for the large private pumpers (who have paramount overlying water rights to the water local groundwater supply and who also generally have severe economic constraints) will not be participating in the importation project. This remaining overdraft of the basin has been estimated by DWR to be in the range of 20,000 to 30,000 AFY. However, it is in the interests of all parties benefitting from water pumpage from the groundwater basin that this overdraft be additionally reduced to a reasonable extent, even beyond that achievable by municipal participants in the SWP importation project, such as Cal Cities Water. To that end, and also to allow for contingencies such as might result from underestimating the future demands, a modest 10 percent contingency factor has been recommended to be added to the basic overdraft mitigation values calculated for supplemental water importation. This contingency factor will increase the mineral water quality benefits, generally proportionately.

13) **What are the amounts of SWP supplemental water that have been calculated as being required to mitigate allocated basin overdraft and to allow for reasonable future growth (no increase in basin overdraft, following mitigation of current overdraft)?**

The amounts that have been calculated are as tabulated below for theoretical recent (1990), year 2000, and General Plan Buildout Condition, respectively:

Item	Required Supplemental Supply, AFY 1990	2000	Gen.Pl.Buildout
GWB Overdraft Mitigation			
Sisquoc System	8	10	11
Lake Marie System	81	128	172
Tanglewood/Orcutt	2,271	2,952	3,117
CCW, Santa Barbara Co.	2,360	3,090	3,300
Vista System	100	120	150
Total, Cal Cities Water	2,460	3,210	3,450
Support Gen. Plan Growth			
Sisquoc System	0	5	10
Lake Marie System	0	159	330
Tanglewood/Orcutt	0	2,080	2,815
CCW, Santa Barbara Co.	0	2,214	3,155
Vista System	0	320	579
Total, Cal Cities Water	0	2,534	3,734
Total of Objectives			
Sisquoc System	8	15	21
Lake Marie System	81	287	502
Tanglewood/Orcutt	2,271	5,032	5,932
CCW, Santa Barbara Co.	2,360	5,334	6,455
Vista System	100	440	729
Total, Cal Cities Water	2,460	5,744	7,184

14) What are the quantities of supplemental SWP supply that should be provided when a modest 10 percent contingency factor is employed to allow for possible greater demand than anticipated, increase groundwater basin reduction more than allocated, and/or improve indirect water quality benefits?

The quantities are as indicated in the tabulation below:

Total Supplemental Supply Requirement from SWP
Values are Listed in AFY

Item	1990	2000	Gen.Pln.Build.
Basic Importation Levels for Offsetting GB Deficits & Sustaining General Plan Conforming Growth	2,460	5,744	7,184
Recommended Contingency and General Benefit (10 %)	246	574	718
Total Recommended Import	2,706	6,318	7,902
ROUND OFF	2,700	6,320	7,900

* * * * *

APPROPRIATE QUANTITY OF STATE WATER PROJECT WATER FOR SANTA MARIA SERVICE AREA

I - INTRODUCTION

This Report by Lawrance, Fisk & McFarland, Inc. (LFM) has been prepared at the request of Cal Cities Water in order to obtain a consultant's determination of the appropriate amount of supplemental water supply from the State Water Project for the various water systems of the company.

NATURE OF CAL CITIES WATER

The Santa Maria District of the Southern California Water Company is known as Cal Cities Water and comprises five (5) separate systems. The Vista System is located on south-central Nipomo Mesa in San Luis Obispo County, while the remaining 4 systems are located in Santa Barbara County. Of these, Lake Marie and Sisquoc Systems are relatively small systems, fairly well separated from the urban or urbanizing area. On the other hand, the Tanglewood System and, especially, the Orcutt System are well within the urban area of the southern portion of Santa Maria Valley.

All of the Cal Cities Water Systems are largely, if not exclusively, residential. The Sisquoc and Lake Marie Systems are rural residential, while the Tanglewood and Vista Systems are of a suburban residential character. The Orcutt System is much the same but includes limited commercial accounts as well.

Water service from all 5 Cal Cities Water Systems is exclusively to unincorporated areas, save for a small portion of the City of Santa Maria served by the Orcutt System. The service areas are depicted on the Map entitled "Cal Cities Water, Existing and Potential Services Areas." (See Map Pocket at end of Report.)

WATER SUPPLY FOR CAL CITIES WATER

Groundwater is the exclusive source of supply for Cal Cities Water Systems. The four systems within Santa Barbara County overlie the Santa Maria Groundwater Basin, while the Vista System overlies the Nipomo Subarea of the Arroyo Grande Groundwater Basin. Some investigators consider that the latter basin is merely an extension of the Santa Maria Groundwater Basin into San Luis Obispo County.

The Santa Maria Groundwater Basin is currently the sole source of supply for the urban, industrial, and agricultural areas within the Santa Maria Valley. However, imported supplemental water from the SWP is programmed for the major municipal water systems within the Santa Maria Valley, including Cal Cities Water and the Cities of Santa Maria and Guadalupe.

The Arroyo Grande Groundwater Basin, as defined by the State Department of Water Resources (DWR), is contiguous with the Santa Maria Groundwater Basin, beginning at the Santa Maria River, and it extends northward from the Santa Maria River as far as the northwesterly areas of the City of Pismo Beach. It comprises three hydrologic subunits or subareas. The southernmost of these is the Santa Maria Valley Hydrologic Subunit, which extends northerly from the Santa Maria River to the southerly bluff of Nipomo Mesa. The central one of these is Nipomo Mesa Hydrologic Subarea, and this serves as the supply source of the Vista Division and certain other groundwater pumpers. The northernmost is the Arroyo Grande Plain - Tri-Cities Mesa Subarea, and this is the only subarea currently to receive imported surface water supply (pipeline from the Lopez Project). Only a limited amount of imported supplemental water supply from the SWP is foreseen for urban areas within the Nipomo Mesa Subarea and the Arroyo Grande Plain - Tri-Cities Mesa Subarea. Cal Cities Water planning to date has included supplemental SWP supply for the Vista System.

REASONS FOR SWP IMPORTATION

The primary purposes for importing water from the SWP have been to mitigate groundwater basin overdraft and to permit reasonable urban growth consistent with General Plan guidelines. A secondary purpose has been to improve mineral water quality for water-users.

GROUNDWATER BASIN OVERDRAFT

It is common knowledge that the Santa Maria Groundwater Basin has been in a state of overdraft for many years and continues to be overdrafted. For example, the Santa Barbara County Water Agency Final Report on the Adequacy of the Santa Maria Groundwater Basin (Ref. 1) found that overdraft under 1975 conditions was approximately 20,000 acre-feet per year (AFY) on the basis of consumptive use and about 28,000 AFY on the basis of pumpage (no credit made for return flows to the basin). The State of California, Department of Water Resources (DWR) Southern District Office in cooperation with Santa Barbara County Flood Control and Water Conservation District published an April 1985 report on Santa Barbara County State Water Project Alternatives (Ref. 2), and this report noted that the water deficit for the Santa Maria Subarea was projected to rise from a 21,600 AFY value in 1980 to 23,300 AFY in year 2010. However, the DWR Final EIR Volume One on the SWP Coastal Branch Phase II and Mission Hills Extension (Ref. 3) showed the deficit in 1990 to be nearly 37,000 AFY and to rise to over 39,000 AFY by the time of General Plan Buildout (somewhat beyond year 2010). These values are net values, i.e. equivalent to consumptive use overdraft.

The most recent DWR studies (Refs. 2 & 3) have confirmed the findings of earlier studies that no local supplemental supply sources can be developed economically for the Santa Maria Valley. Furthermore, considerations of economics, water rights, and environmental impacts have generally placed the burden of developing supplemental water upon the urban water users, i.e. municipal and industrial or "M&I" users.

For the Nipomo Mesa Subarea, the balance of water supply and disposal is less well defined, in part because of data limitations. For example, a June 1979 DWR Report on groundwater for the Arroyo Grande Area (Ref. 4) found that there was no overdraft in that overall basin and that the Nipomo Mesa Subarea was supplying a substantial quantity of water to the adjacent subareas via subsurface outflow. The greatest portion of this went to Santa Maria Valley. When this subsurface outflow was properly taken into account, it was clear that surplus groundwater existed in Nipomo Mesa Subarea under 1975-77 conditions.

A 1988 Report by LFM reflecting 1985-87 conditions, indicated a supply deficiency for the Nipomo Mesa Subarea, due in large part to considerable peripheral subsurface outflow to Santa Maria Valley to the southwest and to the more moderate outflow to Arroyo Grande Plain - Tri-Cities Mesa Subarea to the northwest (Ref. 5). This LFM report adhered to the basic DWR assumptions concerning recharge from deep penetration of rainfall as well as various subsurface flows. However, a recent consultant EIR, taking a fresh look at water levels and employing different interpretations of data presented in the important June 1979 DWR study as regards rainfall recharge (Ref. 4), has concluded that no overdraft currently exists (Ref. 6).

MINERAL QUALITY IMPROVEMENT

Improvement of mineral quality of the public water supplies has been an important secondary purpose, if not actually a primary purpose, of the participating water purveyors in the Santa Maria Valley in subscribing for SWP supplemental supply. For example, the groundwater produced by the City of Santa Maria is very hard, causing many consumers to practice softening. The combination of hard water supply and waste softening brines discharged into the municipal sewer system creates a wastewater quality that is considered detrimental to the groundwater underlying the municipal disposal lands. As a consequence, the City of Santa Maria has been under an order from the California Regional Water Quality Control Board, Central Coast Region (RWQCB) to comply with waste discharge requirements from the City's Wastewater Treatment Plant effluent as regards certain mineral constituents, currently excessive. Santa Maria has determined, through Consultant John Carollo Engineers (Ref. 7), that SWP importation and substitution for a major portion of the City's supply would represent the most cost-effective means of dealing with this effluent disposal problem.

A somewhat similar problem has faced the Laguna County Sanitation District in its effluent disposal requirements, and this problem, and certain others, have been studied by LFM and County Staff (Refs. 8, 9, & 10). Laguna County Sanitation District serves nearly all of the Orcutt and Tanglewood Systems of Cal Cities Water as well as portions of the City of Santa Maria and the Santa Maria Public Airport. The LFM and

Laguna CSD studies have emphasized source control for reduction of the excessive mineral content of the wastewater but have also considered the possibilities of sequestering excessive streams of this wastewater. Consideration was also given to the beneficial effects that could be realized by diluting of the local freshwater supply with imported SWP supplemental water.

Due to their limited size and remoteness, the Lake Marie and Sisquoc Systems of Cal Cities Water do not have municipal wastewater systems, and the impacts of private disposal systems upon underlying groundwater have not been of major concern to RWQCB so far.

The groundwater supply of the Vista System of Cal Cities is also typically hard, although one of the wells produces unusually low mineral content water. Therefore for reasons both of quantity and quality, the Vista System has planned to be supplied with a significant amount of imported SWP water.

STUDY APPROACH

The determination of the appropriate quantity of supplemental water supply from the State Water Project (SWP) to be obtained by Cal Cities Water requires consideration of the following factors:

- Realistic projections of the future total water demands of the five Systems individually and in the aggregate.

- Incremental supply needed to satisfy incremental demand occasioned by reasonable future growth.

- Appropriate reductions in local groundwater basin overdraft attributable to switching a portion of the total system supply from groundwater to imported SWP water, both for the five systems individually and for Cal Cities Water as a whole. The same basis as employed by DWR in its Final EIR (Ref. 3) is followed in allocating reductions in total groundwater basin overdraft among water purveyors participating in the SWP importation project.

- Other relevant factors such as mineral water quality improvement benefits for consumers and facilitation of compliance with wastewater treatment plant effluent disposal requirements of RWQCB.

These factors are addressed in subsequent sections of this report.

* * * * *

II - PROJECTIONS OF FUTURE WATER DEMANDS OF WATER SYSTEMS

LFM used available data from responsible planning agencies as well as operating data from Cal Cities Water in this phase of the study. It was necessary to exercise judgment in all cases. For the urban area involving the Orcutt and Tanglewood Systems, informal conferences were held among Cal Cities Water representatives and those of the City of Santa Maria, whose service areas are contiguous and where there could be some duplication of interest in extending service areas to certain currently-undeveloped lands.

No specific analyses were performed nor calculations made as to the potential effects of consumer conservation on the future demand. Rather, this aspect was deferred for subsequent consideration. Thus, the projections shown herein are believed realistic if normal" demand patterns continue, including some allowances for increasingly widespread use of water-conserving fixtures in households and elsewhere.

RURAL SYSTEMS IN SANTA BARBARA COUNTY

As far as we have been able to determine, the water demands and growth patterns of the Sisquoc and Lake Marie Systems of Cal Cities Water have not been studied in detail by any public agency; rather, the studies for these small systems have been limited to those of Cal Cities Water. In both cases, the impacts upon future SWP needs of Cal Cities Water will not be greatly influenced by even moderate deviations from the projections made by CCW for these systems, should they occur. Therefore, it is deemed proper to give primary credence to the CCW projections as discussed below.

Sisquoc System

According to CCW data and projections (Ref. 11), the Sisquoc System had 71 active services in 1990 and experienced a demand of 0.470 acre-foot per year (AFY) per service for a total system demand of 33 AF. Based upon a slow growth rate in this system, the number of services is anticipated to increase at the rate of about 1 per year, building out to some 90 services in year 2010. The unit demand is expected to continue at 0.470 AFY/service, so the year 2010 total demand is projected by CCW to be some 42 AFY. Although this represents a 20-year increase of some 27 percent, it is less than 1.3 percent annual rate. From the standpoint of the overall CCW systems, this projection can be accepted without compunction.

This water system's population and demand were considered as part of the entire unincorporated area of Santa Maria Valley by certain planning agencies mentioned below.

Lake Marie System

This System is closer to the urban area than Sisquoc, but it is currently isolated from the other urban developments by U.S. 101 and certain open space. However, the potential exists for additional development of land within this system. Because of the nature of the development (residences located on large lots having substantial irrigation), the unit demand rate for Lake Marie has been the highest of any of the CCW systems. According to CCW records there were some 201 services in 1990, experiencing 1.602 AFY/service for a total annual demand of some 322 AFY. The projections by CCW for Lake Marie indicate a 99 percent increase in active services in the 20-year period to year 2010. This corresponds to an annual service growth rate of 3.5 percent (compounded), which may be reasonable for this system (Ref. 11).

In contrast, the CCW projection of annual growth rate in total demand for this same period amounted to 4.4 percent (compounded). This reflected a projected increase in unit demand (AFY/service) which did not appear to be consistent with growing emphases on consumer conservation or with an ever-increasing proportion of established homebodies in the total mix of new homebodies and older homebodies.

As a result of the foregoing, it appeared to LFM that for the purposes of this study the unit demand rate for Lake Marie should be assumed to be constant, 1990-2020, resulting in a 99 percent increase in total demand for this period. The incremental demand for the period would then be 319 AFY, and the year 2010 total demand would be 641 AFY.

It is noted that CCW plans to construct a pipeline between the Orcutt System and Lake Marie System, to ensure adequate supply for the Lake Marie area.

The Lake Marie water system's population and demand were also considered as part of the entire unincorporated area of Santa Maria Valley by the planning agencies identified below.

SUBURBAN SYSTEMS IN SANTA BARBARA COUNTY

The Orcutt and Tanglewood Systems have been studied by CCW individually and demand projections made individually as well. However, various public agencies studying population growth, land development, and/or water demand for this general area have not differentiated between these separate water systems but apparently have lumped them together and have even included the Rural Systems (Lake Marie and Sisquoc) with them. LFM believes that Orcutt and Tanglewood should be considered jointly because of their proximity to each other and to the City of Santa Maria and Santa Maria Public Airport District (SMPAD).

Population and Land Use, General Orcutt Area

The most reliable sources for population and land use data are official planning agencies, while CCW obviously is the best source for actual service connections and historical water demands. Thus, in this study, the population data derived from Santa Barbara County Association of

Governments (SBCAG) is considered the most reliable and are used where possible. These data are incorporated in the report "Santa Barbara County Regional Growth Forecast, 1985-2005," August, 1989, published by Santa Barbara County-Cities Area Planning Council, the predecessor to SBCAG (Ref. 12). The actual data considered are taken from SCAG's Draft tabulation "Revised Growth Forecast, Based on 1990 Census Data."

For water demand projections, primary consideration is given to those of DWR as embodied in the May 1991 Final Environmental Impact Report (Ref. 3) and the later report by Santa Barbara County Water Agency "Santa Barbara County Growth Inducement Potential of State Water Importation," Revised September 28, 1991 (Ref. 13). This latter was a joint SBCWA Staff and Consultant (Pamela Gene Cosby) report which contained certain tabular population and demand data of interest to this LFM study. These data were essentially the same as appeared as an appended "Santa Barbara County Statement of Growth Inducement" in the DWR EIR of May 1991.

Population Projections

Table 1 presents highlights of population projections for the areas taken by LFM to represent the CCW Suburban Systems (Tanglewood and Orcutt) and the nearby City of Santa Maria.

TABLE 1

POPULATION PROJECTIONS FOR CAL CITIES WATER SUBURBAN AREA AND CITY OF SANTA MARIA AREA

Date/Item	Value	Remarks
1990 Federal Decennial Census, Covering:		
City of Santa Maria	61,284	Updated numbers used
Unincorporated	31,709	About same as CCW
Census County Division	92,993	Total area (SBCAG)
1995 Projection (SBCAG):		
City of Santa Maria	69,009	
Unincorporated	36,174	About same as CCW
Census County Division	105,183	Total area
2000 Projection (SBCAG):		
City of Santa Maria	76,699	
Unincorporated	40,730	About same as CCW
Census County Division	117,429	Total area (SBCAG)
2000 Projection (DWR):		
City of Santa Maria	76,808	
So. Calif. Water Co.	38,739	Most of unincorpor'd
Total of Purveyors	115,547	Total area (by DWR)
2005 Projection (SBCAG):		
City of Santa Maria	84,283	
Unincorporated	42,450	About same as CCW
Census County Division	126,733	Total area (SBCAG)

Buildout (DWR):		
City of Santa Maria	98,200	(LFM derived)
So. Calif. Water Co.	45,200	(LFM derived)
Total of Purveyors	143,400	(From per capita)

Notes:

(1) In this tabulation, CCW represents all Systems within Santa Barbara County, i.e. Sisquoc and Lake Marie as well as Tanglewood and Orcutt. No attempt has apparently been made to break out the smaller (rural) systems. Vista System (San Luis Obispo County) is not included in these data.

(2) The projection dates used by SBCAG and DWR do not correspond, but the growth trends follow each other closely.

(3) The Buildout Date was not identified. The Revised "Growth Inducement Potential" Report notes that estimated "buildout" populations correspond to full land development under the adopted General Plan and that in some areas, household size estimated by SBCAG is used in calculating buildout populations.

(4) DWR used Santa Maria's "Santa Maria/Orcutt Sphere of Influence Boundary and Concurrent Annexation Study" (McClelland Associates, 1990) for population forecasting and did not include CCW households "for Orcutt area." Santa Maria's assumed household size was 3.01 persons.

(5) For Southern California Water Company population estimation, SBCAG and DWR used 3.0 persons per dwelling unit in 1990, tapering to 2.95 per unit by year 2010. DWR reportedly used 9,737 housing units for Orcutt area in 1990, increasing to 14,000 by buildout.

(6) It is also noted that the date of reaching buildout conditions depends on the pace of economic growth and the city or county permitting process. Thus, strong economic growth could lead to buildout sooner than 2010, while a weak economy would slow down development.

Mutual Targets for Service Area Extension

Note (4) of Table 1 acknowledged that the City of Santa Maria's population data did not include any of CCW's "Orcutt area" housing units. For 1990 condition, the DWR number of 9,737 housing units is probably equivalent to CCW's number of 9,817 services, allowing for some commercial accounts.

However, Note (4) and the DWR EIR mentioned nothing about potential duplication of areas planned for service area extension by both the City of Santa Maria and CCW. Thus, this matter required certain resolution for the purposes of this study.

The LFM Map Cal Cities Water Existing and Potential Service Areas identifies several land areas as "Target and Alternative Area of Annexation, City of Santa Maria." These are the results of the McClelland Associates study alluded to in Note (4) of Table 1. It will be noted that Areas 7 and 8 immediately adjoin CCW's Tanglewood System (Area 7 actually encroaches into the Tanglewood Service Area). Other target and alternative areas are more distant from the CWC systems and less likely to become mutual target areas for expansion.

According to a September 11, 1991 Santa Barbara County Planning Commission Staff Report and Recommendations (Ref. 14) concerning the West Orcutt Area, the County of Santa Barbara had been directed by the Local Area Formation Commission (LAFCO) to study the potential development of West Orcutt (Area 8 on the Map), which had originally been included as a target area for study in the Santa Maria Sphere of Influence and Concurrent Annexation Study (McClelland Study, Ref. 15). However, LAFCO considered Area 8 to be more closely tied to the community of Orcutt than the City of Santa Maria and excluded Area 8 as a primary target area for Santa Maria but altered it to an Alternative Target. Pending completion of the EIR for the City's annexation study, the County would report back to LAFCO who would then make a final determination as to whether Area 8 should be included within the City's Sphere of Influence.

Tentative Demarcation of Areas for Future Water Service

In order to help resolve questions of future areas of water service, representatives of CCW and the City of Santa Maria held an informal conference on February 10, 1992 to discuss matters of mutual interest regarding potential expansions of their respective service areas. As a result of this meeting, it was determined tentatively that the future service areas should be as follows:

- CCW would continue to serve Tanglewood but would now extend service from this area northerly approximately 500 feet and southerly as far as State Highway 1, with service on the west extending to Black Road and to the east to an irregular line of demarcation involving SMPAD and vicinity. This total area, in effect, constitutes the City of Santa Maria's Alternative Study Area 8 slightly augmented to the north, and it involves about 1,260 acres including the current Tanglewood area (see Map).

- CCW would maintain its current certificated area for the Orcutt System, which is bounded on the east by U.S. 101, extends northerly to the junction of Santa Maria Way and Broadway, extends westerly in an irregular pattern (sometimes westerly of Orcutt Road), and extends southerly in an irregular pattern south of Clark Avenue. It comprises about 5,160 acres (see Map).

- CCW should plan to serve that portion of undeveloped unincorporated land lying easterly of U.S. 101 which straddles the easterly extension of Lakeview Road (also Township Line), and

southerly within a mile of Clark Avenue (see Map). This was identified as City of Santa Maria Alternative Study Area C, and it involves some 1,216 acres (see Map).

- o CCW should plan to continue service to Lake Marie System (about 210 acres) but should also plan to serve the currently undeveloped lands lying between Lake Marie and U.S. 101, both north and south of Clark Avenue, estimated at somewhat less than 1,000 acres

- o The City of Santa Maria should plan to serve or continue to serve all areas northerly of those designated for CCW service. These will include SMPAD and vicinity (see Map).

These staff conclusions were embodied in a City of Santa Maria Public Works Department File Memo (Ref. 16) and were later incorporated into an Agreement between the City of Santa Maria and the Southern California Water Company (Ref. 17).

Future Land Development Possibilities

The Tanglewood area is already fairly well developed, but the strip of land northerly of Tanglewood is vacant agricultural land. The remaining bulk of Area 8 currently is largely agricultural land, some of which is actively in strawberry production. Plans and practices of Laguna County Sanitation District no longer include any use of any of the lands within Area 8 for wastewater treatment plant disposal (Ref. 18).

According to City of Santa Maria planning, Area 8's projected development included various areas of airport flight approach zone, vernal pools, parks, open space, environmentally-sensitive habitat, residences (of differing densities), schools, commercial, and community center. The projected resident population at buildout was nearly 3,200 persons. Allowing a gross unit per capita water demand of 250 gpcd, LFM calculates the approximate ultimate demand as about 890 AFY for the residential and commercial areas, including Tanglewood. The park areas, conceptually planned as embracing some 61 acres would require additional water, but the extent would depend upon the nature of the vegetation to be irrigated and whether or not reclaimed water from the nearby Laguna CSD could be supplied for this purpose.

Alternative Target Area 2, lying east of U.S. 101 was also conceptually planned by the City of Santa Maria (see Map). The absence of vernal pools and environmentally-sensitive habitat permitted the overall planning density to be greater than that for Alternative Target Area 8, so that as many as 6,077 dwelling units were being considered on 1,216 acres of land, for a density of 5 DU/gross acre. Allowing for up to 3 persons per DU, the buildout population under this concept would be about 18,200. LFM calculates the buildout demand for this area as being approximately 5,000 AFY.

The currently undeveloped area straddling Clark Avenue and located mostly east of U.S. 101 and west of Telephone Avenue (westerly boundary of Lake Marie System) comprises 1,000 acres and is owned by a Mr. Martin Smith. Development is contemplated for a planned community which will

incorporate various types of residential housing (including affordable housing), light commercial, school, recreation, and an 18-hole golf course. Some 3.3 DU/ac are being allowed for, corresponding to 3,300 DU and a possible 9,900 or 10,000 buildout population. This could readily require 2,000 AFY of water supply.

Depending upon arrangements finally adopted, the area might be sewered into the existing Laguna CSD system or, alternatively, might be provided with its own wastewater treatment and reclamation facility, with recycling of effluent for golf course irrigation. Laguna CSD's treatment and disposal facilities are premised upon an eventual capacity of 3.2 mgd, corresponding to some 3,578 AFY of effluent. The master planning of Laguna CSD does not currently contemplate extension of sewerage service to areas that might require handling more than this amount of wastewater in the aggregate. Unit wastewater production for Laguna CSD has been estimated at only about 65 gpcd or less than half of the normal overall per capita water demand.

Although the Alternative Target Areas of the City of Santa Maria for potential annexation were alternative to primary target areas, this does not necessarily preclude the possibility of both of those areas tentatively agreed to be within the future service areas of CCW from being developed simultaneously. Therefore, as a matter of conservatism, it is assumed that both Target Areas 3 and 8 will be developed along with the Smith property.

Water Demand Projections

Based upon the data in Table 1, the urban water demand projections for CCW in Santa Barbara County would be as indicated in Table 2.

TABLE 2

URBAN WATER DEMAND PROJECTIONS FOR CCW AND SANTA MARIA AREAS
(Demand in AFY)

Date/Item	Demand	Unit Demand
1990 (Historical)		
Santa Maria (DWR)	12,058	0.197 AFYc
So.Cal.W.Co. (DWR)	8,818	0.277 "
CCW (SBCo.) (CCW)	9,345	0.296 "
Subtotal DAU 71 (DWR)	18,163	
1995 (Projected)(LFM)		
Sisquoc	35	0.155 AFYc
Lake Marie	401	0.534 "
Tanglewood/Orcutt	10,179	0.285 "
CCW, SBCo.	10,615	
2000 (Projected)(LFM)		
Sisquoc	38	0.155 AFYc
Lake Marie	481	0.534 "
Tanglewood/Orcutt	11,070	0.275 "
CCW, SBCo.	11,589	

2010 (Assumed Buildout)		
Sisquoc	42	0.155 AFYc
Lake Marie	641	0.534 "
Tanglewood/Orcutt	11,597	0.255 "
CCW,SBCo.	12,280	

VISTA SYSTEM, SAN LUIS OBISPO COUNTY

Information obtained for the Vista System from CCW or its parent company (Southern California Water Company) indicated recent and projected growth in service connections water deliveries as shown in Table 3.

TABLE 3

RECENT AND PROJECTED SERVICE CONNECTIONS
AND ANNUAL DELIVERIES FOR THE VISTA SYSTEM

Year	Service Conns.	AFY Deliv.	Data From
1980	629	470	Letter, 2/17/87
1990	1,182	921	Water Mgt Program
2000	1,600	1,350	Water Mgt Program
2005	1,800	1,580	Water Mgt Program
2010	1,900	1,737	Water Mgt Program

Notes:

(1) The Southern California Water Company letter of February 17, 1987 was to LFM in connection with the LFM studies on Nipomo Mesa (report of August 24, 1987).

(2) The Water Management Program projections assume certain rates of increase in the 20-yr period 1990-2010 amounting to 2.4 percent (compounded) annual increase in services and 3.2 percent (compounded) annual increase in overall deliveries. Thus, the latter projection allows for a significant annual increase in unit water demand (AFY/service).

San Luis Obispo County Area Plan - Inland Area, Land Use Element. Circulation Element, from San Luis Obispo County General Plan currently has a Revised Hearing Draft circulating for public review (Ref. 19). This includes an Areawide Planning Area Standard concerning water-conserving landscaping which emphasizes consumer conservation in sizing of landscaped areas, selection of vegetation to be irrigated, and frugal application of irrigation water. This Standard is consistent with local standards for water conservation in water-short areas and implies that the future per service water demand for the Vista System should not be expected to increase significantly, if at all. Accordingly, the same considerations mentioned for Lake Marie should apply for Vista as well.

The Revised Hearing Draft, which is intended to respond to mitigation measures that are proposed in the final EIR on the hearing draft plan, does contain certain general comments regarding water service which are relevant, viz:

- CCW is described as supplying water to the "rapidly expanding residential area in the southwest portions of the Nipomo Urban Area.

- Both Nipomo Community Services District (NCSD) and CCW have recently expanded their facilities, and if additional improvements are made as scheduled, facilities should be adequate to serve their areas.

- CCW water service area is mostly comprised of large lot residential subdivisions in the southwest area of Nipomo, this being outside the sphere of influence of NCSD and intended for suburban density services.

- Notwithstanding the foregoing, several areas within CCW service boundary do fall within NCSD's sphere of influence and are expected to develop with both public water and sewer services in the future. Inasmuch as NCSD policy is that areas receiving service from NCSD must accept **both** water **and** sewer services a potential exists for future jurisdictional disputes, so the possibility of a consolidated water system should be studied.

The Revised Hearing Draft does not provide sufficient specific population data to aid in the evaluation of CCW's projections of services and, ultimately, in water demand. However, this document does provide gross population figures for the "South County" Planning Area, broken down between Nipomo (Urban) and Nipomo (Rural), at 5-year intervals, 1990-2020. These data are helpful in guiding the more detailed projections as they pertain to Vista System.

DWR's EIR on the Coastal Branch Phase II and Mission Hills Extension contains certain analyses for both Santa Barbara County and San Luis Obispo County broken down to areas identified as Detailed Analysis Units (DAU's). For the purposes of this LFM study for CCW, the DAU's of interest are DAU 70 and the neighboring DAU 71. These are both identified as "Santa Maria," but DAU 70 lies wholly within San Luis Obispo County while DAU 71 lies wholly within Santa Barbara County.

DAU 70 includes the area served by both NCSD and CCW (Vista System). It also includes certain rural portions of Nipomo Mesa but not the entire Mesa. (Certain northern portions of the Mesa are included in DAU 68 Arroyo Grande.) The EIR compares population projections by San Luis Obispo County and those of the California Department of Finance for DAU 70-Santa Maria, among others, as summarized in Table 4.

TABLE 4

COMPARISON OF DAU-70 SANTA MARIA POPULATION PROJECTIONS OF SAN LUIS OBISPO COUNTY AND CALIFORNIA DEPARTMENT OF FINANCE

Year	San Luis Obispo Co.	Calif. Dept. of Finance
1985	3,900	3,900
2000	6,100	7,900
2010	7,300	10,400

Notes:

(1) Data are from DWR's EIR on Coastal Branch. Phase II. A (northerly) portion of Nipomo Mesa is not included.

(2) SLOCo. data imply an annual growth rate, 1985-2010, of about 2.5 percent (compounded).

(3) California DOF data imply an annual growth rate, 1985-2010, of about 4 percent (compounded).

The EIR population data are of general interest in helping estimate future populations to be served by CCW Vista System, although they do not contain detailed breakdown data. The DOF data presented appear to be more in keeping with CCW experience than do the County data. However, neither the SLOCo data nor the DOF data reconcile with previous LFM estimates of total population served by CCW (Vista) and NCSD during the 1980-85 period, which were as follows:

1980	5,000 persons served by CCW & NCSD
1985	6,540 " " " " " "

The LFM figures for 1980 were some 28 percent higher than those of either SLOCo or DOF. The LFM figures were developed with careful consideration of available SLOCo data as well as data from CCW and NCSD and are thought to be reasonable (Ref. 5). Table 5 presents relevant SLOCo population data taken from Table A-1 of the Revised Hearing Draft (Ref. 19).

TABLE 5

SAN LUIS OBISPO COUNTY DEPARTMENT OF PLANNING AND BUILDING POPULATION DATA FOR PORTIONS OF SOUTH COUNTY

Data are Taken from Table A-1 of Revised Hearing Draft

Area	1990	1995	2000	2005	2010	2015	2020
Nipomo:							
Urban	8,376	9,489	10,618	11,750	12,873	13,976	15,050
Rural	7,825	7,825	8,819	9,281	9,717	19,127	10,512
So.Co.	16,201	17,822	19,437	21,031	22,590	24,103	25,562

Notes:

(1) The 1990 values shown reconcile reasonably well with population trends identified in the LFM Report.

(2) Discrepancies between these population values and those presented in the DWR EIR for DAU-70 Santa Maria are possibly due to boundary differences, among other things.

(3) These population data suggest that the Nipomo urban annual population growth rate, 1990-2020, is approximately 2 percent annual rate, compounded. The corresponding rate for the entire South County (rural plus urban) is about 1.5 percent. The urban annual growth rate, 1990-2010, is 2.2 percent, compounded, and this harmonizes quite well with the projected growth of service connections of CCW.

In view of the foregoing, and lacking more definitive data, LFM believes that reliance may properly be placed upon CCW's projections for service connections but that modified unit demand values to be applied to them for estimation of future demands.

Table 6 summarizes the population and demand projections used by LFM for Vista System of CCW.

TABLE 6

LFM PROJECTIONS OF POPULATION AND DEMAND FOR VISTA SYSTEM

Date	No. Active Services	Pop'n Served	Unit Demand gpcd	Unit Demand AFY/sv.	Demand AFY
1990	1,182	3,546	232	0.779	921
2000	1,600	4,800	232	0.779	1,246
2010	1,900	5,700	232	0.779	1,480
Build't	1,900	5,700	232	0.779	1,480

Notes:

(1) The CCW-projected numbers of services, 1990-2010 are accepted by LFM as being reasonable.

(2) The projections of active services and corresponding population served assume continued operation of Vista System within its current certificated service area.

(3) For long-range planning purposes, LFM does not expect that the unit demand will increase significantly over recent levels. Even though the proportion of large lots of the total lots served by the Vista System may increase, consumer conservation measures are expected to counteract an increase in unit demand otherwise experienced.

(4) Buildout conditions are assumed same as 2010 conditions.

SUMMARY OF PROJECTED WATER DEMANDS FOR ALL CCW SYSTEMS

Table 7 summarizes the future projected water demands for the 5 CCW Water Systems.

TABLE 7

SUMMARY OF LFM PROJECTED WATER DEMANDS FOR CCW WATER SYSTEMS

Demands are in AFY

CCW System	1990	1995	2000	2005	2010	Build't
Sisquoc	33	35	38	40	42	-
Lake Marie	322	401	481	561	641	-
Tanglewood)						
Orcutt)	8,990	10,179	11,070	11,505	11,597	-
Subtotal, SBCo.	9,345	10,615	11,589	12,106	12,280	-
Vista	921	1,091	1,246	1,402	1,480	-
All Systems	10,266	11,706	12,835	13,508	13,760	-
ROUND OFF	10,266	11,700	12,800	13,500	13,800	14,000

* * * * *

III - SWP SUPPLEMENTAL SUPPLY TO MEET GROWTH DEMANDS

This Section considers the supplemental supply that may reasonably be taken from the SWP to sustain growth in water demands that results from developments within the guidelines of the approved General Plans of the affected areas of CCW. The supplemental SWP supply would be beyond the groundwater production which is currently the sole source for supplying demands.

This Study is primarily concerned with supply sources and only incidentally with local system facilities. However, recognition is made of the general need for adequate production, treatment, storage, and distribution facilities for conjunctive management of groundwater and imported water. This is potentially important, inasmuch as water demands fluctuate seasonally, but the SWP supply will be imported at a uniform rate, so that groundwater supply operations may need to experience accentuated seasonal variations. This will be particularly so as demands increase and the SWP assumes more of the "base load," requiring groundwater to provide peaking in addition to its share of the "base load." This Study does not deal with the engineering aspects of this conjunctive management nor with the specifics of blending of the imported SWP supply and the local groundwater supply.

Table 8 summarizes the incremental water supply, from a combination of local and supplemental sources, needed to meet the incremental growth demands.

TABLE 8

INCREMENTAL WATER SUPPLY TO MEET INCREMENTAL DEMANDS, CCW

Year	Total CCW Water Supply and Demands, AFY		
	Total Demand	1990 Supply	Incr. Demand
1990	10,266	10,266	0
1995	11,700	10,266	1,434
2000	12,800	10,266	2,534
2005	13,500	10,266	3,234
2010			
2015	14,000	10,266	3,734
2020			"

In Table 8, the "point of departure" for calculating incremental demand and incremental supply needed to meet that demand has been taken arbitrarily as 1990.

* * * * *

IV - GROUNDWATER BASIN OVERDRAFT AND MITIGATION

A major justification for SWP importation is relief of groundwater basin overdraft. This element of SWP importation is over and above that which is needed to sustain reasonable growth.

As regards groundwater basin overdraft and its mitigation, the two basins to be considered are Santa Maria Groundwater Basin and Nipomo Mesa Sub-area.

SANTA MARIA GROUNDWATER BASIN

All four Santa Barbara County Systems of CCW are supplied exclusively from Santa Maria Groundwater Basin. Various consultants and public agencies have studied this basin for the past several years (Refs. 1, 2, 3). The public agency that has been most consistently involved in studying and evaluating groundwater conditions in this basin for the past several years is the Santa Barbara County Water Agency (SBCWA). Senior Hydrologist Jon A. Ahlroth of SBCWA has informed LFM that the most recent report on the overall basin is that SBCWA publication of November 1977 "Final Report, Adequacy of the Santa Maria Groundwater Basin." Mr. Ahlroth considers this report still to be generally representative of general basin hydrologic conditions although actual annual overdrafts have increased since that time (Ref. 20), and 1991 water levels were estimated to be at or near an all time low point (Ref. 21).

CURRENT ASSESSMENT OF BASIN OVERDRAFT

The DWR EIR on the Coastal Branch Phase II and Mission Hills Extension (Ref. 3) utilized SBCWA data and evaluations pertaining to Santa Maria Groundwater Basins and other affected basins within Santa Barbara County. The EIR listed various relevant data for recent and projected demand conditions for groundwater use and overdraft for DAU 71 Santa Maria. More definitive data were presented in Table 6 of the Santa Barbara County Growth Inducement Potential Update Report (September 28, 1991), excerpts from which are listed in Table 9 (Ref. 13). The values are representative of the Santa Maria Groundwater Basin within Santa Barbara County.

The data shown on water demand are <u>net demands</u>, that is, water that is used consumptively and is completely lost from the groundwater basin. In effect, the gross water demands supplied from groundwater pumpage to the various types of usages have been reduced by the portions of water supply that return to the groundwater basin by percolation, the difference being net demands. Similarly, the safe yield is expressed in terms of pumpage to supply consumptive use, excluding pumpage that returns eventually to the groundwater basin.

TABLE 9

GROUNDWATER CONDITIONS SHOWN IN SBCWA REPORT FOR DAU 71
SANTA MARIA

Values Listed Are in AFY

Item	1990	2000	Buildout
City of Santa Maria	6,194	8,478	10,078
SoCalWCo., SBCo.	6,020	8,478	8,498
Agricult.+ Pri. M&I	84,430	83,811	79,250
Total Use	100,956	104,146	103,346
Safe Yield	64,000	64,000	64,000
Overdraft:			
Santa Maria	2,267	3,268	3,837
SoCalWCo., SBCo.	2,204	2,857	3,235
Agr./Pri. M&I	30,906	32,307	30,172
Total	36,956	40,146	30.346

Notes:

(1) This table is derived from SBCWA's Update Report (Ref. 13) Table 6 "Existing and Projected Safe Yield Supply Versus Demand and Resulting Deficits." For simplicity, data for City of Guadalupe and Santa Maria Valley Industrial users are not listed separately, but their numbers are included in the totals.

(2) The data assume, for illustrative purposes, that no imported water supply is implemented and groundwater remains the sole source of supply. It is also assumed that no significant cultural changes are involved that affect the safe yield of the basin. Therefore, the safe yield is indicated to remain steady throughout the study period.

(3) For simplicity, DWR's proportionate method of allocation of the basin overdraft is followed and is based upon overall consumptive demand. Thus, for 1990, SoCalWCo's (CCW's) net demand of 6,020 AFY out of 100,956 total consumptive demand or 6.0 percent of the total demand. Hence, 6.0 percent of the 36,956 AFY net overdraft or about 2,204 AFY of the total overdraft is allocable to CCW in 1990, under the data and assumptions being used.

The CCW Systems located within DAU 71 Santa Maria would supposedly be responsible for a proportionate share of the total urban overdraft. This allocated overdraft could be mitigated by SWP importation at this level, if this were the only factor to be considered.

The DWR EIR considers three alternative scenarios for allocation of imported SWP supplemental supply regarding reduction of basin overdraft, viz:

1. **Maximize** total basin overdraft reduction by devoting the **entire** SWP **importation** to reduction of an equivalent amount of groundwater use.

2. **Limit** the overdraft reduction to the **urban share only**.

3. Provide **no overdraft reduction at all**.

ALLOCATION OF BASIN OVERDRAFT

As indicated earlier in this Report, the water purveyors generally have multiple reasons for adopting SWP importation, including reasonable growth as well as mitigation of at least a portion of the groundwater basin overdraft. Furthermore, the quantity of imported supplemental SWP water available through the water service contracts will not be sufficient to eliminate the basin overdrafts completely, even if such were an objective of the participating water purveyors (Refs. 3 & 13). Consequently, Scenario 1, technically speaking, is not considered a reasonable possibility but overdraft mitigation reduction to some point beyond that of Scenario 2 is considered reasonable.

The EIR (Ref. 3) contains considerable discussion and illustrations of potential growth-inducing impacts for the above scenarios. Table 5 of the EIR as well as in the Growth Inducement Potential September 28, 1991 Update (Ref. 13) present data prorating safe yield water supply to the water purveyors and other urban water users within DAU 71. For example, based upon water demand projections and a total basin safe yield for consumptive use of 64,000 AFY (which is 71 percent of the 90,000 AFY safe yield for pumpage) CCW's allocated safe yield for consumptive use would be 3,816 AFY in 1990, 4,554 AFY in 2000, and 5,263 AFY at buildout.

Accordingly, the Scenario 2 data for CCW were indicated in the EIR Table 6 as shown below in Table 10.

TABLE 10

EXISTING AND PROJECTED SAFE YIELD SUPPLY VERSUS DEMAND AND RESULTING DEFICITS, AFTER DWR'S EIR, TABLE 6, AS UPDATED

Values are shown in AFY

CCW, SBCo Item	1990	2000	Buildout
Net Urban Demand	6,020	7,410	8,498
Safe Yield, Alloc.	3,816	4,554	5,263
Deficit (Diff.)	(2,204)	(2,856)	(3,325)

Notes:

(1) Mitigation of the allocated deficit would represent Scenario 2 type of importation.

(2) The net urban demand for CCW is calculated as 69 percent of the gross urban demand for 1990 and 2000 conditions and 68 percent at buildout conditions. The difference between gross and net demand represents return flows, primarily via wastewater treatment/disposal systems.

(3) Provision of supplemental SWP supply in excess of the deficits listed would ostensibly help reduce the deficit attributable to agriculture.

(4) Based upon LFM's review of the CCW water demands, the Scenario 2 importation levels for 1990 and 2000 would be scaled up by about 7 percent and 8 percent, respectively as a rough approximation of the increase in allocated deficit due to their demands being somewhat higher than projected or allowed for by SBCWA. However, the General Plan Buildout values projected by LFM were no different than those of SBCWA. Accordingly, LFM believes that the Scenario 2 importation levels for 1990, 2000, and General Plan Buildout should be approximately 2,360, 3,090, and 3.330 AFY, respectively.

As mentioned in the EIR (Ref. 3), the Santa Barbara Water Purveyors Agency (SBWPA) have committed to give first priority of imported SWP supply to offsetting groundwater overdraft that is attributable to their extraction of groundwater and otherwise reconfirm their support for proposed Policy Option 3.2 of the Groundwater Resources Section of the County Comprehensive Plan (Ref. 19). Accordingly, Scenario 3 (no overdraft reduction) is considered moot, and the only issue should be the determination of a the suitable level for CCW within Scenario 1 or Scenario 2. This is examined later on in this report.

NIPOMO MESA SUB-AREA GROUNDWATER

The DWR EIR (Ref. 3) presented groundwater use and overdraft according to various DAU's but without breakdown according to "sector." Selected relevant values from EIR Table 9-1 are presented in Table 11 below.

TABLE 11

EXCERPT FROM DWR'S EIR REGARDING DAU 70 SANTA MARIA GROUNDWATER USE AND OVERDRAFT (TABLE 9-1)

Values are Shown in AFY

DAU 70 Item	1985	2000	2010	2035
Demand:				
Urban	600	700	900	1,200
Agricultural	21,600	26,500	25,400	25,400
Total	22,200	27,200	26,300	26,600
Safe Yield	13,500	13,500	13,500	13,500
Overdraft:				
Urban	200	400	400	600
Agricultural	8,500	13,300	12,400	12,500
Total	8,700	13,700	12,800	13,100

Notes:

(1) Demand is satisfied solely by groundwater from the Nipomo Sub-area plus the Santa Maria Valley Hydrologic Sub-Unit.

(2) Overdrafts are allocated proportionate to demands (quantities of water pumped).

(3) These data are presented for illustrative purposes only, inasmuch as the "sectors" have not been defined. Thus, the data are apparently not directly comparable with certain others previously presented herein. For example, the 1985 pumpages for CCW Vista and NCSD alone were considerably higher than the urban values shown. On the other hand, LFM's 1987 study did not include the large agricultural areas of Santa Maria Valley Hydrologic Sub-unit but limited consideration to Nipomo Mesa, for which the agricultural pumpage on Nipomo Mesa was estimated by LFM from DWR-furnished data to be less than 2,500 AFY.

The DWR analysis, reflected in Table 11, lumps the Santa Maria Valley Hydrologic Sub-Unit and Nipomo Mesa Sub-Area together for study purposes. This avoids the hydrological considerations of subsurface outflow from Nipomo Mesa to Santa Maria Valley as well as differences these two sub-basins in the matter of basin recharge by deep penetration of rainfall.

The LFM August 24, 1987 (Ref. 5) report pointed out that DWR's 1975-77 value of 3,300 AFY rainfall percolation for Nipomo Mesa (Ref. 4) was the best available value and should serve as the basis for any necessary corrections reflecting changes that have apparently taken place since the time of the DWR Report (June 1979). Therefore only moderate adjustments were made to this element of recharge in the LFM Report, which considered the Nipomo Mesa Sub-Area separate and apart from its

adjoining sub-basins. The LFM numbers indicated an apparent deficit of some 4,200 AFY between inflow and outflow for the Nipomo Mesa, of which some 2,790 AFY were outflow to adjacent basins, for 1986--87 conditions.

On the other hand, Dr. Donald O. Asquith, Proprietor of the Morro Group and author of the 1990 Environmental Impact Report for South County Area Plan (Ref. 6), reanalyzed the relevant data, including groundwater levels, and concluded that the groundwater regime beneath the Nipomo Mesa was then approximately in balance with outflow to adjacent portions of the basin. He also concluded that the value used by DWR for the category of deep percolation of precipitation was too low, given soil conditions on the Mesa and values for this category used by DWR in adjacent areas. He opined that the Nipomo Mesa value should be at least twice as high as used by DWR. Even if the DWR analysis were correct, Dr. Asquith noted that Nipomo Mesa Sub-Area could not be considered in overdraft" because: (a) it was supplying 82 percent of its recharge to adjacent areas of the basin; and (b) there was no evidence of an adverse condition resulting from existing groundwater levels.

The Morro Group also pointed out in their EIR (Ref. 6) that urban type of water use consumes less than agricultural water use, on a unit basis. Thus, conversion of agricultural lands to urban use would actually release water.

There is no municipal wastewater effluent export from Nipomo Mesa; rather, all effluent, other than that portion lost to consumptive use is recycled to the groundwater. SWP importation to Nipomo Mesa will, of course, result in an augmentation of basin yield, due to this aspect of recharge as well as modest returns from landscape irrigation.

CURRENT GROUNDWATER CONDITIONS

Dr. Asquith reviewed the groundwater hydrographs contained in the LFM Report and from these and other considerations, concluded that the Nipomo Sub-Area is so close to being naturally full that very wet years are not effective (in recharge) unless space for recharge has been provided in previous dry years. In effect, there appeared to be a "cap" on water level recovery in very wet years, under present conditions. He also noted that annual variations in most years were generally in the range of 3-5 feet, while the two-year drought of 1976-77 resulted in a significant lowering of groundwater levels in most wells.

Mr. W. Ryder Ray, General Manager & Chief Engineer of NCSD reported to LFM that groundwater levels for their production wells are "holding up" (Ref. 21). Apparently, the current drought is not affecting the Nipomo Sub-Area significantly, at least in areas where the NCSD's wells are located. NCSD currently produces approximately 1,300 AFY from its wells. LFM notes that water level trends in response to pumping are not consistent throughout the Nipomo Mesa.

Data were supplied to LFM for analysis of water levels and production for the 7 CCW Vista wells by Mr. Tom Bunosky, Manager of Operations for Southern California Water Company (Ref. 21). It was mentioned that declines in local well production were affected by well sanding and

certain deterioration of casings. The data included standing levels, pumping levels, and well production. The data for some of the wells extended back as far as 1977, while for others the data period was more limited. The data were most complete for four wells (Vista No. 3, Vista No. 4, La Sirena, and Eucalyptus) and, although still limited in extent, did span a period of both wet years and dry years, including the advent of greatly increased pumpage by the Vista System to meet increasing water demands.

Preliminary analysis of these CCW data by LFM was summarized in a February 24, 1992 Memorandum (Ref. 24); the findings were inconclusive as to demonstrating the effects of increased (or decreased) individual annual well pumpage upon the standing water levels of the individual well. Nevertheless, there appeared to be a current downward trend in standing water levels indicated by CCW Vista System wells after approximate adjustments had been made to reflect changed pumping conditions. It was noted as a matter of general interest that standing water levels had dropped several feet in each of the four wells between Spring, 1985 conditions and Spring, 1991 conditions. This period contained both dry years and a recent wet year.

The quantity of supplemental supply needed by Vista System to mitigate allocated groundwater basin overdrafts cannot presently be determined from DWR analyses because the data are not broken down by "sector," among other things. The LFM 1988 analyses suggested that under 1987 conditions, a "deficit" of some 4,200 AFY existed for the Nipomo Sub-Area, but that of this, some 2,790 AFY were flowing out subsurfacely to adjacent sub-basins, helping in their recharge. Therefore, the only indicated "overdraft" from pumpage was about 1,410 AFY. The total pumpage at that time was estimated at 6,460 AFY, of which Vista System's gross pumpage was responsible for about 760 AFY or about 11.8 percent. Due to return flows, the percentage would probably be less than 10 percent of the "overdraft," although the report did not discuss this in detail. However, the implication is that Vista's allocated share of the basin "overdraft" would probably be in the order of 100 AFY, assuming a proportionate allocation method such as used by DWR.

The limited data analysis by LFM on recent well level and production data by Vista System wells suggest the possibility of declining levels in the water table in that part of the Nipomo Mesa, but the data and analysis are insufficient either to confirm or deny the presence of an "overdraft" of the Nipomo Mesa Sub-Area.

On the other hand, if there is no actual overdraft in the Nipomo Mesa Sub-Area, as located by Dr. Asquith, then this particular aspect would need to be considered. However, it may be prudent to allow for the possibility of some modest amount of overdraft mitigation being allocated to Vista System at some future time. A value of 100 AFY appears to be ample for this purpose.

SWP IMPORTATION PLANS ON NIPOMO MESA

Vista Division of CCW originally subscribed for 500 AFY of supplemental SWP water but now has increased this quantity to some 2,500 AFY, to be included within the total block of CCW water being requested of Central Coast Water Authority (CCWA) which is being addressed herein.

NCSD originally subscribed to 1,500 AFY of SWP water, and increased this amount to 3,500 AFY in 1988. The issue of importation became conversial with the electorate, and the advisory election on the SWP supplement, held in 1991, was defeated. The Board of Directors determined that the results should be voided and the subscription maintained. However, a subsequent (binding) election on this matter, held in May 1992, was also defeated despite feeling by the management of NCSD that there should be up to 2,000 AFY SWP importation to satisfy supplemental water needs for at least 15 years, permitting reduced reliance upon the groundwater (Ref. 22).

CCW SUPPLEMENTAL WATER REQUIREMENTS TO OFFSET OVERDRAFTS

Table 12 summarizes the estimated requirements of the CCW Systems in both Counties to offset basin overdrafts.

TABLE 12

SUMMARY OF ESTIMATED SUPPLEMENTAL WATER REQUIREMENTS OF CCW SYSTEMS TO OFFSET ALLOCATED GROUNDWATER BASIN OVERDRAFTS IN BOTH SANTA BARBARA AND SAN LUIS OBISPO COUNTIES

Values are Presented in AFY

CCW System Area	1990	2000	Gen. Plan Buildout
Santa Barbara County	2,360	3,090	3,330
San Luis Obispo County	100	120	150
Total CCW, both Counties	2,460	3,210	3,450

Notes:

(1) Santa Barbara County values are taken from Table 10, Footnote (4). These are for Sisquoc, Lake Marie, Tanglewood, and Vista Systems lumped together and drawing from Santa Maria Groundwater Basin.

(2) San Luis Obispo County includes only the Vista System, drawing from Nipomo Sub-Area of the Arroyo Grande Area Basin, the values being allowances made by LFM.

* * * * *

V - SWP WATER FOR GROWTH AND BASIN OVERDRAFT REDUCTION

Supplemental SWP importation quantities have been calculated initially without consideration of beneficial effects of mineral water quality improvement or possible increase in groundwater basin overdraft reduction. These are considered in subsequent sections.

Table 13 summarizes the projected supplemental SWP needs of the total CCW Systems for permitting General Plan type growth and reducing groundwater basin overdrafts according to proportionate consumptive use pumping allocations.

TABLE 13

IMPORTED WATER REQUIREMENTS TO SUSTAIN GROWTH AND MITIGATE CURRENT ALLOCATED GROUNDWATER BASIN OVERDRAFT CONDITIONS

Values Shown are in AFY

Total CCW Item	1990	2000	Gen.Plan Buildout
To Sustain Growth	0	2,534	3,734
To Offset Overdraft	2,360	3,090	3,330
Total of Items	**2,360**	**5,624**	**7,064**

Notes:

(1) Data are from Table 8 and from Footnote (4) of Table 10. Values should actually be rounded but are shown as calculated for reasons of continuity.

(2) Data do not yet reflect the general consideration aspects of mineral quality benefits nor the need for additional groundwater basin overdraft mitigation.

* * * * *

VI - MINERAL WATER QUALITY CONSIDERATIONS

The imported SWP supply will be much less salinized than the local groundwater supplies being produced by CCW in its 5 systems. Parameters frequently used in comparing mineral quality of potable waters are total hardness (TH) and total dissolved solids (TDS).

MINERAL QUALITY OF SWP IMPORTED WATER

The SWP imported water has contractual water quality objectives for TDS and TH of 220 mg/l and 110 mg/l, respectively, as 10-year average values (Ref. 25). The DWR EIR for the Coastal Branch lists average values of the SWP water at Check 5 (Coastal Branch) as 258 mg/l TDS and 100 mg/l TH (Ref. 3).

MINERAL QUALITY OF LOCAL GROUNDWATER SUPPLYING CCW

In contrast, Table 14 lists these constituent levels as they typically are found in the domestic water supplies of the individual water systems of CCW.

TABLE 14

REPRESENTATIVE MINERAL CHARACTERISTICS OF CCW DOMESTIC WATER

CCWC Water System	TDS, mg/l			TH, mg/l CaCO3		
	Low	Typical	High	Low	Typical	High
Sisquoc	858	870	882	623	624	625
Lake Marie	616	637	664	388	408	426
Tanglewood	324	350	376	169	198	228
Orcutt	600	650	710	350	370	410
Vista	130	620	830	30	300	430

It is clear that from the mineral standpoint, the SWP supply offers consumers a significant advantage over local groundwater quality.

INDIRECT WATER CONSUMER BENEFITS OF SWP

The principal benefit of relatively low mineral content potable water supply to water consumers is in reduced needs and costs for onsite softening. A secondary benefit is in reduced corrosion potentials for plumbing and plumbing fixtures where these are vulnerable to corrosion.

Improvements have been made over the past several years in reducing the vulnerability of municipal waterworks piping and equipment to corrosion by highly mineralized water by selection of proper materials for meters and other equipment, by use of various linings for piping, valves, and hydrants, and by certain other measures. Generally comparable

improvements have been experienced in domestic and commercial plumbing, where use of copper piping is more widespread than previously and plastic fixture materials are supplanting more corrosion-vulnerable materials.

WATER HARDNESS AND WATER SOFTENING CONSIDERATIONS

Improvements have also been made to home softening equipment and commercial softening equipment in terms of durability and salt efficiency. Nevertheless, hard water remains a significant cost to many consumers, particularly if they soften their onsite water (frequently restricted to the hot water system). There is even an indirect cost due to increased use of detergents for those who do not elect to soften the water. Also, limestone deposition in plumbing is still a possibility, even if corrosion difficulties may be lessened.

Lompoc Area Study by DWR

Improved mineral quality supply water, such as from supplemental SWP supply, will represent a potential economic benefit to the community which may help offset the costs of such supplemental water. A DWR Southern District June 1978 Report "Consumer Costs of Water Quality in Domestic Water Use, Lompoc Area" (Ref. 26) found that water hardness is positively related to the percentage of households using home water softeners which increases community wide expenditures for such treatment. The DWR report concluded that the penalty cost for home softening was estimated to be $28.35 per household for a 100 mg/l increase in hardness within the range of hardness from 153 to 403 mg/l. The DWR Report also noted that expenditure for soap and detergent appears to be related to water hardness and that extensive home water softening may actually reduce the cost of soap and detergent to below costs associated with water supplies of considerably lower natural hardness. The DWR Study and Report findings were confined to domestic water users.

Earlier Consultant Study

An earlier consultant study by the author of this CCW report considered the indirect quality costs of consumers over a large urban area (Ref. 27). These included not only residential consumers but also commercial and industrial users and even the effects upon water utilities which supplied the water. Unlike the DWR Study which produced considerable original data, this earlier consultant study contained no original work but only analyses of information then available from the professional literature, most of which was also later considered by DWR.

The earlier consultant study is of general significance to the extent that it is generally consistent with the later DWR study, despite somewhat differing scopes and emphases. The DWR Report recognized the importance to many persons of water palatability and the impacts that hard water or mineralized water in general may have on the marketability of bottled water. Although the earlier consultant study discounted this aspect altogether, a common thread of information appeared in both studies as concerns indirect economic impacts of hard water.

APPROXIMATE QUANTIFICATION OF HARDNESS PENALTIES

While the costs calculated from use of data from the studies cited must be considered as approximate at best, they are nonetheless indicative and should therefore be useful for this purpose.

The analysis of approximate indirect costs as applied to the CCW Systems is as follows:

1. The DWR analysis indicated that the penalty cost for hard water for individual households for hardness in the range of 153 to 403 mg/l (as CaCO3) was $28.43 per 100 mg/l increase in total hardness (TH).

2. If it assumed that a typical household uses about 0.5 AFY, this would translate into about $57/AF/100 mg/l TH.

3. If it is further assumed that a "typical" natural water supply in this general area of Southern California has about half the TH content of the TDS content (as was assumed in the earlier consultant study noted), then the parameter would be changed back to $28.43/AF//100 mg/l TDS.

4. The earlier (consultant) study related indirect costs to TDS content within a range of 200 mg/l to 800 mg/l and corresponding TH content within a range of 100 mg/l to 400 mg/l. It noted that a significant proportion of the indirect cost was attributable to softening requirements (or alternative costs if softening was not practiced) and that a parameter for indirect costs for all aspects of water quality and for all types of activities appeared to be in the range of $25-35/AF/100 mg/l TDS (Ref. 25).

5. Although adjustments can be made to these numbers to account for inflation, the general absence of industrial uses, and changes over the years in vulnerability of certain types of municipal waterworks equipment and domestic types of fixtures, a value of $30/AF/100 mg/l TDS is probably reasonably indicative of the penalty cost for domestic consumers in the CCW service areas. This value harmonizes properly with the DWR numbers reported and as converted above.

The value of $30/AF/100 mg/l TDS is used herein as an indicator of penalty cost (the cost to consumers for not having lower TDS water) or, conversely, the benefit to consumers for having lower TDS water than the local water supply. While not a major factor, it is nonetheless of some importance.

TREATMENT PLANT EFFLUENT DISPOSAL CONSIDERATIONS

The mineral quality of the water supplied to customers influences the mineral quality of the wastewater emanating from the service areas in public sewer systems or in discharge into the underground via septic systems.

LAGUNA COUNTY SANITATION DISTRICT CONCERNS

Laguna County Sanitation District, which provides sewerage service to essentially the same areas served by CCW's Tanglewood and Orcutt Systems plus Santa Maria Public Airport, has been unable to comply fully with the waste discharge requirements of Order No. 87-43 of RWQCB (Ref. 28). This Order prohibits the 12-month running mean values of TDS, Sodium, Chloride, Sulfate, and Boron in the wastewater treatment plant effluent from exceeding certain specified values, arranged according to the needed degree of protection for underlying groundwater.

Table 15 lists the effluent limitations of Order No. 87-43 for the designated disposal lands overlying the Main Recharge Area of that local element of the Santa Maria Groundwater Basin and the "General Area" (which has intervening clay strata between the surface and the deep potable aquifer).

TABLE 15

EFFLUENT LIMITATIONS OF REGIONAL WATER QUALITY CONTROL BOARD UNDER ORDER NO. 87-43 FOR LAGUNA COUNTY SANITATION DISTRICT CONCERNING MINERAL CONTENT WITH RESPECT TO GROUNDWATER AREAS

Values are Listed in milligrams per liter (mg/l)

Mineral Constituent	Mean Value for Location	
	General	Main Recharge
Total Dissolved Solids (TDS)	1,200	1,000
Sodium	250	200
Chloride	300	125
Sulfate	300	300
Boron	0.5	0.5

Notes:

(1) The Main Recharge Area is considered to have no intervening clay strata to impede the percolation of effluent to the deep groundwater, whereas the General Area of disposal lands does incorporate such aquitards and experiences perched groundwater. Thus, RWQCB finds it acceptable to permit greater concentrations of specified minerals in the effluent for the General Area than for the Main Recharge Area.

(2) The mineral constituents directly affected by the extent of water softening by consumers are the first three listed, i.e. TDS, sodium, and chloride.

As a result of the effluent limitations of Order No. 87-43, there is only limited allowable mineral "pickup" as the freshwater is converted by water-users to wastewater. This is indicated in Table 16.

TABLE 16

ALLOWABLE MINERAL PICKUP OF SUPPLY WATER FROM CCW WITHIN LAGUNA CSD RELATIVE TO COMPLIANCE WITH RWQCB ORDER NO. 87-43

Values are Listed in mg/l

Mineral Constituent	Allowable Mineral Pickup During Usage For Main Recharge Area	For Remaining Area
TDS	1,000 - 650 = 350	1,200 - 650 = 550
Na	200 - 50 = 150	250 - 50 = 200
Cl	125 - 50 = 75	300 - 50 = 250
SO4	300 - 190 = 110	300 - 190 = 110
B	0.5 - 0.1 = 0.4	0.5 - 0.1 = 0.4

Notes:

(1) Data are from LFM February 29, 1988 Partial Draft Engineering Report of Laguna CSD to RWQCB, Compliance Schedule Regarding Order No. 87-43 (Ref. 8).

(2) Values for effluent limitations are fixed and are taken from Table 15, whereas "supply water" values are approximate, rounded and are deducted from the effluent limitations to indicate the allowable "pickup" for each constituent. Supply water mineral constituent values appeared to be generally stable, although calcium (Ca) had registered a recent increase and magnesium (Mg) a recent decrease.

(3) The actual plant effluent characteristics reported by LFM were based upon somewhat less than a full 12-months running mean but indicated that monthly values for TDS, Na, Cl, and B were approximately 1,180, 260, 300, and 0.6 mg/l, respectively. This indicated noncompliance being threatened by these four constituents; SO4 was not threatened for noncompliance.

(4) The three constituents representing the most serious noncompliance were those directly associated with onsite softening, i.e. TDS, Na, and Cl. These result from the regeneration of sodium-cycle, cation-exchange softener units regenerated with brine (NaCl), whose excess regenerant and rinse waters are discharged into the wastewater collection system and affect the disposability of the LCSD plant effluent.

(5) The actual mineral pickup being experienced was about as follows:

- o TDS 550 mg/l pickup (actual)
- o Na 220 " " "
- o Cl 240 " " "

This excessive mineral pickup resulted in apparently noncompliant conditions with respect to the Main Recharge Area and marginal conditions with respect to the General Area.

A January 26, 1989 LFM Engineering Report Update of the February 29, 1988 Partial Draft Engineering Report (Ref. 9) included the results of a November 1988 7-day sampling program for Laguna CSD treatment plant influent mineral constituents which replicated and expanded the results of an earlier January 1988 sampling study. This supplementary sampling and laboratory analysis study confirmed the findings of the earlier study and demonstrated that onsite softening was responsible for a major part of the excess mineralization.

As a result of the various analyses, LFM concluded (January 26, 1989) that as a practical matter, all alternatives for compliance with Order No. 87-43 would involve a combination of source control and effluent management operations. For source control, emphasis was placed upon phasing out home-regenerated water softeners and limiting softening to commercially-regenerated softener units (whose waste brines would be proportionately less than those from home units, due to greater salt efficiency) and whose discharges would be outside of the Laguna CSD system, presumably in the Santa Maria system.

POTENTIAL WASTEWATER QUALITY BENEFITS FOR LAGUNA CSD

Although the aspect of imported water from the SWP was not emphasized, recognition was given to the possible beneficial effects of such importation, should it occur, to the wastewater effluent, among other things.

Table 17 illustrates certain possibilities for mineral water quality improvement for the CCW systems involved with the Laguna CSD wastewater management system as regards importation of SWP.

TABLE 17

ILLUSTRATION OF MINERAL WATER QUALITY IMPACTS OF IMPORTATION OF SWP SUPPLEMENTAL SUPPLY TO THE TANGLEWOOD/ORCUTT SYSTEMS FOR AN ASSUMED BUILDOUT COMBINED WATER DEMAND OF 10,000 AFY

	Scenario A			Scenario B			Scenario C		
Item	G.W.	SWP	Total	G.W.	SWP	Total	G.W.	SWP	Total
Avg. Supply, % Total	70	30	100	50	50	100	30	70	100
Blended Supply:									
TDS, mg/l	455	77	532	325	129	454	195	181	376
TH, mg/l	245	30	275	175	50	225	105	70	175
Na, mg/l	35	15	25	25	24	49	15	34	49
Cl, mg/l	35	19	54	25	32	57	15	44	59
Assumed % of Services w/ Onsite Soft'g	-	-	40	-	-	30	-	-	15

Assumed Pickup:									
TDS, mg/	--	--	400	--	--	330	--	--	290
Na, mg/l	--	--	160	--	--	130	--	--	120
Cl, mg/l	--	--	180	--	--	150	--	--	130
Assumed Wastewater									
TDS, mg/l	--	--	982	--	--	784	--	--	666
Na, mg/l	--	--	185	--	--	179	--	--	169
Cl, mg/l	--	--	234	--	--	207	--	--	189
Compliance with RWQCB 87-43, M.R.A.									
Re TDS	--	--	Yes	--	--	Yes	--	--	Yes
Re Na	--	--	Yes	--	--	Yes	--	--	Yes
Re Cl	--	--	No	--	--	No	--	--	No

Notes:

(1) Assumed proportions of the respective supply sources, groundwater and supplemental SWP water, are arranged in the Scenarios to provide reasonable perspective of the most significant impacts on mineral quality. Listed under the three Scenarios are the weighted average contributions of the local and SWP supplies for the three constituents shown.

(2) Typical TDS, TH, Na, and Cl values of the local groundwater sources are as listed earlier in Table 14. For SWP, these values are taken from the DWR EIR as 258, 100, 48.4, and 63.4 mg/l, respectively.

(3) Assumed percentage of customers practicing home softening is approximate only, using rounded values, and is guided by certain findings listed in DWR's June 1978 District Report "Consumer Costs of Water Quality in Domestic Water Use, Lompoc Area" (Ref. 26). This report presented a general curve relating the percentage of homes using softeners to the total hardness of the domestic water supplied. These conditions, as applied to Tanglewood/Orcutt Systems of CCW and resulting Laguna CSD wastewater, were used to guide LFM in assumptions concerning mineral pickup.

(4) Assumed mineral pickup requires consideration of the freshwater supply quality and the likely effects of various types and extents of home softening (and commercial softening) by consumers. These matters are somewhat complex and difficult to quantify, but for the purposes of this study, certain illustrative items were considered.

(a) A June 11, 1991 LFM Interim Report on Wastewater Reclamation Study for Vandenberg Village CSD (Ref. 29) compared the freshwater supply and resulting wastewater for this District and neighboring Mission Hills CSD and noted the following:

Mineral Constit.	VVCSD System Wells	Pickup	MHCSD System Wells	Pickup	Percent Pickup VVCSD	MHCSD
TDS	614	575	488	325+/-	93.6	66.7
Na	87	189	62.3	102.8	217	165
Cl	147	222	106.1	61.9	151	58.3

The MHCSD freshwater mineral quality is better (lower concentrations) than that of VVCSD, and the extent of softening is correspondingly less as is the overall mineral pickup sustained as the water is used by consumers and converted into wastewater.

(b) In addition to absolute levels of TDS, TH, Na, and Cl in both freshwater and wastewater, the ratios of Na and Cl to each other as well as to the TDS are of interest, inasmuch as they may indicate the level of softening by brine-regenerated units being practiced, as indicated for the Tanglewood/Orcutt water supply and the Laguna CSD wastewater, viz:

Item	CCW Supply Freshwater	Nacl Brine	Pickup in Use	Laguna CSD Wastewater
TDS, mg/l	650	--	550	1,200
Na, mg/l	50	--	220	270
Cl, mg/l	50	--	240	290
Ratio:				
Na/TDS	0.077	0.393	0.400	0.225
Cl/TDS	0.077	0.607	0.436	0.242
(Na+Cl)/TDS	0.154	1.000	0.836	0.467
Na/Cl	1.000	0.647	0.917	0.931

It is seen that the proportions of Na and Cl of the total TDS in the freshwater are quite low, whereas in the wastewater they are beyond the halfway point of representing pure NaCl used in softener regeneration brine. The fact that the ratio of Na/Cl in the wastewater is considerably higher than the theoretical 0.647 value for pure NaCl (table salt) is explained in part by the fact that a portion of the home softeners in use are portable units regenerated outside of the sewerage area and thus contributing only sodium salts to the wastewater instead of both Na and Cl salts (as is true of home-regenerated units).

(c) For comparative purposes with the CCW Tanglewood/Orcutt Systems and Laguna CSD wastewater, Vandenberg Village CSD data indicated the following ratios:

Ratio	Vandenberg Village CSD 1990 Value Supply	Wastewater	Pickup
Na/TDS	0.142	0.232	0.329
Cl/TDS	0.239	0.310	0.386
(Na+Cl)/TDS	0.381	0.542	0.715
Na/Cl	0.592	0.748	0.851

(5) The illustrative data in Table 17 do not reflect any effects of future ordinances prohibiting onsite regeneration of home softeners, although such are programmed.

(6) For comparative purposes, a Scenario with no SWP supplement at all would be equivalent to current conditions at Tanglewood/Orcutt and Laguna CSD. That is, the wastewater values for TDS, Na, and Cl would be approximately 1,200, 270, and 290 mg/l, respectively, and there would be a total noncompliance with Order No. 87-43 for the Main Recharge Area.

(7) In contrast, with a hypothetical Scenario involving 100 percent SWP supply, the TDS pickup might be only about 250 mg/l, the Na pickup only about 90 mg/l, and the Cl pickup only about 100 mg/l. The resulting wastewater's 626 mg/l TDS and 139 mg/l Na would readily comply with Order No. 87-43, but the Cl value of 169 mg/l would still be excessive.

Table 17 illustrates the possibilities for significant improvement in the mineral quality of the potable water supply and, indirectly, in the mineral quality of wastewater treatment plant effluent discharged onto lands overlying the potable groundwater aquifers. As noted, ordinances are scheduled to reduce the practicing of onsite softening and discharge of regeneration wastes into the sewer system. This in itself will make the effluent more completely in compliance with Order No. 87-43, so the role of imported SWP supply will be less important in this regard. However, the overall benefits of the SWP supplement in reducing the need for home softening and, indirectly, in reducing salt loadings upon the groundwater basin will still be very important. (The apparent noncompliance aspect of Cl for the Main Recharge Area, even with improved water quality, should probably be reviewed by RWQCB and a more realistic objective considered for this constituent in the effluent discharge.)

GENERAL EFFLUENT DISPOSAL CONSIDERATIONS

Public sewer service is currently available only for small portions of CCW's Vista System and for essentially all of the Tanglewood and Orcutt Systems. Thus, water users within all of the Sisquoc and Lake Marie Systems and nearly all of the Vista System rely upon onsite subsurface sewage disposal systems. Although the discharges from these

decentralized individual systems are relatively diffused over a large area, the mineral impacts of urban wastewater contributions to the groundwater basins will be somewhat lessened if the freshwater supply is less salinized than currently and so does not result in as much water softening as at present. Furthermore, a potential may exist for public sewers and treatment/disposal facilities in some areas not currently served, especially in the southeastern Orcutt area. Should such develop, there could be another point discharge with substantial loadings to the land and underlying basin comparable to that of Laguna CSD. Thus, the differing aspects of the relatively-low TDS quality SWP supply should be of general importance.

WASTEWATER RECLAMATION POTENTIAL CONSIDERATIONS

The importance of wastewater reclamation has become increasingly evident over the last several years as water demands have increased and available water supplies have become increasingly stressed. One of the obstacles to greater implementation of wastewater reclamation projects has been the generally high TDS content of the candidate wastewaters. Having lower TDS content and generally more favorable mineral content will increase the potential value of such reclaimed waters for landscape irrigation, among other uses. It will also reduce potential adverse impacts upon groundwater basins in certain cases. Thus, importation of relatively low TDS supplemental water from the SWP should enhance the potential of future reclaimed water projects.

* * * * *

VII - TOTAL SUITABLE SWP IMPORTATION QUANTITIES

The total suitable SWP importation quantities for CCW are the summation of quantities to sustain reasonable growth and to mitigate allocated groundwater overdrafts plus related and general benefits to the affected communities.

GENERAL CONSIDERATIONS JUSTIFYING SWP IMPORTATION

The DWR EIR (Ref. 3) and SBCWA Update (Ref. 13) have established that the SWP importation as envisioned will not be growth inducing. This conclusion is summarized in the Update as follows:

> "If General Plan buildout continues without additional water supplies from the state water project and, in addition, some other source(s), even larger numbers of people will be at risk when the next drought comes. If one defines growth inducing as promoting growth beyond the General Plan Buildout population, this analysis has shown that the proposed project is not growth inducing. If one defines growth inducing as promoting population growth beyond the current population, even if it is included in the General Plan, the case for importing water to address existing 1990 water quality and quantity requirements is still quite clear."

For CCW, the already-justified quantities of imported SWP supply shown in Table 12 for 1990, Year 2000, and General Plan Buildout Condition are 2,360 AFY, 5,624 AFY, and 7,064 AFY, respectively. These are based upon incremental water demands to support General Plan-approved growth beyond the 1990 condition and supplemental water to be used for correction of allocated groundwater basin overdraft conditions according to the proportionate net pumpage allocation basis used by DWR.

The general conditions prevailing in the various CCW Systems are estimated to be as shown in Table 18.

TABLE 18

GENERAL CONDITIONS PREVAILING IN CCW SYSTEMS WITH SWP IMPORTATION TO SUSTAIN APPROVED GROWTH AND OFFSET OVERDRAFTS

Item	1990 SLOCo.	1990 SBCo.	Year 2000 SLOCo.	Year 2000 SBCo.	Gen.Pl.Build. SLOCo.	Gen.Pl.Build. SBCo.
SWP, AFY:						
For Growth	0	0	320	2,214	579	3,155
For Deficits	100	2,360	120	3,090	150	3,330
Total Req'd	100	2,360	420	5,304	729	6,485
Remaining GWB Deficits, AFY	?	30,906	?	32,307	?	30,172

Percent SWP of Total	10.9	25.3	33.7	45.8	48.6	51.9
Avg. TDS of Tot. Supply	531	551	498	470	444	444

Notes:

(1) SWP deliveries are estimates taken from Tables 12 and 13, including considerations summarized in Tables 7 and 8.

(2) Remaining groundwater basin deficits, if any, for Nipomo Sub-Area are unknown. Those listed for Santa Maria Groundwater Basin (Santa Barbara County) are taken from revised Table 6 of the Updated DWR EIR without further adjustment. The values assume that all municipal type purveyors, such as CCW and Santa Maria, have mitigated their allocated groundwater basin deficits by importing the proper amount of SWP water and the only unmitigated overdraft is that of the Private M&I and Agricultural pumpers. These latter are not participants in the SWP importation, and presumably they have primary overlying water rights to the groundwater.

(3) The percent SWP in the total supply uses total SWP Requirements (deliveries) as listed and total demands shown in Table 7.

(4) For illustrative purposes, the average TDS values assume "complete mixing" of the respective quantities of SWP water (at 258 mg/l) with local groundwater for Vista System (at 620 mg/l) and local groundwater for the CCW Systems in Santa Barbara County (at 650 mg/l). Under this hypothetical blending condition, the average TDS of the delivered water in all water systems, by Year 2000, would conform to the value of 500 mg/l TDS recommended by the State of California, Department of Health Services, as the Maximum Contaminant Level under Table 7 Mineralization - Secondary Drinking Water Standards, Title 22, California Administrative Code (Ref. 30).

(5) Because of its small size and remoteness, Sisquoc System will not be supplied with imported SWP supply via "surface deliveries," although SWP will be imported on behalf of this small system for its modest growth and groundwater deficit offset requirements. However, the three other Systems in Santa Barbara County would actually be integrated within a few years, and, imported SWP supply should be available to virtually all consumers to some degree. Consumers nearest the delivery point (Black Road and Highway 1) would be expected to receive the most consistent benefit from the imported supply and vice versa.

From Table 18, it is clear that the projected level of SWP water importation should be of substantial benefit in reversing the adverse condition of increasing groundwater basin overdrafts, improving the mineral quality of water delivered to consumers, and reducing the need for water softening by consumers and concurrently reducing adverse loadings of wastewater effluent upon receiving lands and underlying groundwater. For these conditions, the General Plan Buildout requirement for the CCW Systems is:

CCW System Location	GPBO SWP, AFY
San Luis Obispo Co.	729
Santa Barbara Co.	6,485
Total, all Systems	7,214

The above figures do not contain any specific element of contingency, nor do they move towards alleviation of groundwater basin overdraft more than would be allocated to CCW on the basis of net pumpage. These conditions deserve some consideration, viz:

- There remains the possibility of additional growth occurring even though current General Plans contain limits. In the long run, it is conceivable that additional water supply may actually be required, more than has been allowed for in the preceding analyses. It would therefore be prudent to recognize such a possibility by means of incorporating an appropriate contingency factor.

- There appear to be no means of bringing the groundwater basin(s) into balance under currently accepted means of deficit reduction, i.e. under the proportionate net pumpage method of allocation of deficits to be reduced by SWP importation. This is because the primary holders of water rights, private M&I pumpers and agricultural pumpers, are not participants in the SWP importation program. While there may be objections to having municipalities "subsidize" these overlying pumpers by paying for imported SWP water while these pumpers pay nothing, it must be recognized that their water rights are paramount. Also, it is to the benefit of all pumpers, overlying as well as others (appropriators) to maintain the integrity of the basin(s). Accordingly, there is some justification for CCW (and other municipal pumpers) to exceed their allocated basin deficit offsets, at least moderately by increasing their importation levels. (Santa Maria is already taking steps to do this). This will still leave room for local projects designed to improve basin recharge.

- Although most consumers will benefit to some extent by improved mineral quality water supply, it may prove difficult and/or costly to provide all consumers with generally equitable water quality. However, increasing the importation levels will improve the prospects for extending the benefits of the imported water's favorable mineral quality to the more remote areas of the distribution system.

- o Increased improvement of the mineral quality of the freshwater supply should also increase the prospects for implementation of reclaimed water projects, to the general benefit of the area.

As a result of the foregoing, and notwithstanding recognition of the eventual possibilities for development of local projects to conserve and/or develop more water supply, it is recommended that a modest contingency factor be added to the values computed above amounting to about 10 percent of the calculated values. The resulting recommended importation levels are presented in Table 19.

TABLE 19

RECOMMENDED SWP IMPORTATION LEVELS FOR CCW SYSTEMS

Values are Listed in AFY

Item	1990	2000	Gen.Pl.Build.
Calculated Importation Level for Sustaining Growth and Offsetting Groundwater Deficits	2,460	5,744	7,184
Recommended Contingency and General Benefit (10 %)	246	574	718
Total Recommended Import	2,706	6,318	7,902
ROUND OFF	2,700	6,320	7,900

LFM recommends that the imported water commitment for SWP supply for Cal Cities Water be at least 7,900 AFY for ultimate (buildout) conditions.

* * * * *

R E F E R E N C E S

(1) Jones, Keith; Lawrance, Charles; Ahlroth, Jon; and MacDonald, Patrick: Santa Barbara County Water Agency Staff Report "Adequacy of the Santa Maria Groundwater Basin," November 1977.

(2) State of California, Department of Water Resources, Southern District, in Cooperation with Santa Barbara County Flood Control and Water Conservation District, "Santa Barbara County Alternatives," April 1985.

(3) State of California, Department of Water Resources, "Final Environmental Impact Report, Volume One, State Water Project, Coastal Branch, Phase II and Mission Hills Extension," May 1991.

(4) State of California, Department of Water Resources, Southern District, "Ground Water in the Arroyo Grande Area," June 1979.

(5) Lawrance, Fisk & McFarland, Inc. "Final Report - Water, Wastewater, and Drainage Studies, Nipomo Mesa Planning Study," Prepared for RRM Design Group for the Nipomo Mesa Technical Study Sponsors, August 24, 1987.

(6) The Morro Group, "Environmental Impact Report on Proposed Update of South San Luis Obispo County Area General Plan," (including Appendix a "Review of Groundwater Conditions in the Northern Santa Maria Basin and Scenarios for the Evaluation of Impacts of Development on the Water Resources of Nipomo Mesa"), prepared for The Office of the Environmental Coordinator, County of San Luis Obispo, July 1990.

(7) John Carollo Engineers, "Brine Calculation Spreadsheet Analysis" (8 Alternatives/Subalternatives on Home Softener Units Phaseout, with and without State Water Project), February, 1992.

(8) Lawrance, Fisk & McFarland, Inc. "Partial Draft of Engineering Report of Laguna County Sanitation District to California Regional Water Quality Control Board, Central Coast Region, Compliance Schedule Regarding Order No. 87-43," February 29, 1988.

(9) Lawrance, Fisk & McFarland, Inc. "Engineering Report Update, Laguna County Sanitation District, Compliance with Order No. 87-43 of California Regional Water Quality Control Board, Central Coast Region," January 26, 1989.

(10) Lawrance, Fisk & McFarland, Inc. "Information Summary - Draft - Laguna County Sanitation District, Compliance with Regional Water Quality Control Board Order No. 87-43 for Protection of Groundwater Quality in the Santa Maria Valley," July 6, 1989.

(11) Cal Cities Water "Water Management Program," Circa 1991-91.

(12) Santa Barbara County-Cities Area Planning Council "Santa Barbara County Regional Growth Forecast, 1985-2005," August 1989.

(13) Santa Barbara County Water Agency and Pamela Gene Cosby "Santa Barbara County Growth Inducement Potential of State Water Importation," Revised September 28, 1991.

(14) Fuz, G. and Gira, Dan "Santa Barbara County Planning Commission Staff Report and Recommendations, West Orcutt ("Area 8") Update," September 11, 1991.

(15) McClelland Engineers "City of Santa Maria Sphere of Influence and Concurrent Annexation Study, Draft Environmental Impact Report," February 18, 1991.

(16) Reese Riddiough, City of Santa Maria, Director of Public Works, Memorandum to File "Domestic Water Service - Santa Maria Sphere and Annexation Study Areas."

(17) Agreement between City of Santa Maria and Southern California Water Company, approval of draft pending, as of June 15, 1992.

(18) Private communication, C.H. Lawrance of Lawrance, Fisk & McFarland, Inc., and R.C. Upham, Engineer and Manager of Laguna County Sanitation District, January 22, 1992.

(19) Department of Planning and Building, San Luis Obispo County, "Land Use Element. Circulation Element, San Luis Obispo County General Plan, Revised Hearing Draft, South County Area Plan - Inland Area," October 16, 1991.

(20) Private communication, C.H. Lawrance, of Lawrance, Fisk & McFarland, Inc., and Jon A. Ahlroth, Senior Hydrologist, Santa Barbara County Water Agency, January 16, 1992.

(21) Ahlroth, Jon, Senior Hydrologist, Santa Barbara County Water Agency Memorandum to Santa Maria Basin Management Committee "Estimated Storage in Santa Maria Groundwater Basin," June 27, 1991.

(22) Private communication, C.H. Lawrance, of Lawrance, Fisk & McFarland, Inc., and W. Ryder Ray, General Manager & Chief Engineer, Nipomo Community Services District, February 6, 1992.

(23) Letter from Tom Bunosky, Manager of Operations, Southern California Water Company, to Lawrance, Fisk & McFarland, Inc., transmitting graphs of Vista System Wells, January 30, 1992.

(24) Lawrance, Fisk & McFarland, Inc. Memorandum to Messrs. R. Brett and T.J. Bunosky, Cal Cities Water Re "Preliminary Analysis of Groundwater Data for Vista System, 1977-91," February 24, 1992.

(25) Water Supply Contract Between The State of California, Department of Water Resources and Santa Barbara County Flood Control and Water Conservation District, February 26, 1963, Article 19. Water Quality.

(26) State of California, Department of Water Resources, Southern District, "Consumer Costs of Water Quality in Domestic Use, Lompoc Area," :June 1978.

(27) Lawrance, Charles H., "Estimating Indirect Cost of Urban Water Use, Journal of the Environmental Engineering Division," Proceedings of the American Society of Civil Engineers, Vol. 101, No. EE4, August, 1975.

(28) California Regional Water Quality Control Board, Central Coast Region, Order No. 87-43 "Waste Discharge Requirements for Laguna County Sanitation District, Santa Barbara County," April 10, 1987.

(29) Lawrance, Fisk & McFarland, Inc. "LFM Interim Report on Wastewater Reclamation Study," Prepared for Vandenberg Village Community Services District, June 11, 1991.

(30) State of California, Department of Health, Sanitary Engineering Section, "California Domestic Water Quality and Monitoring Regulations," Excerpts from the California Health and Safety Code and the California Code of Regulations, Title 22, 1989.

* * * * *

THIS SHEET LEFT INTENTIONALLY BLANK