Exhibit 1

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2010 City of Stockton
Urban Water Management Plan

26 May 2011

Prepared for

City of Stockton
Department of Municipal Utilities
2500 Navy Drive
Stockton, CA 95206-1191

K/J Project No. 1170004*00

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K Samples of Public Education Materials
L City of Stockton Rate Structure
M AB 1420 Documentation
N Mandatory Water Use Reduction Ordinance

List of Abbreviations and Acronyms

AF – Acre-feet

AF/ac/year – Acre-feet per acre per year

BMP – Best Management Practices

CCWD – Calaveras County Water District

Cal Water – California Water Service Company

CEQA – California Environmental Quality Act

CII – Commercial and Industrial

COS – City of Stockton

COSMUD – City of Stockton Municipal Utilities Department

COSMA – City of Stockton Metropolitan Area

CUWCC – California Urban Water Conservation Council

CVP – Central Valley Project

CDPH – California Department of Public Health

CSJWCD – Central San Joaquin Water Conservation District

DMM – Demand Management Measure

DWR – California Department of Water Resources

DWSP – Delta Water Supply Project

gpcd – gallons per capita per day

HET – High Efficiency Toilet

M&I – Municipal and Industrial Uses

MG – Million Gallons

MGD – million gallons per day

NEPA – National Environmental Policy Act

OID – Oakdale Irrigation District

RWCF – Regional Wastewater Control Facility

SAWS – Stockton Area Water Suppliers

SB – Senate Bill

SEWD – Stockton East Water District

SJCOG – San Joaquin Council of Governments

SSJID – South San Joaquin Irrigation District

SWP – State Water Project

SWRCB – State Water Resources Control Board

TAF – Thousands of Acre-feet

ULFT – Ultra Low Flush Toilet

UWMP – Urban Water Management Plan

WTP – Water Treatment Plant

City of Stockton
2010 Urban Water Management Plan
Contact Sheet

Date plan submitted to the Department of Water Resources: **07/21/2011**

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The Water supplier is a: **Municipality**

The Water supplier is a: **Retailer**

Utility services provided by the water supplier include: **Water, Wastewater, and Stormwater.**

Is This Agency a Bureau of Reclamation Contractor? **No**

Is This Agency a State Water Project Contractor? **No**

Section 1: Introduction and Plan Preparation

This Urban Water Management Plan (UWMP) has been prepared for the City of Stockton (City) in accordance with the Urban Water Management Planning Act (the Act) Division 6, Part 2.6, of the California Water Code, Sections 10608 through 10657 as last amended by Senate Bill No 7 (SBX7-7), the Water Conservation Act of 2009.

The organization of this UWMP follows the State Department of Water Resources (DWR) Guidelines for the development of an UWMP. When applicable, each section or subsection includes the excerpt from the California Water Code at the beginning to provide the basis of the information contained within the section. In instances where specific information is not available to respond to the code excerpt, the California Water Code section may still be included to be used as a reference for data requirements and will act as a catalyst to begin collecting data for future UWMP updates. In addition to the code excerpts, the UWMP cites references in the text that are critical supporting documents in describing the quantity, availability, and reliability of the various water supplies. This also includes the projection of water demands and the various City programs underway for increased water conservation and water shortage contingency plans.

1.1 Requirement for an UWMP

All urban water suppliers in the State of California (State) are required to prepare an UWMP and complete updates at least once every five years on or before December 31, in years ending in five and zero. As defined by the California Water Code (Section 10617) an “urban water supplier” is a supplier, either publicly or privately owned, that provides water to more that 3,000 customers or supplies more than 3,000 acre-feet (AF) of water annually on a wholesale or retail basis or both.

This 2010 UWMP has been prepared for the City as an update to the 2005 UWMP. The City of Stockton Municipal Utilities Department (COSMUD) serves approximately 47,000 water service connections and delivers approximately 32,000 AF of potable drinking water (2010).

1.2 Purpose of the COSMUD UWMP

This UWMP is being developed by the City because of its retail water supply responsibilities within its service area within the City (See Figure 1 for the City Urban Water Retailer Service Areas). An UWMP contains information about an urban water supplier’s water supplies, water supply reliability, water conservation, water shortage contingencies, and recycled water usage. Because of the relationships with adjacent water agencies and water wholesalers, this UWMP will discuss some issues that relate to the City of Stockton Metropolitan Area (COSMA) and others where the City is singled out and discussed in more detail.

The UWMP is a valuable long-range planning document for water supply and is the foundation document for Water Supply Assessments (Senate Bill (SB) 610) Water Code §10613 et seq. (Added by Statutes 2001, c. 643), Written Verifications of Water Supply (SB 221) Water Code §66473.7 (Added by Statutes 2001, c. 642), and can serve as a one of many building blocks for an Integrated Regional Water Management Plan in San Joaquin County (County).

1.3 Preparation and Implementation of the Plan

The City prepared this UWMP through COSMUD with the assistance of its consultant, Kennedy/Jenks Consultants, as permitted by Section 10620 of the Act. During the preparation of the UWMP, past UWMPs were reviewed and information from those documents was incorporated as applicable into this UWMP.

The City is committed to the implementation of this UWMP concurrent with the scheduled activities identified herein as required by Section 10643 of the Act.

1.4 Public Participation

> 10642. Each urban water supplier shall encourage the active involvement of diverse social, cultural, and economic elements of the population within the service area prior to and during the preparation of the plan. Prior to adopting a plan, the urban water supplier shall make the plan available for public inspection and shall hold a public hearing thereon. Prior to the hearing, notice of the time and place of hearing shall be published. After the hearing, the plan shall be adopted as prepared or as modified after the hearing.

The City encourages public participation in the development of all water supply planning efforts. In the development of its UWMP, the City solicited comments on the draft UWMP from its water wholesaler - Stockton East Water District (SEWD), adjacent water purveyors - California Water Service Company (Cal Water) and San Joaquin County, the City of Stockton Water Advisory Group, and the City of Stockton Council Water Committee. The City also placed information on its website regarding the status of the UWMP and held a public meeting on May 26, 2011 for review and comments on the draft UWMP prior to finalization and holding a public hearing followed by consideration and adoption by the Stockton City Council on June 21, 2011. A copy of the notice for the public hearing is contained in Appendix A. Copies of web site information pertaining to public information, public notices, and review of the UWMP are contained in Appendix B.

In accordance with Section 6066 of the California Government Code, notice of the public hearing was published in the Stockton Record newspaper on June 5, 2011. Copies of the report are available for public review at the City Clerk's Office and Cesar Chavez Library. A copy of the Notice for Public Hearing is provided in Appendix A.

1.4.1 Plan Adoption and Filing

This updated UWMP was considered for adoption by the City Council on June 21, 2011. The City Council resolution is attached as Appendix C. This plan includes the information necessary to meet the requirements of California Water Code Division 6 Part 2.6. The adopted plan with comments incorporated will be filed with DWR on July 21, 2011. In addition, a copy will be sent to the State Library to be in compliance with the UWMP Act.

1.5 Agency Coordination

> 10620 (d) (2) Each urban water supplier shall coordinate the preparation of its plan with other appropriate agencies in the area, including other water

suppliers that share a common source, water management agencies, and relevant public agencies, to the extent practicable.

Kennedy/Jenks Consultants coordinated closely with City staff to develop this plan. A list of groups that participated in the development of this UWMP is contained in Table 1 shown below. Comments received regarding the UWMP are contained in Appendix D.

1.5.1 Interagency Coordination and Notification

The COSMA receives its urban water supply from three urban water retailers: COSMUD, Cal Water, and the County. These three urban water retailers also contract with SEWD for the wholesale purchase of treated surface water. Information provided by both SEWD and Cal Water was reviewed in the development of this UWMP Update. The COSMUD, Cal Water, San Joaquin County and SEWD met on May 23, 2011 to discuss the UWMP. The County service areas are significantly smaller in size and depend on either local groundwater supplies or from COSMUD water supplies during peak periods. In addition, COSMUD provided their 60 day notification on April 20, 2011 to other local cities and counties within their service area in accordance with 10621 sub section (b). A copy of this notification is contained in Appendix E.

Table 1 summarizes the efforts that the City has taken to include various agencies and citizens in its planning process.

Table 1: Coordination and Public Involvement Actions

	Coordination and Public Involvement Actions				
Entities	**Was contacted for assistance**	**Was sent a copy of the draft**	**Commented on the draft**	**Attended public meetings**	**Was sent a notice of intention to adopt**
Stockton East Water District	✓	✓			✓
California Water Service Company	✓	✓			✓
Woodbridge Irrigation District	✓	✓			✓
San Joaquin County	✓	✓			✓
Water Advisory Group	✓	✓	✓	✓	✓
General Public	✓ via website	✓ via website		✓	✓ via website
Public Library		✓			
Council Water Committee	✓	✓	✓	✓	✓

1.6 Plan Organization

This UWMP is organized according to the format presented in the Guidebook to Assist Urban Water Suppliers, DWR 2011. The organization is shown in Table 2 as is the corresponding Guidebook Check list number that is applicable to that section.

Table 2: Summary of UWMP Chapters and Corresponding Provisions of the California Water Code

Chapter	Corresponding Provisions of the Water Code		Guide Book Checklist No.
Section 1: Plan Preparation	10642	Public participation	55
	10643	Plan implementation	58
	10644	Plan filing	59
	10645	Public review availability	60
	10620 (a)–(e)	Coordination with other agencies; document preparation	4
	10621 (a)–(c)	City and County notification; due date; review	6
Section 2: System Description	10631 (a)	Area, demographics, population, and climate	8-12
Section 3: Water Use	10608	Urban water use targets	1
	10631 (e), (k)	Water use, data sharing	25 and 34
Section 4: Water Supply	10631 (b)–(d), (h), (k)	Water sources, transfers and exchanges, supply projects, data sharing	13-21, 24, 33
	10631 (i)	Desalination	31
	10633	Recycled water	44-51
	10620 (f)	Resource optimization	5
Section 5: Water Service Reliability	10635, 10634, and 10631	Water service reliability, reliability of supply, and water quality impacts on reliability	30, 52
Section 6: Conservation Program and Demand Management Measures	10631 (f)–(g), (j) and 10631.5	Conservation program and DMM implementation status	26-29, 32
Section 7: Water Shortage Contingency Plan	10632	Water shortage contingency plan	35-43

Section 2: Supplier Service Area

The City has provided water service to North Stockton since 1954 and South Stockton since 1984. The City created COSMUD in the late 1970's for purposes of constructing, operating, and maintaining water, wastewater, and drainage facilities within the City service areas. The central Stockton water service area is owned and operated by Cal Water, which is an investor-owned public utility company regulated by the California Public Utilities Commission (CPUC). In addition, there are smaller developed areas served by San Joaquin County as two small maintenance districts within the City boundaries. Over the past 20 years, the City's responsibilities have been focused on providing adequate wastewater and drainage service within City limits, and water service to growing areas of Stockton outside the franchise boundaries of Cal Water and the County maintenance districts. Figure 1 shows the entire City and the areas that are served by COSMUD and Cal Water.

2.1 Climate

The City is located in the heart of the fertile central valley of California. The climate ranges from summer temperatures routinely exceeding 100°F with low humidity, and winter temperatures dipping into the 30's. Average annual rainfall is approximately 14 inches.

Dense fog is common in the area during the winter. Occasional dust storms, triggered by barren agricultural land coupled with Delta winds gusting to 30 mph, occur primarily from about March through September. Average temperature and precipitation data for Stockton is obtained from the Western Regional Climate Center (WRCC) website (www.wrcc.dri.edu). The WRCC has maintained historical climate records for period of record from 10/1/1948 to 9/30/2010 for the Stockton area as summarized in Table 3.

Figure 1: Location Map of City of Stockton
Urban Water Retailer Service Areas

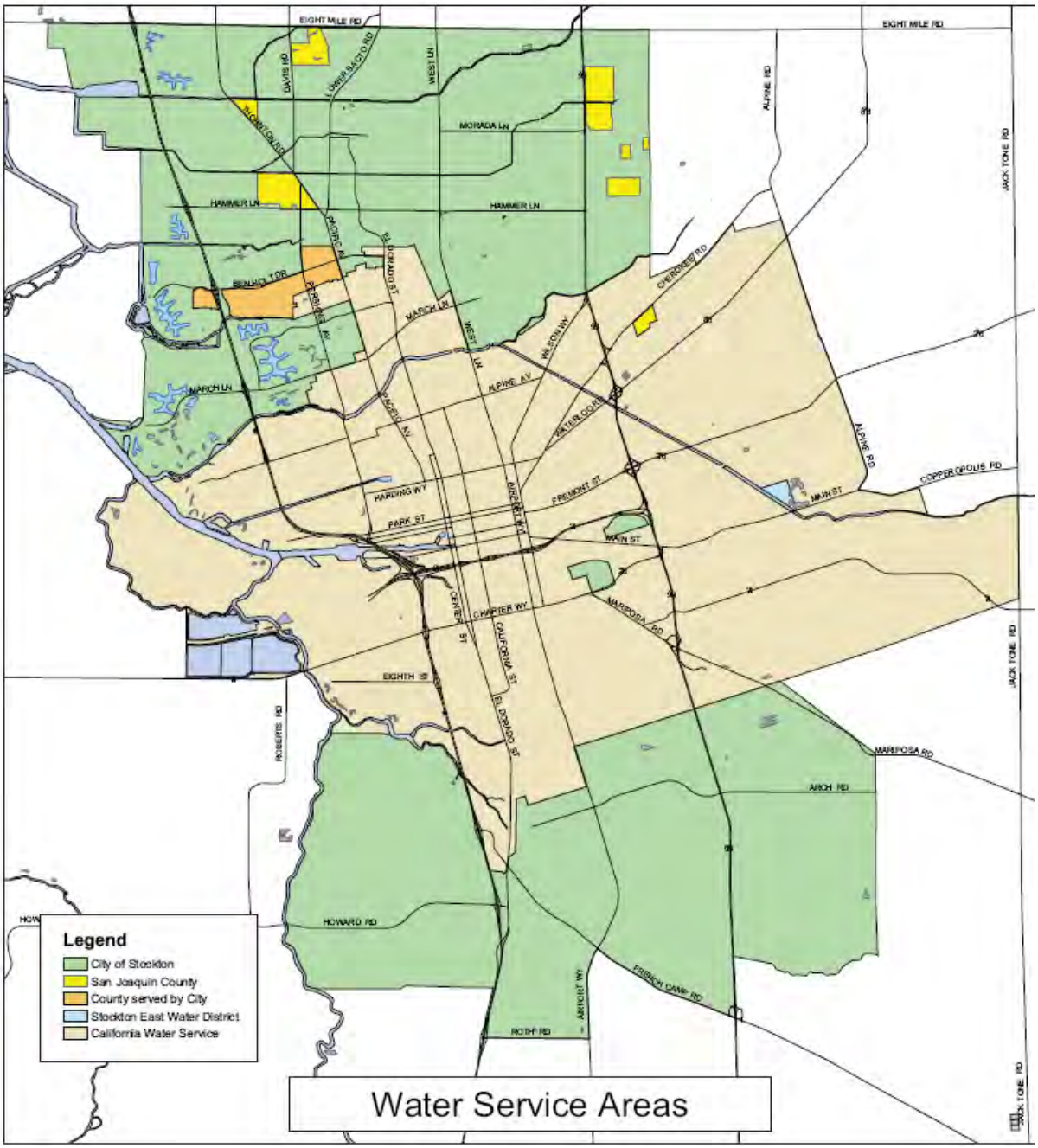


Table 3: City of Stockton Monthly Climate Summary

(Degrees Fahrenheit)

Location	Elev. (feet)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Stockton WSO (048558)	20	Period of Record: 10/1/1948 to 9/30/2010												
Avg. Max Temp		53.6	60.6	66	72.8	81.1	88.5	94.3	92.6	88.2	78.4	64.5	53.9	74.5
Avg. Min Temp		37.6	40.5	42.6	46	51.7	57	60.5	59.8	57	50.2	42.2	37.5	48.5
Avg. Total Precip. (in)		2.86	2.26	2.01	1.14	0.41	0.08	0.03	0.04	0.26	0.72	1.71	2.31	13.81

Source: Western Regional Climate Center

2.2 Population Growth and Other Demographic Factors

The City is located in north central California, approximately 70 miles east of San Francisco Bay Area and 50 miles south of Sacramento. The City is roughly bordered by Interstate 5 on the west side and State Highway 99 on the east side.

The City was founded in the late 1840s and grew as a supply center during the California gold rush. The City was incorporated in 1850 and now occupies approximately 56.5 square miles. The deepwater port and channel to San Francisco Bay help support a large industrial and agricultural base. As reported in the 2000 Census, median household income for the City is approximately $35,453, which is below the County's median household income of $41,282 and the State's median household income of approximately $47,493.

The City is California's 12th largest city and the 4th largest in the Central Valley. Generally, over the past 15 years, the City has seen an increase in water demand. Since 1995, new water demand has generally paralleled the City's population growth. However, the City experienced a decline in water demand across all customer sectors between 2008 and 2010, coupled with the economic downturn and increased water conservation efforts.

The population projections and growth rates for the City are published by the San Joaquin Council of Governments (SJCOG) and were updated in 2009. In late 2010, COSMUD contracted with West Yost Associates (West Yost) to evaluate the water use target methods, select a target method, and provide a recommendation for 2020 urban water use targets. Table 4 presents both adjusted and not adjusted population projections. Adjusted SJCOG projections are used for this UWMP because they reflect service area growth in accordance with the number of water service connections and were carefully analyzed in the West Yost SBX7-7 Technical Memorandum (West Yost TM) (Appendix F). The adjusted projections are taken through this UWMP and used for per capita calculations. The non-adjusted SJCOG projections are presented for comparison purposes and were not used because the adjusted projections more accurately reflect the rapid growth the City experienced from 2000 to 2006. The SJCOG projections are still based on the 2000 census since the full results of the 2010 census have not been incorporated into SJCOG's population projections.

Table 4: Population Projections for the City of Stockton Water Service Area

	2000	2010	2015	2020	2025	2030	2035
SJCOG Growth Rates [1]	N/A	N/A	7.82%	9.11%	8.05%	7.37%	6.31%
Adjusted SJCOG	121,969	169,963	183,247	199,948	216,038	231,955	246,596
Non-adjusted SJCOG	121,969	148,423	160,023	174,608	188,658	202,559	215,344

[1] Rounded

The population for the COSMUD service area was estimated by using GIS mapping and including the population of each census block that fell within the City's service area. The census blocks contain population data from the 2000 census. The total population of the census blocks provided the baseline population for the year 2000. The population was then corrected to the year 2010. To correct the population to 2010, the population was adjusted according to the actual number of residential service connections in 2010 assuming a fixed number of people per connection of 3.801 (established in 2000). The corrected population was used for 2010. Starting in 2015 the population projections use the SJCOG growth rates for the remainder of the projection period starting from the actual population established in 2010 and continuing to 2035. The methodology to determine the population within the COSMUD service area is explained in more detail in the West Yost TM. West Yost compared the population estimates to estimates that Cal Water had performed and determined that the estimates were generally consistent.

2.3 Past Drought, Water Demand, and Conservation Information

The Stockton area has experienced drought conditions twice in the past 30 years. The first drought was in 1977, the first year the SEWD Water Treatment Plant (WTP) went on-line. Groundwater supplies were critically overdrafted during this time, raising higher concerns of saline intrusion and pesticide migration. The second was a prolonged drought from 1987 to 1994. During this period, a reduced amount of surface water was available for the City. As a result of the reduced surface water through SEWD, the City's urban water retailers relied heavily on groundwater to meet customer water demands. The groundwater level during this time dropped approximately 10 to 30 feet at various well sites.

The City Council adopted a Water Conservation Ordinance in 1988. Stockton Municipal Code, Sections 13.28 and 13.32 include both voluntary and mandatory conservation stages. From 1990 to 1992, mandatory water reduction stages were in force due to the prolonged years of drought. The City initiated a voluntary reduction stage in 1993 and has maintained a voluntary reduction stage since that time.

Section 3: Water Use Provisions

10631. A plan shall be adopted in accordance with this chapter and shall do all of the following:

10631 (e) (1) Quantify, to the extent records are available, past and current water use, over the same five-year increments described in subdivision (a), and projected water use, identifying the uses among water use sectors including, but not necessarily limited to, all of the following uses:

(A) Single-family residential; (B) Multifamily; (C) Commercial; (D) Industrial; (E) Institutional and governmental; (F) Landscape; (G) Sales to other agencies; (H) Saline water intrusion barriers, groundwater recharge, or conjunctive use, or any combination thereof; and (I) Agricultural.

(2) The water use projections shall be in the same 5-year increments to 20 years or as far as data is available.

3.1 Past, Current, and Projected Water Use

The COSMUD currently serves 169,963 residents through approximately 47,010-metered services. Based on the total number of accounts, residential users make up about 95 percent of the total customer base, commercial, industrial and institutional users account for approximately 3 percent, and the remaining 2 percent of connections is for landscape irrigation.

The City is expected to grow at an annual rate of approximately 1.56 percent from 2010 to 2015, predominantly in the COSMUD service area, based on SJCOG's growth projection of 7.82 percent. Table 5 shows past, current, and projected connections by customer type from 2005 to 2035. An explanation of the methodology to calculate the projected number of service connections can be found under Section 3.2.

Table 5: Past, Current, and Projected City Water Service Connections by Customer Type

Water Use Sectors	2005	2010	2015	2020	2025	2030	2035
Single Family Residential (2)	38,511	41,070	43,172	47,107	50,898	54,648	58,097
Multi-Family Residential (2)	5,078	3,643	5,038	5,497	5,939	6,377	6,780
Commercial/Institutional (3)	1,316	1,420	1,623	1,754	1,878	2,011	2,145
Industrial (1)	NA	5	6	6	7	7	8
Landscape Irrigation (2)	773	872	940	1,026	1,108	1,190	1,265
Total	45,678	47,010	50,779	55,390	59,830	64,233	68,295

(1) In 2005 industrial connections were included in the Commercial/Institutional Customer category.
(2) Single Family, Multi-Family and Landscape Irrigation categories use population growth rates.
(3) Commercial/Institutional and Industrial categories use employment growth rates.

Table 6 shows past, current, and projected water use from 2005 to 2035 in acre-feet per year. An explanation of how the projected water use was calculated is presented below in Section 3.2. The calculation methodology is explained for all water use categories except for "Wholesale to Other Agencies". Currently COSMUD wholesales between 1,100 to 1,450 AFY of potable water to the County to supplement the County's SEWD supplies. In light of the DWSP coming online in February of 2012; COSMUD, Cal Water and the County are working on reallocating SEWD supplies, and for the purposes of this UWMP, the corresponding County allocation is projected to go to zero since the County water will be provided directly from SEWD.

Table 6: Past, Current, and Projected COSMUD Water Demand (AFY)

Water Use Sectors	2005	2010	2015	2020	2025	2030	2035
Single Family Residential	20,082	18,639	22,462	24,510	26,482	28,433	30,228
Multi-Family Residential	3,874	3,047	4,432	4,836	5,225	5,610	5,964
Commercial/Institutional	5,471	4,471	6,627	7,159	7,666	8,209	8,756
Industrial (1)	NA	624	714	771	826	884	943
Landscape Irrigation	3,012	3,392	3,962	4,323	4,671	5,015	5,331
Other(4)	180	53	100	100	100	100	100
Unaccounted For Water	1,530	3,107	2,021	2,201	2,373	2,547	2,710
Total	**34,149**	**33,333**	**40,318**	**43,900**	**47,343**	**50,798**	**54,032**
Wholesale to Other Agencies	531	163	0	0	0	0	0

(1) In 2005 industrial connections were included in the Commercial/Institutional Customer category.

(2) Single Family, Multi-Family and Landscape Irrigation categories use population growth rates.

(3) Commercial/Institutional and Industrial categories use employment growth rates.

(4) Other includes rental meters used for construction, system maintenance, and street sweeping. Projections are estimated based on historical use.

3.2 Projection Calculation Methodology

This section explains the methodology used to calculate the water use projection for the COSMUD service area.

Step 1: The first step is to calculate the number of service connections and the number of connections projections for the service area. The population projections were presented in Section 1 and the growth rates from SJCOG were used for the population projections to 2035. The West Yost TM estimated 3.801 people per service connection which is assumed to carry forward through the projection period. Dividing the total population by the assumed number of people per service connection provides a total number of residential service connections. The split between the number of single family and multi-family connections was calculated by taking the 10 year average of the percent of connections in each category. The average was calculated from 2001 to 2010 and was approximately 90% single family connections and 10% multi-family connections. The percentage between single and multi-family connections is assumed to be constant through the projection period. Finally, using 2010 as a baseline for service connections, projections were calculated to 2035 for the single and multi-family categories.

Commercial, institutional, and industrial connections reflect the growth rates for employment projections (SJCOG 2009) to calculate their respective growth rates through 2035. The growth rates used for the calculations are presented in Table 7. The landscape irrigation category used the growth rates from the population projections, not employment projections like the other categories. Once again using 2010 as a baseline, the growth rates were applied to the number of connections starting in 2010 and projected to 2035. The employment projections were deemed to be a more accurate representation of the growth for these sectors. The service connection projections for all customer types are presented above in Table 6.

Table 7: SJCOG Growth Rates

	2015	2020	2025	2030	2035
Population	7.82%	9.11%	8.05%	7.37%	6.31%
Employment	14.33%	8.04%	7.07%	7.09%	6.66%

Step 2: The second step to identify water use projections is to calculate the water use factor for each category of water use. The water use factor is used to calculate the total water use for each category. The water use factor is the total number of connections for a given year divided by the water use for that category in acre-feet for that year; the units are acre-feet per year per connection. The average of water use factors was taken for the period from 2000 through 2010. Table 8 presents a summary of the calculated water use factors. The full spreadsheet used to calculate the water use factor is presented in Appendix G.

Table 8: Calculated Water Use Factors (AFY per Connection)

	Single Family Residential	Multi Family Residential	Commercial	Industrial	Landscape Irrigation	Other
Calculated Water Use Factor	0.52	0.88	4.08	124.86	4.21	4.23

Step 3: The third step to calculate the water use projections is to multiply the water use factors by the projected number of service connections by category. The water use projections are presented above in Table 6.

Step 4: The last step is to calculate percent of unaccounted for water using the data from 2000 to 2010. The unaccounted for water is calculated by subtracting the total amount of metered water deliveries from the total amount of water pumped and purchased. The average was calculated to be 5.3%, and is consistent with previous calculations on unaccounted for water. Table 9 shows the total water supplied to COSMUD, gross water use and the calculated unaccounted for water percent.

Table 9: Unaccounted for Water Summary

	Total Supply (Wells and Purchased) (AF/Y)	Gross Water use (AF/Y)	Unaccounted for water (AF/Y)	Percent Unaccounted For Water
2000	26,949	26,231	718	3%
2001	29,191	28,358	833	3%
2002	30,502	29,404	1,098	4%
2003	32,868	30,410	2,458	7%
2004	36,525	34,107	2,418	7%
2005	34,680	33,150	1,530	4%
2006	34,806	33,900	906	3%
2007	40,076	37,269	2,807	7%
2008	38,143	35,594	2,549	7%
2009	36,646	34,648	1,998	5%
2010	35,255	32,149	3,106	9%
			Average Unaccounted for Water	**5.3%**

3.3 Sales to Other Agencies

As shown above in Table 6, COSMUD provides water to the County. COSMUD has provided treated water to the County as far back as records are available and has provided from approximately 531 AFY in 2005 to 163 AFY in 2010. COSMUD projects that they will no longer need to provide water to the County through the projection period due to SEWD being able to directly supply water to the County. Table 10 shows the past and projected water supplied to the County.

Table 10: Projected Sales to Other Agencies (AFY)

	2005	2010	2015	2020	2025	2030	2035
San Joaquin County Demand	531	163	0	0	0	0	0

3.4 Senate Bill 7 (SBX7-7) Water Use Targets

SBX7-7 was enacted in November 2009 and requires urban water agencies throughout California to increase conservation to achieve a statewide goal of a 20 percent reduction in urban per capita use by December 31, 2020. SBX7-7 establishes December 31, 2015 as an intermediate (interim) deadline for urban water suppliers to meet water use target of 10 percent reduction over baseline use.

SBX7-7 requires urban water agencies to develop interim and ultimate urban water use targets and incorporate the numbers in the adopted 2010 UWMP. The bill sets four methods developed by DWR for calculating both the baseline water usage and water use targets in gallons per capita per day (gpcd), as documented in Section D of the Guidebook to Assist Urban Water Suppliers to Prepare a 2010 Urban Water Management plan (DWR Guidebook) issued in March 2011.

Section 10608.20(e) states the following:

> 10608.20 (e) An urban retail water supplier shall include in its urban water management plan required pursuant to Part 2.6 (commencing with Section 10610) due in 2010 the baseline daily per capita water use, urban water use target, interim urban water use target, and compliance daily per capita water use, along with the bases for determining those estimates, including references to supporting data.

The West Yost TM reviewed Methods 1 through 3 since, at that time; Target Method 4 was not expected to be released and therefore was not evaluated. According to the law, an urban water retailer is required to adopt one method. The water retailer is not required to evaluate all four methods, although it is beneficial to do so to determine the most favorable water use reduction method for the water retailer. The West Yost TM is provided as Appendix F.

DWR released a provisional Target Method 4 in February 2011. The Method 4 approach assumes the 2020 urban water use target can be achieved by cumulative water savings between the baseline water use year and year 2020 by implementing metering of unmetered water connections and achieving water conservation measures in three water use sectors: 1) Residential indoor, 2) Commercial, industrial, and institutional (CII), and 3) Landscape water use, water loss, and other unaccounted for water. Method 4 is essentially a Best Management Practices (BMP) calculator. A preliminary evaluation of Method 4 has been performed using the DWR supplied BMP calculator. Inputs were set at default settings and the results indicate approximately 20% per capita water use reduction using Method 4.

Table 1 of the West Yost TM provides a summary of the evaluated SBX7-7 methodologies and calculated base daily water use, 2015 urban water use targets, and 2020 urban water use targets. The West Yost TM Table 1 is reproduced below as Table 11. It should be noted that each methodology has a specific method to calculate the base daily per capita water use. The base per capita water use that will be used to establish the baseline for ultimate water use reduction is the 10-year rolling average calculated in Method 1 and is 195 gpcd.

Table 11: Summary of SBX7-7 Methodologies for Determining Urban Water Use Targets (gpcd)

Target Method	Key Elements	Base Daily Per Capita Water Use,	Interim Urban Water Use Target (2015)	Urban Water Use Target (2020)
1	• Uses historical gross water use and service area population to determine a base daily per capita water use. The Urban Water Use Target is 80 percent of this value. • Based on 10-year running average per capita water use using historical data from 1994 to 2010. • Gross water use is the total water supplied to the system less recycled water, wholesale water and/or agricultural deliveries.	195	176	156
2	• Uses performance standards for indoor water use, landscape irrigation use and commercial, institutional, and industrial (CII) uses. • Residential water use = 55 gpcd. • Uses Model Water Efficient Landscape Ordinance for definitions and calculations. Uses total landscaped area (estimated from GIS and site visits) and applies a Maximum Applied Water Allowance, calculated from the ordinance. • CII use based on historical CII per capita use less 10 percent.	195 [(a)]	176	156 [(b)]
3	• Uses 95 percent of the applicable state hydrologic region target as defined in the state's draft 20x2020 Water Conservation Plan issued by DWR in April 2009. • COSMUD is located in state hydrologic region number 6, San Joaquin Region.	248	200	165

(a) The baseline for this method is the same from Method 1 and used to establish the interim target.
(b) This method requires a data-intensive analysis using GIS, coupled with site visits to estimate appropriate irrigation areas. For preliminary screening purposes to evaluate use of the method, irrigation area was estimated in the West Yost TM from a small data sample.

The Target Method 3 is most favorable to the City compared to Method 1, 2, and 4 which all require approximately 20% per capita water savings. In addition, the West Yost TM also recommended COSMUD to adopt the water use targets from Method 3. Cal Water who serves the remainder of the City service area has also performed their SBX7-7 calculations and chosen Method 3 as their target method and 2020 water use goals.

Method 3 water use targets are calculated by multiplying 95% by the hydrologic region water use targets, which are published in the State 20x2020 Water Conservation Plan. SBX7-7, section 10608.20 (b) defines Method 3 as following:

> (3) Ninety-five percent of the applicable state hydrologic region target, as set forth in the state's draft 20x2020 Water Conservation Plan (dated April 30, 2009). If the service area of an urban water supplier includes more than one hydrologic region, the supplier shall apportion its service area to each region based on population or area.

California hydrologic regions are delineated based on the state's major drainage basins. There are a total of 10 hydrologic regions in California. The City is located within the San Joaquin Region (Region 6). A summary of Water Use Target Method 3 Calculation is shown as Table 12.

Table 12: Water Use Target Method 3 Calculation Summary

Description	Gallons per Capita Per Day (gpcd)
Hydrologic Region Interim (2015) Target	211
Hydrologic Region Compliance (2020) Target	174
Hydrologic Region Base Daily Per Capita Water Use	248
95% Hydrologic Region Interim (2015) Target	200
COSMUD Interim Target Based on 10-yr Rolling Average of 195 gpcd	180
95% Hydrologic Region Compliance (2020) Target	165

Systems with a baseline per capita water use of greater than 100 gpcd must also calculate a minimum water use reduction, which the 2020 water use target cannot exceed. The minimum water use reduction compliance target is 95% of the 5-year rolling average base daily per capita water use (ending no earlier than December 31, 2007, and no later than December 31, 2010). The 5-year rolling average base daily per capita water use was calculated as approximately 193 gpcd. Therefore, the minimum reduction target becomes 184 gpcd with an interim target of 189 gpcd. The results of the minimum reduction target calculation are presented in Table 13. Since the minimum reduction target is higher than the Method 3 calculation, Method 3 is used.

Table 13: Minimum Reduction Target Calculation

Year	Population	Gross Water Use (MG/Year)	Per capita use per year (gpcd)	5-year rolling Avg (gpcd)	95% of 5-yr Avg (gpcd)
2003	144,236	10,536	200		
2004	155,564	11,260	198		

2005	165,690	11,127	184		
2006	168,078	11,091	181		
2007	167,013	12,427	204	**193**	**184**
2008	167,051	12,185	200	193	184
2009	168,344	11,288	184	190	181

The projected water use at the 2020 target of 165 gpcd calculates to a total savings of approximately 15.4%. The percent reduction is calculated by dividing the target gpcd by the baseline of 195 gpcd. The interim target is half of the final target reduction or approximately 7.7% (180 gpcd) by 2015. The projections are presented in Table 14 along with the projected water savings from the reductions. The 20x2020 target is the projected population multiplied by the target per capita water use for the interim target and final target in 2020.

Table 14: SBX7-7 Water Use Projections in AFY

Year	Water Use Without Reductions (AF)	Target GPCD	Population Projection	Water Use with Reductions (AF)	Projected Water Savings (AF)
2010	33,333			33,333	
2015 Interim Target	40,318	180	183,247	36,947	3,371
2020 Final Target	43,900	165	199,948	36,955	6,945
2025	47,343	165	216,038	39,929	7,414
2030	50,798	165	231,955	42,871	7,927
2035	54,032	165	246,596	45,577	8,455

3.5 Water Use Reduction Plan

This section describes the water use reduction plan to comply with SBX7-7 and meet the target water use of 165 gpcd by 2020.

In general, the City's per capita water use has been fairly steady over the last 10 years with the lowest per capita usage in 2010 at 173 gpcd and the highest in 2007 at 204 gpcd. The downward trend in the last four years is most likely due to the state wide drought and the down turn in the economy. It is very possible that the current 173 gpcd could start to rise again with the end to the state wide drought and a growing economy. The City's plan to reach the 20x2020 goal is based on the continuation of BMP implementation and tracking of the gpcd water use.

3.5.1 Implementation and Evaluation of BMPs

COSMUD will continue to implement their BMP program and evaluate the effectiveness of the BMPs. The most effective BMPs that gain the most water savings will be accelerated to ensure the City meets their 165 gpcd goal by 2020.

3.5.2 Tracking Per Capita Water Use

COSMUD will track the per capita water use on an annual basis and adjust the BMP program accordingly. If the per capita water use increases, BMPs that gain increased water savings can be emphasized to help lower the per capita water use.

3.6 Disadvantaged Communities Water Use

> 10631.1 (a) Include projected water use for single-family and multi-family residential housing needed for lower income households, as identified in the housing element of any city, county, or city and county in the service area of the supplier.

SB 1087 requires that water use projections of a UWMP include the projected water use for single and multi-family residential housing for lower income households as identified in the housing element of any city or county in the service area of the supplier. The City last updated its housing element in 2010. The City's housing element does not identify the number or specific location of low income households in the City, nor does the housing element project the number or location of low-income households in the future. For this reason, it is not possible to accurately project water use for lower income households separate from overall residential demand. However, it is assumed the City will not deny nor impose conditions of approval of water services, nor reduce the amount of services applied for by a proposed development that includes housing units affordable to lower income households unless one or more of the following occurs:

- The City specifically finds that it does not have sufficient water supply,
- The City is subject to a compliance order issued by the California Department of Public Health that prohibits new water connections, or
- The City has failed to agree to reasonable terms and conditions relating to the provision of services.

10631 (b) Identify and quantify, to the extent practicable, the existing and planned sources of water available to the supplier over the same five-year increments described in subdivision (a). If groundwater is identified as an existing or planned source of water available to the supplier, all of the following information shall be included in the plan:

(1) A copy of any groundwater management plan adopted by the urban water supplier, including plans adopted pursuant to Part 2.75 (commencing with Section 10750), or any other specific authorization for groundwater management.

(2) A description of any groundwater basin or basins from which the urban water supplier pumps groundwater. For those basins for which a court or the board has adjudicated the rights to pump groundwater, a copy of the order or decree adopted by the court or the board and a description of the amount of groundwater the urban water supplier has the legal right to pump under the order or decree. For basins that have not been adjudicated, information as to whether the department has identified the basin or basins as overdrafted or has projected that the basin will become overdrafted if present management conditions continue, in the most current official departmental bulletin that characterizes the condition of the groundwater basin, and a detailed description of the efforts being undertaken by the urban water supplier to eliminate the long-term overdraft condition.

(3) A detailed description and analysis of the location, amount, and sufficiency of groundwater pumped by the urban water supplier for the past five years. The description and analysis shall be based on information that is reasonably available, including, but not limited to, historic use records.

(4) A detailed description and analysis of the amount and location of groundwater that is projected to be pumped by the urban water supplier. The description and analysis shall be based on information that is reasonably available, including, but not limited to, historic use records.

(c) (1) Describe the reliability of the water supply and vulnerability to seasonal or climatic shortage, to the extent practicable, and provide data for each of the following:

(A) An average water year; (B) A single dry water year; (C) Multiple dry water years.

(2) For any water source that may not be available at a consistent level of use, given specific legal, environmental, water quality, or climatic factors, describe plans to supplement or replace that source with alternative sources or water demand management measures, to the extent practicable.

(d) Describe the opportunities for exchanges or transfers of water on a short-term or long-term basis.

(h) Include a description of all water supply projects and water supply programs that may be undertaken by the urban water supplier to meet the total projected

> water use as established pursuant to subdivision (a) of Section 10635. The urban water supplier shall include a detailed description of expected future projects and programs, other than the demand management programs identified pursuant to paragraph (1) of subdivision (f), that the urban water supplier may implement to increase the amount of the water supply available to the urban water supplier in average, single dry, and multiple dry water years. The description shall identify specific projects and include a description of the increase in water supply that is expected to be available from each project. The description shall include an estimate with regard to the implementation timeline for each project or program.

This section describes the City's current water sources and future water supply reliability.

The City currently meets its water demands from a combination of sources that include:

1. Wholesale treated surface water from SEWD,
2. Delta Water Supply Project (DWSP) - Surface water from the San Joaquin River (February of 2012),
3. Woodbridge Irrigation District (Woodbridge ID) - Surface water from the Mokelumne River (February of 2012), and
4. Appropriative overlying groundwater rights from the basin aquifer underlying the City service areas.

Construction of the DWSP (first phase to be completed in about February of 2012), will introduce a new 33,600 AFY or about 30 MGD supply to the COSMUD system. The City plans to plans to split the main supply between SEWD and the DWSP and supplement the San Joaquin River water with Woodbridge ID water when the San Joaquin water is curtailed for environmental reasons. Groundwater continues to be a vital conjunctive water supply for the City and is needed in critical dry years, for reliable source redundancy, and to maintain public health and safety.

4.1 Current and Projected Water Supplies

Table 15 summarizes current and projected water supply quantities by source for the City. In 2015, we estimate there will be a significant decrease in groundwater use due to the DWSP becoming operational in 2012. From 2012 to 2035, it is assumed that COSMUD will receive 100 percent of the DWSP water output and approximately 25-35% of the SEWD water output, depending on the actual output from SEWD. To establish the projected groundwater supply, COSMUD is assuming that their current water service area of 38,524 acres is pumped at 0.6 acre-feet per acre, per year. To be conservative for this plan COSMUD is not projecting the future growth of their service area and a subsequent increase of groundwater pumping.

Table 15: COSMUD Current and Projected Water Supplies (AFY)

Source of Supply	2005	2010[3]	2015	2020	2025	2030	2035
Surface Water Supply (SEWD)[1]	20,250	29,780	17,500	17,500	17,500	17,500	17,500
Surface Water Supply (DWSP)[2]	0	0	33,600	33,600	33,600	33,600	33,600
Woodbridge ID	0	0	6,500	6,500	13,000	13,000	13,000
Groundwater Supply	14,430	5,475	23,114	23,114	23,114	23,114	23,114
Recycled Water Supply	-	-	-	-	-	-	-
Totals	**34,680**	**35,255**	**80,714**	**80,714**	**87,214**	**87,214**	**87,214**

[1] SEWD Supplies based amount of water delivered in the previous year.
[2] Based on 2006 WSE General Plan Update.
[3] 2010 data based on actual water use.

4.2 SEWD Supply

The COSMUD currently receives treated surface water supplies from SEWD. SEWD currently has four (4) sources of raw water as shown in Table 16. SEWD has two surface water sources; New Hogan Reservoir and New Melones Reservoir. SEWD recently also started a groundwater bank that will add approximately an additional 3,360 AFY to their supply in dry years if the existing surface water supplies are not able to meet SEWD's commitments to the urban contractors.

The City supply allocation from SEWD is based on the amount of water delivered in the previous year. It has been 45%-55% of SEWD's WTP production historically and is projected to decrease to 25%-35% of SEWD's WTP production with the addition of the DWSP supply.

New Hogan Reservoir and New Melones Reservoir are the current sources of surface water for the treated water supply distributed to urban retailers by SEWD. SEWD is contracted to deliver from SEWD WTP a minimum 20,000 AFY to the urban contractors. Table 16 shows SEWD's current typical supply allocations.

Table 16: SEWD Current and Planned Water Supply Sources (AFY)

Water Source	For Treatment Plant	For Ag & Recharge
New Hogan	20,000	32,822
New Melones	24,000	51,000
SSJID Transfer	15,000	
Groundwater Bank [2]	3,360	
Total	**62,360**	**83,822**

(1) Based on DWR Guide Book Table 4
(2) Groundwater Bank water intended for use during critical dry years. Quantity based on SEWD estimates.

Table 17 summarizes the SEWD WTP projected production capacity based upon planned treatment plant expansions compared to supply projections.

Table 17: Projected Water Supply and Treatment Plant Capability (AFY)

	2005	2010	2015	2020	2025	2030	2035
New Hogan	20,000	20,000	20,000	20,000	20,000	20,000	20,000
New Melones	24,000	24,000	24,000	24,000	24,000	24,000	24,000
SSJID Transfer	30,000	15,000	15,000	15,000	15,000	15,000	15,000
Groundwater Bank [(a)]	0	0	10,080	23,520	30,240	43,680	50,400
Total Supply	74,000	74,000	84,080	97,520	104,240	117,680	124,400
WTP Capability	39,668	55,680	58,000	60,320	62,645	64,960	67,290

(a) Groundwater Bank to be developed adding 2 to 4 - 3 MGD wells per year starting in 2012. Groundwater will be used as needed to supplement surface water availability.

4.2.1 New Hogan Reservoir

New Hogan Dam and Reservoir are located on the Calaveras River approximately 28 miles east of Stockton. The New Hogan Reservoir provides water storage for flood control, municipal and industrial water supply, irrigation and recreation. The maximum capacity of New Hogan Reservoir is approximately 317,000 AF. The average long-term conservation yield to the SEWD and CCWD is approximately 84,100 AFY, assuming "safe yield operation".

Under the original 1970 contract with Calaveras County Water District (CCWD), the SEWD supply is 56.5% of the project water. Under normal year conditions this is approximately 40,341 AFY. In addition, SEWD is entitled to 12,650 AFY in recognition of senior water rights of individual landowners that live within the SEWD service area. The total supply available to the two districts is 84,100 AFY in normal water years, of which a maximum of 80,000 AFY has been available to SEWD.

The 1970 contract noted above was modified by a 1982 Memorandum of Understanding (MOU) between SEWD and CCWD to maximize yield by diverting water when it is available. This practice results in little or no water being available in dry years. Under contract, SEWD is entitled to all the available project supply not used by CCWD. At the current level of CCWD use, SEWD can rely on about 83,000 AFY of regulated Calaveras River water supply for percolation and surface delivery in normal water years under safe yield operation. If CCWD maintains its percentage entitlement (43.5%) and exercises it, SEWD's share will be reduced.

4.2.2 New Melones Reservoir

In 1983, SEWD and Central San Joaquin Water Conservation District (CSJWCD) contracted with U.S. Bureau of Reclamation (USBR) for 155,000 AFY of New Melones water. SEWD was to receive 75,000 AFY, of which 10,000 AFY is for municipal and industrial use and the remainder for agricultural use. The allocation of municipal and industrial water under the contract can be increased to the contract total. In 1994, conveyance system and treatment plant expansion was completed at a cost of approximately $65 million.

SEWD has experienced difficulty obtaining water pursuant to its water supply contract with USBR for New Melones water. The 75,000 AFY water allocation to SEWD has been reduced for

fish and wildlife enhancement pursuant to the Central Valley Project Improvement Act (CVPIA) and for enhancement of the Bay-Delta Estuary pursuant to the Bay-Delta Accord. USBR has interpreted the current findings such that SEWD and CSJWCD will receive a full allocation on all but dry years based on inflow to New Melones Reservoir. The USBR's New Melones Interim Plan of Operation provides that applicable Central Valley Project (CVP) water contractors will be allocated up to 90,000 AFY based upon New Melones end of February storage plus forecasted March through September inflow. CSJWCD's USBR contract calls for 49,000 AFY of firm yield and up to 31,000 AFY on an interim basis and in past years has used approximately 30,000 AFY. In 2006, SEWD and CSJWCD received a full water allocation of 155,000 AFY for the first time. This contract remains under litigation.

In addition to the contract with USBR, SEWD is finalizing a Water Transfer Agreement with SSJID for up to 15,000 AFY of New Melones Reservoir water. This agreement adjusted the amount of water available depending on the inflow to New Melones Reservoir. The term of the Agreement was ten years, and it expired in 2009. For the purposes of this UWMP, it is assumed that both irrigation districts will continue to cooperate in a similar manner until 2030.

4.2.3 SEWD Groundwater Supply

SEWD currently has two wells at its WTP used only for emergency and dry year supply which can pump approximately 1,200 gpm. The SEWD groundwater bank noted in prior sections significantly enhances the supply of groundwater during dry years. The groundwater bank is a new source of supply for SEWD and at this time it is still not clear the ultimate capacity of this supply source. For the purposes of this UWMP the groundwater bank is assumed to accumulate 3,360 AF/Y and be able to be utilized when the water supply is needed.

The groundwater basin underlying the SEWD service area is part of the fairly contiguous Central Valley aquifer system, which is a source of water for agricultural, domestic, and industrial water users through the San Joaquin and Sacramento Valleys. This aquifer system also provides groundwater to the City and is discussed in detail in Section 2.6 of this UWMP.

4.3 Delta Water Supply Project Supply

As a result of new development, the acknowledgment that SEWD supplies during dry and critical years will be curtailed and the need to actively manage the groundwater basin; the City is developing new surface water supplies from the DWSP noted above. The objective is to achieve a long-term reliable water supply in the Delta for existing and future customers.

A product of the effort to obtain new surface water supplies from the Delta is a water right application to the State Water Resources Control Board (SWRCB) submitted on April 18, 1996. The ensuing permit from the SWRCB was issued on March 8, 2006 for a 33,600 AFY supply from the Sacramento/San Joaquin Delta.

Phase 1 DWSP intake and water treatment plant is currently under construction. Once it is completed in about February 2012, the City will have a new source of supply from the Delta along with its existing surface water supplies through SEWD and existing groundwater supplies that underlie the City's service area. The initial capacity of the DWSP will be 30 MGD (33,600 AFY). The projected capacity of the DWSP by 2035 is 90 MGD with an annual production of approximately 50,000 AFY based on the projected wastewater flows. Table 18

presents current and future DWSP supplies as stated in the Water Supply Evaluation for the General Plan Update Preferred Alternative (Montgomery, Watson, Harza, 2006).

Table 18: Phasing of COSMA DWSP Water Supply (MGD) Based on 1990 General Plan

Year	2010	2015	2020	2025	2030	2035
Water Supply	30	30	60	60	90	90

4.3.1 Delta Water Rights

Because portions of the COSMA fall within the legally defined Delta and the area of origin, the City has rights to Delta water. To access water for the DWSP, the City filed an application for the appropriation of surplus water in the Delta, plus water the City is entitled to pursuant to Water Code Sections 1485 and 11460-11465.

4.3.2 Section 1485 Water Rights

California Water Code Section 1485 can be summarized as follows: any municipality disposing of treated wastewater into the San Joaquin River (River) may seek a water right to divert a like amount of water, less losses, from the River or Delta downstream of the point of wastewater discharge.

Water losses associated with these discharges once they enter the river system can result from seepage, evaporation, or transpiration between the Regional Wastewater Control Facility (RWCF) and the diversion. The River and associated Delta channels are in balance with the connected groundwater systems, therefore, seepage losses can be estimated at zero. Also, the incremental flow added at the RWCF has no measurable effect on the top width of the River therefore; evaporation from the River surface is not increased. Similarly, transpiration is not measurably affected by the incremental flow since the top width of the water surface is not increased. Therefore, it is assumed that the volume of water loss between the RWCF and any diversion point downstream is negligible.

Unlike Area of Origin Water Rights described in 4.3.3, the City's Section 1485 Water Rights are not subject to Water Right Standard Permit Term 91.

4.3.3 Area of Origin Water Rights

The California Water Code contains a number of sections addressing certain benefits and obligations of areas in which water originates. These "Area of Origin" provisions have not yet been thoroughly interpreted by the courts, so their potential impacts to the City remain unclear.

For purposes of planning for a Delta surface supply, it is assumed that the ability to divert water under the California Water Code Sections 11460 et seq. may be limited by conditions similar to those contained in Water Right Standard Permit Term 91. If the City's water right permit for area of origin water contains Term 91, no diversion would be allowed at times when the CVP and/or State Water Project (SWP) are required to release water from storage in excess of export diversions, SWP/CVP carriage water, and SWP/CVP in-basin deliveries. In other words, a

DWSP diversion would only be allowed at times when Delta outflow is greater than minimum regulatory requirements.

4.4 Woodbridge Irrigation District Supply

In 2008, the COSMUD executed a 40 year purchase agreement with Woodbridge ID for 6,500 AFY of water from the Mokelumne River for municipal and industrial use within the City. The water will be conveyed to the DWSP WTP for treatment and pumping to the water distribution system. According to the agreement Woodbridge ID will construct conveyance improvements to deliver the water to the DWSP WTP.

The benefit of this supply is to supplement DWSP diversions from the San Joaquin River to avoid protected species. The U.S. Fish and Wildlife Service Biological Opinion stipulates mandatory pumping curtailment beginning in March and continuing into June of each year. The California Department of Fish and Game Incidental Take Permit extended that curtailment to begin in February. In order to maintain treated water delivery from the DWSP WTP an alternate supply is beneficial. Woodbridge water deliveries would fulfill the purpose supplementing San Joaquin River supplies when they are curtailed.

Under this contract an additional 6,500 AFY WID supply will become available to the City as WID-served agricultural lands in the northern part of the City are annexed to the City for Municipal and Industrial (M&I) use at a rate of 3.0 AF/Ac/Yr.

4.5 Summary of City's Future Surface Water Utilization

The COSMA has and will continue to meet annual demands during differing hydrologic periods with surface water, groundwater, water conservation, and/or other potential water supplies such as non-potable supplies from local communities, raw surface water from local irrigation districts, and/or water from future groundwater storage projects. Currently, the COSMUD, along with the other COSMA retailers, are pursuing an extension of a raw surface water transfer agreement with local irrigation districts and municipalities. The City recently completed a feasibility study and is currently investigating the possible use of tertiary treated recycled water from the City of Lodi for use as a non-potable source for irrigation of public landscape areas. Any future surface water transfer supplies would be diverted for treatment at the SEWD WTP or the DWSP WTP.

4.6 Groundwater Supply

The groundwater basin underlying the County is part of the contiguous Central Valley aquifer system, which supplies groundwater to agricultural, domestic, and industrial water users extending from about Redding to Bakersfield. The basin consists of Pre-Tertiary igneous and metamorphic rocks of the Sierra Nevada that continue west beneath the valley floor. Marine sediments, thousands of feet thick, overlie the basement rocks. Continental deposits overlie the marine rocks and act as the primary freshwater aquifer in the study area. In local areas, fresh water may be present in both marine and continental deposits, and saline water may be found in continental deposits.

DWR Bulletin 146 identifies the usable aquifer in the eastern portion of San Joaquin County as the continental deposits of Miocene and younger age. The usable aquifer is present within the boundaries of the county in distinct geologic formations that include the Mehrten Formation, the

Laguna Formation, the Victor Formation, flood basin deposits, and alluvial fan and stream channel deposits. The thickness of the usable aquifer ranges from less than 100 feet in the eastern edge of the county to over 3,000 feet in the southwestern edge, and is approximately 1000 feet beneath Stockton.

Groundwater in the County area moves from sources of recharge to areas of discharge. Most recharge to the aquifer system occurs from the Delta and along active stream channels where extensive sand and gravel deposits exist. Consequently, the highest groundwater elevations typically occur near the Delta, the Stanislaus River, and the Mokelumne River. Other sources of recharge within the project area include subsurface recharge from fractured geologic formations to the east, as well as deep percolation from applied surface water and precipitation.

Municipal and agricultural uses of groundwater within the County contribute to an overall average yield of groundwater estimated to be 761,828 AFY for agricultural uses and 47,493 AFY for municipal and industrial uses (DWR Bulletin 118, 2006). Historically, groundwater elevations have declined from about 40 to 60 feet averaging approximately 1.7 feet per year. As a result, a regional cone of depression has formed in Eastern San Joaquin County creating a gradient that allows saline water underlying the Delta region to migrate northeast within the southern portions of the City. Groundwater underlying the City generally flows to the east due to the regional cone of depression.

A Groundwater Management Plan for the East San Joaquin Groundwater Basin was prepared in San Joaquin County in 2004 and is included as Appendix H.

4.6.1 COSMUD Groundwater

The COSMUD currently exercises (and will continue to exercise) its rights as an overlying groundwater appropriator to extract groundwater from the groundwater basin underlying the COSMA for delivery to its customers. Groundwater is an extremely important resource for all of the City's urban water retailers and can be managed for long-term sustainability through conjunctive use with the surface water supplies described above. The volume of groundwater pumped for the last five years is presented in Table 19.

Table 19: Amount of Groundwater Pumped 2005-2010 (AFY)

	2005	2006	2007	2008	2009	2010
Groundwater Use	14,430	13,581	12,202	11,121	7,470	5,475

Projected groundwater pumping is expected to decrease significantly when the DWSP WTP comes online. COSMUD is projecting only needing approximately 2,000 AFY of groundwater under normal conditions. In critical dry years, groundwater pumping may increase above 2,000 AFY to make up for curtailments in surface water deliveries as a conjunctive use strategy. Table 20 presents the projected amount of groundwater that could be pumped for the next 25 years. This quantity is based on 0.6 acre-feet of groundwater pumped per acre of land with in the COSMUD service area set to 2015. As mentioned earlier this projection is not showing the City's service area increasing to be conservative for this plan. It is assumed that as the service

area increases groundwater pumping can increase beyond 23,114 AFY. Based on historical pumping amounts, the projected groundwater supply is expected to be 100% reliable.

Table 20: Groundwater Pumping Projections (AFY)

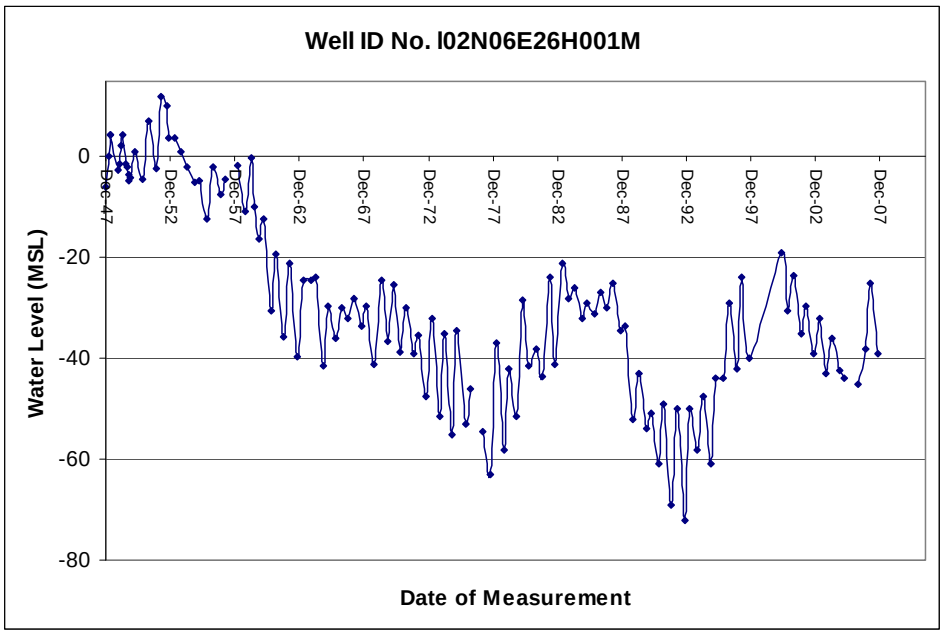
	2010	2015	2020	2025	2030	2035
Groundwater Use	5,475	23,114	23,114	23,114	23,114	23,114

Conjunctive use implies that groundwater will be preserved as the last source of supply that is used if surface water supplies are insufficient to meet demands. Careful planning and study have taken place to help insure that groundwater extraction yields, on average, do not pose any risk of salinity intrusion or undue risk to private domestic or agricultural wells in the City area. In wet years, when surface water is more plentiful, the groundwater basin is allowed to recover through in-lieu recharge (i.e., allowing natural recharge to occur from streams and rivers) and not pumping, and in the dry years, groundwater is extracted to meet the shortfall of surface water supplies in meeting municipal and industrial (M&I) water demands. This UWMP recognizes the need to protect this resource that is already threatened by salinity intrusion, and to provide a plan to protect the groundwater resources indefinitely.

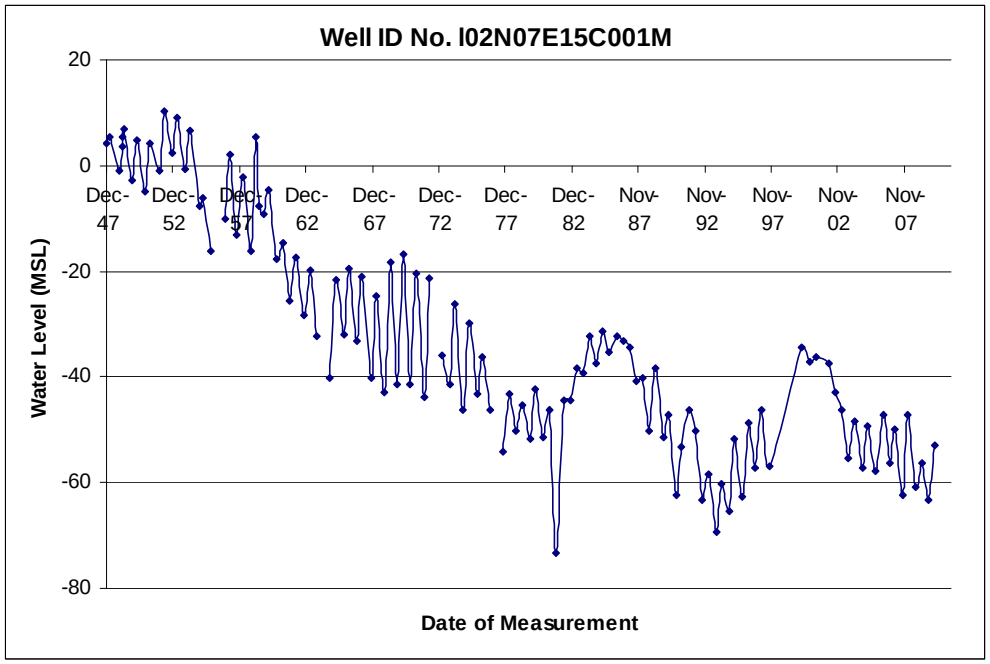
As mentioned above, groundwater use within the broader San Joaquin County region has resulted in a decline of groundwater elevations over the period from 1947 to 2008/2010 as indicated by the three hydrographs shown in Figure 2. The data was obtained from the Department of Water Resources, Central District Groundwater Supply Assessment and Special Studies Section and was published online as well monitoring information. The data were downloaded in March of 2011. The figure illustrates groundwater elevations at wells located within and adjacent to the City. The short duration fluctuations in Figure 2 result from the seasonal wet and dry months and irrigation usage within each year. An overall decline in groundwater elevations from 1947 to 1978 is the result of agriculture and urban areas relying entirely on groundwater supplies. Figure 3 and 4 in Appendix I show the groundwater contour elevations for the spring and fall of 2010, and the approximate location of the wells listed here.

Figure 2: Groundwater Elevation Hydrographs for Areas Near the City of Stockton

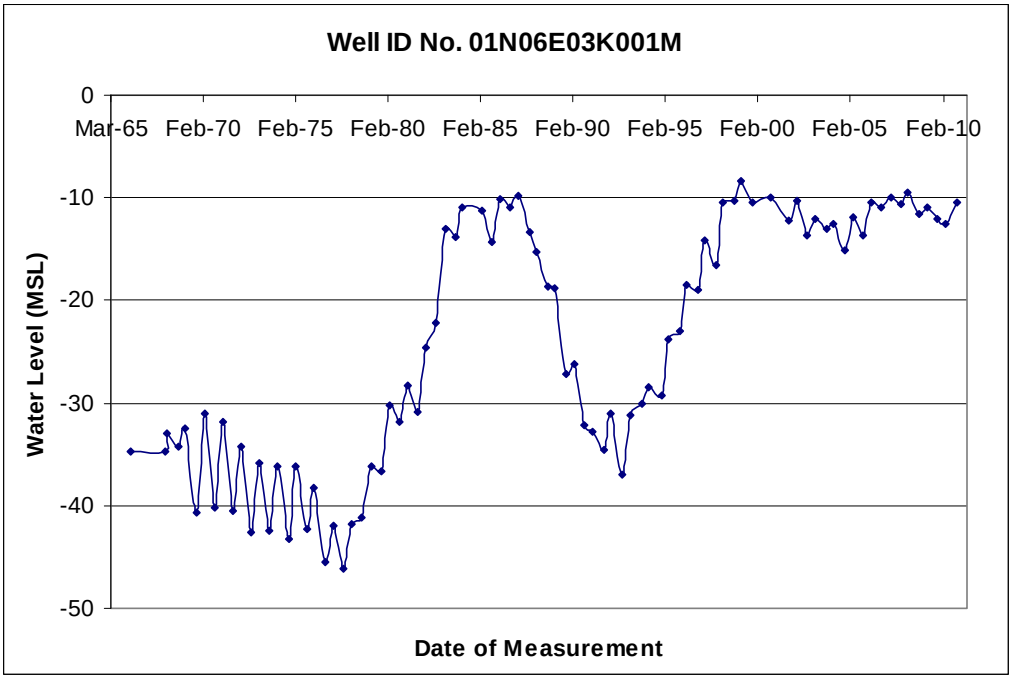
a) Well 1 Hydrograph from 1947 to 2008



b) Well 2 Hydrograph from 1947 to 2008



c) Well 3 Hydrograph from 1947 to 2010



In the late 1970's, SEWD began to provide supplemental supplies of surface water to the Stockton urban water retailers. The use of surface water in the COSMA resulted in an increase in groundwater elevations as shown in the hydrographs in Figure 2. Increases in the elevation continued until the drought of the late 1980's and early 1990s. The behavior of the groundwater basin during the drought and subsequent normal year hydrology of the late 1990's indicate that the basin is recovering, and is operating within a manageable range. The recent stabilization and improvement in groundwater elevations are the result of wet hydrology, active recharge projects, and increased surface water deliveries in areas historically served by groundwater.

Over the period from 1947 to present, the change in slope of the groundwater surface in western San Joaquin County has created a condition that has allowed saline water to migrate east-northeast into a portion of the COSMA, degrading water quality and rendering it unsuitable for municipal or agricultural use in some areas.

The sustainable yield of the groundwater basin is based on changes in the rate of movement of the salinity front. Over the years, there have been various estimates of the sustainable long-term yield from the groundwater aquifer. The February 1992 Supplemental Report for Water Supply prepared for the COS Special Planning Area Study states: "about 40,000 acres and an average withdrawal of 0.75 AF/ac/year. …groundwater can provide from 0.75 to 1.0 AF/ac/year on a long-term basis."

Other references to sustainable groundwater yield are included in the COS 1995 Urban Water Management Plan Update, which uses a long-term firm yield of 1.0 acre feet per acre per year (AF/ac/year), and from the North Stockton Master Plan in which 0.75 AF/ac/year is used. A principal objective of the DWSP is to reduce groundwater overdraft and protect the groundwater basin from further saltwater intrusion and water quality degradation. Thus, it is appropriate to

use a reasonable but conservative assumption for groundwater extraction in the urban water retailer's long-term water supply planning to insure that the long-term program is protective of the groundwater resources.

For future planning, it is proposed that a maximum long-term operational yield objective of the basin underlying the Urban Services Area is described in General Plan Policy PFS 2 of the 2035 General Plan Update reflect a conservative 0.60 AF/ac/year groundwater pumping rate. If lands within the General Plan Planning Area Boundary are converted from agriculture irrigated with groundwater to urban uses, an agricultural credit is assumed based on not exceeding a 1.0 AF/ac/year maximum. This is acknowledging that the aquifer was sustaining the agricultural use prior to urbanization and at a rate that was likely 2 or 3 times that of the self-imposed maximum of 1.0 AF/ac/year.

4.7 Transfers and Exchanges

The urban contractors have a draft agreement for 15,000 AF/Y for 10 years with SSJID. SEWD currently does take part in a water transfer from SSJID from New Melones Reservoir (agreement is not finalized). The water transfer has a maximum allotment of 15,000 AFY. Table 21 presents a summary of transfers and exchanges for the COSMUD system and transfer and exchanges that affect COSMUD's water supply (from wholesaler).

COSMUD water supply from WID is also considered a transfer and is shown below.

Table 21: Transfer and Exchange Opportunities

Transfer and Exchange Opportunity	Transfer or Exchange	Short Term	Proposed Quantities	Long Term	Proposed Quantities
SSJID to Urban Contractors	Transfer	N/A	N/A	From 2010 through Projection Period	4,000 AFY to 15,000 AFY
WID to COSMUD	Transfer	N/A	N/A	40 Years starting in 2010	6,500 to 13,000 AFY

4.8 Planned Water Supply Projects and Programs

This section presents a summary of the COSMUD's proposed water supply projects and programs. Currently there are two water supply projects under construction for COSMUD, they are:

- Delta Water Supply Project and Water Treatment Plant (DWSP WTP)
- Woodbridge ID raw water supply to the DWSP WTP

The largest water supply project of the two is the DWSP WTP. This project includes the installation of a raw water intake on the San Joaquin River, a raw water pipeline, and a 30 MGD water treatment plant on Lower Sacramento Road. The entire project is currently under

construction and scheduled to be completed by about February 2012. As mentioned before the DWSP is entitled to up to 33,600 AFY of San Joaquin River water.

The Woodbridge ID supply is a 6,500 AFY supply that will augment the DWSP supply if the San Joaquin water is not available due to environmental issues. The delivery is via a new pipeline that will be installed to the DWSP WTP.

4.8.1 Wholesale Agency Projects and Programs

SEWD has two planned water supply projects that will be implemented in 2011 and carried onwards. The first is a groundwater bank project where they will recharge the aquifer and "bank" approximately 3,360 AFY of surface water that can later be pumped to augment supplies if surface water supplies are curtailed. The second SEWD supply project is a new agreement for continuation of SSJID transfer water for up to 15,000 AFY. Both projects are discussed in greater detail in the discussion of SEWD's supply, Section 4.2

4.9 Desalinated Water

While COSMUD may eventually become part of regional water supply improvement efforts through desalination of either surface water from the Delta or local groundwater, however there are no current plans underway.

4.10 Recycled Water

The City owns and operates the RWCF. This facility is located adjacent to the San Joaquin River and State Highway 4. The existing treatment capacity at the RWCF is 48 MGD average dry weather flow.

4.10.1 Wastewater Treatment Process

The treatment processes include:

- Grit Removal
- Primary Clarification
- High Rate Trickling Filters
- Secondary Clarification
- Anaerobic sludge digestion and belt press dewatering
- Oxidation Ponds – Enhanced Secondary Treatment
- Tertiary Treatment including biological reduction of ammonia, algae removal, and filtration
- Disinfection
- Dechlorination

The Stockton RWCF provides tertiary level treatment year round and was upgraded to full Title 22 in May 2006.

4.11 Wastewater Disposal and Recycled Water Uses

4.11.1 Recycled Water Currently Being Used

The RWCF had been, until recently, supplying recycled water to a privately owned 14-acre farm for over 20 years. The farm used the recycled water to irrigate crops of alfalfa and safflower. The farm was supplied approximately 107 AFY of recycled water. Because the Section 1485 water right is based on the amount of treated wastewater effluent discharged from the plant, there is little incentive to seek opportunities for recycled water.

4.11.2 Potential Uses of Recycled Water

Three potential options for recycled water use in the Stockton Area were identified in a study conducted in 1996: community based customers, market to Central San Joaquin Water Conservation District (CSJWCD), and groundwater recharge in the Linden area. The City has held focus group meetings for the three alternatives. The meetings included individuals with knowledge on water issues in the Stockton Area, individuals with expertise in recycled water, farmers, community members and customers from the Linden area.

Distribution pipelines would be required throughout the City to carry the recycled water to any customer. A storage requirement of approximately 43 AF would also be required. The estimated cost for implementing community based recycled water use is about $135 million. Recycled water would not be able to be used throughout each year within the community. Storage or diverting of the unused recycled water would be required.

Marketing to CSJWCD would require a pipeline to Woodward Reservoir and need 33,200 AF of storage space. The estimated cost for providing recycled water to CSJWCD is about $60 million. Farmers in the San Joaquin area currently have a reliable supply of water at a fairly low cost. Therefore, currently there is minimal interest by farmers in the area in paying for recycled water.

Groundwater recharge in the Linden area would require a pipeline to Linden. No storage would be necessary. The estimated cost for groundwater recharge is approximately $86 million to $117 million. The range in cost is based on the rate of percolation, which has been found to vary from about 1 to 11 feet per day in previous studies.

Customers in the Stockton area have expressed concerns over the potential use of recycled water. Concerns include the long-term impacts recycled water would have on groundwater and surface water, negative impacts on crops and soils, and a decrease in marketability of crops irrigated by recycled water.

Lastly, any recycled water use will reduce the availability of Section 1485 water that will be diverted and treated by the DWSP. This provides a no incentive for increasing recycled water production beyond current flows.

The City at this time is not pursuing the alternatives listed above. Estimated costs, lack of public interest, concerns of the customers, and the reduction in potable water rights make the alternatives prohibitive to implement at the present time. The information from the Recycled Water Market Evaluation Study and will be used in future master planning of the Wastewater

Treatment Plant. The City is reviewing options for obtaining $40 million in grant money for implementing a future recycled water project.

4.12 Historical and Projected Wastewater Production

Historical and projected discharges from the City's Regional Wastewater Control Facility are presented in Table 22 and 23. The projections are expected to approximately follow the growth rate and projected water use of the COSMUD service area. The discharge projections were provided by the COSMUD Wastewater section.

Table 22: Historical Wastewater and Recycled Water (AFY)

	2005	2006	2007	2008	2009	2010
Wastewater Collected and Treated	34,830	35,260	35,210	35,260	31,770	29,950
Quantity Used for Recycled Water	0	0	0	0	0	0

Based on DWR Guide Book Table 33

Table 23: Projected Wastewater and Recycled Water Quantity (AFY)

	2010	2015	2020	2025	2030	2035
Wastewater Collected and Treated	29,950	32,400	34,100	38,500	43,600	49,300
Quantity Used for Recycled Water	0	0	0	0	0	0

Based on DWR Guide Book Table 33

Section 5: Water Service Reliability

10631 (c) (1) Describe the reliability of the water supply and vulnerability to seasonal or climatic shortage, to the extent practicable, and provide data for each of the following:

(A) An average water year; (B) A single dry water year; (C) Multiple dry water years.

(2) For any water source that may not be available at a consistent level of use, given specific legal, environmental, water quality, or climatic factors, describe plans to supplement or replace that source with alternative sources or water demand management measures, to the extent practicable.

10635. Every urban water supplier shall include, as part of its urban water management plan, an assessment of the reliability of its water service to its customers during normal, dry, and multiple dry water years. This water supply and demand assessment shall compare the total water supply sources available to the water supplier with the total projected water use over the next 20 years, in five-year increments, for a normal water year, a single dry water year, and multiple dry water years. The water service reliability assessment shall be based upon the information compiled pursuant to Section 10631, including available data from state, regional, or local agency population projections within the service area of the urban water supplier.

5.1 Reliability of Supply

This section describes the reliability of each of COSMUD's water supply sources that include:

- San Joaquin River Delta Water Supply
- Mokelumne River water from Woodbridge ID
- East San Joaquin Groundwater Basin
- Wholesale Supply from SEWD

A written description of the reliability of each supply will be presented, along with the average, single-dry, and multiple-dry water year scenarios. Finally the water supply will be compared to demand over the next 25 years for normal, dry, and multiple dry water years.

5.1.1 San Joaquin River Delta Water Supply

The San Joaquin River water supply that will be available when the DWSP WTP is completed in about February 2012 is projected to provide 30 MGD (33,600 AFY) on an annual basis. At this point COSMUD has not used water from this supply but COSMUD anticipates pumping restrictions to be in effect in the spring months to protect sensitive species. Even with pumping restrictions COSMUD anticipates being able to use the full 33,600 AFY allotment for normal, single dry, and multiple dry water year scenarios.

5.1.2 Mokelumne River water from Woodbridge Irrigation District

The current contract from Woodbridge Irrigation District (Woodbridge) is for an initial 6,500 AF/Y. This water supply is projected to be available in March of 2012 in conjunction with the

completion of the DWSP WTP. The Woodbridge water will be conveyed to the new WTP for treatment and distribution. The plan for Woodbridge water is to be used when and if the San Joaquin River water pumping is curtailed. This supply will ensure the WTP will be able to meet the projected demand during the spring months. It is assumed at this time that the full supply will be available when it is needed.

Under this contract an additional 6,500 AFY WID supply will become available to the City as WID-served agricultural lands in the northern part of the City are annexed to the City for Municipal and Industrial (M&I) use at a rate of 3.0 AF/Ac/Yr.

5.1.3 East San Joaquin Groundwater Basin

Currently COSMUD relies on groundwater for their supply. Existing groundwater usage made up 42% in 2005 to 16% in 2010 of COSMUD's supply. Groundwater usage has been decreasing steadily in the last 5 years and is projected to decrease to approximately 2,000 AFY when the DWSP WTP comes online. COSMUD still needs the groundwater supply to meet peak demands, maintain system pressure, and provide emergency water supply if other water supplies are curtailed.

As described in Section 4 the groundwater basin has historically been in overdraft and encountered water quality issues from salt water intrusion. M&I use historically make up about 6% of the total water extracted from the groundwater basin and the remainder being used for agricultural purposes. It is estimated, based on historical use and availability that 23,114 AF will be available for the normal, dry, and multiple-dry year scenarios to 2035. This estimate is based on the City's overlying groundwater right of 0.6 AF per acre per year and the City's current water service area acreage.

5.1.4 Wholesale Supply from Stockton East Water District

SEWD currently supplies the COSMUD with 74% of their water supply. SEWD provides treated water from New Hogan Reservoir, New Melones Reservoir, groundwater, and/or OID/SSJID transfers. More detail on their supply sources can be found in Section 2. The majority of SEWD's water used for their urban retailers is diverted from New Hogan and New Melones Reservoirs. By contract, SEWD is required to deliver a minimum of approximately 20,000 AFY of treated water to the urban retailers (COSMUD and Cal Water). The minimum delivery is split between the urban retailers based on that year's agreement on allocation. Historically SEWD has delivered as little as 12,495 AFY in 1990.

With COSMUD bringing the DWSP WTP online in about February of 2012, COSMUD is projecting to decrease the amount of SEWD water deliveries from about 74% of their total supply to approximately 50% of their total supply, or approximately 17,500 AFY. COSMUD is projecting to keep SEWD deliveries at this level for the projections presented in this UWMP.

Since SEWD has diversified its supplies with the SSJID transfer water, their supply of 17,500 AFY is projected to be 100% reliable for the normal and single dry year scenario. However, SEWD is forecasting a shortage for the multiple dry year scenario. Assuming COSMUD's supply is 17,500 AFY or 40% of their firm supply of 44,000 AFY (excluding OID/SSJID and groundwater bank supply). The next three year minimum and multiple dry year supply is as follows:

- Year 1: 17,500 AFY
- Year 2: 11,930 AFY (40% of 30,000 AFY)
- Year 3: 8,000 AFY (40% of 20,000 AFY)

This scenario is the most conservative supply for COSMUD from SEWD since the SSJID transfer water that is still in negotiation between SEWD, the Urban Contractors, and SSJID.

5.2 Summary of Supply Reliability

From the previous descriptions Table 24 has been developed to demonstrate the reliability of the existing supply under the normal year, single dry year and multiple dry year scenarios at year 2035. As can be seen in Table 24, SEWD is the only supply with any reductions under the multiple dry water year scenario. It is assumed that the deficit in supply from SEWD will be made up by using groundwater.

Table 24: Normal, Single, and Multiple Dry Year Supply Reliability at 2035 (AFY)

	Normal Year	Single Dry Year	Multiple Dry Years		
			Year 1	Year 2	Year 3
Surface Water Supply (SEWD)	17,500	17,500	17,500	11,930	8,000
Surface Water Supply (DWSP)	33,600	33,600	33,600	33,600	33,600
Woodbridge ID	13,000	13,000	13,000	13,000	13,000
Groundwater Supply	23,114	23,114	23,114	23,114	23,114
Recycled Water	0	0	0	0	0
Total Supply	**87,214**	**87,214**	**87,214**	**81,644**	**77,714**
% Reduction	0%	0%	0%	6%	11%

5.3 Supply and Demand Comparisons

As shown on Tables 25, 26, and 27 below, this section compares water demands developed in Section 2 to the reliability of the supply. The comparison is required for the normal year, single dry year and multiple dry year scenarios in 5 year increments for the next 25 years. As previously discussed, the only reliability issue is the surface water supply form SEWD, then only for the multiple dry year situations. Water supply shortages in surface water will be made up from additional groundwater pumping.

Table 25: Normal Year Supply and Demand Comparison (AFY)

	2005	2010	2015	2020	2025	2030	2035
Supply totals	35,568	35,255	80,714	80,714	87,214	87,214	87,214
Demand totals	35,568	35,255	40,317	43,900	47,342	50,799	54,032
Difference (supply minus demand)	0	0	40,397	36,814	39,872	36,415	33,182
Difference as % of supply	0	0	50%	46%	46%	42%	38%
Difference as % of demand	0	0	100%	84%	84%	72%	61%

Table 26: Single Dry Year Supply and Demand Comparison (AFY)

	2005	2010	2015	2020	2025	2030	2035
Supply totals	35,568	35,255	80,714	80,714	87,214	87,214	87,214
Demand totals	35,568	35,255	40,317	43,900	47,342	50,799	54,032
Difference (supply minus demand)	0	0	40,397	36,814	39,872	36,415	33,182
Difference as % of supply	0	0	50%	46%	46%	42%	38%
Difference as % of demand	0	0	100%	84%	84%	72%	61%

Table 27: Multiple Dry Year Supply and Demand Comparison (AFY)

Year	Supply	Demand	Difference	Difference as Percent of Supply	Difference as Percent of Demand
2012					
2013	87,214	37,786	49,428	57%	131%
2014	81,644	39,052	42,592	52%	109%
2015	77,714	40,317	37,397	48%	93%
2016					
2017					
2018	87,214	42,467	44,747	51%	105%
2019	81,644	43,183	38,461	47%	89%
2020	77,714	43,900	33,814	44%	77%
2021					
2022					
2023	87,214	45,965	41,249	47%	90%
2024	81,644	46,654	34,990	43%	75%
2025	77,714	47,342	30,372	39%	64%
2026					
2027					
2028	87,214	49,416	37,798	43%	76%
2029	81,644	50,107	31,537	39%	63%
2030	77,714	50,799	26,915	35%	53%
2031					
2032					
2033	87,214	52,739	34,475	40%	65%
2034	81,644	53,385	28,259	35%	53%
2035	77,714	54,032	23,682	30%	44%

5.4 Water Quality

This section describes the water quality of COSMUD's supplies and the effects of water quality on the reliability of those supplies. Since COSMUD has a variety of supplies, each source will be discussed separately. Within the 25 year projection period water quality is not projected to affect supplies. COSMUD's decision to provide most of its water from surface water from the San Joaquin River and treated water from SEWD will help ensure a high quality source of water. By reducing groundwater usage, COSMUD will be able to use the groundwater as a high quality source during critically dry years when the surface water supplies are curtailed.

5.4.1 Groundwater

The City currently operates twenty-two (22) groundwater wells in North Stockton and five (5) groundwater wells in South Stockton. The quality of the groundwater has generally been good, with chlorination being the only treatment required. However, there are naturally occurring constituents in the groundwater such as arsenic and magnesium. The City has indicated that there is adequate groundwater supply that meets Title 22 requirements to meet groundwater usage projections.

5.4.2 San Joaquin and Mokelumne River Water

The DWSP treatment plant will be treating both San Joaquin River raw water and Woodbridge ID supplied Mokelumne raw water. The new treatment plant uses filtration and disinfection to remove solids, organic mater, and biological constitutions that are common in surface water supplies. There are currently no water quality issues that are projected to affect these surface water supplies.

5.4.3 SEWD Treated Water

The SEWD supply provided to COSMUD is a treated water supply. SEWD does not project any water quality issues affecting their supply.

5.5 Resource Optimization

Section 10620 (f) of the Act asks urban water suppliers to evaluate water management tools and options to maximize water resources and minimize the need for imported water from other regions. COSMUD understands the limited nature of water supply in California and is committed to optimizing its available water resources. This commitment is demonstrated through COSMUD's use of water management tools throughout its service area to promote the efficient use of water supplies from local sources, wherever feasible. Additionally, COSMUD has taken efforts to procure new water supplies that include the DWSP San Joaquin River water and Woodbridge ID Mokelumne River water sources. COSMUD is a regular participant in local water resources planning efforts through SAWS as well as development of a robust water conservation program.

COSMUD has implemented a robust water conservation program, deployed in its service area. In an effort to expand the breadth of offered programs, COSMUD partners with wholesale suppliers, and other agencies that support water conservation programs through SAWS.

Section 6: Water Demand Management Measures

10631 (f) Provide a description of the supplier's water demand management measures. This description shall include all of the following:

(1) A description of each water demand management measure that is currently being implemented, or scheduled for implementation, including the steps necessary to implement any proposed measures, including, but not limited to, all of the following:

(A) Water survey programs for single-family residential and multifamily residential customers; (B) Residential plumbing retrofit; (C) System water audits, leak detection, and repair; (D) Metering with commodity rates for all new connections and retrofit of existing connections; (E) Large landscape conservation programs and incentives; (F) High-efficiency washing machine rebate programs; (G) Public information programs; (H) School education programs; (I) Conservation programs for commercial, industrial, and institutional accounts; (J) Wholesale agency programs; (K) Conservation pricing; (L) Water conservation coordinator; (M) Water waste prohibition; (N) Residential ultra-low-flush (ULFT) toilet replacement programs.

(2) A schedule of implementation for all water demand management measures proposed or described in the plan.

(3) A description of the methods, if any, that the supplier will use to evaluate the effectiveness of water demand management measures implemented or described under the plan.

(4) An estimate, if available, of existing conservation savings on water use within the supplier's service area, and the effect of the savings on the supplier's ability to further reduce demand.

(g) An evaluation of each water demand management measure listed in paragraph (1) of subdivision (f) that is not currently being implemented or scheduled for implementation. In the course of the evaluation, first consideration shall be given to water demand management measures, or combination of measures, that offer lower incremental costs than expanded or additional water supplies. This evaluation shall do all of the following:

(1) Take into account economic and noneconomic factors, including environmental, social, health, customer impact, and technological factors.

(2) Include a cost-benefit analysis, identifying total benefits and total costs.

(3) Include a description of funding available to implement any planned water supply project that would provide water at a higher unit cost.

This section presents the City's past, current, and future water conservation effort in compliance with the section 10631 of the UWMP Act. The 2010 UWMP Guidebook states that wholesale and

retail urban water suppliers have different requirements for Demand Management Measures (DMM) implementation:

- Wholesale urban water suppliers need to address DMM 3, 4, 10, 11, 12
- Retail urban water suppliers need to address all DMMs, except DMM 10.

The City operates mainly as a retail urban water supplier, with a very little wholesale capacity (less than 0.6% if its annual water deliveries in 2010). The City is committed to implementing economically feasible programs that promote efficient water use and continues to implement demand management measures to the extent practicable. Section 10631 (f) of the Act requires that "all" DMMs are to be discussed and a discussion of each DMM is presented in this section. The 14 DMMs are listed in Table 28 below:

Table 28: UWMP Demand Management Measures (DMM)

DMM No.	DMM Name	Implementation Status	Comments
1	Water survey programs for single-family residential and multifamily residential customers	Yes	Fully implemented and ongoing
2	Residential plumbing and retrofit	Yes	Over 1,000 kits distributed
3	System water audits, leak detection, and repair	Yes	Fully implemented
4	Metering with commodity rates for all new connections and retrofit of existing connections	Yes	Fully implemented
5	Large landscape conservation programs and incentives	Yes	No specific program by COS; However COS performs services that fall under this DMM
6	High-efficiency washing machine rebate programs	Yes	311 rebates distributed
7	Public information programs	Yes	Participating through own programs and SAWS
8	School education programs	Yes	Participating through SAWS
9	Conservation programs for commercial, industrial, and institutional accounts	Yes	269 toilet rebates distributed
10	Wholesale agency programs	Yes	Participates through SAWS
11	Conservation pricing	Yes	Fully implemented
12	Water Conservation Coordinator	Yes	Fully implemented and ongoing
13	Water waste prohibition	Yes	Through Stockton Municipal Code
14	Residential ultra-low-flush toilet replacement program	Yes	137 toilet rebates distributed

COSMUD became a signatory to the CUWCC in 2006. However, due to limited staff resources and the CUWCC's late release of its new reporting database, COSMUD has been unable to complete the CUWCC's on-line BMP reporting and for purposes of this UWMP is evaluating the 14 DMM's listed above, which mirror the CUWCC's BMP's. COSMUD administers the program to the greatest benefit of the resources available to promote water conservation. In this section, each DMM includes the following:

A. Description of the DMM as implemented by COSMUD,

B. Schedule of Implementation,

C. Methods to Evaluate Effectiveness, and

D. Water Savings.

If the DMM is currently not being implemented, a cost effectiveness evaluation is provided and if it is cost effective to implement, a plan for implementation is outlined.

6.1 DMM 1: Water Survey Programs for Single-Family Residential and Multifamily Residential Customers

A. Implementation

Until May 2010, the City offered complimentary water use surveys for single and multi-family residential customers. Surveys were conducted by City staff certified as AWWA Water Use Efficiency Practitioners, covering indoor and outdoor water uses.

Due to limited staff resources, the City is now developing a self-performed water use survey modeled after the City of Santa Rosa.

Surveys consist of water use evaluation for appliances, such as dishwashers, washing machines, toilets, and faucets. Landscape and irrigation systems are evaluated as a part of the outdoor water use survey and the customer's water meter is observed to ensure no leaks are occurring. Following completion of the survey, customers are provided a low-flow water use efficiency kit that includes low-flow shower head(s), faucet aerators, toilet flapper(s), a metal garden hose nozzle, and a brochure containing water conservation facts and tips.

B. Implementation Schedule

The City first implemented water surveys for single and multi-family residential customers in May 2009. This program is still being implemented and will continue to be implemented for at least the next 5 years. In 2009, 148 water surveys were performed and 127 water surveys were performed in 2010.

C. Methods to Evaluate Effectiveness

Effectiveness for this DMM is quantifiable by the number of water surveys conducted. It should be noted that implementation of this DMM can also increase higher participation of DMMs 2, 6, 13, and 14.

Dependent upon available resources, the City may conduct a survey for participating customers on resulting awareness of water conservation and report the findings from the survey results with the next UWMP.

D. Water Savings Assumptions

The City currently has no means to quantify the water conservation savings from this DMM.

6.2 DMM 2: Residential Plumbing Retrofit

A. Implementation

The City offers and promotes low-flow water use efficiency kits through distribution at community events, after completion of water surveys, via the City website, through 866-STOKWTR, as well as advertising through utility bill inserts. The low-flow water use efficiency kit includes the following items: (2) 1.5 gpm low-flow shower head(s), a 1.5 gpm kitchen aerator, (2) 1.0 gpm bathroom aerators, toilet flapper(s), and a metal garden hose nozzle.

B. Implementation Schedule

The City has been distributing low-flow water use efficiency kits, in various forms, for a number of years back to 1990. However, distribution and tracking of the kits described above commenced in 2009 and continues. The City will continue to offer low-flow water use efficiency kits during the reporting period.

C. Methods to Evaluate Effectiveness

The City is tracking the number of retrofit kits distributed during the reporting period. The number of kits distributed during 2009 and 2010 is presented in Table 29.

Table 29: Number of Water Conservation Kits Distributed

Year	Number of Low-Flow Water Use Efficiency Kits
2009	467
2010	595

D. Water Savings Assumptions

The City will continue to track number of kits offered and compare the total water usage for customers before and after kits are received. The City will report the comparison results with the next adoption of UWMP.

6.3 DMM 3: System Water Audits, Leak Detection, and Repair

A. Implementation

The City of Stockton has a continuous distribution system water audit program in place. Ongoing analysis of unaccounted for water is one of the most effective means to achieve conservation by reducing leaks from the system. The City maintains an average of 5.3% water loss from 2000 to 2010.

The City currently documents unmetered consumption in its Monthly Operations and Maintenance Report. All water meter leaks, service line, main break and manifold leaks are reported to the City by customers calling in or by a system generated work order. All leaks/breaks are documented in the City's Computerized Maintenance Management System (CMMS). Information documented includes: date and time of reported leak, name of person responding to the call, type of leak, work done, customer side or city leak, and time to complete. Also documented is any communication with the customer or if a note was left to describe what was done and if any follow up is needed. All meter leaks are repaired the same day they are reported. All emergency breaks are also repaired the same day they are reported. Non-emergency service line and main breaks are usually held until a 48 hour USA is completed. Numbers from main and service line breaks are obtained by taking the line size, duration of the leak and volume of water leaking to estimate total water loss. Meter leak water loss numbers are estimated based on the volume of water found and duration of the leak.

Once a year, the City flushes the system through fire hydrants. The time spent flushing is documented in the CMMS. Hard copies of each hydrant flushed and how long it was flushed are kept as records. Water loss numbers are calculated by volume of water being flushed and time flushed multiplied by the number of hydrants flushed. City fire flow tests, commercial and residential construction usage and equipment testing are sources of water loss that are estimated based on the number of tests performed and number of new construction sites. Street sweeping water usage is documented on hard copies and calculated by size of tank, number of street sweepers and load counts.

In 2009, the City started using the AWWA Water Audit Software.

B. Implementation Schedule

This DMM is currently being implemented and will continue to be implemented as part of COSMUD's ongoing operations and maintenance program.

C. Methods to Evaluate Effectiveness

The City keeps records of the number and type of leaks reported monthly. The continuous review of the system allows the City to maintain unaccounted for water losses at an average of 5.3%.

D. Water Savings Assumptions

The total amount of water conserved over the five-year period by implementing this DMM is directly related to the percentage of unaccounted for water loss leaving the system. The City is committed to maintaining an average of 8% or less unaccounted for water during the reporting period.

6.4 DMM 4: Metering with Commodity Rates for All New Connections and Retrofit of Existing Connections

A. Implementation

The entire City of Stockton service area is fully metered and all connections are billed based on the volume of water used. The City became fully metered in 1954. In addition, customers are classified by meter type including single-family residential, multi-family residential, commercial, institutional, industrial and irrigation accounts.

B. Implementation Schedule

This DMM is fully implemented.

6.5 DMM 5: Large Landscape Conservation Programs and Incentives

A. Implementation

The City currently does not currently have a Large Landscape Conservation Program. However, effective January 1, 2010, the City began implementing the State's Model Water Efficient Landscape Ordinance (MWELO) and is currently working to develop its own similar ordinance as part of the City's Climate Action Plan work. Upon request, COSMUD will meet with Homeowners Associations who are large landscape users and evaluate their water use and provide recommendations for improvements.

In addition, in 2009 the COSMUD invested $92,560 to finalize the conversion of 12 of the newest City parks to computerized (SMART) irrigation control to achieve an approximate energy and water savings of 25 percent.

In 2010, the City launched a web site offering water wise landscaping resources, tips and virtual tours and photo galleries of local low-water use gardens. This information can be found at: http://www.stockton.watersavingplants.com. Examples of print materials used in public information materials are included in Appendix J.

B. Implementation Schedule:

The City is currently working to identify its largest landscape/irrigation customers in an effort to launch a pilot program whereby water budgets will be established and monthly water use reports will be generated and distributed to customers to evaluate their water use and monetary savings.

The City park retrofit project was recently completed in 2010.

C. Methods to evaluate effectiveness:

The City will develop water use reports for large landscape/irrigation customers within 18 months of the UWMP adoption. The City will track report results and provide follow-up when necessary to evaluate the effectiveness of this DMM.

Data from the City park retrofit project is currently begin gathered to compare water use prior to and after the SMART controller retrofit.

D. Water Savings Assumptions

Water savings for this DMM are currently not quantifiable.

6.6 DMM 6: High-Efficiency Washing Machine Rebate Programs

A. Implementation

The City offers a rebate up to $150 per high-efficiency washing machine through the CUWCC's SMART Rebate Program. To date, the City has invested approximately $144,000 for the combined rebate program of high efficiency clothes washers and toilets and associated administrative costs (DMM14). The City's web page for Municipal Utilities Water Conservation advertises the available rebates as does the CUWCC website. Rebates are processed as received and as funding allows. The City has issued 311 rebates to date.

B. Implementation Schedule

This program was started in 2007 and is currently in place. The Program has not placed limitations on the quantity of rebates offered each year. The City will continue to issue rebates until the program funding is expended.

C. Methods to Evaluate Effectiveness

The City will continue to track the number of rebates during reporting period. The total number of rebates used will be the method to evaluate the effectiveness of this DMM.

D. Water Savings Assumptions

Gross water savings (gallons) are calculated using the CUWCC's formula for Gross Water Savings for high efficiency washing machine rebates. Each installation is assumed to save 0.314 AF. Since a total of 311 rebates have been issued, it can be assumed that a total of 97.6 AF is being saved as a result of this program.

6.7 DMM 7: Public Information Programs

A. Implementation

The City of Stockton provides water conservation information as part of MUD's outreach program. Current budget for the City's public information programs is $232,000. The public information program includes print and web-based publications, monthly bill inserts, and public outreach events.

The City includes water conservation tips and information in the City's monthly utility bill newsletter, *Stockton Water News*, which is mailed to all City of Stockton water customers. Water Conservation is featured in the May issue of *Stockton Water News* as a part of Water Awareness Month. City staff also provides an annual update on the City's water supply to the City's Water Advisory Group, Council Water Committee and City Council. This report provides information regarding anticipated water supplies and provides an overview of the City's water use and conservation programs.

The City is also a USEPA WaterSense Partner and is able to utilize available promotional materials and actively promotes EPA's Fix a Leak Week every year.

Water conservation outreach literature is also distributed at community events such as Family Day in the Park, Black Family Day, Cinco de Mayo, State of the City and the annual Earth Day Festival. Water conservation literature is also distributed throughout City departments and to various community centers and libraries. The public can access water conservation information on the Municipal Utilities Department section of the City's web page at:

http://www.stocktongov.com/government/departments/municipalUtilities/utilWaterCon.html

In 2010, the City launched a web site offering water wise landscaping resources, tips and virtual tours and photo galleries of local low-water use gardens. This information can be found at: http://www.stockton.watersavingplants.com. Examples of print materials used in public information materials are included in Appendix J.

B. Implementation Schedule

This DMM is currently in place. The City will continue to implement this DMM during the reporting period.

C. Methods to Evaluate Effectiveness

The City provides residents with an 866-STOKWTR number where they can call and report water wasters as well as request information.

The City is currently restructuring its website and is planning to add a “How Are We Doing” section to the City’s water conservation web page to evaluate the effectiveness of its public outreach efforts.

D. Water Savings Assumptions

The City currently has no method to quantify water conservation savings from this DMM.

6.8 DMM 8: School Education Programs

A. Implementation

The City provides water conservation education as part of the community and school outreach program through the Stockton Area Water Suppliers (SAWS), a consortium of water agencies including the COSMUD, Cal Water, SEWD and San Joaquin County. SAWS water conservation materials are included with teacher packets for classroom presentations and are discussed during classroom programs.

The City participates with SAWS to develop and implement a water education program for public and private schools within its service area. SAWS is an association of water providers dedicated to communication and mutual assistance regarding issues affecting water supply, distribution, and conservation in the COSMA. The SAWS group believes that providing water education in elementary and secondary schools is highly effective in reaching the public at large because young children are apt to share the lessons they learn in class with their parents, siblings, and extended families.

Educational materials, pamphlets, and guidance to classroom activities are available to schools and the public to highlight the value of water and ways to conserve. SAWS’s Water Conservation Program reaches approximately 28,000 K-6 grade students annually and has an outreach budget of $157,000. The program provides outreach in various formats, including: a large assembly program, in-class presentations, after-school programs, at festivals and community events, and various workshops. Examples of written materials used in public education programs are included in Appendix K.

B. Implementation Schedule

This DMM is currently in place. The City will continue to provide water conservation materials as part of its community and school outreach programs, as well as continue to work cooperatively with SAWS to develop and distribute water conservation information to K-6 grade students in public and private schools.

C. Methods to Evaluate Effectiveness

The City will work cooperatively with SAWS to develop teacher and student surveys to measure the effectiveness of the outreach campaign. All comments will be tracked and programmatic adjustments will be made based on the information received.

D. Water Savings Assumptions

The City currently has no method to quantify water conservation savings from this DMM.

6.9 DMM 9: Conservation Programs for Commercial, Industrial, and Institutional Accounts

A. Implementation

City of Stockton promotes water conservation to its commercial, industrial and institutional (CII) users by charging users by volume of wastewater discharged from their facility in addition to charging CII users per a uniform water rate structure.

Beginning in 2010, the City started offering a high efficiency toilet (HET) Direct Install Program for CII customers. The program covers the cost of the installation and hardware. CII customers may select a pre-approved plumbing contractor for the installation. The approved budget for the HET Direct Install Program is $150,000. To date, 269 HETs have been installed for approximately 27 CII customers.

In addition, the City, as part of SAWS, participates as part of the Greater Stockton Chamber of Commerce's REACON (Recycling, Energy & Conservation) Program and makes periodic visits to CII customers to conduct water use evaluations as a way to assist businesses with reducing their costs of doing business and at the same time, promote environmental stewardship via water conservation practices. In 2009, the City conducted 8 REACON assessments and in 2010, conducted 6 REACON assessments.

B. Implementation Schedule

This DMM is currently in place. The City will continue to implement this DMM. However, parts of the DMM overlaps with other DMMs implementation as listed below:

a. See DMM 4 for volumetric billing Implementation Schedule.

C. Methods to Evaluate Effectiveness

Effectiveness of this DMM will be evaluated through tracking multiple parameters including program participation, number of audits conducted for high water users, and comparison water use readings before and after program participation. The City will track the parameters and include the results in the next UWMP cycle.

D. Water Savings Assumptions

Water savings for a HET replacement is established by CUWCC. The City has installed 269 toilets since program commencement through its HET Direct Install Program at an approximate savings of 253.129 AF annually.

6.10 DMM 10: Wholesale Agency Programs

A. Implementation

The City of Stockton, Cal Water, County of San Joaquin and SEWD are members of Stockton Area Water Suppliers (SAWS). SAWS meets monthly to discuss water-related matters, including water supply, use, conservation and development of water shortage contingency plans. The City funds its portion of school education and public information through its wholesale water cost to SEWD.

B. Implementation Schedule

The City will continue to meet with SAWS to discuss the state of water-related matters in the Stockton area.

C. Methods to Evaluate Effectiveness

There is no available method to evaluate effectiveness of this DMM.

D. Water Savings Assumptions

The City currently has no method to quantify water conservation savings from this DMM.

6.11 DMM 11: Conservation Pricing

A. Implementation

See copy of City of Stockton Water Fee Schedule Effective July 1, 2010 in Appendix L. This fee schedule has a uniform rate structure. The City's water conservation ordinance allows the City to raise water prices during declared water emergencies.

B. Implementation Schedule

The Water Fee Schedule is in place and effective beginning July 1, 2010 and is adjusted annually July 1 in accordance with approved rate increases and/or cost of living adjustments. The City will continue to implement this DMM.

C. Methods to Evaluate Effectiveness

There is no available method to evaluate effectiveness this DMM.

E. Water Savings Assumption

The City currently has no method to quantify water conservation savings from this DMM.

6.12 DMM 12: Water Conservation Coordinator

A. Implementation

The City's Water Resources Program Manager currently serves part-time as the City's Water Conservation Coordinator. The Conservation Coordinator establishes an annual program budget based on available funding and resources. Program accomplishments are highlighted and corresponding goals are established for the upcoming year. Each DMM will be monitored to ensure implementation and the water use targets set by SBX7-7 and AB 1420 will be tracked.

B. Implementation Schedule

This DMM is currently in place. City will continue to implement this DMM.

C. Methods to Evaluate Effectiveness

The Water Conservation Coordinator is responsible for program management, tracking, planning, documenting, and reporting on the implementation of DMMs. The effectiveness of this DMM is based on the overall effectiveness of the program as it relates to annual water savings.

D. Water Savings Assumptions

The City currently has no method to quantify water conservation savings from this DMM.

6.13 DMM 13: Water Waste Prohibition

A. Implementation

The City of Stockton Municipal Code Chapter 13.28 is dedicated for Water Conservation and restricts certain uses of water. Water use restrictions include the following:

a. Use of potable water from fire hydrant other than for fire suppression purposes by the local fire department or by the responsible water agency.
b. Use of potable water for exterior irrigation other than drip and/or mist irrigation system between 11:00 a.m. to 6:00 p.m. (May 1 to November 1) or use that allows water to run off or escape from the premises or to be wasted, except for the initial 21-day period of establishment for new plantings
c. Use through leaks, breaks, or malfunction within the water user's plumbing or distribution system
d. Use of water for washing cars, boats, or buildings without the use of a quick-acting positive shut-off nozzle on the hose

e. Use of potable water for dust control purposes
f. Use of ornamental fountains in public or commercial establishments without recirculation system
g. Use of potable water for drinking in restaurants if not requested by customers

The restrictions are enforceable per the Stockton Municipal Code §13.28.090. and enforced by the COSMUD.

B. Implementation Schedule

This DMM is currently in place.

C. Methods to Evaluate Effectiveness

Water waste complaints and violations are received and investigated by COSMUD staff and addressed via door hangers and/or direct contact in person/via telephone with tenants and property owners. Complaints and/or violations are opened, tracked and closed in the COSMUD Monthly Operations and Maintenance Report.

D. Water Savings Assumptions

The City currently has no method to quantify water conservation savings from this DMM.

6.14 DMM 14: Residential Ultra Low Flush Toilet Replacement Program

A. Implementation

The City offers a rebate up to $100 per ultra low flush/high efficiency toilet through the CUWCC's SMART Rebate Program. To date, the City has invested approximately $144,000 for the combined rebate program of high efficiency clothes washers and toilets and associated administrative costs (DMM6). The City's web page for Municipal Utilities Water Conservation advertises the available rebates as does the CUWCC website. Rebates are processed as received and as funding allows. The City has issued 137 rebates to date.

B. Implementation Schedule

This program was started in 2007 and is currently in place. The Program has not placed limitations on the quantity of rebates offered each year. The City will continue to issue rebates until the program funding is expended.

C. Methods to Evaluate Effectiveness

The City will continue to track the number of rebates during reporting period. The total number of rebates used will be the method to evaluate the effectiveness of this DMM.

D. Water Savings Assumptions

Gross water savings (gallons) are calculated using the CUWCC's formula for Gross Water Savings for ultra low flush/high efficiency toilet rebates. Each installation is assumed to save 0.5600 AF. Since a total of 137 rebates have been issued, it can be assumed that a total of 76.72 AF is being saved as a result of this program.

6.15 AB 1420 Compliance

COSMUD submitted their AB 1420 self certification of DMMs in August of 2010. COSMUD submitted based on the gpcd compliance option. DWR has reviewed the submittal and found the City eligible to receive water management grant or loan funds based on gpcd compliance. The target water use for compliance is 159 gpcd by 2018. A copy of the AB 1420 compliance letter is contained in Appendix M COSMUD will continue to track their water use and provide compliance reports as required. The water usage for 2010 was 173 gpcd. This is encouraging and proves COSMUD is on target for 159 gpcd by 2018.

Section 7: Water Shortage Contingency Plan

> 10632. The plan shall provide an urban water-shortage contingency analysis that includes each of the following elements that are within the authority of the urban water supplier:
>
> (a) Stages of action to be undertaken by the urban water supplier in response to water supply shortages, including up to a 50 percent reduction in water supply, and an outline of specific water supply conditions, which are applicable to each stage.
>
> (b) An estimate of the minimum water supply available during each of the next three water years based on the driest three-year historic sequence for the agency's water supply.
>
> (c) Actions to be undertaken by the urban water supplier to prepare for, and implement during, a catastrophic interruption of water supplies including, but not limited to, a regional power outage, an earthquake, or other disaster.
>
> (d) Additional, mandatory prohibitions against specific water-use practices during water shortages, including, but not limited to, prohibiting the use of potable water for street cleaning.
>
> (e) Consumption reduction methods in the most restrictive stages. Each urban water supplier may use any type of consumption reduction methods in its water shortage contingency analysis that would reduce water use, are appropriate for its area, and have the ability to achieve a water-use reduction consistent with up to a 50 percent reduction in water supply.
>
> (f) Penalties or charges for excessive use, where applicable.
>
> (g) An analysis of the impacts of each of the actions and conditions described in subdivisions (a) to (f), inclusive, on the revenues and expenditures of the urban water supplier, and proposed measures to overcome those impacts, such as the development of reserves and rate adjustments.
>
> (h) A draft water shortage contingency resolution or ordinance.
>
> (i) A mechanism for determining actual reductions in water use pursuant to the urban water shortage contingency analysis.

SAWS was formed in 1980 as an association of Stockton urban area retail water suppliers. Members of SAWS include the City, SEWD, the County, and the Cal Water. The City and each entity contracting with SEWD for the supply of treated surface water have a contractual limit to the amount of SEWD water they can receive. When SEWD declares a supply shortage, all member agencies receive a uniform percentage reduction from their contractual allocation.

In 2010, treated surface water accounted for about 84.5 percent of the City's water supply. The other 15.5 percent of the City's current supply was produced by City-owned wells from the groundwater basin.

SAWS members meet monthly to discuss water-related matters, including water supply, water use, water conservation, and the development of water shortage contingency plans. In declared emergencies, when more extensive coordination is necessary, members meet as frequently as necessary.

At the SAWS monthly meetings, planning efforts, education and public information, and other water management activities are implemented and coordinated. As a result of these meetings, all SAWS member agencies have adopted compatible rationing plans, landscape water use restrictions, and nearly identical "mandatory water reduction" ordinances. The Mandatory Water Use Reduction Ordinance adopted by the City has been incorporated into the City Municipal Code supplied in Appendix N.

7.1 Rationing Stages and Reduction Goals

The City has developed a five stage rationing plan (see Table 30 below) to invoke during declared water shortages. The rationing plan includes voluntary and mandatory rationing, depending of the causes, severity, and anticipated duration of the water supply shortage.

Table 30: City Water Rationing Stages and Reduction Goals

Shortage Condition	Stage	Customer Reduction Goal	Type of Rationing Program
Up to 10%	1	10%	Voluntary
Up to 20%	2	20%	Mandatory
20-30%	3	30%	Mandatory
30-40%	4	40%	Mandatory
40-50%+	5	≥ 50%	Mandatory

The City has a legal responsibility to provide water for the health and safety needs of the community. In order to minimize the social and economic impact of water shortage, the City manages water supplies prudently. This rationing plan is designed to provide a minimum of 50 percent of normal supply during a severe or extended water shortage. The rationing program triggering levels are established to ensure that these policy statements are implemented, and are based upon the mutual sharing of the groundwater basin by all urban area water purveyors.

As noted above, the City's two water sources are groundwater and surface water. Rationing stages may be triggered by a shortage in one source or a combination of sources. Because stages overlap, the triggers stated herein automatically implement the more restrictive stage, unless the City Council, at a public hearing, adopts findings to implement the less restrictive stage. Shortages may trigger a change in stage at any time.

Table 31 shows the specific criteria for triggering the City's rationing stages.

Table 31: Water Supply Triggering Levels

Stage	Percent Shortage	Water Shortage	Carry-over Storage
Stage 1	Up to 10% supply reduction	Supply reductions that increases the overdraft by 6,000 AFY	Insufficient storage to provide 50% of normal supplies for the year
Stage 2	10 to 20% supply reduction	Supply reductions that increases the overdraft by 12,000 AFY	Insufficient storage to provide 35% of normal supplies for the year
Stage 3	20 to 30% supply reduction	Supply reduction that increases the overdraft by 18,000 AFY	Insufficient storage to provide 25% of normal supplies for the next year
Stage 4	30 to 40% supply reduction	Supply reduction that increases the overdraft by 24,000 AFY	Insufficient storage to provide 10% of normal supplies for the next year
Stage 5	40 to 50% supply reduction	Supply reduction that increases the overdraft by 30,000 AFY	No storage for either agriculture or municipal and industry (M&I) use

7.1.1 Water Allotment Methods

Each urban water supplier may use any type of consumption limit in its water shortage contingency plan that would reduce water use and is appropriate for its area. Examples of consumption limits that may be used include, but are not limited to, percentage reduction in water allotments, per capita allocations, an increasing block rate schedule for high usage of water with incentives for conservation, or restrictions on specific uses.

The City has established the following allocation method for each customer type:

Customer Class	Stage	Allocation Method
Residential	1-4	Percentage reduction with maximum amount
	5	Hybrid of per capita and percentage
Commercial	1-4	Percentage reduction
	5	Percentage reduction; vary by efficiency
Institutional and all others	1-4	Percentage reduction
	5	Percentage reduction; vary by efficiency

The specific percentage reductions at each stage and for each customer class correspond to the figures listed above.

The individual customer allotments were originally based on a 1987 base year and customer class averages. However, if mandatory rationing is required, the base year will be adjusted to as recent a year as practical. This adjustment will be made because the data changes constantly from year to year in terms of account ownership and the effect of habit changes. It is assumed that an adjustment will have to be made relative to water savings compared to the 1987 base consumption per account and customer type.

7.2 Next 3-Year Minimum Supply

An estimate of the next three year minimum supply is presented in Table 32. The DWSP (San Joaquin River) and Woodbridge ID water supply have no supply reliability history at this time. It is assumed that the SEWD supply will be reduced to their minimum delivery amount. However, based on the reliability of the groundwater supply and SEWD supplies, a water shortage is very unlikely.

Table 32: Next Three Year Minimum Supply (AFY)

Supply Source	2011	2012	2013
SEWD	21,490	11,930	8,000
DWSP-San Joaquin River	-	33,600	33,600
Woodbridge Irrigation District	-	6,500	6,500
Groundwater	15,000	16,000	16,000
Totals	36,490	68,030	64,100

7.3 Catastrophic Interruption and Response

Water shortage emergency response is coordinated with the County's Advisory Water Commission. Actions to be taken in the event of loss of water facilities are incorporated into the City's Emergency Plan. The City's response planning includes the use of standby generators, water purification supplies and equipment, emergency drinking water storage, and water trucks. Water storage, treatment and pumping facilities have been constructed to meet earthquake safety standards and are inspected regularly.

During any declared Stage 5 Water Shortage Emergency, the City Building Department can process applications for building permits, but will not issue the actual permits until the Emergency Declaration is rescinded.

7.3.1 Supplemental Water Supplies

None of the agencies contracting with SEWD depends solely on treated surface water. COSMUD has wells capable of supplying all of the normal base demand from the groundwater basin and has emergency interties with Cal Water in the event of a failure of one or more wells. During years of normal to above normal rainfall, SEWD does direct recharge of the groundwater basin. The recharge helps to ensure sufficient groundwater supplies will be available during times of drought. In addition to being able to rely on groundwater COSMUD now has the DWSP San Joaquin supply and the Woodbridge ID supply. The additional surface water supplies enable COSMUD to not have to rely as heavily on the groundwater supply during normal supply years enabling the groundwater to be even more reliable if needed.

7.3.2 Water Transfers

SEWD and the urban retailers are entering into a Water Transfer Agreement with SSJID. The agreement stipulates that the irrigation district transfer up to 15,000 AF of their surface water

that is surplus to the needs of their landowners and water users to SEWD. Table 33 shows the amount of water available to SEWD, depending on the inflow to New Melones Reservoir.

Table 33: Water Transfer Agreement (AF)

Inflow into New Melones Reservoir	Water Transfer
550,000 AF or more	15,000
550,000 - 500,000	6,250
Less than 500,000	4,000

7.3.3 Long-Term Additional Water Supply Options

The Final Environmental Impact Report (EIR) for the Delta Water Supply Program was adopted November 8, 2005. The DWSP WTP will be completed about February of 2012 and will provide a reliable supply of 33,600 AFY (30 mgd). In addition, COSMUD has an agreement with Woodbridge ID for an additional 13,000 AFY. This project essentially eliminates the need for groundwater during years of average to above average rainfall. Groundwater will still be required during the hottest months of the year due to distribution system issues that will be resolved over time to maximize groundwater use. Over time as COSMUD's demands grow, it is anticipated that the DWSP San Joaquin River supply will increase in kind with demand.

7.4 Mandatory Prohibitions

The City adopted a Water Conservation Ordinance (1988) and Water Shortage Emergency Ordinance (1991) into the City Municipal Code. The City Municipal Code includes prohibitions on various wasteful water uses such as fire hydrant use restrictions; exterior irrigation restrictions; requirements for correction of leaks, breaks or malfunctions within a user's plumbing system; car, boat, building, and mobile home washing restrictions; non-self service commercial car wash restrictions; ornamental fountains restrictions; restrictions on the washing of sidewalks and driveways; restriction on filling of swimming pools; and restrictions on use of potable water for dust control purposes.

The priorities for use of available water have been established based on the California Water Code and community input. Water allocations are established for all customers according to the following ranking system (in decreasing order of priority):

1. Health and Safety - interior residential and fire fighting
2. Commercial and Institutional - maintain jobs and economic base
3. Existing Landscaping - especially trees and shrubs
4. New Demand - projects without permits when shortage declared
5. New Landscaping - defer until after emergency is over
6. Nonessential Uses - to be curtailed for duration of emergency

7.4.1 City Water Shortage Response

In response to a water shortage emergency, the City developed a five stage rationing plan. The City's Plan includes both voluntary and mandatory conservation stages. From 1990 to 1992, mandatory water reduction stages were in force due to the prolonged years of drought. 1990 required a mandatory program with odd-even day restrictions. 1991 required a mandatory 20 percent reduction. 1992 required a mandatory 10 percent reduction. The City initiated a voluntary reduction stage (10 percent) in 1993 and has maintained a voluntary reduction stage since that time.

7.5 Consumption Reduction Methods

The City's plan to institute consumption reduction methods consists of following the City Mandatory Water Use Reduction Ordinance. The consumption reduction methodology is summarized as follows:

- The City's ordinance specifically prohibits certain types of water uses during declared water shortage emergencies.
- Enacting mandatory rationing by water use category in accordance with the stages presented in Section 7.1.
- Enforcing the water rationing program in accordance with the water use reduction ordinance.

7.6 Penalties or Charges for Excessive Use

If a customer receives more than one written warning for violation of the provisions of the Mandatory Water Use Reduction Ordinance, or for any of the prohibited uses as defined, and after the observation of a subsequent violation, the City may install a flow restricting device on the customer's water service, which will remain for a period of at least 48 hours, and until the specified removal penalty has been paid. For a subsequent violation, the flow restrictor will remain for a period of at least two weeks.

7.7 Revenue and Expenditure Impacts and Measures to Overcome Impacts

Revenue from water sales are used to fund Water Utility Operations, water bond repayment and other water system capital improvements. Water rates are adjusted annually based on City Council approved rate increases and/or the Consumer Price Index (CPI). The City maintains an adequate operational reserve to protect against a temporary water shortage.

7.8 Water Shortage Contingency Ordinance/Resolution

The City has an adopted water shortage contingency ordinance, and a copy of this ordinance is contained in Appendix N.

7.9 Measuring Water Use Reductions

In normal water supply conditions, production figures are recorded and reported weekly to the City Deputy Director of the Department of Municipal Utilities responsible for the water operations. Totals are reported monthly to the City Director of the Department of Municipal Utilities and incorporated into the water supply report.

During a Stage 1 or 2 Water Shortage, daily production figures are reported to the City Water Division supervisor. The Supervisor compares the weekly production to the target weekly production to verify that the reduction goal is being met. Weekly reports are forwarded to the Deputy Director and the Water Shortage Response Team. Monthly reports are sent to the City Council by the Director of Municipal Utilities. If reduction goals are not met, the City Manager will notify the City Council so that corrective action can be taken.

During a Stage 3 or 4 Water Shortage, the procedure listed above will be followed, with the addition of a daily production report to the City Manager. During a disaster shortage, production figures will be reported to the Supervisor hourly, and to the City Manager daily. Reports will also be provided to the City Council.

References

City of Stockton Municipal Utilities Department. August 2005. *Water Supply Assessment for Weston Towne Center Project*.

City of Stockton Municipal Utilities Department. 1999. *Public Water Supply Statistics, 1999-2004*.

City of Stockton Municipal Utilities Department. http://www.stocktongov.com/mud/index.cfm.

City of Stockton. August 2005. *Draft Regional Water Supply Assessment for the Stockton Metropolitan Area*.

City of Stockton. December 2000. *Urban Water Management Plan 2000 Update*,

Kennedy/Jenks Consultants. August-November 2005. Telephone Communication with Jonathan Goetz, MWH.

MWH and ESA. January 2003. *City of Stockton, Delta Water Supply Program Feasibility Study*.

San Joaquin Council of Governments. http://www.sjcog.org/sections/departments/planning/research/projections?table_id=140&section_id=36&historic=0.

Stockton East Water District. December 2000. *Urban Water Management Plan 2000 Update*,

Western Regional Climate Center. http://www.wrcc.dri.edu/cgi-bin/cliMAIN.pl?castoc+nca.

Appendix A

Copy of Notice for Public Meeting

THE RECORD
PROOF OF PUBLICATION

STATE OF CALIFORNIA
COUNTY OF SAN JOAQUIN

THE UNDERSIGNED SAYS:

I am a citizen of the United States and a resident of San Joaquin County; I am over the age of 18 years and not a part to or interested in the above-entitled matter. I am the principal clerk of the printer of THE RECORD, a newspaper of general publication, printed and published daily in the City of Stockton, County of San Joaquin by the Superior Court of the County of San Joaquin, State of California, under the date of February 26, 1952, File No. 52857, San Joaquin County Records; that the notice of which the annexed is a printed copy (set in type not smaller than nonpareil), has been published each regular and entire issue of said newspaper and not in any supplement thereof on the following dates,
To wit, June 5 2011

I declare under penalty of perjury that the foregoing is true and correct. Executed on June 5, 2011 In Stockton California

Carlette Schnell

Carlette Schnell,
The Record

0000871728

Public Hearing
Stockton City Council

On Tues, June 21, 2011, at 5:30 pm, in the Council Chambers, 425 N El Dorado St, a public hearing will be held to consider a resolution adopting the City of Stockton 2010 Urban Water Management Plan. The 2010 Urban Water Management Plan may be viewed prior to the public hearing at the City of Stockton Office of the City Clerk, at the Cesar Chavez Library, or at www. stocktongov.com/mud.

All City Council proceedings are in English. If an interpreter is needed, it shall be the responsibility of the person needing one.

Anyone wishing to be heard on this matter may appear at the public hearing and/or file a written opinion with the City Clerk, City Hall, Stockton, prior to the hearing.

If you challenge the proposed action in court, you may be limited to raising only those issues you or someone else raised at this public hearing, or in written correspondence delivered to the City Council at, or prior to, the public hearing.

Katherine Gong Meissner
City Clerk, City of Stockton

#871728 6/5/2011

RECEIVED
JUN - 7 2011
CITY CLERK
CITY OF STOCKTON

Name: City of Stockton Clerk's Office

Ph. (209) 937-8646
Acct. # 2099378863

Ordered By: Lori Nielsen
Billing Address: City Clerk's Office
425 N. El Dorado St.
Stockton, CA 95202
Change of Copy: ____
Run Date(s): **June 5, 2011**
Rate Code: KCYO
Description: PH 06-21-11 MUD

Public Hearing
Stockton City Council

On Tues, June 21, 2011, at 5:30 pm, in the Council Chambers, 425 N El Dorado St, a public hearing will be held to consider a resolution adopting the City of Stockton 2010 Urban Water Management Plan. The 2010 Urban Water Management Plan may be viewed prior to the public hearing at the City of Stockton Office of the City Clerk, at the Cesar Chavez Library, or at www.stocktongov.com/mud.

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Katherine Gong Meissner
City Clerk, City of Stockton

FOR CITY CLERK USE:
Contact: Melissa Price MUD ext 8782
Account Number: 421-4210-572.20-52 publication costs / 421-4210-572 staff time

Notice of Public Meeting

City of Stockton
Urban Water Management Plan

Thursday, May 26th
5:30 pm—7:30 pm
2500 Navy Drive
Stockton, CA 95206

For additional information and
a copy of the Draft Plan:
www.stocktongov.com/mud

Sunday, May 22, 2011 - Stockton Record

CITY OF STOCKTON
MUNICIPAL UTILITIES
www.stocktongov.com • (209)937-8700

2010 Urban Water Management Plan
Public Information Meeting
2500 Navy Drive
Stockton, CA 95206

Thursday, May 26, 2011
5:30 pm

AGENDA

5:30 – 5:45	Welcome and Introductions
5:45 – 6:30	Presentation of DRAFT 2010 Urban Water Management Plan
6:30 – 7:00	Public Comments and Questions

****

For More Information and
Copy of DRAFT 2010 Urban Water Management Plan:
www.stocktongov.com/mud

CITY OF STOCKTON

MUNICIPAL UTILITIES DEPARTMENT

WATER RESOURCES - URBAN WATER MANAGEMENT PLAN (Draft) - PUBLIC MEETING **MAY 26, 2011 5:30 P.M.**

Handouts: Agenda
Draft Urban Water Management Plan
Prepared by Kennedy Jenks
PPT

SIGN-IN SHEET

City of Stockton Staff:
Robert Granberg, , Deputy Director Water Resources
Melissa Price, Program Manager III, Water Resources
Laura McKinney, Temporary Office Assistant (Recorder)

Name – Please Print	Mailing Address / Agency	Phone Number	Email
No attendees			

CITY OF STOCKTON

Municipal Utilities Department

Notice of Public Meeting

A public meeting will be held on Thursday, May 26, 2011, 5:30pm to 7:30pm at the Municipal Utilities Department Delta Room, 2500 Navy Drive, Stockton, to review and accept comments on the Draft Urban Water Management Plan (UWMP). A copy of the Draft UWMP may also be found at the City's Cesar Chavez Central Library at 605 N. El Dorado Street.

Department Overview

The Municipal Utilities Department (MUD) is responsible for the operations of the three water utilities: water, wastewater, and stormwater. The Department:

- Provides high quality potable water on demand,
- Collects, treats, and disposes of wastewater, and
- Collects and disposes of stormwater.

This work is performed in accordance with applicable regulations and responsible business practices. A Business Plan has been developed to guide the Department in daily operations and service.

General information about water, wastewater, and stormwater utility services, including information for residents and businesses, permit requirements and regulations, fee calculators, industrial pretreatment, and the Fats, Oils, and Grease (FOG) program can be found under Utility Services.

Each month, a Monthly Operations and Maintenance Report (MOMR) is prepared that details the operations of the Department.

Tours of the Regional Wastewater Control Facility are available along with bird watching opportunities in our wetlands. More information can be found under Utility Services on the Regional Wastewater Control Facility-Plant Tours and Birdwatching page.

For additional information or to report a water, wastewater, or stormwater emergency, please Contact Us.

MUD protects both the environment and the community by caring for the City's water resources.

The Regional Wastewater Control Facility is a 24/7 operation that treats residential, commercial, industrial and institutional wastewater throughout the City and parts of the surrounding County.

CITY OF STOCKTON

Municipal Utilities Department

Notice of Public Meeting

A public meeting will be held on Thursday, May 26, 2011, 5:30pm to 7:30pm at the Municipal Utilities Department Delta Room, 2500 Navy Drive, Stockton, to review and accept comments on the Draft Urban Water Management Plan. A copy of the Draft 2010 Plan will be available to the public on or before May 13th.

Department Overview

The Municipal Utilities Department (MUD) is responsible for the operations of the three water utilities: water, wastewater, and stormwater. The Department:

- Provides high quality potable water on demand,
- Collects, treats, and disposes of wastewater, and
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The Regional Wastewater Control Facility is a 24/7 operation that treats residential, commercial, industrial and institutional wastewater throughout the City and parts of the surrounding County.

Appendix B

Copies of web site information pertaining to UWMP Review and adoption

CITY OF STOCKTON

Water

Stockton Water System

The City's Municipal Utilities Department provides water service to the residents and businesses in the North Stockton and South Stockton areas. California Water Service (CalWater), a private company, is the provider for most of central Stockton.

Areas served by the City of Stockton Municipal Utilities Department are identified on Water Service Area Maps . The water fee estimator will calculate your estimated fees if you are in the City's service area.

For additional information about service providers for your address, please visit About Your Address.

If you are within the City's Municipal Utilities Department Water Service Area and would like to start or stop water service, please contact Utility Billing Customer Service.

Water Supplies

Approximately 25% of the City's water supply originates from groundwater wells with the remaining water supply from treated surface water supplied by the Stockton East Water District (SEWD). More information on the SEWD can be found under External Links below.

Upon completion of the Delta Water Supply Project in 2012, the City's Municipal Utilities Department will reduce the amount of water received from SEWD and reduce the amount of groundwater pumped each year, improving the City's water supply reliability and protecting its groundwater resources. More information on the Delta Water Supply Project, including construction updates, reports and permits can be found under External Links below.

Water Resources Planning

Urban Water Management Plans (UWMPs) are prepared by California's urban water suppliers to support their long-term resource planning and ensure that adequate water supplies are available to meet existing and future water demands. Every urban water supplier that either provides over 3,000 acre-feet of water annually or serves more than 3,000 or more connections is required to assess the reliability of its water sources over a 20-year planning horizon considering normal, dry, and multiple dry years. The Urban Water Management Planning Act requires the City of Stockton to prepare this plan every 5 years and submit to the Department of Water Resources. The City is currently working on its 2010 UWMP which is due to the State by July 31, 2011. A draft of the 2010 UWMP will be available for public review in May 2011 and is scheduled for City Council adoption at a public hearing in June. The 2010 UWMP Schedule , including key dates, is available for review.

Recycled Water

The 2010 Joint Water Recycling Facilities Planning Study is an effort between the City of Stockton and the City of Lodi to consider the feasibility of using Lodi's treated wastewater as a recycled water source for the North Stockton area. The use of non-potable water would extend the City's water resources, address groundwater overdraft, and re-use water that would otherwise be disposed.

CITY OF STOCKTON
MUNICIPAL UTILITIES DEPARTMENT
2010 Urban Water Management Plan
2011 Schedule and Key Dates

Urban Water Management Plans (UWMPs) are required to be adopted by July 1, 2011 per California Water Code Section 10608.20. In addition to this date, there are several important requirements for Urban Water Suppliers to consider regarding preparation, coordination, adoption, and submittal of UWMPs. Some key dates for the 2010 Stockton UWMP are identified below:

60-Day Notice of UWMP Preparation	**April 20**
Initial Draft UWMP Available for Public Review	**May 13**
Draft UWMP Presented to Water Advisory Group	**May 18**
Draft UWMP Presented to Council Water Committee	**May 25**
Public Meeting to present UWMP **Final Draft UWMP Available for Public Review**	**May 26**
Public Hearing and Adoption of UWMP	**June 21**
Submit UWMP to State Department of Water Resources	**July 21**
Provide copy of submitted UWMP for Public Review	**August 19**
Provide copy of submitted UWMP to other Agencies	**September 21**

Appendix C

Resolution to Adopt the Urban Water Management Plan

(To be provided with Final UWMP)

Resolution No. 11-0169

STOCKTON CITY COUNCIL

RESOLUTION APPROVING AND ADOPTING THE 2010 URBAN WATER MANAGEMENT PLAN

On January 25, 2011, by Resolution 11-0020, the City Council authorized an amendment to the Professional Services Master Contract with Kennedy/Jenks Consultants to prepare the 2010 Urban Water Management Plan (Plan); and

The Urban Water Management Planning Act (Cal. Wat. Code, Div. 6, Pt. 2.6, §§ 10610 through 10656) requires urban water suppliers providing over 3,000 acre-feet of water annually or serving 3,000 or more connections to prepare and submit an Urban Water Management Plan to the State Department of Water Resources every five years; and

An Urban Water Management Plan is necessary for water agencies to be eligible for State water management grants and loans; and

As part of the Urban Water Management Plan, the Water Conservation Act of 2009 (Senate Bill X7-7) calls for a statewide per capita water use reduction of 20 percent by 2020 and requires water agencies to determine their baseline water use, an interim water use target, and a compliance water use target using one of four methodologies identified by the State Department of Water Resources; and

The City of Stockton's (City) baseline water use has been calculated at 195 gallons per capita per day, and it is recommended the City adopt Method 3 which provides for a 2015 interim water use target of 180 gallons per capita per day and a 2020 compliance water use target of 165 gallons per capita per day; and

The City is committed to implementing the Demand Management Measures identified in the Plan to help achieve both the interim and compliance water use targets based on available resources; the financial impact and commitment for which will be evaluated as part of the annual budget process; and

In accordance with the California Water Code and other applicable laws, a 60-day notice was provided to all applicable agencies on April 20, 2011, the Plan was made available for public inspection prior to consideration for adoption, and notice of the time and place of the public hearing was provided in the Stockton Record on June 5, 2011; and

City Atty Review GOP
Date June 14, 2011

The Urban Water Management Plan complies with the requirements of the Urban Water Management Planning Act; now, therefore,

BE IT RESOLVED BY THE COUNCIL OF THE CITY OF STOCKTON, AS FOLLOWS:

1. The City Council approves and adopts the Plan in accordance with the California Water Code and authorizes its transmittal to the State Department of Water Resources, a copy of which is attached as Exhibit 1 and incorporated by this reference.

2. As part of the Plan, the City Council identifies 195 gallons per capita per day as the City's baseline water use and adopts Method 3 for determining both the 2015 interim and 2020 compliance water use targets of 180 and 165, respectively as identified in the Plan.

3. Adoption of the Plan is exempt from the California Environmental Quality Act pursuant to the California Water Code.

4. The City Manager is hereby authorized and directed to take all necessary actions to carry out the purpose and intent of this resolution and to incorporate any necessary amendments as stipulated by the State Department of Water Resources.

PASSED, APPROVED, and ADOPTED JUN 2 1 2011.

Ann Johnston

ANN JOHNSTON
Mayor of the City of Stockton

ATTEST:

Bonnie Paige
for KATHERINE GONG MEISSNER
City Clerk of the City of Stockton

STOCKTON FOUNDED JUNE 1849 INCORPORATED JULY 1850

::ODMA\GRPWISE\COS.MUD.MUD_LIBRARY:145715.1

Appendix D

Comments on the 2010 UWMP Update

(To be provided with Final UWMP)

Appendix E

60-Day Notification

CITY OF STOCKTON

DEPARTMENT OF MUNICIPAL UTILITIES
2500 Navy Drive • Stockton, CA 95206-1191 • 209/937-8750 • Fax 209/937-8708
www.stocktongov.com

April 20, 2011

Kevin Kauffman
General Manager
Stockton East Water District
P.O. Box 5157
Stockton, CA 95205

Ross Moilan
District Manager
California Water Service Company
1550 W. Fremont Street, Suite 100
Stockton, CA 95203

Steve Winkler
Deputy Director
San Joaquin County
Public Works Department
1810 E. Hazelton Avenue
Stockton, CA 95205

CITY OF STOCKTON 2010 URBAN WATER MANAGEMENT PLAN

The City of Stockton (City) is updating its Urban Water Management Plan (UWMP) which will be submitted to the State of California's Department of Water Resources (DWR) in July 2011.

The City is required by the California Water Code to update and adopt an UWMP and submit a completed plan to DWR every five years. The UWMP provides an overview of the City's water supply sources and usage in addition to conservation programs. The UWMP is part of the City's long-range planning to ensure water supply reliability for City customers.

In compliance with the California Water Code, the City is providing this notice to encourage participation in the update of the UWMP.

The current status of the 2010 UWMP is posted on the City's website, including a list of key dates and public meetings:

http://www.stocktongov.com/government/departments/municipalUtilities/utilWater.html

The City's Draft 2010 UWMP is expected to be released in May 2011. A public review period, public comment meeting, and a public hearing will be held to provide an opportunity to comment on the Draft 2010 UWMP. A public hearing to be followed by the City Council's consideration for adoption of the plan is tentatively scheduled for June 21, 2011 at 5:30 pm at City Hall, 425 N. El Dorado Street, Stockton, CA 95202.

Should you have any questions or would like additional information, please contact Melissa Price via e-mail at melissa.price@ci.stockton.ca.us or by telephone at (209) 937-8782.

JEFF WILLETT
INTERIM DIRECTOR OF MUNICIPAL UTILITIES

ROBERT L. GRANBERG, P.E.
DEPUTY DIRECTOR
WATER RESOURCES PLANNING

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Stockton
All-America City
2004
1999

Appendix F

West Yost Technical Memorandum
"Evaluation of Preliminary Urban Water Use Targets for Compliance with Senate Bill No. 7"

WEST YOST ASSOCIATES 20 years

TECHNICAL MEMORANDUM

DATE: December 2, 2010

Project No.: 129-06-10-20

TO: Melissa Price, City of Stockton

CC: Robert Granberg, City of Stockton
Sharene Gonzales, City of Stockton

FROM: Polly Boissevain, R.C.E. #36164
Brenda Estrada, R.C.E. #67062

REVIEWED BY: Gerry Nakano, R.C.E. #29524

SUBJECT: Evaluation of Preliminary Urban Water Use Targets for Compliance with Senate Bill No. 7

REGISTERED PROFESSIONAL ENGINEER
POLLY L. BOISSEVAIN
No. 36164
Exp. 6/30/2012
CIVIL
STATE OF CALIFORNIA

This technical memorandum (TM) presents West Yost Associates' (West Yost's) analysis to develop the City of Stockton Municipal Utilities Department's (COS MUD) preliminary estimates of base daily per capita water use and urban water use targets to comply with the requirements of Senate Bill 7 (SBx7-7).

1.0 OVERVIEW AND SUMMARY

SBx7-7 was enacted in November 2009 and requires urban water agencies throughout California to increase conservation to achieve a statewide goal of a 20 percent reduction in urban per capita water use by 2020. The legislation requires that water utilities calculate their reduction targets using one of four methods. Three of the methods are contained in the legislation and the fourth method is to be developed by the Department of Water Resources (DWR) no later than December 31, 2010. The legislation also establishes 2015 interim urban water use targets that require a 10 percent reduction over baseline use.

COS MUD contracted with West Yost to provide support in addressing the SBx7-7 requirements. Specifically:

- Determining COS MUD interim and final per capita water use targets,
- Identifying the most appropriate base year,
- Evaluating and recommending the most appropriate method for developing COS MUD's urban water use targets, based on the three methodologies currently identified, and
- Assisting with the public hearing process required by the legislation to adopt the baseline method to be used.

This TM provides a summary of the work performed, recommended urban water use targets, and detailed information on the methodologies used. This TM reviews Methods 1 through 3 from SBx7-7. The requirements and methodologies for Method 4 are not expected to be released until December 31, 2010. Once this information is released by DWR, COS MUD will evaluate the urban water use targets for this method and make a final recommendation on the method to use.

Table 1 summarizes the methods for calculating base daily water use and the interim and final target daily water use in gallons per capita per day (gpcd).

Table 1. Summary of SB7 Methodologies for Determining Urban Water Use Targets

Method	Key Elements	Base Daily Per Capita Water Use, gpcd	Interim Urban Water Use Target (2015), gpcd	Urban Water Use Target (2020), gpcd
1	• Uses historical gross water use and service area population to determine a base daily per capita water use. The Urban Water Use Target is 80 percent of this value. • Based on 10-year running average per capita water use using historical data from 1994 to 2010. • Gross water use is that total water supplied to the system less recycled, wholesale or agricultural deliveries • Since the COS MUD service area does not include the entire city, population is based on census block data for year 2000, and estimated from growth in service connections for other years.	195	176	156
2	• Uses performance standards for indoor water use, landscape irrigation use and commercial, institutional and industrial (CII) uses. • Residential water use = 55 gpcd • Uses Model Water Efficient Landscape Ordinance for definitions and calculations. Uses total landscaped area (estimated from GIS and site visits) and applies a Maximum Applied Water Allowance, calculated from the ordinance. • CII use based on historical CII per capita use less 10 percent	195[(a)]	176	156[(b)]
3	• Uses 95 percent of the applicable state hydrologic region target as defined in the state's draft 20x2020 Water Conservation Plan issued by DWR in April 2009 • COS MUD is located in state hydrologic region number 6, San Joaquin Region.	248	200	165
4	• Not yet defined. City will need to evaluate method once it is defined by DWR (expected by December 31, 2010).			

(a) The baseline for this method is the same from Method 1 and used to establish the interim target.
(b) This method requires a data-intensive analysis using GIS, coupled with site visits to estimate appropriate irrigation areas. For preliminary screening purposes to evaluate use of the method, irrigation area was estimated by West Yost from a small data sample (see additional discussion under Section 4.0).

All of the three methods evaluated result in similar water use targets. The method resulting in the highest water use target is the method that is most advantageous to the City. Based on the results of the preliminary analysis, West Yost recommends that COS MUD adopt the results from Method 3 at this time.

It should be noted that while the general methods are established in the legislation, DWR was charged with developing specific, more detailed methodologies for calculations relating to baseline water use which were published October 1, 2010. Calculation methods used by West Yost for the analysis are based on definitions in the legislation and draft information on baseline methodologies from DWR available at the time of the analysis (July 2010). West Yost compared the draft methodologies used to the published methodologies and it appears the changes to the methodologies do not affect the calculations in this analysis.

The City will review West Yost's recommendation once the Method 4 methodology becomes available December 31, 2010 to determine if the Method 4 urban water use targets are preferable to Method 3.

2.0 SUPPORTING DATA FOR CALCULATIONS

Calculations for SBx7-7 require historical system information. COS MUD provided West Yost their "Public Water System Statistics" reports that have been submitted to DWR for the years 1990 through 2009. These statistics include information on total active service connections by customer type, total water supplied to the system, and total metered deliveries by customer type. Below is a summary of the data.

2.1 Service Connections

The service connections from the "Public Water System Statistics" break down the number of active connections per customer class. Table 2 shows the active service connections for COS MUD from 1990 through 2009.

The single family customers make up a majority of the service connections. From 1990 through 2009, single family connections made up an average of 82 percent of active connections. Each single family connection represents a single household or dwelling unit. The multi-family connections are the second largest customer class. However, the multi family connections do not reflect actual number of dwelling units being served. A single multi-family connection may represent multiple dwelling units being served, such as an apartment complex. COS MUD provided GIS housing data which was used to determine the number of active households for the multi-family service connections.

Table 2. COS MUD Annual Active Service Connections

Calendar Year	Single-Family Residential	Multi-Family Residential	Commercial	Industrial[(a)]	Public	Other	Total
1990	19,872	4,255	885	--	153	475	25,640
1991	20,264	4,140	884	--	145	462	25,895
1992	20,819	4,080	901	--	106	506	26,412
1993	21,515	4,091	912	--	107	530	27,155
1994	22,424	4,068	1,014	--	525	2	28,033
1995	23,137	4,066	1,025	--	542	3	28,773
1996	24,246	4,044	1,059	--	529	3	29,881
1997	24,393	4,040	1,077	--	541	260	30,311
1998	25,366	4,123	1,109	--	576	230	31,404
1999	26,546	4,148	1,141	--	595	73	32,503
2000	27,903	4,184	1,163	--	592	75	33,917
2001	29,576	4,189	1,186	--	615	67	35,633
2002	30,345	4,997	1,209	--	655	67	37,273
2003	32,961	4,984	1,226	--	693	70	39,934
2004	36,024	4,901	1,091	--	714	97	42,827
2005	38,511	5,078	1,316	--	773	61	45,739
2006	40,525	3,692	1,344	--	818	11	46,390
2007	40,271	3,666	1,362	--	840	--	46,139
2008	40,311	3,636	1,389	--	852	--	46,188
2009	40,709	3,578	1,467	5	867	--	46,626

[(a)] Industrial connections were not tracked separately from commercial connections previous to 2009.

2.2 Supplies

COS MUD's potable water supplies come from two sources, groundwater wells within the service area and surface water purchased from Stockton East Water District (SEWD). The percentage of groundwater and surface water used varies from year to year. From 1990 to 2009 on average, COS MUD purchased approximately 60 percent of their total potable water supply from SEWD. From 1998 to 2002, COS MUD also received a small amount of recycled water which served a single user. This recycled water was less than 1 percent of the total supply received.

2.3 Demands

The "Public Water System Statistics" include the metered water deliveries broken down by customer class. Table 3 shows the water deliveries made for the years 1990 through 2009.

Table 3. COS MUD Annual Water Deliveries in Million Gallons (MG)

Calendar Year	Single-Family Residential	Multi-Family Residential	Commercial	Public[c]	Irrigation	Other[d]	Wholesale [d]	Total
1990[a]	--	--	--	6,094	--	--	498	6,592
1991[a]	--	--	--	5,456	--	--	446	5,902
1992	3,044	973	721	403	433	--	481	6,055
1993	3,324	1,044	722	575	488	--	557	6,710
1994	3,579	1,093	1,136	--	539	244	536	7,127
1995	3,862	1,172	1,272	71	591	132	559	7,659
1996[b]	4,213	1,166	1,318	--	616	522	--	7,835
1997	4,362	1,155	1,497	52	700	122	626	8,513
1998	3,900	1,123	1,261	33	643	183	142	7,285
1999	4,449	1,174	1,499	29	714	8	168	8,042
2000	4,772	1,233	1,529	--	726	109	178	8,547
2001	5,145	1,263	1,654	--	885	102	191	9,241
2002	5,393	1,424	1,642	--	856	75	191	9,581
2003	5,616	1,317	1,665	--	880	257	174	9,909
2004	6,347	1,329	1,736	--	986	75	641	11,112
2005	6,543	1,262	1,783	--	981	59	173	10,801
2006	6,807	1,163	1,800	--	964	62	250	11,046
2007	7,155	1,080	1,895	--	1,347	35	631	12,143
2008	6,919	1,106	1,878	--	1,388	64	243	11,597
2009	6,533	1,079	1,687	--	1,330	8	652	11,289

(c) 1990-1991 data did not separate deliveries by customer class. The "other" category represents San Joaquin County deliveries.
(d) Data for the wholesale customer demands are not consistent for the year 1996.
(e) The “public” category for 1995 and 1997-1999 include deliveries for a category referred to as "finals" in the “Public Water System Statistics”.
(f) "Other" typically represents construction water while "wholesale" represents San Joaquin County deliveries.

Some of the data recorded was not clear in which customer class the data belonged. For the years 1995 and 1997 through 1999 a category called “finals” is included in the data submitted to DWR. Since there is no definition for this category, it is assumed this demand falls into the category of commercial, industrial, and institutional (public) (CII). Wholesale deliveries for July through September 1996 were not available, and use of available data in conjunction with reported retail water use resulted in total deliveries that exceeded reported production. Therefore, the information for 1996 was excluded in determining urban water use targets.

3.0 METHOD 1

SBx7-7 legislation, section 10608.20 (b) (1) defines Method 1 as:

10608.20 (b) An urban retail water supplier shall adopt one of the following methods for determining its urban water use target pursuant to subdivision (a)…

(1) Eighty percent of the urban retail water supplier's baseline per capita daily water use.

Urban water use targets calculated using Method 1 rely on the historic gross water use and service area population to determine a base daily per capita water use. The definitions and methodologies used for Method 1, as defined in the legislation, are detailed below. These definitions are consistent with the detailed methodologies published by DWR.

3.1 Gross Water Use

Gross water use is the annual water supplied to the distribution system adjusted for recycled, wholesale, and agricultural deliveries.

3.1.1 Definition

10608.12 (g) "Gross water use" means the total volume of water, whether treated or untreated, entering the distribution system of an urban retail water supplier, excluding all of the following:

(1) Recycled water that is delivered within the service area of an urban retail water supplier or its urban wholesale water supplier.

(2) The net volume of water that the urban retail water supplier places into long-term storage.

(3) The volume of water the urban retail water supplier conveys for use by another urban water supplier.

(4) The volume of water delivered for agricultural use, except as otherwise provided in subdivision (f) of Section 10608.24.

3.1.2 Calculation Method Used

The annual amount of water supplied within the COS MUD service area is provided in the "Public Water System Statistics" report. Adjustments to the total water supplied to the system were needed to account for recycled and wholesale water deliveries made through COS MUD's distribution system. To determine the gross water use for COS MUD these deliveries were deducted from the annual water supplied.

From 1998 to 2002, COS MUD delivered recycled water to a single user. The annual recycled water delivered was less than 1 percent of COS MUD's total water supplies.

San Joaquin County (County) receives wholesale water from COS MUD to service County islands as well as two small developed maintenance districts within the City limits, Colonial Heights and Lincoln Village. Historically, 2 to 8 percent of the COS MUD's annual supply has been wholesaled to the County.

Table 4 shows the COS MUD historical annual supply into the system, recycled water deliveries, wholesale water deliveries, and gross water use [total water supplies minus recycled and wholesale water deliveries].

Table 4. COS MUD Gross Water Use

Year	Total Water Supplied, MG	Recycled Water Delivered, MG	Wholesale Water Delivered, MG	Gross Water Use, MG
1990	6,737		498	6,239
1991	6,114		446	5,668
1992	6,648		481	6,167
1993	6,735		557	6,178
1994	7,467		536	6,931
1995	7,716		559	7,157
1996	8,142		NA	8,142
1997	8,940		626	8,314
1998	7,535	47	142	7,346
1999	8,406	35	168	8,203
2000	8,818	37	178	8,603
2001	9,546	35	191	9,320
2002	9,973	35	191	9,748
2003	10,709		174	10,536
2004	11,901		641	11,260
2005	11,300		173	11,127
2006	11,341		250	11,091
2007	13,058		631	12,427
2008	12,428		243	12,185
2009	11,940		652	11,288

NA = data incomplete and not available from COS MUD.

The 1996 “Public Water System Statistics” did not separately report wholesale deliveries made. COS MUD records were incomplete for the total wholesale water delivered for that year, with July through September deliveries missing. When wholesale estimates were excluded from production, calculated gross water use was less than retail deliveries. Due to the inconsistency, the 1996 gross water use is not included in the evaluation. The gross water use from 1997 to 2009 is used in developing the base daily per capita water use due to the requirement of a continuous 10-year period being needed.

3.2 Service Area Population

Service area population is used to determine per capita water use.

3.2.1 Definition

> *(2) 10608.20 (f) When calculating per capita values for the purpose of this chapter, an urban retail water supplier shall determine population using federal, state, and local population reports and projections.*

3.2.2 Calculation Method Used

California Department of Finance (DOF) provides historical population statistics by year for cities and counties in the state. City population statistics are based on the incorporated city limit. COS MUD provides potable water service to only a portion of the City of Stockton. Portions of the COS MUD service area outside the City limits are not served potable water by COS MUD. Areas within the City limits not served by COS MUD are served by either California Water Service Company (Cal Water) or the County, see Figure 1. Therefore, COS MUD is not able to rely on information from the California Department of Finance to determine their service area population.

Since the COS MUD service area only covers a portion of city area within the city limits, a methodology using 2000 census data was used to determine the service area population. 2000 census population data are available by census tract or block. Census blocks typically cover relatively small areas. There are approximately 3,590 census blocks in the City of Stockton and 1,187 of the census blocks in the City are within COS MUD's service area.

The steps used to estimate COS MUD's service area population are described below:

1. The COS MUD electronic geographic information system (GIS) data for their service area boundary was used. This boundary was overlaid with GIS files of the 2000 Census blocks and the Stockton city limits.
2. All 2000 Census blocks with their centroid located within both the COS MUD service area and the city limits were identified. See Figure 2.
3. The 2000 Census population by blocks for the County was downloaded from the Census website (www.census.gov).
4. The population for the blocks identified in step 2 was totaled to determine the year 2000 population of the COS MUD service area. This is considered the anchor year population and estimates for other years are based off the 2000 population (based on 2000 census, 3.8 people per connection).
5. The annual percentage of change in active single family and multi-family service connections (both backward and forward from the anchor year of 2000) for the COS MUD service area were calculated.
6. The annual percentage changes calculated in step 5 were applied going forward and backwards from the anchor year of 2000 to estimate the historical service area population.

7. As a methodology confirmation check, population estimates available from Cal Water, which uses a similar method to calculate population within their service area were added to the City estimates and compared with the DOF historical estimates as the customer population sum of the two agencies should essentially equal the City census data. Although the total population exceeds the DOF estimates because Cal Water serves some areas outside of the City limits, the estimates were generally consistent. Figure 3 shows the total service area population estimates for COS MUD and Cal Water compared with the DOF population estimates for the City.

Table 5 shows the COS MUD annual active residential connections, percent change in connections, and estimated service area population.

Table 5. COS MUD Estimated Service Area Population

year	Historic Service Connections[a]			Annual Percentage Change in Service Connections	Population Calibrated to 2000 Census Block data[b]
	Single Family Connections	Multi-Family Connections	Total		
1990	19,872	4,255	24,127	-1.14	91,711
1991	20,264	4,140	24,404	-1.99	92,764
1992	20,819	4,080	24,899	-2.76	94,646
1993	21,515	4,091	25,606	-3.34	97,333
1994	22,424	4,068	26,492	-2.61	100,701
1995	23,137	4,066	27,203	-3.84	103,404
1996	24,246	4,044	28,290	-0.50	107,536
1997	24,393	4,040	28,433	-3.58	108,079
1998	25,366	4,123	29,489	-3.93	112,093
1999	26,546	4,148	30,694	-4.34	116,674
2000[c]	27,903	4,184	32,087	--	121,969
2001	29,576	4,189	33,765	5.23	128,347
2002	30,345	4,997	35,342	4.67	134,342
2003	32,961	4,984	37,945	7.37	144,236
2004	36,024	4,901	40,925	7.85	155,564
2005	38,511	5,078	43,589	6.51	165,690
2006	40,525	3,692	44,217	1.44	168,078
2007	40,271	3,666	43,937	-0.63	167,013
2008	40,311	3,636	43,947	0.02	167,051
2009	40,709	3,578	44,287	0.77	168,344

(a) Data provided by City of Stockton Public Water System Statistics.
(b) Year 2000 Census block population based on Census blocks within the COS MUD service area and city limits.
(c) 2000 census data used to establish an estimate of 3.8 people per connection. This estimate is used to calculate population for other years (service connections x 3.8 persons/connection = estimated population)

The population estimates show from 1997 to 2005 a steep growth in the service area population and from 2005 to 2009 a flattening, and even slight decrease, in growth. These trends reflect what has occurred within the City of Stockton. Stockton experienced very high growth during the housing boom in the late 1990's and early 2000's. Since the economic down turn, the Stockton area has been hard hit. The flat growth and slight dip seen from 2005 to 2009 is fairly typical of what has been experienced in the Stockton area. COS MUD's service area includes most of the areas within Stockton that were experiencing rapid growth and are now experiencing a large slow down in growth.

A check to the estimated population calculated for 2009 was performed using COS MUD's GIS service area housing data. The data provided indicates the COS MUD's active service connections were comprised of 40,709 single family units and 13,068 multi-family units for a total housing unit count of 53,777 households as of 2009. Using the 2009 DOF persons/household rate of 3.075 persons/household for Stockton, the estimated 2009 service area population is 165,364, compared with the 168,344 persons estimated in the analysis (see Table 5). This difference is minor (less than 2 percent) and confirms the method used for calculation of service area population is adequate for this analysis.

3.3 Method 1 Base Daily Per Capita Water Use

The base daily per capita water use is the historic gross water use divided by the service area population. Figure 4 shows the historical service area population and gross water use.

3.3.1 Definition

10608.12 (b) "Base daily per capita water use" means any of the following:

(1) The urban retail water supplier's estimate of its average gross water use, reported in gallons per capita per day and calculated over a continuous 10-year period ending no earlier than December 31, 2004, and no later than December 31, 2010.

3.3.2 Calculation Method Used

Using the gross water use and estimated service area population, a base daily per capita water use was calculated in gallons per capita per day (gpcd). Figure 5 shows the historic per capita water use.

Per the definition, a continuous 10-year period is needed to calculate the base daily per capita water use. Since the gross water use can not be determined due to inconsistencies in the wholesale water information for the year 1996, only 1997 through 2009 were used in determining the base daily per capita water use of 195 gpcd (see Table 6.)

Table 6. Method 1: 80% of Baseline Per Capita Daily Water Use

		Historical Water Demand (from Use and Production Statistics 2008)				Per Capita Water Use					Check Compliance with Section 10608.22	
Year	Estimated COS MUD Total Service Area Population	Gross Water Use, afa	Recycled Water Demand, afa	Total Demand, afa	Percent of Total Demand Met With Recycled Water	Calculated Per Capita Potable Water Use, gpcd	Calculated Per Capita Total Water Use, gpcd	10-Year Average Gross Water Use ending between 2004 and 2010 (does not include Recycled Water) (per Section 10608.12 (b) (1))	2020 Target = 80% of Baseline Per Capita Water Use	2015 Target = 90% of Baseline Per Capita Water Use	5-Year Average Gross Water Use ending between 2007 and 2010 (per Section 10608.12 (b) (3))	Minimum Per Capita Water Use Reduction (5% of 5-Year Average gpcd), gpcd
1990	91,711	19,148	-	19,148	0.0%	186	186		156	176		
1991	92,764	17,396	-	17,396	0.0%	167	167		156	176		
1992	94,646	18,927	-	18,927	0.0%	179	179		156	176		
1993	97,333	18,961	-	18,961	0.0%	174	174		156	176		
1994	100,701	21,273	-	21,273	0.0%	189	189		156	176		
1995	103,404	21,965	-	21,965	0.0%	190	190		156	176		
1996	107,536	23,201	31	23,231	0.1%	193	193		156	176		
1997	108,079	25,516	-	25,516	0.0%	211	211		156	176		
1998	112,093	22,690	144	22,834	0.6%	181	182		156	176		
1999	116,674	25,284	107	25,392	0.4%	193	194		156	176		
2000	121,969	26,516	114	26,630	0.4%	194	195		156	176		
2001	128,347	28,712	107	28,820	0.4%	200	200		156	176		
2002	134,342	30,024	107	30,131	0.4%	200	200		156	176		
2003	144,236	32,336	-	32,336	0.0%	200	200		156	176		
2004	155,564	34,559	-	34,559	0.0%	198	198		156	176		
2005	165,690	34,149	-	34,149	0.0%	184	184		156	176		
2006	168,078	34,039	-	34,039	0.0%	181	181	194	156	176		
2007	167,013	38,139	-	38,139	0.0%	204	204	193	156	176	193	10
2008	167,051	37,398	-	37,398	0.0%	200	200	195	156	176	193	10
2009	168,344	34,645	-	34,645	0.0%	184	184	194	156	176	190	10
2010												

Baseline gpcd = Maximum 10-Year Average Gross Water Use ending between 2006 and 2010	195
2015 Interim Target = 90% of Baseline gpcd	176
2020 Target = 80% of Baseline gpcd	156

3.4 Method 1 Urban Water Use Targets

The urban water use targets are calculated based on the daily per capita water use of 195 gpcd.

3.4.1 Definition

10608.12 (j) "Interim urban water use target" means the midpoint between the urban retail water supplier's base daily per capita water use and the urban retail water supplier's urban water use target for 2020.

10608.12 (q) "Urban water use target" means the urban retail water supplier's targeted future daily per capita water use.

3.4.2 Calculation Method Used

The 2020 water use target is simply calculated as 80 percent of the base daily per capita water use and equals 156 gpcd (80 percent of 195 gpcd = 156 gpcd). Figure 6 shows the historical per capita use, base daily per capita water use, and 2020 urban water use target.

The 2015 interim is determined as the midpoint between the base daily per capita water use and the 2020 urban water use target and equals 176 gpcd.

4.0 METHOD 2

SBx7-7 legislation, section 10608.20 (b) (2) defines Method 2 as:

10608.20 (b) An urban retail water supplier shall adopt one of the following methods for determining its urban water use target pursuant to subdivision (a):

(2) The per capita daily water use that is estimated using the sum of the following performance standards:

(A) For indoor residential water use, 55 gallons per capita daily water use as a provisional standard. Upon completion of the department's 2016 report to the Legislature pursuant to Section 10608.42, this standard may be adjusted by the Legislature by statute.

(B) For landscape irrigated through dedicated or residential meters or connections, water efficiency equivalent to the standards of the Model Water Efficient Landscape Ordinance set forth in Chapter 2.7 (commencing with Section 490) of Division 2 of Title 23 of the California Code of Regulations, as in effect the later of the year of the landscape's installation or 1992. An urban retail water supplier using the approach specified in this subparagraph shall use satellite imagery, site visits, or other best available technology to develop an accurate estimate of landscaped areas.

(C) For commercial, industrial, and institutional uses, a 10-percent reduction in water use from the baseline commercial, industrial, institutional water use by 2020.

Method 2 calculations use three separate base daily per capita water use categories; residential, landscaped area, and CII water use, to determine the urban water use target. The evaluation of Method 2 in this TM is a preliminary investigation to determine whether this urban water use target will be the potential recommended method for COS MUD to adopt. Additional data intensive calculations would be required to confirm the urban water use target for this method if it appears to be favorable.

4.1 Residential Indoor Water Use

The residential indoor urban water use target is set at 55 gpcd. The legislation requires that DWR assess whether this is a reasonable assumption in a report due in 2016. Depending on the findings, the residential indoor urban water use target may be adjusted after 2016.

4.2 Landscaped Area Water Use

The landscaped area urban water use target relies on the state-adopted Model Water Efficient Landscape Ordinance for definitions and calculations. The landscaped area for the service area must be computed and then the Maximum Applied Water Allowance (MAWA) calculated from the Model Water Efficient Landscape Ordinance.

4.2.1 Definition

10608.20 (b)(2)(B) For landscape irrigated through dedicated or residential meters or connections, water efficiency equivalent to the standards of the Model Water Efficient Landscape Ordinance set forth in Chapter 2.7 (commencing with Section 490) of Division 2 of Title 23 of the California Code of Regulations, as in effect the later of the year of the landscape's installation or 1992. An urban retail water supplier using the approach specified in this subparagraph shall use satellite imagery, site visits, or other best available technology to develop an accurate estimate of landscaped areas.

4.2.2 Calculation Method Used

The Model Water Efficient Landscape Ordinance requires a determination of the total landscaped area to determine the MAWA. The computation of estimated landscaped area requires the following criteria be satisfied:

- The landscaped area must be measured or estimated for each parcel served by a residential or dedicated landscape water meter or connections within the water supplier's service area.
- Only irrigated landscape area served by residential or dedicated landscape water meters or connections shall be included in the calculation of landscaped area water use. Landscape served by CII connections and non-irrigated landscape shall be excluded.

To determine the estimated total for the landscaped area of COS MUD the following steps were performed:

1. Using the City's land use GIS, an average parcel size was determined for low and medium density residential lots in the COS MUD's service area.
2. A small sampling (40 parcels) from each residential land use category was selected for parcels that were approximately the average size calculated in step 1 and located throughout the service area.
3. A rough estimate of landscaped area for residential parcels was determined using an aerial image from ArcGIS online and tracing areas that appeared to be irrigated landscape.
4. A rough estimate of landscaped area for the landscape irrigation customers was calculated based on 2008 deliveries. The 2008 deliveries were used as representative of a higher water use year. The total deliveries, in acre-feet (af), for the landscape irrigation customers was divided by an assumption for average water applied to landscaped areas of 3.5 af/ac. The resulting area was converted to square feet (sf) and added to the residential landscaped area total calculated in step 5.
5. The average for the residential landscaped area was applied to the number of residential parcels located within the COS MUD service area to determine the overall landscaped area. (average landscaped area per parcel equals approximately 2,800 sf which is approximately 37 percent of the average parcel size).

The equation used to calculate the MAWA on landscaped areas constructed prior to January 1, 2010 is:

Maximum Applied Water Allowance (MAWA) = (ETo) (0.62)(0.8 x LA)

Where,

MAWA is in gallons per year

ETo = 53.3 inches/year. Reference evapotranspiration (inches per year), which is "a standard measurement of environmental parameters which affect the water use of plants". COS MUD is located in Zone 12 as referenced on page 38.10 of the Model Water Efficient Landscape Ordinance

0.62 = Conservation Factor (from inches/year to gallons/sf/year)

0.8 = ET Adjustment Factor (ETAF). When applied to reference evapotranspiration, the ETAF "adjusts for plant factors and irrigation efficiency, two major influences upon the amount of water that needs to be applied to the landscape.

LA = Landscaped Area(sf), which includes "all the planting areas, turf areas, and water features in a landscape design plan subject to the MAWA calculation." (For SBx7-7 compliance, only irrigated landscape area should be included).

A second equation to determine the MAWA on landscaped areas constructed after January 1, 2010 is:

> *Maximum Applied Water Allowance (MAWA) = (ETo) (0.62) [(0.7 x LA)+ (0.3 x SLA)]*
>
> Where definitions for factors not provided above are,
>
> *0.7 = ET Adjustment Factor (ETAF). When applied to reference evapotranspiration, the ETAF "adjusts for plant factors and irrigation efficiency, two major influences upon the amount of water that needs to be applied to the landscape.*
>
> *0.3 = Additional Water Allowance for Special Landscape Area (SLA), resulting in an effective ETAF for SLA of 1.0.*
>
> *SLA = Special Landscaped Area (sf), which is defined as "an area of the landscape dedicated solely to edible plants, areas irrigated with recycled water, water features using recycled water and areas dedicated to active play such as parks, sports fields, golf courses, and where turf provides a playing surface."*

For this TM, the 2020 landscaped area was not evaluated. This second equation allows for special landscaped areas to be included, however, it should result in a lower unit use factors, making this method less desirable. Additional planning information would be needed to include the results for the future landscaped areas in the determination of the target water use for this method.

Once the MAWA was determined for the COS MUD service area, the water use was converted to a per capita water use target by dividing the total by the service area population and converting it to daily use. The estimated urban water use target for landscaped area was calculated as 72 gpcd.

The analysis performed for the landscaped area is very preliminary and uses a small sampling to determine a rough estimate on the existing service area. Additional analysis would be required using more precise aerial imagery and a larger sample size to fine tune the landscaped area if this is the preferred method. In addition, more analysis would be required to estimate landscaped areas for the year 2020 to include in the determination of the urban water use target. However, this evaluation is suitable and appropriate for comparison of the three DWR published methodologies.

4.3 Commercial, Industrial, and Institutional Water Use

The CII water urban water use target for COS MUD was calculated using historical information for the total average CII water use in the service area. An average of approximately 17 percent of gross water was delivered to CII customers from 1997 through 2006.

4.3.1 Definition

10608.20 (b)(2)(C) For commercial, industrial, and institutional uses, a 10-percent reduction in water use from the baseline commercial, industrial, institutional water use by 2020.

4.3.2 Calculation Method Used

The average percentage of CII deliveries for COS MUD was determined from the service area data provided. CII use has made up approximately 17 percent of total deliveries within the COS MUD service area. The annual CII deliveries from 1997 through 2006 were divided by the total service area population and converted into daily use to determine a per capita value of 32 gpcd. Per SBx7-7, the average CII per capita use was reduced by 10 percent to determine the urban water use target of 29 gpcd.

4.4 Method 2 Base Daily Per Capita Water Use

The base daily per capita water use determined in Method 1 of 195 gpcd is used as the base daily per capita water use for Method 2. This base daily per capita water use is included to calculate the 2015 interim urban water use target.

4.5 Method 2 Urban Water Use Targets

The urban water use target for Method 2 is the sum of the urban water use targets determined for residential, landscaped area, and CII water use. The urban water use target for Method 2 is 156 gpcd.

The 2015 interim urban water use target is calculated as the midpoint between the base daily per capita water use and the 2020 urban water use targets, 176 gpcd.

Table 7 shows the Method 2 calculations used and Figure 7 shows the urban water use target compared to the historic per capita water use.

5.0 METHOD 3

SBx7-7 legislation, section 10608.20 (b) (3) defines Method 3 as:

10608.20 (b) An urban retail water supplier shall adopt one of the following methods for determining its urban water use target pursuant to subdivision (a):

> *(3) Ninety-five percent of the applicable state hydrologic region target, as set forth in the state's draft 20x2020 Water Conservation Plan (dated April 30, 2009). If the service area of an urban water supplier includes more than one hydrologic region, the supplier shall apportion its service area to each region based on population or area.*

Method 3 is based solely on the hydrologic region targets that have been established in the draft 20x2020 Water Conservation Plan.

5.1 Hydrologic Region

Due to the variety of climates and topography throughout California, DWR divides the state into 10 hydrologic regions. The hydrologic regions correspond to the state's major water drainage basins. COS MUD is located in the state hydrologic region number 6, San Joaquin.

Table 7. Method 2: Indoor and Outdoor Water Uses

Part A: Indoor Residential Water Use

Indoor Residential Water Use (provisional standard per Section 10608.20 (**55 gpcd**

Part B: Irrigated Landscapes

Landscaped Area, sf	Eto (Zone 12), inches/yr	Maximum Applied Water Allowance (MAWA), gal/yr	2008 Population	Landscape Water Use, gpcd
112,870,800	53.3	**2,983,942,765**		
53,012,520	53.3	**1,401,481,389**		
165,883,320		**4,385,424,154**	**167,051**	**72**

Number of Single Family Accounts in 2008 (DWR System Statistic Report)			40,311	accounts
Est. average landscaped area per single family account (based on a small sample of lots)			2,800	sf
Total estimated residential landscaped area			112,870,800	sf
Potable Water Use Irrigation Accounts (2008 Data) (4261 af/3.5 af/ac)	1,217	acres	53,012,520	sf
Recycled water use areas		acres	-	sf

Part C: Commercial, Industrial and Institutional (CII) Water Use

16.6% of total

Year	Population	Total CII Water Use, af/yr	Per Capita CII Water Use, gpcd	10-Year Rolling Average gpcd
1990	91,711	3,179	31	
1991	92,764	2,888	28	
1992	94,646	3,142	30	
1993	97,333	3,148	29	
1994	100,701	3,531	31	
1995	103,404	3,646	31	
1996	107,536	3,851	32	
1997	108,079	4,236	35	
1998	112,093	3,767	30	
1999	116,674	4,197	32	
2000	121,969	4,402	32	
2001	128,347	4,766	33	
2002	134,342	4,984	33	
2003	144,236	5,368	33	
2004	155,564	5,737	33	
2005	165,690	5,669	31	
2006	168,078	5,650	30	32
2007	167,013	6,331	34	32
2008	167,051	6,208	33	32
2009	168,344	5,751	30	32

Baseline = Max 10-Year Rolling Average	32	gpcd
10% Reduction in CII Baseline	(3)	gpcd
CII 2020 Target	29	gpcd

Summary

Part A: Indoor Residential Water Use	**55**	**gpcd**
Part B: Irrigated Landscapes	**72**	**gpcd**
Part C: Commercial, Industrial and Institutional (CII) Water U	**29**	**gpcd**
Per Capita Daily Water Use Target	**156**	**gpcd**

5.2 Base Daily Per Capita Water Use

As part of the 20x2020 Water Conservation Plan, statewide baseline water use values were established for the different hydrologic regions based on the best available data. For the San Joaquin region, the baseline value was calculated to be 248 gpcd.

5.3 Urban Water Use Targets

Several regional factors were considered in the development of the urban water use targets for each region in the draft 20x2020 Plan. A "balancing" process was performed to assign each region with an appropriate regional target. This was done to ensure that the state as a whole can meet the 20 percent reduction.

SBx7-7 establishes the 2020 Urban Water Use Target as 95 percent of the regional baseline value in the 20x2020 Water Conservation Plan. See Table 8 for an overview of the hydrologic region targets. Figure 8 shows the urban water use target compared to the COS MUD historic per capita water use.

The 2015 interim urban water use target is calculated as the midpoint between the regional baseline water use and the 2020 urban water use target, and is calculated as 200 gpcd.

6.0 METHOD 4

SBx7-7 legislation, section 10608.16 (j) requires Method 4 be reviewed once the methodology has been developed by DWR:

10608.16 (j) An urban retail water supplier shall be granted an extension to July 1, 2011, for adoption of an urban water management plan pursuant to Part 2.6 (commencing with Section 10610) due in 2010 to allow use of technical methodologies developed by the department pursuant to paragraph (4) of subdivision (b) and subdivision (h). An urban retail water supplier that adopts an urban water management plan due in 2010 that does not use the methodologies developed by the department pursuant to subdivision (h) shall amend the plan by July 1, 2011, to comply with this part.

7.0 CONCLUSION

The three currently defined DWR SBx7-7 methodologies for establishing an agency's interim and final urban water use targets were determined for COS MUD to establish which methodology to recommend for COS MUD to adopt. Each of the three methodologies developed an urban water use target slight differently, and depend on various information sources: Method 1 relies on historic system data; Method 2 relies on performance standards for multiple water use types; and Method 3 relies on hydrologic region information set by DWR. Comparing the base daily water use and urban water use targets demonstrates that the urban water use targets developed using Method 3 are the most favorable for COS MUD. Table 9 displays and summarizes the results for each method.

Table 8. Method 3: 95% of State Hydrologic Region Target

(based on Draft 20 x 2020 Water Conservation Plan dated April 30, 2009)

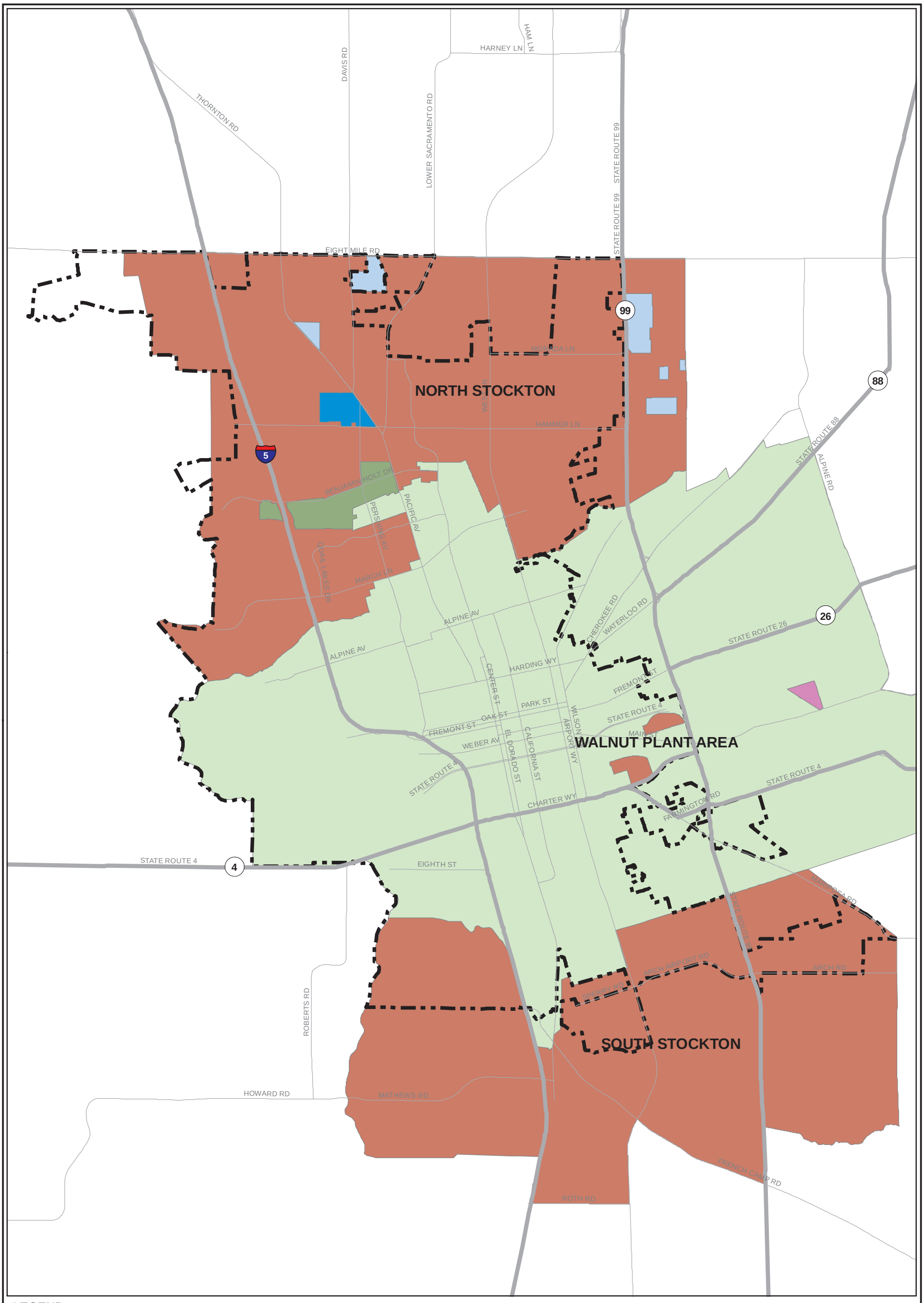
City of Stockton is located within DWR Hydrologic Region No. 6 (San Joaquin)

DWR Hydrologic Region Number	1	2	3	4	5	6	7	8	9	10
DWR Hydrologic Region Name	North Coast	San Francisco Bay	Central Coast	South Coast	Sacramento River	San Joaquin	Tulare Lake	North Lahonton	South Lahontan	Colorado River
Baseline (1995-2005), gpcd	165	157	154	180	253	248	285	243	237	346
Interim Targets (2015), gpcd	151	144	139	165	215	211	237	208	204	278
Targets (2020), gpcd	137	131	123	149	176	174	188	173	170	211
95% of Interim Targets (2015), gpcd	**143**	**137**	**132**	**157**	**204**	**200**	**225**	**198**	**194**	**264**
95% of Targets (2020), gpcd	**130**	**124**	**117**	**142**	**167**	**165**	**179**	**164**	**162**	**200**

Table 9. Comparison of Urban Water Use Targets

	Method 1	Method 2	Method 3
Base Daily per Capita Water Use, gpcd	195	195	248
2015 Interim Urban Water Use Target, gpcd	176	176	200
2020 Urban Water Use Target, gpcd	156	156	165

It is recommended that COS MUD adopt the Method 3 at this time. This recommendation will be reviewed after Method 4 is established to determine if the Method 4 urban water use targets are preferable to Method 3 targets.



LEGEND

- CITY LIMITS
- COS MUD
- Cal Water
- County Area
- Colonial Heights
- Lincoln Village
- SEWD WTP

N

0 3,500 7,000

Scale in Feet

FIGURE 1

City of Stockton
SB 7 Support

EXISTING SERVICE AREAS

WEST YOST ASSOCIATES
Consulting Engineers

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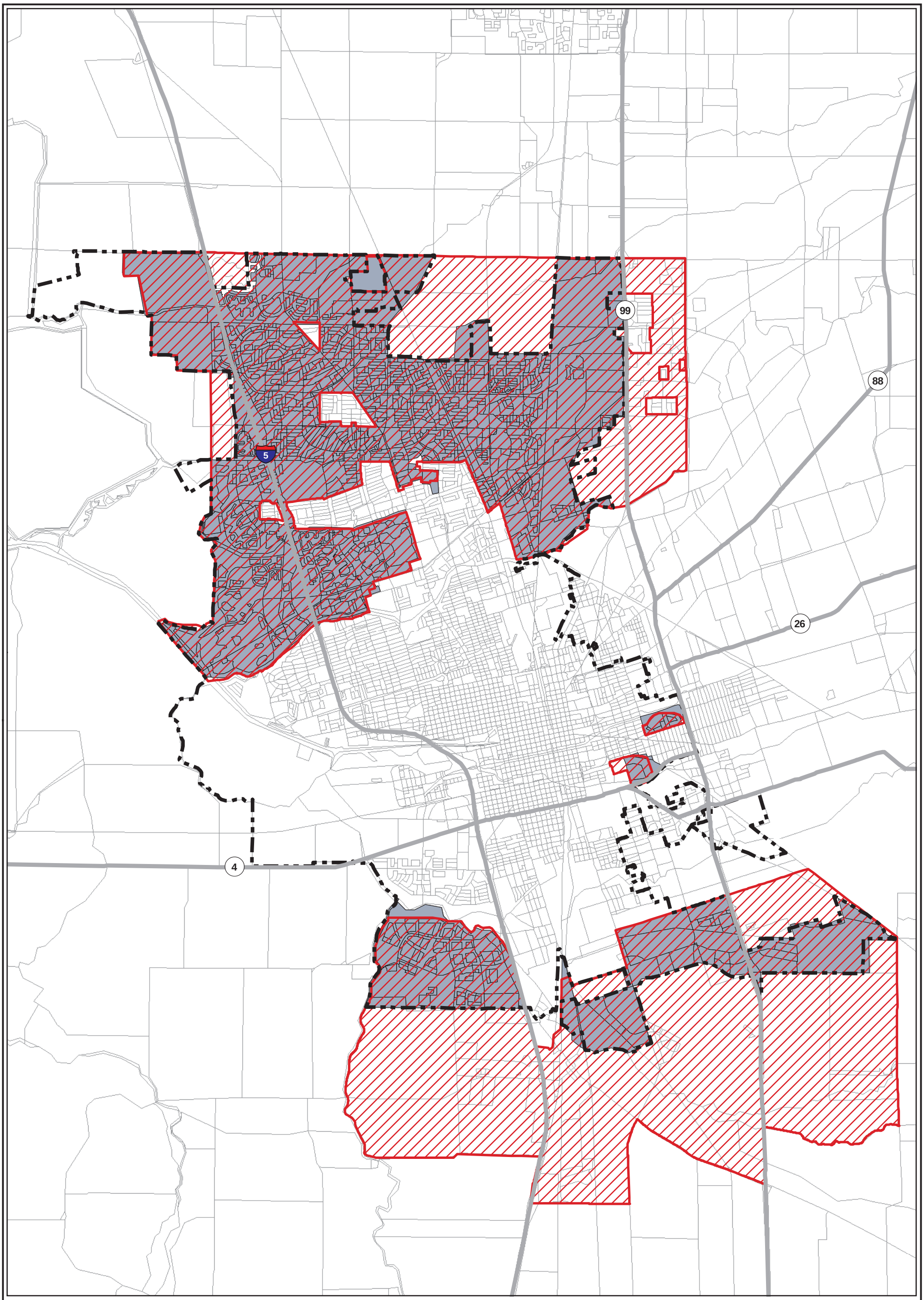


LEGEND

- COSMUD Water Service Area
- COS MUD 2000 Census Blocks
- 2000 Census Blocks
- CITY LIMITS

N

0 3,500 7,000

Scale in Feet

FIGURE 2

City of Stockton
SB 7 Support

CENSUS BLOCKS

WEST YOST ASSOCIATES
Consulting Engineers

O:\Clients\129 Stockton\06-10-20 Senate Bill No. 7 Support\GIS\Figures\Census blocks.mxd 7/2/2010

Figure 3. Comparison of Population Served and DOF Population Estimates

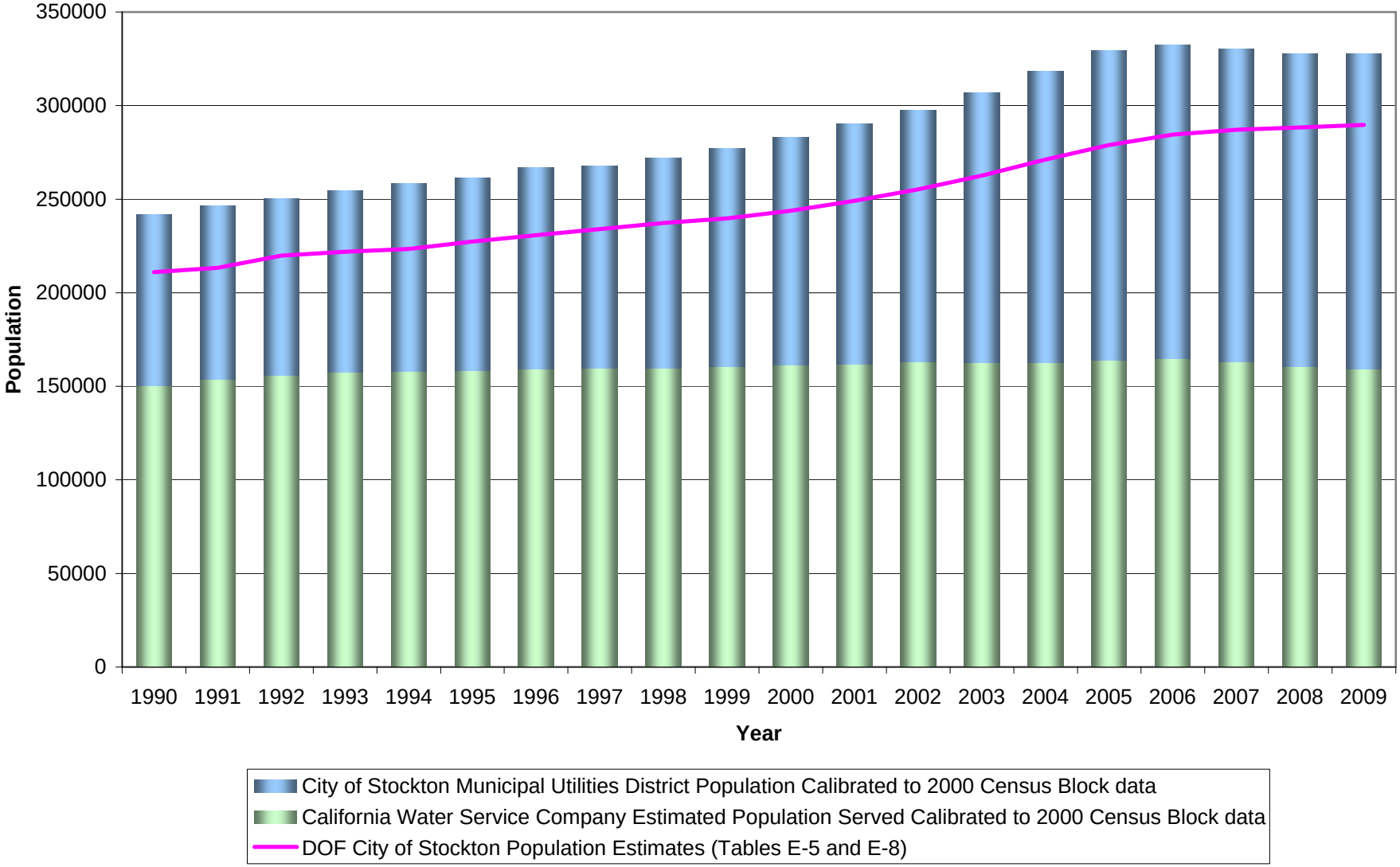


Figure 4. COS MUD Historical Population and Gross Water Use

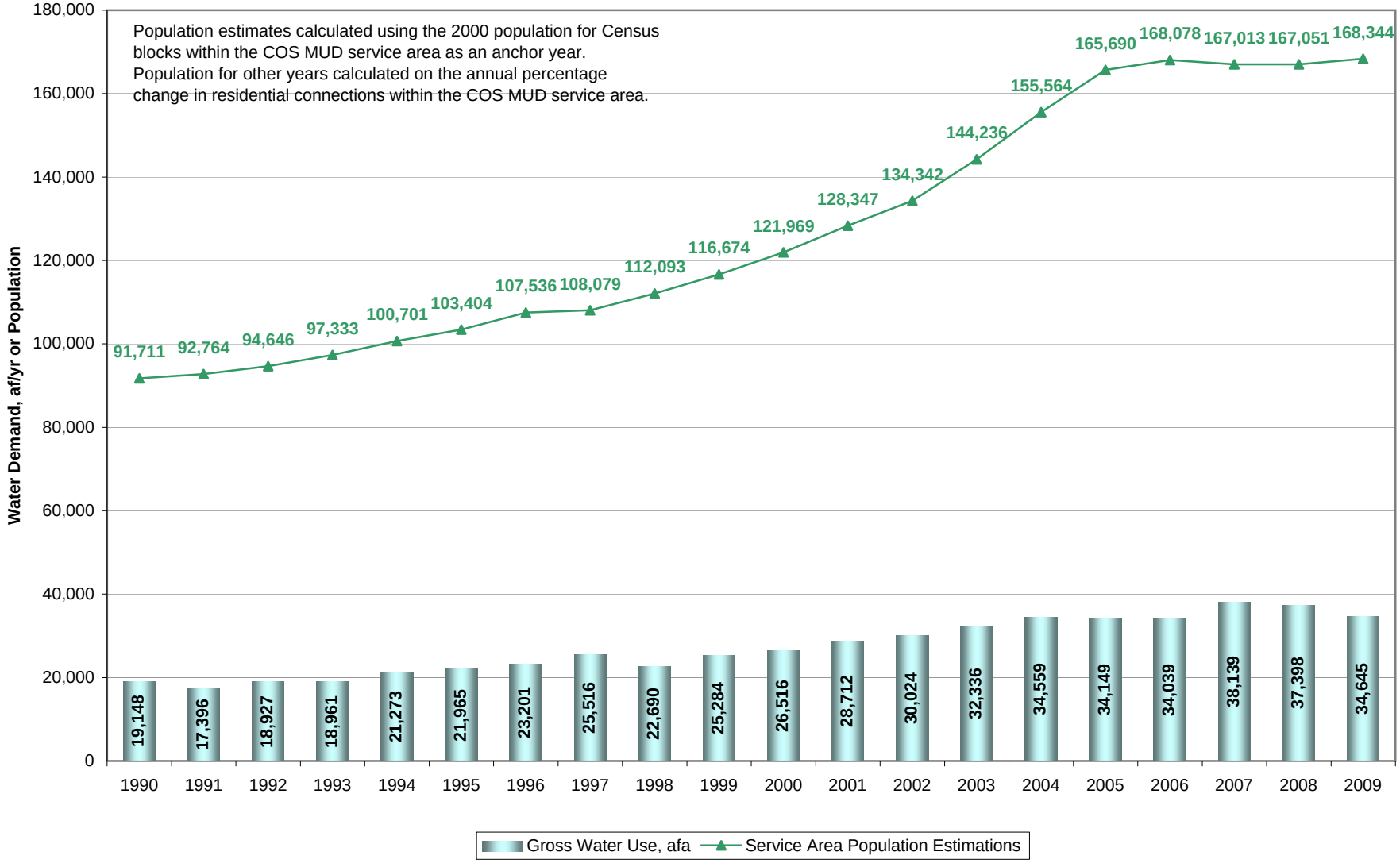


Figure 5. COS MUD Historical Per Capita Water Demand

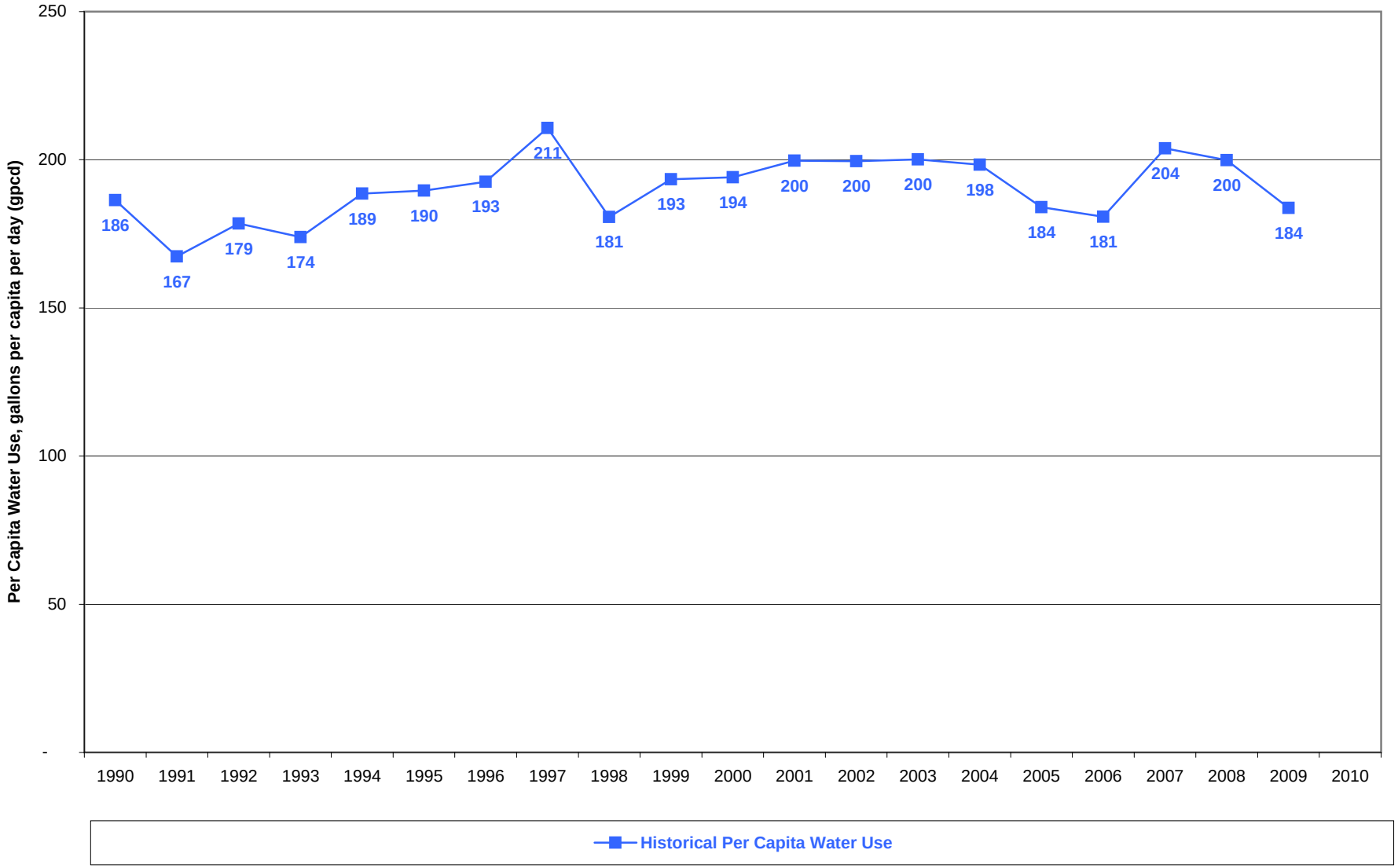


Figure 6. COS MUD Method 1 (10-year Rolling Average gpcd)

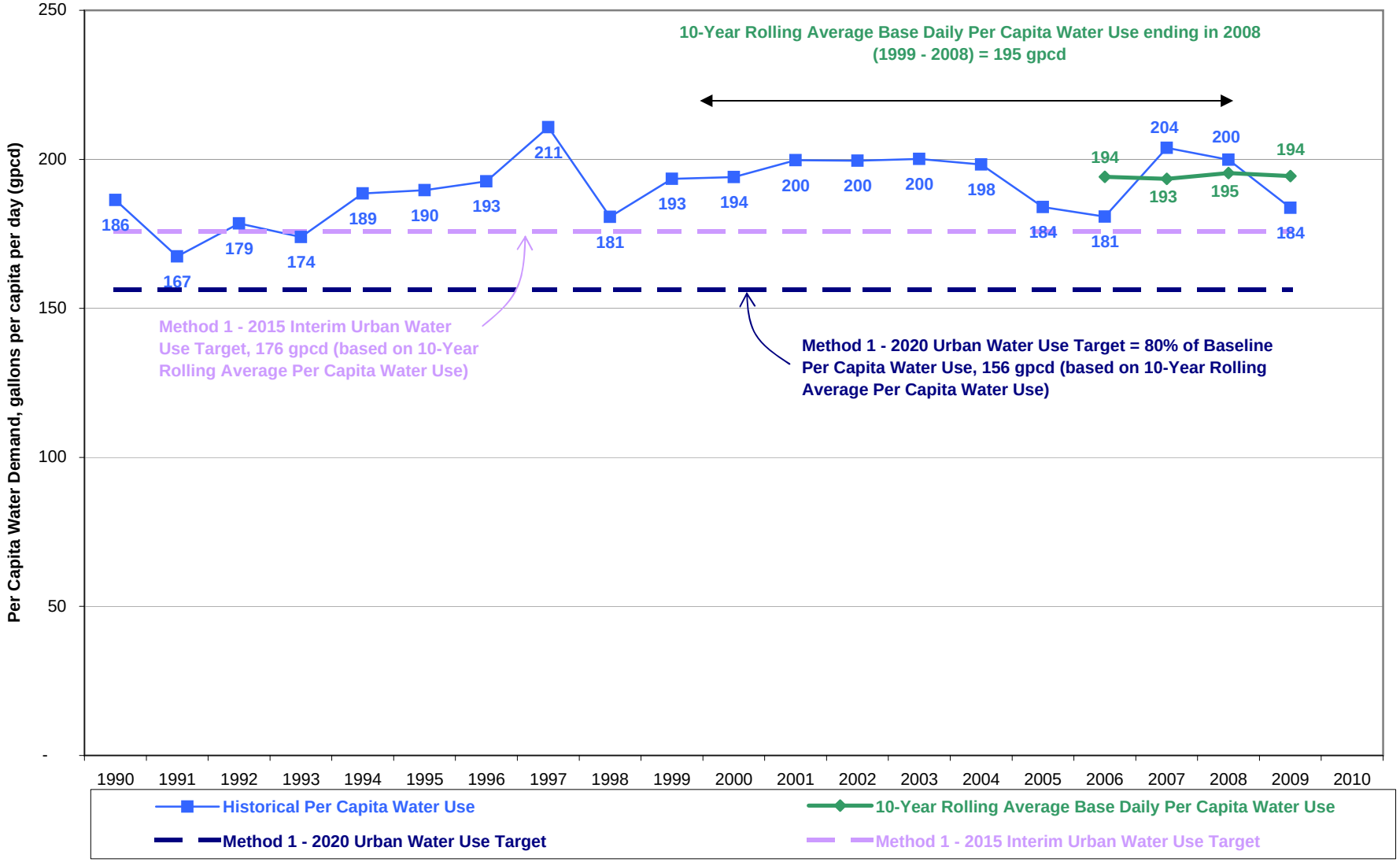


Figure 7. COS MUD Method 2 (Indoor and Outdoor Water Use)

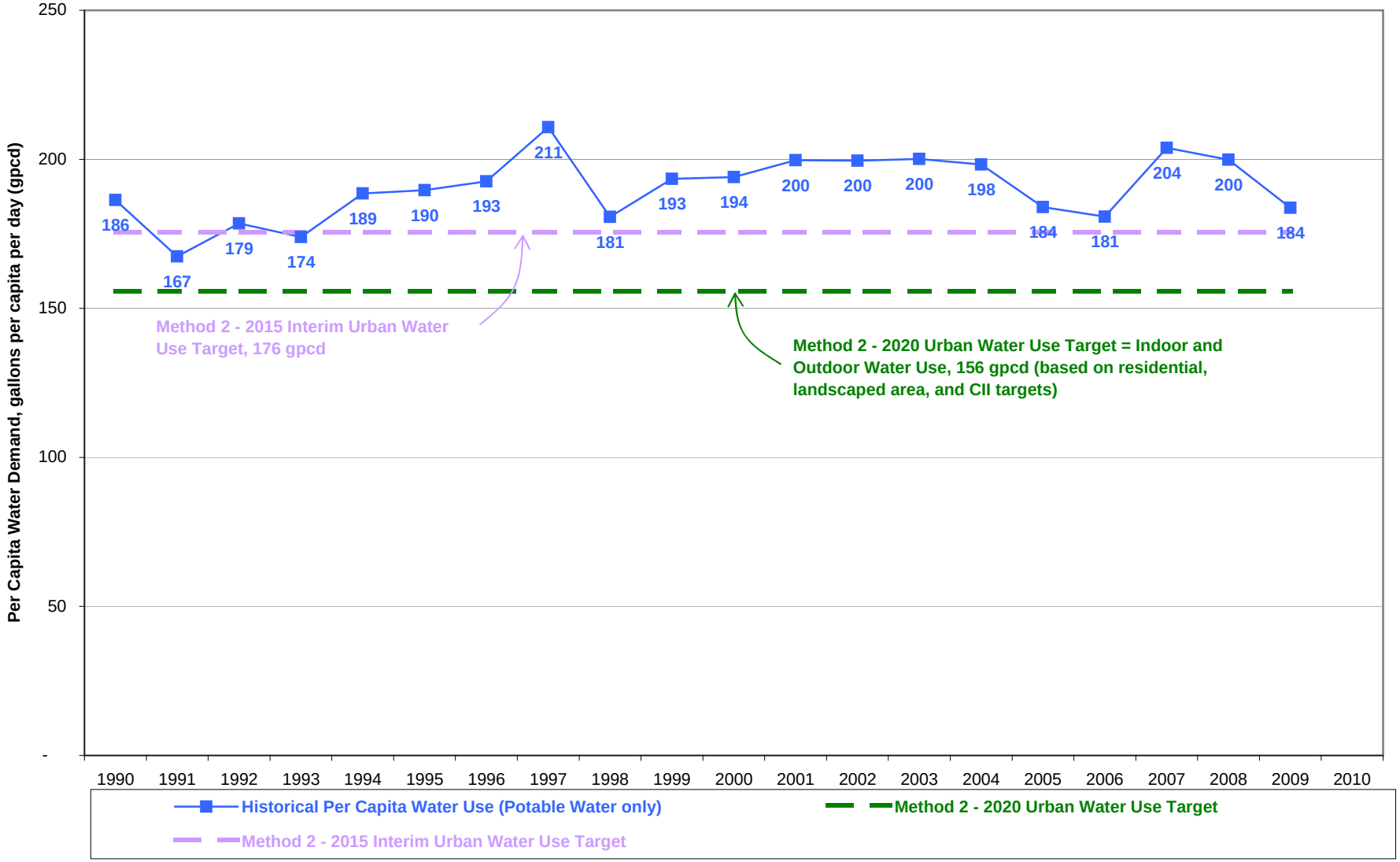
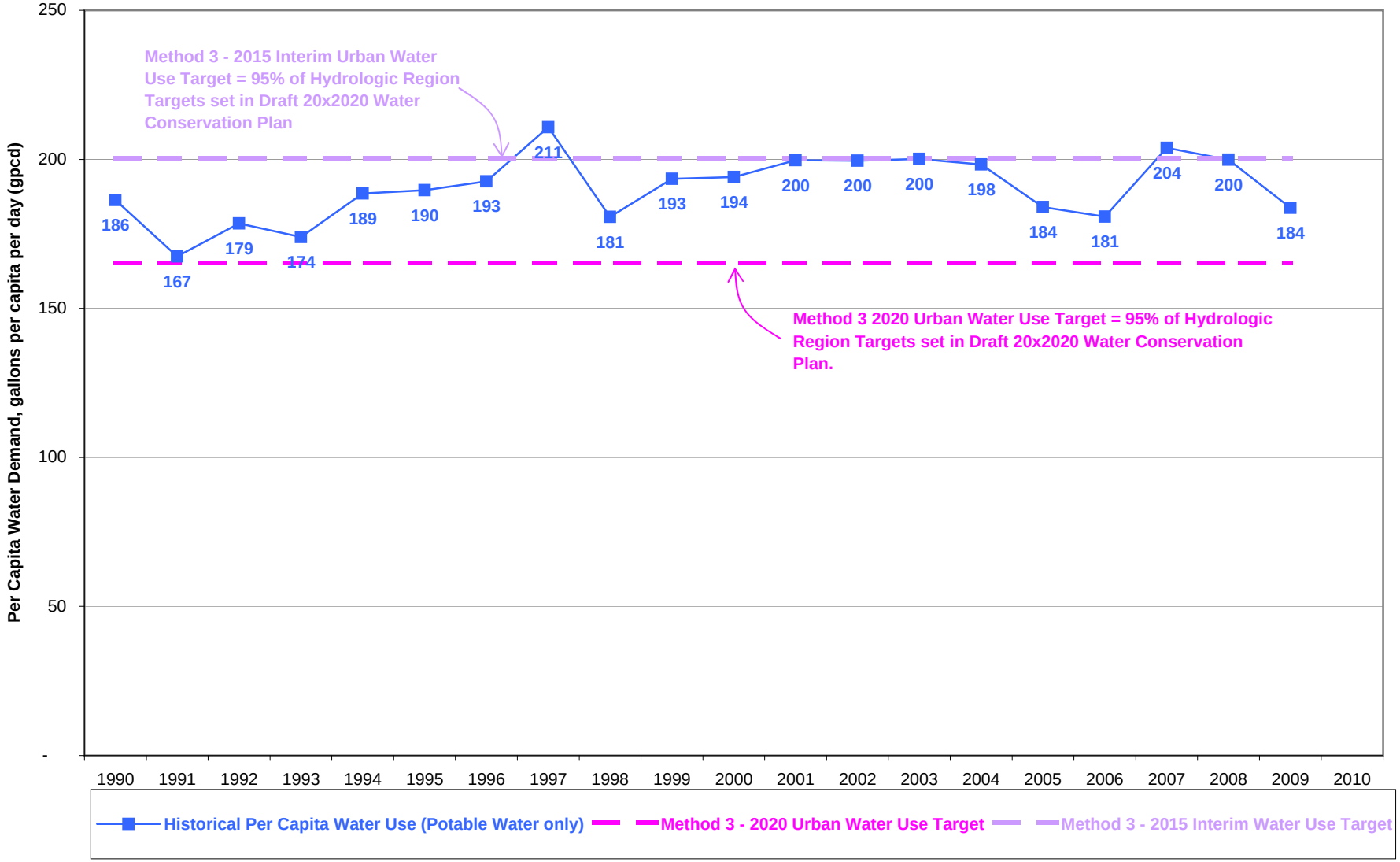


Figure 8. COS MUD Method 3 (Hydrologic Region)



Appendix G

Water use factor calculations

Water Use Factor Calculation Table

		2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	Average Water Use Factor
	Water Use (AF/Y)	14,646	15,791	16,552	17,236	19,480	20,081	20,891	21,959	21,235	20,050	18,639	
	Number of connections	27,903	29,576	30,345	32,961	36,024	38,511	40,525	40,271	40,311	40,709	41,070	
Single Family	Water Use Factor	0.52	0.53	0.55	0.52	0.54	0.52	0.52	0.55	0.53	0.49	0.45	**0.52**
	Water Use (AF/Y)	3,784	3,876	4,370	4,042	4,079	3,873	3,569	3,315	3,394	3,312	3,047	
	Number of connections	4,184	4,189	4,997	4,984	4,901	5,078	3,692	3,666	3,636	3,578	3,643	
Multi Family	Water Use Factor	0.90	0.93	0.87	0.81	0.83	0.76	0.97	0.90	0.93	0.93	0.84	**0.88**
	Water Use (AF/Y)	4,693	5,076	5,039	5,110	5,328	5,472	5,524	5,816	5,764	5,178	4,471	
Commercial/	Number of connections	1,163	1,186	1,209	1,226	1,091	1,316	1,344	1,362	1,389	1,467	1,420	
Institutional	Water Use Factor	4.03	4.28	4.17	4.17	4.88	4.16	4.11	4.27	4.15	3.53	3.15	**4.08**
	Water Use (AF/Y)	-	-	-	-	-	-	-	-	-	-	624	
	Number of connections	-	-	-	-	-	-	-	-	-	5	5	
Industrial	Water Use Factor	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	124.86	**124.86**
	Water Use (AF/Y)	2,228	2,716	2,627	2,700	3,025	3,012	2,958	4,134	4,260	4,082	3,392	
Landscape	Number of connections	592	615	655	693	714	773	818	840	852	867	872	
Irrigation	Water Use Factor	3.76	4.42	4.01	3.90	4.24	3.90	3.62	4.92	5.00	4.71	3.89	**4.21**
	Water Use (AF/Y)	335	313	230	789	230	181	190	107	196	25	53	
	Number of connections	75	67	67	70	97	61	11	-	-	-	-	
Other	Water Use Factor	4.46	4.67	3.44	11.27	2.37	2.97	17.30	0.00	0.00	0.00	0.00	**4.23**

Appendix H

Groundwater Management Plan for
Eastern San Joaquin Groundwater Basin

September 2004

Eastern San Joaquin Groundwater Basin Groundwater Management Plan

Northeastern San Joaquin County Groundwater Banking Authority

Eastern San Joaquin Groundwater Basin Groundwater Management Plan

Jack A. Sieglock, Chairman
Northeastern San Joaquin County
Groundwater Banking Authority

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Copies of the Groundwater Management Plan may be purchased for $50 from:
San Joaquin County Department of Public Works
P.O. Box 1810
Stockton, California 95201

Make checks payable to: San Joaquin County Department of Public Works

Foreword

. . .

The American West and particularly the State of California is faced with the critical challenge of sustainable development and equitable management of increasingly scarce water resources. The entirety of this concern is framed by greater competition between regional powers for limited surface supplies from major rivers and heightened attention regarding the future use and control of groundwater by overlying landowners, appropriative agencies and the State. Consequently, the Northeastern San Joaquin County Groundwater Banking Authority Joint Exercise of Powers Agreement was established in 2001 to provide a consensus-based forum for local water interests with historically diverse viewpoints regarding the exploitation of groundwater resources in the Eastern San Joaquin Groundwater Basin. Members agreed to work cooperatively with unanimity toward achieving water resource planning objectives and to speak with one regional voice. This Groundwater Management Plan is the result of this inexorable collaborative effort, which was single-minded in its effort to reinforce local control and provide direction for the sustainable development of this vital resource for the future social, economic and environmental viability of San Joaquin County.

Mel Lytle, Ph.D.
Water Resource Coordinator

Acknowledgements

. . .

This Groundwater Management Plan (GMP) is a product of the commitment that the Groundwater Banking Authority (GBA) members together with many other interested agencies made to sustain and enhance the groundwater resources of the Eastern San Joaquin Basin. The GBA extends thanks to staff consultants from HDR, Schlumberger Water Services and Camp Dresser & McKee Inc. in the preparation of materials, modeling information and technical review of the GMP. In addition, special thanks are given for grant funding, information and services provided by the California Department of Water Resources, the Center for Collaborative Policy and the U.S. Geological Survey.

Finally, the GBA would like to thank staff, the Department of Public Works and the GBA Coordinating Committee and Plan Group members in guiding the preparation and technical review of the GMP. Significant funding for this work was provided by GBA member contributions and the San Joaquin County Flood Control and Water Conservation District Water Investigation Zone No. 2. A special benefit assessment supported by the taxpayers of San Joaquin County.

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AB – Assembly Bill
ACWA – Association of California Water Agencies
ADAPS - Automatic Data Acquisition and Processing System
af – Acre-foot
ASR – Aquifer Storage and Recovery
Authority – Northeastern San Joaquin County Groundwater Banking Authority
BMP – Best Management Practice
Cal Water – California Water Service Company
CCWD – Calaveras County Water District
CDWA – Central Delta Water Agency
CERCLA – Comprehensive Environmental Response, Compensation and Liability Act
cfs – Cubic Feet per Second
CSJWCD – Central San Joaquin Water Conservation District
CVP – Central Valley Project
CVPIA – Central Valley Project Improvement Act
DMM – Demand Management Measure
DO – Dissolved Oxygen
DWR – California Department of Water Resources
EBMUD – East Bay Municipal Utility District
EC – Electrical Conductivity
EDF – Environmental Defense Fund
EIR – Environmental Impact Report
EIS – Environmental Impact Statement
ESJGB – Eastern San Joaquin Groundwater Basin
ESJPWA – East San Joaquin Parties Water Authority
FERC – Federal Energy Regulatory Commission
FSC – Folsom South Canal
FRWP – Freeport Regional Water Authority
GBA – Groundwater Banking Authority
GIS – Geographic Information System
GMP – Groundwater Management Plan
GOES – Geostationary Observational Environmental System
JPA – Joint Powers Agreement
MARS – Mokelumne Aquifer Recharge & Storage
mg/L – Milligrams per Liter
MGD – Million Gallons per Day
MORE WATER – Mokelumne Regional Water Storage and Conjunctive Use Project
MO – Management Objective
MOU – Memorandum of Understanding
MRWPA – Mokelumne River Water and Power Authority
MSL – Mean Sea Level
MW – Megawatts
NSJWCD – North San Joaquin Water Conservation District
OID – Oakdale Irrigation District
RWQCB – Regional Water Quality Control Board
SARA – Superfund Amendments and Reauthorization Act
SAWS – Stockton Area Water Suppliers
SB – Senate Bill
SCADA – Supervisory Control and Data Acquisition

SDWA – South Delta Water Agency
SEWD – Stockton East Water District
SJCOG – San Joaquin Council of Governments
SSJID – South San Joaquin Irrigation District
SWP – State Water Project
SWRCB – State Water Resources Control Board
TDS – Total Dissolved Solids
TMDL – Total Maximum Daily Load
USACE – United States Army Corps of Engineers
USBR – United States Bureau of Reclamation
USGS – United States Geological Survey
WHPA – Wellhead Protection Area
WID – Woodbridge Irrigation District

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Executive Summary

ES-1 Background

Independently, agencies in Eastern San Joaquin County have found it difficult to wield the political and financial power necessary to mitigate conditions of critical groundwater overdraft. County interests have come to realize that a regional consensus based approach to water resources planning and conjunctive water management increases the chance for successfully implementing groundwater management actions that are equitable, affordable, and provide far reaching benefits locally, regionally, and Statewide.

Organized in 2001, the Northeastern San Joaquin County Groundwater Banking Authority (Authority) employs the consensus based approach in its goal to develop "…locally supported groundwater banking projects that improve water supply reliability in Northeastern San Joaquin County…and provide benefits to project participants and San Joaquin County as a whole." Collaboration amongst the Authority member agencies has strengthened the potential for broad public support for groundwater management activities as well as the ability to leverage local, State, and federal funds. The Groundwater Management Plan for Eastern San Joaquin County (Plan) is a continuation of the collaborative effort to effectively manage the Eastern San Joaquin Groundwater Basin (Basin). Table ES-1 lists the member agencies of the Authority.

Table ES-1 Member Agencies of the Northeastern San Joaquin County Groundwater Banking Authority
City of Stockton
City of Lodi
Woodbridge Irrigation District
North San Joaquin Water Conservation District
Central San Joaquin Water Conservation District
Stockton East Water District
Central Delta Water Agency
South Delta Water Agency
San Joaquin County Flood Control and Water Conservation District
California Water Service Company*
San Joaquin Farm Bureau Federation*
* Associate Members

ES-2 Purpose and Objectives

The purpose of the Groundwater Management Plan is to review, enhance, assess, and coordinate existing groundwater management policies and programs in Eastern San Joaquin County and to develop new policies and programs to ensure the long-term sustainability of groundwater resources in Eastern San Joaquin County. To better define the supporting values included with this Plan's purpose, the Authority has listed the following mission values centered on the development of the Plan as outlined in Table ES-2.

Table ES-2 Groundwater Management Plan Mission Values for Success		
Be implemented in an equitable manner	Maintain or enhance the local economy	Protect groundwater and surface water quality
Be affordable	Minimize adverse impacts to entities within the County	Provide more reliable water supplies

Exhibit multiple benefits to local land owners and other participating agencies	Maintain overlying landowner and Local Agency control of the Groundwater Basin	Restore and maintain groundwater resources
Minimize adverse impacts to the environment	Protect the rights of overlying land owners	Increase amount of water put to beneficial use within San Joaquin County

In order to meet the purpose of the Plan and ensure the long-term sustainability of the Basin, the Authority created the following Plan objectives:

1. Maintain long-term sustainability of the Basin through the development of management objectives, practices and conjunctive use projects to benefit the social, economic and environmental viability of Eastern San Joaquin County.
2. Prevent further saline intrusion and degradation of groundwater quality throughout the Basin.
3. Increase understanding of Basin dynamics through the development of a sound research program to monitor, evaluate, and predict Basin conditions.
4. Maintain local control of the groundwater Basin through the responsible management of groundwater resources by overlying cities, counties, water districts, agencies, and landowners.
5. Formulate rational and attainable Basin management objectives to comply with SB 1938 and retain State funding eligibility.
6. Formulate voluntary policies, practices and incentive programs to meet established Basin management objectives.
7. Formulate appropriate financing strategies for the implementation of the Plan.

ES-3 Groundwater Management Area

San Joaquin County overlies the Eastern San Joaquin, Cosumnes, and Tracy Sub-basins of the greater San Joaquin Valley Groundwater Basin. For the purposes of the Plan, the Eastern San Joaquin County Groundwater Management Area (GMA) is defined as the portion of San Joaquin County overlying the Eastern San Joaquin and Cosumnes Sub-Basins. Within the GMA, the member agencies of the Authority will implement the Plan within their respective boundaries. To ensure that every parcel in the GMA is represented, all unorganized areas will be included in the San Joaquin County Flood Control and Water Conservation District. Figure ES-1 depicts the member Agencies of the Authority and their respective boundaries within the GMA.

ES-4 Agency Participation

The physical boundaries of the Eastern San Joaquin and Cosumnes Sub-Basins extend beyond the political boundaries of San Joaquin County. Portions of Calaveras and Stanislaus Counties overlie the eastern fringes of the Basin. Recognizing the need for increased coordination between agencies outside of the GMA, the Authority invited a variety of interest groups from the business, environmental, agricultural, and political communities to participate in the development of the Plan. The Authority values the consensus based approach to groundwater management and strives to coordinate, integrate, and mutually benefit from the groundwater management efforts of its member agencies and those with vested interest in the social, economic, and environmental viability of Eastern San Joaquin County.

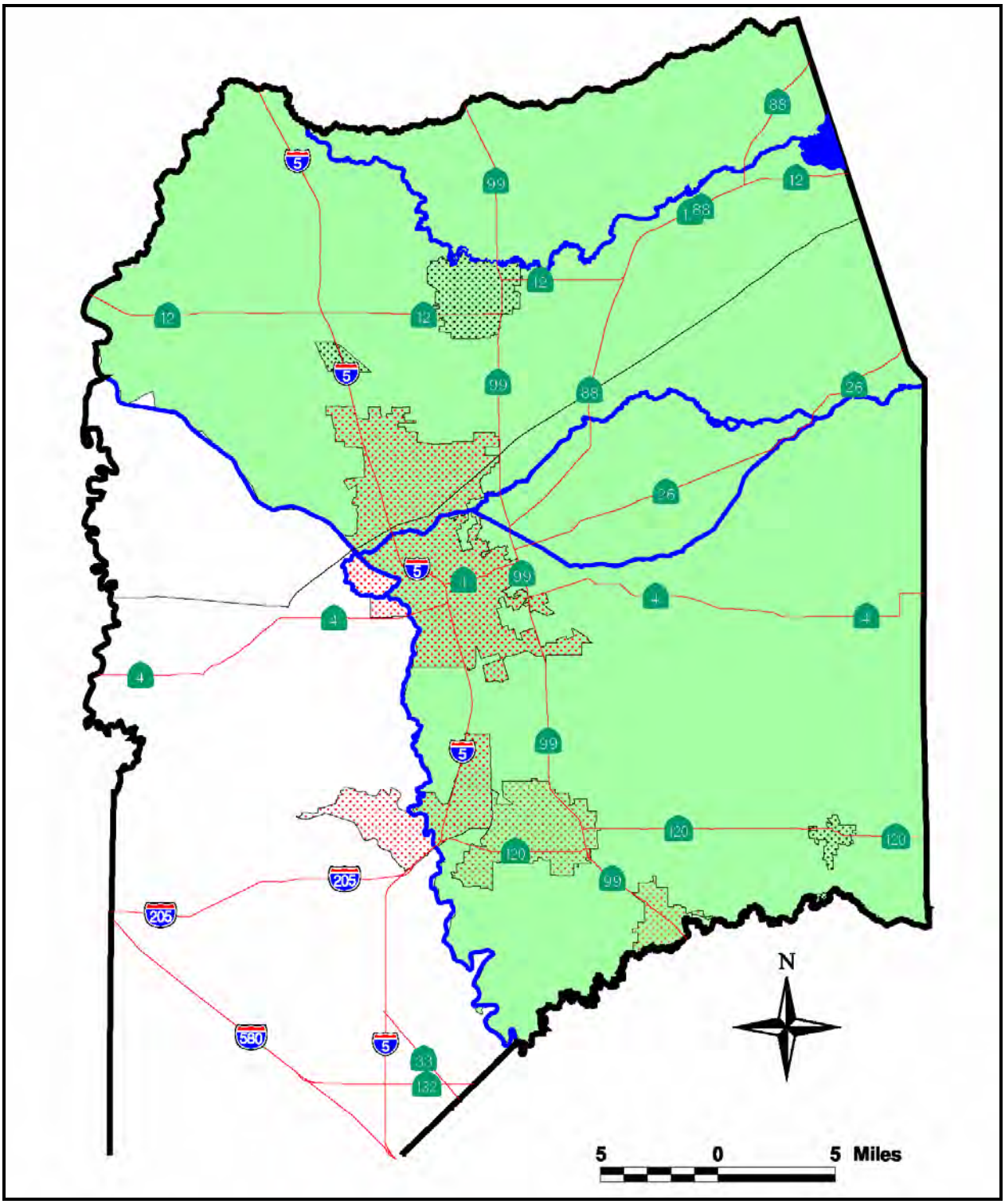


Figure ES-1 Groundwater Management Area
Source: California Spatial Information Library at http://www.gis.ca.gov/

Throughout the planning process, the Authority's Coordinating Committee, a technical sub-group of the Authority, convened every 4th Wednesday of the Month to formulate the Plan. Key discussion points and decisions were debated and finalized by the Coordinating Committee and incorporated into the Plan by Authority Staff. Draft sections of the Plan were also presented to and commented on by the Coordinating Committee. The Authority Board of Directors was regularly updated on the activities of the Plan at their regular meetings on the 2nd Wednesday of the month. For the purpose of providing an atmosphere conducive to broad-based consensus building and compromise, Authority Coordinating Committee meetings were facilitated through the California Center for Collaborative Policy.

Attendees of these meetings include representatives from over 40 agencies and interest groups. Table ES-3 is a list of meeting attendees and agencies contributing to the plan.

Table ES-3 Groundwater Management Planning Participants

Local Participants & Agencies	
Anders Christensen	Woodbridge Irrigation District
Cary Keaton	City of Lathrop
Dante Nomellini	Central Delta Water Agency
Dave Kamper	South San Joaquin Irrigation District
Ed Formosa	City of Stockton Municipal Utilities Department
Ed Steffani	North San Joaquin Water Conservation District
Gary Giovanetti	Stockton City Council
Joe Petersen	San Joaquin Farm Bureau Federation
John Herrick	South Delta Water Agency
Keith Conarroe	City of Manteca
Kevin Kauffman	Stockton East Water District
Larry Diamond	Calaveras County Water District
Loralee McGaughey	Stockton East Water District
Mark Lindseth	City of Lodi
Mark Madison	City of Stockton Municipal Utilities Department
Mel Lytle	San Joaquin County Public Works
Melvin Panizza	Stockton East Water District
Michael McGrew	San Joaquin County Counsel
Paul Risso	California Water Service Company
Ray Borges	San Joaquin County Environmental Health
Reid Roberts	Central San Joaquin Water Conservation District
Richard Prima	City of Lodi
Steve Stroud	South San Joaquin Irrigation District
Teresa Tanaka	Linden County Water District
T.R. Flinn	San Joaquin County Public Works
Tom Gau	San Joaquin County Public Works
State Participants & Agencies	
Ann Jordan	Office of State Senator Charles Poochigan
Mary Bava	Office of Assemblyperson Barbara Matthews
Tim Parker	Department of Water Resources
Federal Participants & Agencies	
David Simpson	Natural Resource Conservation Service
Eric Reichard	US Geologic Survey

John Izbicki	US Geologic Survey
Patrick Dwyer	US Army Corps of Engineers
	Other Participants & Agencies
Barbara Williams	Sierra Club
Carolyn Ratto	California Center for Collaborative Policy
David Beard	Great Valley Center
Gerald Schwartz	East Bay Municipal Utility District
Gina Veronesc	Camp, Dresser, & McKee
James Cornellius	Calaveras County Water District
James Moore	Galt Economic Development Task Force
John Aud	Stanislaus County
Larry Diamond	Calaveras County Water District
Mark Williamson	Saracino-Kirby-Snow
Robert Vince	Camp, Dresser, & McKee
Ron Addington	Business Council, Inc.

The Authority will continue to seek the input of its neighbors and interest groups during the implementation of the Groundwater Management Plan and any future planning efforts.

ES-5 Consistency with Water Code Section 10750 *et. seq.*

Groundwater management is the planned and coordinated effort of sustaining or improving the health of the underlying basin in order to meet future water supply needs. With the passage of Assembly Bill (AB) 3030 in 1992, local water agencies were provided a systematic way of formulating groundwater management plans and granted the Authority to implement those plans through fees and assessments. AB 3030 also encourages coordination between local entities through joint power authorities or memorandums of understanding.

In 2002, the passage of Senate Bill (SB) 1938 further emphasized the need for groundwater management in California. SB 1938 requires AB 3030 groundwater management plans to contain specific plan components in order to receive state funding for water projects. Table ES-4 illustrates the recommended components of a groundwater management plan as outlined in AB 3030 and the required sections under SB 1938. Table ES-4 also indexes the sections of this Plan where the recommended or required AB 3030/SB 1938 components are addressed.

ES-6 Eastern San Joaquin County Hydrogeology

Current and historical groundwater pumping rates exceed the sustainable yield of the underlying groundwater Basin on an average annual basis. Historic groundwater level trends as seen by well hydrographs throughout the Basin illustrate the following trends:

1. In the central portion of the Basin, the groundwater table dropped continuously from the 1950s to the early 1980s. Inclines during the early 1980s are attributed to extreme wet years of heavy rainfall.

2. In the northern part of the Basin, groundwater levels declined into the early 1990s.

3. Beginning in the early 1980s, a distinct drawdown and recovery cycle appears be driven by climatic conditions more than long-term changes in groundwater use.

4. Groundwater levels in the early 1990s had declined to the point where a number of wells throughout the Basin could not be operated. The severity of the situation forced many pumpers to construct new deeper wells.

Table ES-4 Components of a Groundwater Management Plan

Plan Component	Recommended by AB 3030	Required by SB 1938	Plan Sections
Control of saline water intrusion	X		2, 3, 4, 5, 8
Management of wellhead protection and recharge areas	X		4
Regulation of contaminated groundwater	X		4
The administration of a well abandonment	X		4
Elimination of groundwater overdraft	X		2, 3, 4, 5, 8
Replenishment of groundwater	X		2, 3, 4, 8
Groundwater monitoring	X	X	5
Operation of a conjunctive water management system	X		3, 8
Well construction standards	X		4
Financing groundwater management projects	X		6, 7
The development of groundwater management partnerships	X		1, 4, 7, 8
Coordination of land use planning and groundwater management	X		4
Description of participation by interested parties		X	1, 7
Plan to involve agencies overlying the basin		X	1, 7
Basin Management Objectives		X	3
Basin management entity and area map		X	1

Sources: California Department of Water Resources Division of Planning and Local Assistance
http://wwwdpla.water.ca.gov/cgi-bin/supply/gw/management/hq/ab3030/main.pl

California Department of Water Resources Draft 2003 Update Bulletin 118

Figures ES-2 and Figure ES-3 depict the Fall 1993 and Spring 1998 groundwater level contours respectively. The Fall 1993 contour represents the lowest groundwater level contours recorded in the Basin historic record. The Spring 1998 contour represents the recovery of the Basin following years of above average and severe precipitation.

The result of long-term groundwater overdraft is two fold: significant decline in groundwater levels and increased accretions from area waterways. Although increased accretions to the groundwater basin from high quality surface water sources are desirable, accretions in the western fringes of the Basin from the Lower San Joaquin River and older marine geologic formations are generally undesirable primarily due to elevated salt levels. Based on a simplified groundwater balance, as shown in Table ES-5, the net groundwater overdraft is estimated to be approximately 160,000 af/yr.

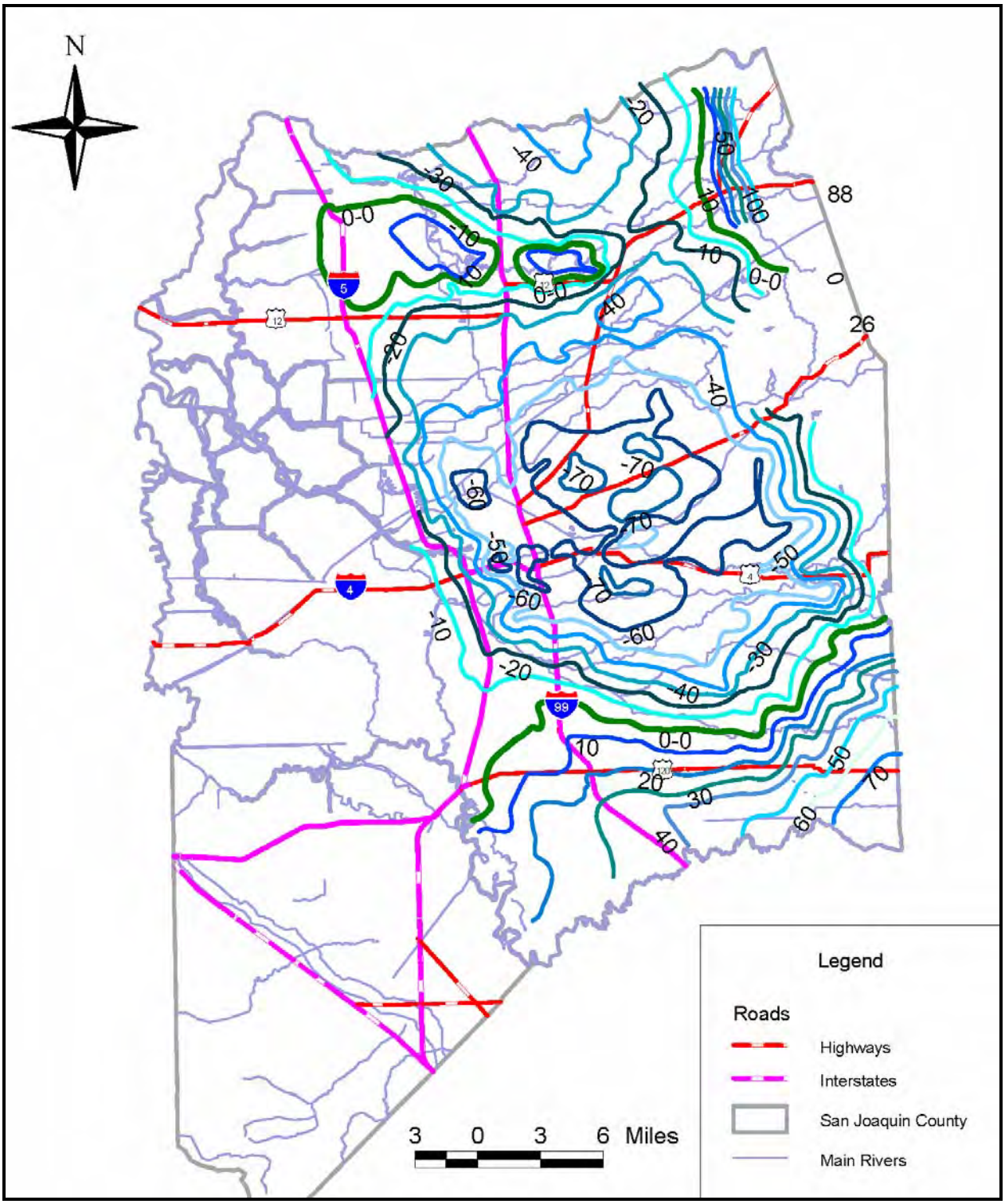


Figure ES-2 Fall 1993 Groundwater Contours
Source: Camp Dresser & McKee Inc.

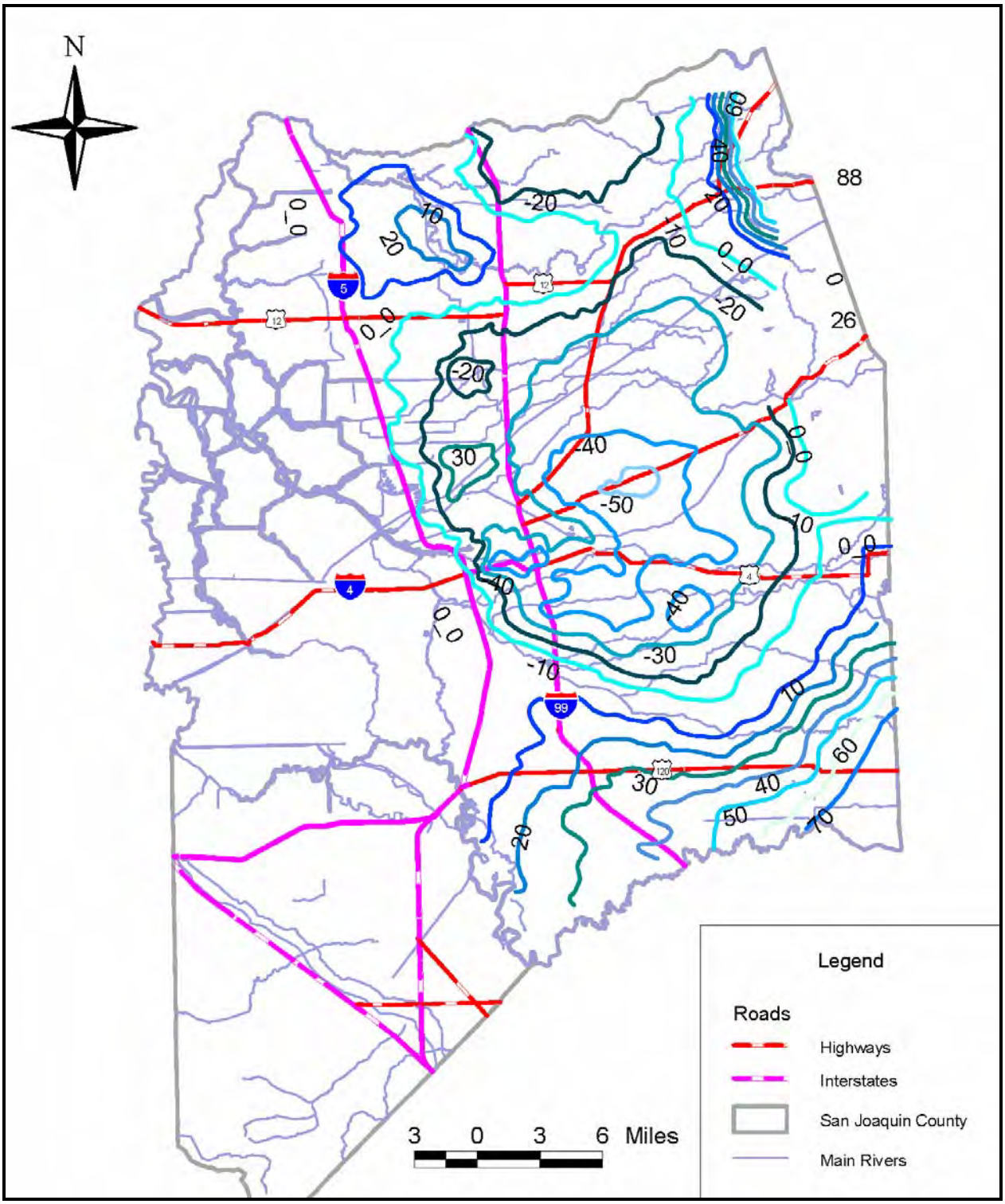


Figure ES-3 Spring 1998 Groundwater Contours
Source: Camp Dresser & McKee Inc.

Table ES-5 Simplified Groundwater Balance for Eastern San Joaquin County		
Groundwater Flow Component	**Average Value**	**Explanation**
Inflows (af)		
Deep Percolation/Recharge	608,400	Net infiltration from rainfall, irrigation, canal leakage etc.
Gain from Streams	198,170	Net inflow from streams to groundwater system
Lateral Inflow	98,000	Net of subsurface inflows and outflows.
Total Inflows	**904,577**	
Outflows (af)		
Groundwater Pumping	867,600	Net agricultural, municipal and industrial pumping
Loss to Streams	108,898	Net outflow from groundwater system to streams
Lateral Outflow	35,300	Subsurface Outflows
Total Outflows	**1,011,815**	
Groundwater Overdraft (af)		
Mined Aquifer Storage	107,238	Total Inflows minus Total Outflows
Estimated Saline Intrusion	42,000	Lateral Saline Intrusion into the Stockton Area
Total Estimated Overdraft	**150,700**	Sum of Mined Aquifer Storage and Saline Intrusion
Source: San Joaquin County Water Management Plan Volume I		

Groundwater flow in the Basin now converges on the depression with relatively steep groundwater gradients eastward from the Delta toward the cone of depression as depicted in Figures ES-2 and ES-3. The eastward flow from the Delta area is significant because of the typically poorer quality water now moving eastward in the Stockton area. Increased lateral inflow from the west is undesirable, as this water is typically higher in TDS and chloride levels and causes the degradation of water quality in the Basin. Figure ES-4 illustrates the approximate location of the 300 mg/L isochlor as measured in 2000. Projections indicate that the rate of eastward migration of the saline front is approximately 150 to 250 feet per year. Figure ES-4 also depicts the projected 2030 location of the 300 mg/L isochlor under no-action conditions.

Degradation of water quality due to TDS or chloride contamination threatens the long-term sustainability of a very important water resource for San Joaquin County, since water high in TDS and/or chloride is unusable for either urban drinking water needs or for irrigating crops. Damage to the aquifer system could for all practical purposes be irreversible due to saline water intrusion, withdrawal of groundwater from storage, and potentially subsidence and aquifer consolidation. The saline intrusion problem is not well understood by the Authority. Further studies and monitoring methods are necessary to ensure the problem is addressed and monitored adequately. The Plan further defines the groundwater science and monitoring investigations geared towards both saline intrusion and general Basin understanding.

A no-action or baseline simulation was conducted to predict how current groundwater and surface management practices would impact the groundwater basin in 2030. Groundwater modeling has shown that unless there is a change in how groundwater is used or managed,

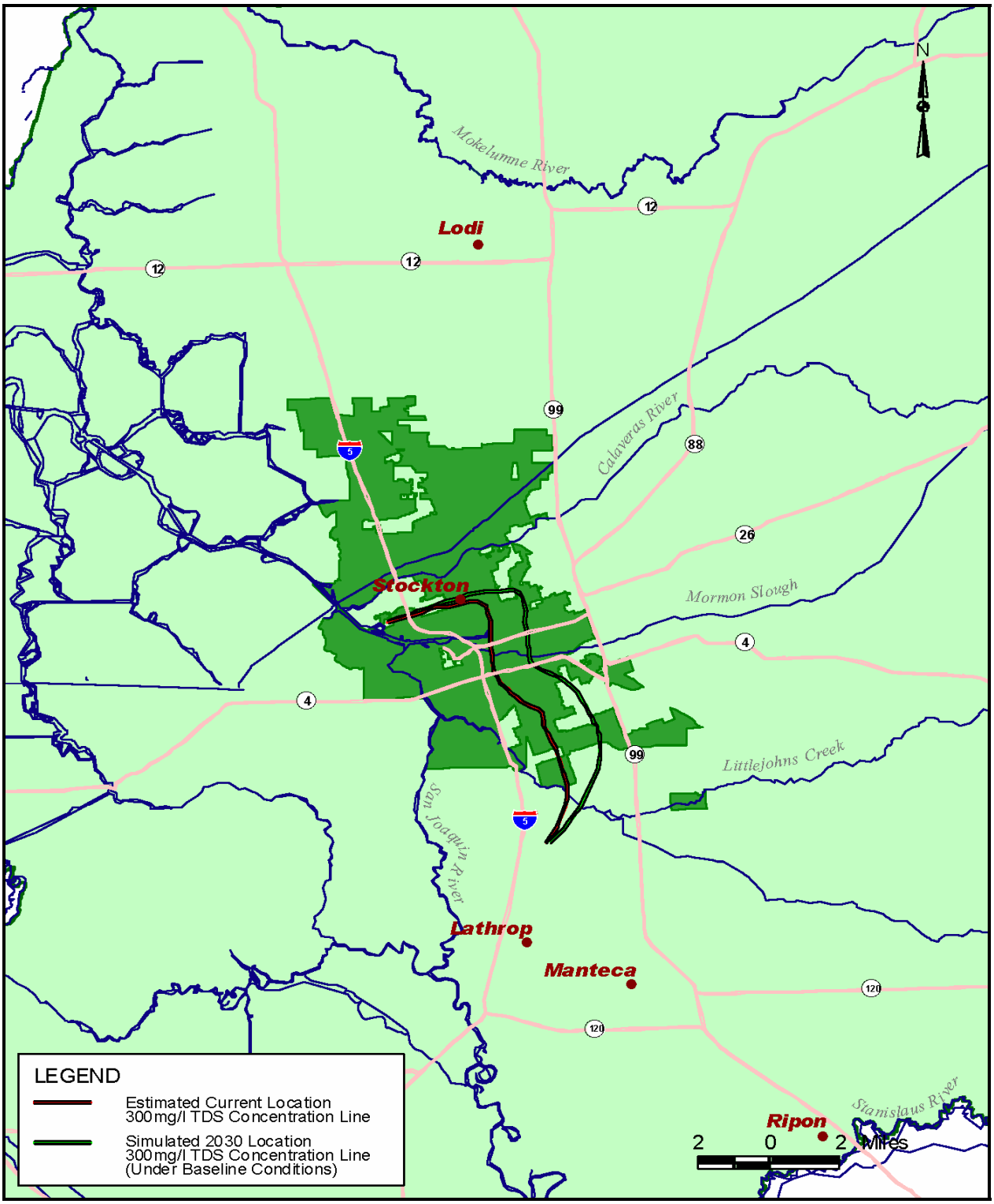


Figure ES-4 Estimated 2000 and 2030 Projected Saline Front
Source: Camp Dresser & McKee, Inc.

levels will continue to decline and storage will continue to be reduced. Figure ES-5 shows the corresponding simulated groundwater table for the year 2030 under baseline conditions. A large portion of the Basin is shown to have groundwater levels 60 to 80 feet below sea level.

Further exacerbating the groundwater conditions, as already mentioned, is the lateral inflow of higher salinity water from the west, which could render parts of the aquifer unusable. Figure ES-4 illustrates the approximate location of the 300 mg/L chloride concentration contour as of 1996 as well as the projected 2030 contour. Groundwater modeling has indicated that the rate of eastward movement of this line is approximately 150 to 250 feet per year. Figure ES-4 also shows the projected location of the 300 mg/L chloride concentration line by the year 2030 under baseline conditions.

ES-7 Basin Management Objectives

SB 1938, created in 2002, requires that agencies that elect to, "Prepare and implement a groundwater management plan that includes basin management objectives for the groundwater basin that is subject to the plan. The plan shall include components relating to the monitoring and management of groundwater levels within the groundwater basin, groundwater quality degradation, inelastic land surface subsidence, and changes in surface flow and surface water quality that directly affect groundwater levels or quality or are caused by groundwater pumping in the basin." In addition, local agencies that do not adopt or participate in a plan fulfilling the requirements of SB 1938 shall not be eligible for State funding intended for groundwater projects. The Authority has developed the following qualitative Basin Management Objectives (MO) for the GMA.

Management Objective #1: Groundwater Levels

Maintain or enhance groundwater elevations to meet the long-term needs of groundwater users within the Groundwater Management Area.

Management Objective #2: Water Quality

Maintain or enhance groundwater quality underlying the Basin to meet the long-term needs of groundwater users within the Groundwater Management Area.

Management Objective #3: Surface Water Quality

Minimize impacts to surface water quality and flow due to continued Basin overdraft and planned conjunctive use.

Management Objective #4: Water Quality

Prevent inelastic land subsidence in Eastern San Joaquin County due to continued groundwater overdraft.

ES-8 Groundwater Management Options

Groundwater management tools available to the Authority are explored in the Plan. In order to successfully implement a conjunctive use program that will meet the goals of this Plan, the Authority must first identify and develop a list of water management options. An option, in the context of this Plan, is the method, program or policy suitable for the broader conjunctive use program for Eastern San Joaquin County. The Plan explores the concepts for the acquisition of new and maximization of existing surface water supplies, groundwater recharge techniques, and other options dealing with demand management and water reuse. Table ES-6 lists the groundwater management options explored in the Plan.

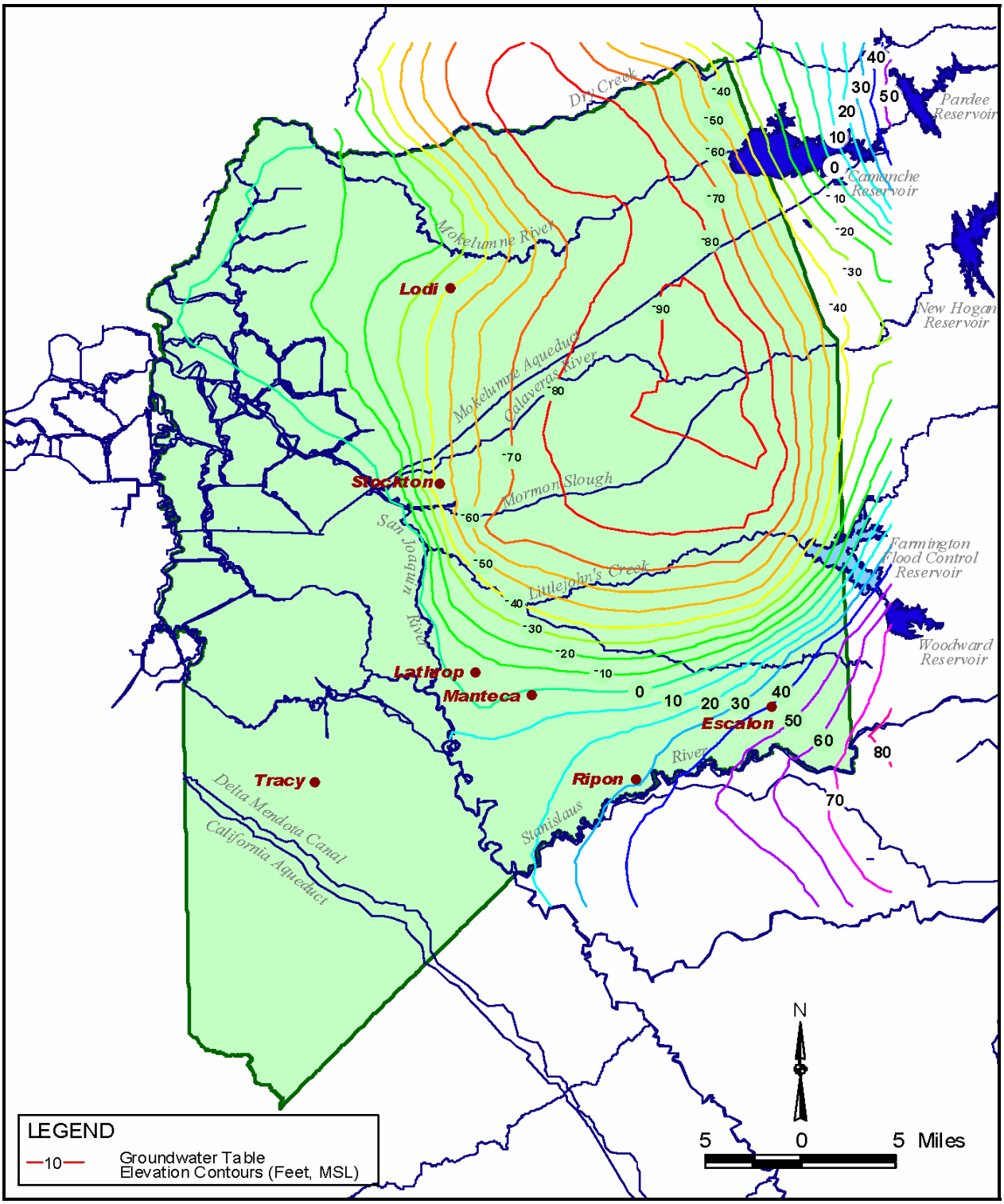


Figure ES-5 Simulated Groundwater Levels Under Baseline Conditions
Source: Camp Dresser & McKee Inc.

Table ES-6 Groundwater Option Comparisons

Option Type	Recharge Method	Improvement Costs ($/af)	Infrastructure Requirements	Land Requirements	Effectiveness	Operation/ Maintenance
Surface Supply Options	Wet Year Flows	~$500	On or off-stream regulating reservoir	Extreme for new reservoir	Very effective based on reservoir size and frequency	Very high requirements
	Water Transfers - Out of Basin	$200-400	Conveyance and storage	Potentially land intensive	Effective based on quantity of water and agreement duration	Varies with infrastructure requirements and year to year availability
	Area of Origin Priority	$0-$350	Use of existing or new infrastructure	Potentially land intensive	Very effective	Varies with infrastructure requirements
	Reservoir Re-operation	~$100	Use of existing infrastructure and storage	Minimal	Less effective	Minimal based on existing facilities
	Water Transfers - In Basin	~$100-$200	Minor conveyance	Minimal	Less effective	Varies with infrastructure requirements and year to year availability
Groundwater Recharge Options	Field Flooding	$50 - $100	Uses Existing Infrastructure	Uses seasonally fallow areas	Somewhat effective only available seasonally	Significant effort
	Spreading Basin/ Recharge Pond	$100 - $150	New Infrastructure	Requires relatively large dedicated areas	Potentially effective, requires detailed field testing	Significant effort
	Recharge Pit	$400 - $450	New Infrastructure	Requires dedicated areas	Potentially effective, requires detailed field testing	Significant effort
	Leaky Canal	Varies	New Infrastructure	Land intensive	Potentially effective, conveyance benefits	Significant effort
	Injection Wells	$150 - $200	New Infrastructure	Requires dedicated areas	Potentially effective, requires extensive well field	Significant effort
	Agricultural In-lieu	$200 - $250	New / Or Existing Infrastructure	Existing Land Use	Very effective based on quantity of water	Additional effort required by owner and district
	Urban In-lieu	~$250-$400	New / Or Existing Infrastructure	Existing Land Use	Very effective based on quantity of water	Requires treatment plant O&M costs
	Regional Groundwater Banking	$200-$300	New / Or Existing Infrastructure	Potentially land intensive	Very effective, financial assistance through third party	Significant effort
Other Options	Water Reclamation	$300-$500	Retrofit of existing facilities	Minimal	Less effective due to treatment costs and public perception	Requires treatment plant O&M costs
	Agricultural Water Conservation	$200-$250	New Infrastructure	Minimal	Potentially effective	Significant effort
	Urban Water Conservation	$200-$250	New Infrastructure	Minimal	Potentially effective	Minimal
	Crop Rotation/Land Fallowing	~$50	None	Potentially land intensive	Potentially effective if mitigated	Minimal

Source: San Joaquin County Water Management Plan Volume I
Farmington Groundwater Recharge and Seasonal Habitat Study

ES-9 Groundwater Contamination

Groundwater contamination and the continued degradation of groundwater quality is a global threat to all groundwater users. The Authority recognizes that the long-term sustainability of the underlying Basin cannot be accomplished without adequate groundwater quality protection, contamination prevention, and remediation programs. The Authority has discussed the issue of managing groundwater protection and contamination programs in Eastern San Joaquin County. A major concern of the Authority is that undertaking regulatory oversight will only duplicate the existing efforts of other regulatory agencies while financially burdening the community beyond its abilities. Increased coordination with regulatory agencies and a concerted effort to ensure its activities do not degrade water quality is potentially less resource intensive for the Authority and a more efficient method of protecting groundwater quality throughout the Basin. The Authority will continue to lead the pursuit against saline groundwater intrusion.

The following policies reflect the Authority's desire to address groundwater contamination and groundwater quality degradation:

1. Coordinate with local, State, and Federal agencies to ensure the underlying Basin is adequately protected against groundwater contamination and to ensure all contaminated sites are documented and mitigated by the responsible parties.

2. Continue to manage efforts to combat saline groundwater intrusion.

3. Strive to improve groundwater quality when technically and economically feasible. Authority actions degrading groundwater quality are not acceptable.

4. Require recharge projects to identify and evaluate impacts to groundwater quality and the potential for mobilization of soil and source water contaminants.

5. Consider current and future water quality standards in the planning and design of projects identified in this Plan.

ES-10 Groundwater Monitoring and Science Program

Since 1971, the San Joaquin County Flood Control and Water Conservation District (County) initiated the collection and management of groundwater data and the production of semi-annual groundwater reports. Currently, the County is undertaking the development of a Web-based interactive tool in order to make groundwater data collected over the years available to the public over the internet. The tool has been coined the San Joaquin County Groundwater Data Center (GDC). The GDC would become the repository for groundwater data and would facilitate groundwater analysis essential to the groundwater management objectives of San Joaquin County. The GDC is not only a technical tool, but also a public outreach tool as well. Through the internet, water users including County and agency staff, industry professionals, decision makers, and the general public will have access to groundwater data and historic semi-annual reports.

The overall goals and objectives of the GDC are:

1. Create and maintain a working groundwater database for San Joaquin County.
2. Develop the tools necessary to analyze groundwater data.
3. Make groundwater information available to decision makers, agency staff, and the general public through the internet.

4. Create an efficient and enforceable QA/QC plan.
5. Utilize the proven and supported technologies in groundwater monitoring, database management, and Geographic Information Systems (GIS).

The Authority and its member agencies are co-participants with the United States Geological Survey (USGS) and California Department of Water Resources (DWR) for the Groundwater Recharge and Distribution of High-Chloride Groundwater from Wells Study (Study). The purpose of the study is to quantify the source, aerial extent, and vertical distribution of high-chloride groundwater and the sources, distribution, and rates of recharge to aquifers along selected flow paths in Eastern San Joaquin County. The information gained from the Study will answer many questions with respect to future water levels, water quality, and storage potential under current and future management of the Basin. The total cost of the study is $2,579,350. The proposed USGS contribution will be $625,000 over 5 fiscal years as well as an additional $625,000 from the DWR over the first 3 fiscal years. Member agencies within the Authority will contribute the remaining $1,322,350 over next 5 fiscal years.

In order to ensure that groundwater data is collected in a systematic and consistent manner, the Authority has adopted the Groundwater Monitoring Program Quality Assurance/Quality Control (QA/QC) Plan, prepared by MWH in 1998. The QA/QC Plan addresses the following items: monitoring and sampling preparations, sample collection procedures, chain-of-custody procedures, sample transport, laboratory procedures and methods, and data validation and reporting. The QA/QC Plan can be obtained at the San Joaquin County Department of Public Works Stormwater Management Division. A revised QA/QC plan proposed as part of the GDC is expected to be completed by the Spring of 2005 ad subsequently adopted by the Authority Board.

ES-11 Financing Options

The development of new water supplies and the necessary infrastructure is a major financial undertaking. It is absolutely necessary for the Authority and its member agencies to leverage as much support for outside funding. The Plan provides a general overview of the potential funding sources, programs, and project partnerships available to the Authority from federal, State, and local sources.

ES-12 Plan Governance

Water interests in San Joaquin County have historically been fragmented, but have realized that projects developed in a collaborative process have the potential to exhibit greater and more far reaching benefits to all involved parties while increasing its implementability and fundability. Implementation of the water management options can best be achieved by continuing to work in a collaborative fashion to develop a broad base of political and financial support. The Authority has explored numerous options concerning the appropriate organization and powers needed to implement the plan and the best management framework that addresses the concerns of the Authority member agencies. Although no changes have been formally proposed to the powers and governance structure, the Authority could consider revisions in the future.

The Authority has served as a regional planning body and a forum for member agencies to share their groundwater management efforts and ensure that those efforts do not detrimentally affect other member agencies. In order to avoid potential conflicts between Basin stakeholders, the Authority employs the following policies:

- **Expanded Membership:** The membership in the Authority is diverse as are the challenges facing water Eastern San Joaquin County. In 2001, the Central Delta Water Agency and the South Delta Water Agency became full contributing and voting member agencies to the Authority. Associate membership (ex-officio) was also extended to the California Water Service and the San Joaquin Farm Bureau Federation as their input and support is essential to the success of the Authority. Other members have been contemplated such as SSJID, OID, City of Lathrop, Manteca, Escalon, and Ripon, Calaveras County Water District, Stanislaus County, DWR, Freeport Regional Water Authority, and EBMUD.

- **Continued Use of the Authority as a Forum:** As the Authority looks to implement the Plan, the member agencies will move the outlined projects through the planning, permitting, and design stages and ultimately to construction. In a forum, implementing member agencies will be able to quantify the benefits of its projects to stakeholders and receive comments and suggestions before disputes arise.

- **Continued Facilitation by the California Center for Collaborative Policy:** The California Center for Collaborative Policy (Center) has been an integral part to the success of the Authority's consensus based process. The Center's presence has maintained an atmosphere conducive to openness, compromise, and agreement. It is expected that the Center will continue to facilitate Authority meetings and throughout the implementation of the Plan.

ES-13 Integrated Conjunctive Use Program

The Integrated Regional Conjunctive Use Program is the key element in fulfilling the purpose of the Plan to ensure the sustainability of Groundwater resources in Eastern San Joaquin County. The Program is an inventory of viable options available to stakeholders in Eastern San Joaquin County as described by major supply elements, major surface storage and conveyance elements, and groundwater recharge components. Supply elements are grouped by river system and are a combination of reallocations, new water, and transfers. Entitlements to water are supported by legal claims based on existing water right permits, water service contracts and agreements, and pending water right applications. Major surface storage and conveyance elements are considered existing or proposed regional infrastructure intended for the capture and delivery of substantial amounts of water when available. Groundwater recharge components include groundwater recharge infrastructure improvements programs, drinking water treatment facilities, and incentive based agency conjunctive use programs. Table ES-7 describes each of the Integrated Conjunctive Use Program components.

The opportunity for groundwater banking partnerships in Eastern San Joaquin County is considered a viable alternative that creates new water. Groundwater banking is supported regionally and Statewide as an alternative means to new highly-contentious on-stream reservoirs and costly desalinization plants. The underlying Basin has the potential to store over 1 million acre-feet in close proximity to the Delta. The opportunities possible are a logical match for regional and Statewide interests to look to the Authority for groundwater banking opportunities. It is paramount to the Authority that banking rates, extraction rates, and quantities remain under local control.

Table ES-7 Integrated Conjunctive Use Program Elements

Supply Source	Water Rights and Contracts	Storage/Conveyance	GW Recharge
American River	• 350 cfs diversion at Freeport from Dec. 1 to June 30 • Currently limited to 155 cfs by EBMUD's pipeline • (Average Annual Yield = 44,000 af)	• Proposed Duck Creek Reservoir • SJC Freeport Interconnect • Alliance Canal • Freeport Regional Water Project	• Farmington Program • GW Recharge and Conjunctive Use • ASR Wells • Third Party Banking and Conjunctive Use Partnerships
Mokelumne River	• 1000 cfs diversion to storage Dec. 1. to June 30 • 620 cfs direct diversion • (Average Annual Yield = 60,000 - 100,000 af) • 39,000 to 60,000 af to WID • 20,000 af to NSJWCD subject to others • (Average Annual Yield = 11,000 af)	• MORE WATER Project Tunnel and Pipeline • MORE WATER Project Lower River Diversions • Woodbridge Dam Replacement and Existing Canal System • Existing South System and North System Rehabilitation • NSJWCD - Bear Creek, Pixely Slough, Paddy Creek, Gill Creek • Alliance Canal	• Proposed Duck Creek • Lodi Recharge or use of 6,000 af transfer • Farmington Program • In-lieu and direct recharge by Districts • Third Party Banking and Conjunctive Use Partnerships • ASR Wells
Calaveras River	• 100,000 af 56.5% to SEWD and 43.5% to CCWD • By agreement, SEWD is allowed to utilize CCWD unused supply • 13,000 ac-ft riparian demand	• Peters Pipeline • Mormon Slough • Alliance Canal • South Gulch Reservoir	• Farmington Program • Treatment Plan Expansion - Urban In-lieu • In-lieu and direct recharge • SJAFCA and Other Storm Water Detention Ponds • Third Party Banking and Conjunctive Use Partnerships
Stanislaus River	• 155,000 af contract to SEWD/CSJWCD • 75,000 af interim to SEWD • 49,000 af firm and <31,000 ac-ft interim to CSJWCD • 320,000 af (In San Joaquin County) • 34,000 af (South County Project In-basin delivery) • 30,000 af transfer to SEWD	• Peters Pipeline • CSJWCD - Lone Tree, Duck Creek, Temple Creek, Littlejohns Creek • Alliance Canal • South County Water Supply Project	• Farmington Program • Treatment Plant Expansion • Lathrop, Manteca, and Escalon In-lieu • In-lieu and direct recharge • SJAFCA and Other Storm Water Detention Ponds • Third Party Banking and Conjunctive Use Partnerships
Littlejohns Creek and Rock Creek	• 250,000 af Dec. 1 to April 30 • 60,000 af direct diversion • 190,000 af to storage • (Average Annual Yield = 15,000 af)	• Farmington Canal • CSJWCD - Lone Tree, Duck Creek, Temple Creek, Littlejohns Creek • Alliance Canal • Farmington Canal to South Gulch • Lyons Dam Project	• Farmington Program • CSJWCD Surface Water Incentive Program • In-lieu and direct recharge by Districts • Third Party Banking and Conjunctive Use Partnerships • SJAFCA and SJCOG Storm Water Detention Ponds
Delta	• City of Stockton Delta Water Supply Project • Initially 20,000 af increasing to 125,900 af in 2050 • (Average Annual Yield = 60,000 af)	• Pipeline and Treatment Facility	• Stockton In-lieu and ASR Wells • Third Party Banking and Conjunctive Use Partnerships • Farmington Program

The San Joaquin Groundwater Export Ordinance (Export Ordinance) is purposefully and notoriously stringent in order to protect local groundwater users from groundwater exports. San Joaquin County Board of Supervisors has continually stated that they are willing to amend the Export Ordinance should a project be proposed that can demonstrate local benefits with minimal risk to losing local control of the Basin.

Banking partnerships could provide the Authority with capital to fund portions of Integrated Conjunctive Use Program envisioned above. Conceptually, the Authority could employ various arrangements for the ranging from water storage agreements, surface water transfers/groundwater substitution, and a 'two for one' storage/extraction concept. Potential partners that have shown interest are EBMUD, Metropolitan Water District of Southern California, DWR, CALFED Environmental Water Account, and the City of Tracy. Entities have purchased raw water from other groundwater banks throughout the State at rates upwards of $420/af.

ES-14 Plan Implementation

The Authority is committed to adopting a Plan implementation strategy that is adaptive and incentive driven. This Plan is the first step in the development of a regional document that details how the groundwater basin will be managed and initiates the process that will ultimately define the guidelines and conditions that water districts and others will follow to achieve basin management objectives. Following the adoption of this Plan, the Authority and its members will work to implement the management objectives. The objectives coupled with regular groundwater monitoring and the development of basin operations criteria will establish a framework and the foundational information for future groundwater banking and recharge project operations in the Basin.

To encourage the continued implementation of the Plan, the Authority will complete a periodic assessment of the progress, direction and recommendations regarding Plan objectives. Basin conditions are currently measured by groundwater level and quality monitoring on a semi-annual basis. This assessment activity will be coupled with the annual review of Plan implementation activities and project development in the basin.

To ensure that the Authority is constantly striving to better manage groundwater resources, the following actions will be undertaken:

1. An annual report by March 1st of each year that outlines the accomplishments of the previous year's groundwater management efforts and report the current state of the Basin,

2. A review of the political, institutional, social, or economic factors affecting groundwater management, and

3. Based on the information gained in the above actions, recommendations for any required amendments to the Plan.

ES-15 Future Activities

The adoption of the Plan is merely the beginning of a series of actions the Authority will undertake to help meet future basin demands. As such, many of the identified actions will likely evolve as the Authority takes a more active approach to manage the Basin and meet the outlined objectives. Many additional actions will also be identified in the annual summary report

described above. The Plan is therefore intended to be an iterative document, and it will be important to evaluate all of the actions and objectives over time to determine how well they are meeting the overall goal of the plan. The Authority plans to evaluate this entire plan within five years of adoption. In the immediate future, the Authority and its member agencies will undertake the following planned activities described below subsequent to the adoption of the Plan.

Integrated Conjunctive Use Program CEQA Review

The California Environmental Quality Act (CEQA) allows agencies to prepare a Programmatic Environmental Impact Report (EIR) for a proposed course of action. The Integrated Conjunctive Use Program is a grouping of stand alone projects that could have very different specific environmental impacts, but would also have to address many of the same global environmental impacts requiring disclosure under CEQA. The Program EIR will support the implementation of future site-specific projects by:

- Allowing proper consideration of broader scale impacts, alternatives, and mitigation criteria that would extremely difficult in individual site-specific project level EIR.
- Focusing on cumulative impacts and growth inducing impacts with the implementation of the Conjunctive Use Program.
- Addressing policy, design, and management issues at the program level rather than repeatedly considering them at the project level.
- Considering broad policy alternatives and programmatic mitigation measures at an early stage in the development of the Conjunctive Use Program when policy flexibility is greatest.
- Conserving resources and promoting consistency by encouraging the reuse of data.
- Providing the basis for National Environmental Policy Act (NEPA) review and Federal permitting approval processes should federal interest be established in the Conjunctive Use Program or any of the Program elements.

The Program EIR would also include a healthy technical appendix that would speak to the feasibility of specific project in the Conjunctive Use Program, demand management measures, and other policy alternatives. The Program EIR will also analyze the potential environmental effects of the Basin Management Objectives, assumptions and technical methods, policy alternatives to achieving identified objectives, broad-scale impacts, and establish mitigation criteria for the overall Plan. The Program EIR effort is expected to begin in 2005 and continue for 18 to 24 months

Basin Operations Criteria

Originally tied to the development of Basin Management Objectives, Basin Operations Criteria would set quantitative target groundwater levels and descriptive basin condition levels. Basin Operations Criteria could potentially consist of a series of groundwater levels that would correspond to basin condition levels (similar to the US EPA Air Quality Index and the US Department of Homeland Security Advisory System) to indicate the effectiveness of groundwater recharge programs and also potentially when and how much groundwater could be exported. The development of Basin Operations Criteria is a collaborative process that will be undertaken by the Authority immediately following the adoption of the Plan and is expected to be completed by summer 2005. Basin Operations Criteria developed with the framework of the Authority could ultimately provide the basis for a revised Export Ordinance and a new Groundwater Management Ordinance.

1 Introduction

1.1 Background

San Joaquin County is home to approximately 600,000 people and sustains a $1.34 billion agricultural economy. The population is expected to increase to approximately 1.1 million by 2030. Water demand in the county is approximately 1,600,000 acre feet per year, 60 percent of which is quenched by groundwater. The California Department of Water Resources (DWR) has declared the Eastern San Joaquin Groundwater Basin (Basin) "critically overdrafted," indicating that the current rate of groundwater pumping exceeds the rate of recharge and is not sustainable. (DWR, 1980) Based on the San Joaquin County Water Management Plan, the Basin is overdrafted by 150,000 af/yr on average. Long-term groundwater overdraft has lowered the groundwater table by 2 ft/yr in some areas to -70 ft (MSL) and has induced the intrusion of highly saline groundwater into the Basin from the west. Without mitigation, such intrusion will degrade portions of the Basin, rendering the groundwater unusable for municipal supply and irrigation.

Failure to address water supply and management needs in Eastern San Joaquin County will ultimately result in severe economic disruptions to the County. Agriculture in San Joaquin County, valued at $1.34 Billion, is already stressed due to declining market prices, rising regulatory, labor, and energy costs, and can ill afford threats to its water supply – a fundamental component of its continued existence. Municipal and industrial users simply must have reliable, high-quality supplies to exist. Loss of supplies to saline intrusion, potential loss of basin yield due to subsidence or simply lack of reliability will translate into business flight, job loss, loss of revenue for public services and general economic decline. Individual agencies in Eastern San Joaquin County have long grappled with declining groundwater levels and unreliable supplemental water supplies.

Conversely, long term overdraft has created opportunities for groundwater banking to the benefit of regional and statewide interest. Overuse of groundwater has depleted a substantial portion of stored groundwater in the Basin and has made available volume for potential regulatory storage. It is estimated that at least 1.2 million af, a volume equivalent to Folsom Lake, could be used to store wet year water for use in subsequent dry years. However, to do so would require the monumental task of overcoming the institutional, political, financial, and physical challenges of groundwater banking.

Independently, agencies in Eastern San Joaquin County have found it difficult to wield the political and financial power necessary to mitigate the conditions of overdraft. County interests have come to realize that a regional consensus based approach to water resources planning and conjunctive water management increases the chance for success. Regional planning efforts such as the San Joaquin County Water Management Plan (adopted by the County Board of Supervisors in October 2002) and the Mokelumne Aquifer Storage, Recovery Study (MARS Study), and the South County Surface Water Supply Project have proven successful ventures.

Since its formation in 2001, the Northeastern San Joaquin County Groundwater Banking Authority (Authority) has employed the consensus based approach in its goal to develop "…locally supported groundwater banking projects that improve water supply reliability in Northeastern San Joaquin County…and provide benefits to project participants and San Joaquin County as a whole." Collaboration amongst the Authority member agencies has strengthened the potential for broad public support for groundwater management activities as well as the ability to leverage local, State, and federal funds. Table 1-1 lists the member agencies of the Authority.

Table 1-1 Member Agencies of the Northeastern San Joaquin County Groundwater Banking Authority
City of Stockton
City of Lodi
Woodbridge Irrigation District
North San Joaquin Water Conservation District
Central San Joaquin Water Conservation District
Stockton East Water District
Central Delta Water Agency
South Delta Water Agency
San Joaquin County Flood Control and Water Conservation District
California Water Service Company*
San Joaquin Farm Bureau Federation*
* Associate Members

1.2 Purpose and Objectives

Over the past several years, the Authority has provided a consensus-based forum of local public water interests to work cooperatively with one voice to study, investigate, and plan locally supported groundwater banking and conjunctive use projects in the Eastern San Joaquin County. The Authority Board convenes monthly while the Authority Coordinating Committee meets twice a month on planning activities with cooperative assistance provided by the California State Department of Water Resources and the Center for Collaborative Policy.

San Joaquin County has made substantial progress related to water resource planning and continues to build on the momentum gained by local achievements in such endeavors through the Authority. In a report published by the Center for Collaborative Policy entitled, “Stakeholder Assessment for San Joaquin County – Conditions, Issues, and Options for Collaborative Solutions”, the report suggested a core group of issues fundamental to continuing a comprehensive approach to solving the water resource needs within the County. The report concluded that the keys to successful planning efforts include:

- Development of a common understanding of the operations of water sub-basins within the County and the necessity of conjunctive use to the health of these basins and the County’s economy in the future
- Use of consensus decision-making
- Grouping of members who are consistent in attendance, clear in communication, and conscientious in relaying information and views between their constituency and the group

One of the major activities the Authority has dedicated itself to this past year is the Groundwater Management Plan (Plan). The purpose of the Plan is to review, enhance, assess, and coordinate existing groundwater management policies and programs in Eastern San Joaquin County and to develop new policies and programs to ensure the long-term sustainability of groundwater resources in Eastern San Joaquin County. To better define the supporting values included with this Plan’s purpose, the Authority has listed the following mission values centered on the development of the Plan as outlined in Table 1-2.

Table 1-2 Groundwater Management Plan Mission Values for Success		
Be implemented in an equitable manner	Maintain or enhance the local economy	Protect groundwater and surface water quality
Be affordable	Minimize adverse impacts to entities within the County	Provide more reliable water supplies
Exhibit multiple benefits to local land owners and other participating agencies	Maintain overlying landowner and Local Agency control of the Groundwater Basin	Restore and maintain groundwater resources
Minimize adverse impacts to the environment	Protect the rights of overlying land owners	Increase amount of water put to beneficial use within San Joaquin County

In order to meet the purpose of the Plan and ensure the long-term sustainability of the Basin, the Authority created the following Plan objectives:

1. Maintain long-term sustainability of the Basin through the development of management objectives, practices and conjunctive use projects to benefit the social, economic and environmental viability of Eastern San Joaquin County.
2. Prevent further saline intrusion and degradation of groundwater quality throughout the Basin.
3. Increase understanding of Basin dynamics through the development of a sound research program to monitor, evaluate, and predict Basin conditions.
4. Maintain local control of the groundwater Basin through the responsible management of groundwater resources by overlying cities, counties, water districts, agencies, and landowners.
5. Formulate rational and attainable Basin management objectives to comply with SB 1938 and retain State funding eligibility.
6. Formulate voluntary policies, practices, and incentive programs to meet established Basin management objectives.
7. Formulate appropriate financing strategies for the implementation of the Plan.

1.3 Groundwater Management Area

San Joaquin County overlies the Eastern San Joaquin, Cosumnes, and Tracy Sub-basins of the greater San Joaquin Valley Groundwater Basin. The Eastern San Joaquin Sub-basin is bounded by the Mokelumne River to the north, the Stanislaus River to the south, the San Joaquin River to the west, and bedrock to the east. The Cosumnes Sub-Basin is defined by the Cosumnes River to the northwest, the Mokelumne River to the South, and bedrock to the east. Figure 1-1 depicts the groundwater sub-basins of San Joaquin County as described in DWR Draft Bulletin 118 Update 2003. For the purposes of the Plan, the Eastern San Joaquin County Groundwater Management Area (GMA), depicted in Figure 1-2, is defined as the portion of San Joaquin County overlying the Eastern San Joaquin and Cosumnes Sub-Basins.. Within the GMA, the member agencies of the Authority will implement the Plan within their respective boundaries. To ensure that every parcel in the GMA is represented, all unorganized areas will be included in the San Joaquin County Flood Control and Water Conservation District. Figure 1-3 depicts the member Agencies of the Authority and their respective boundaries within the GMA.

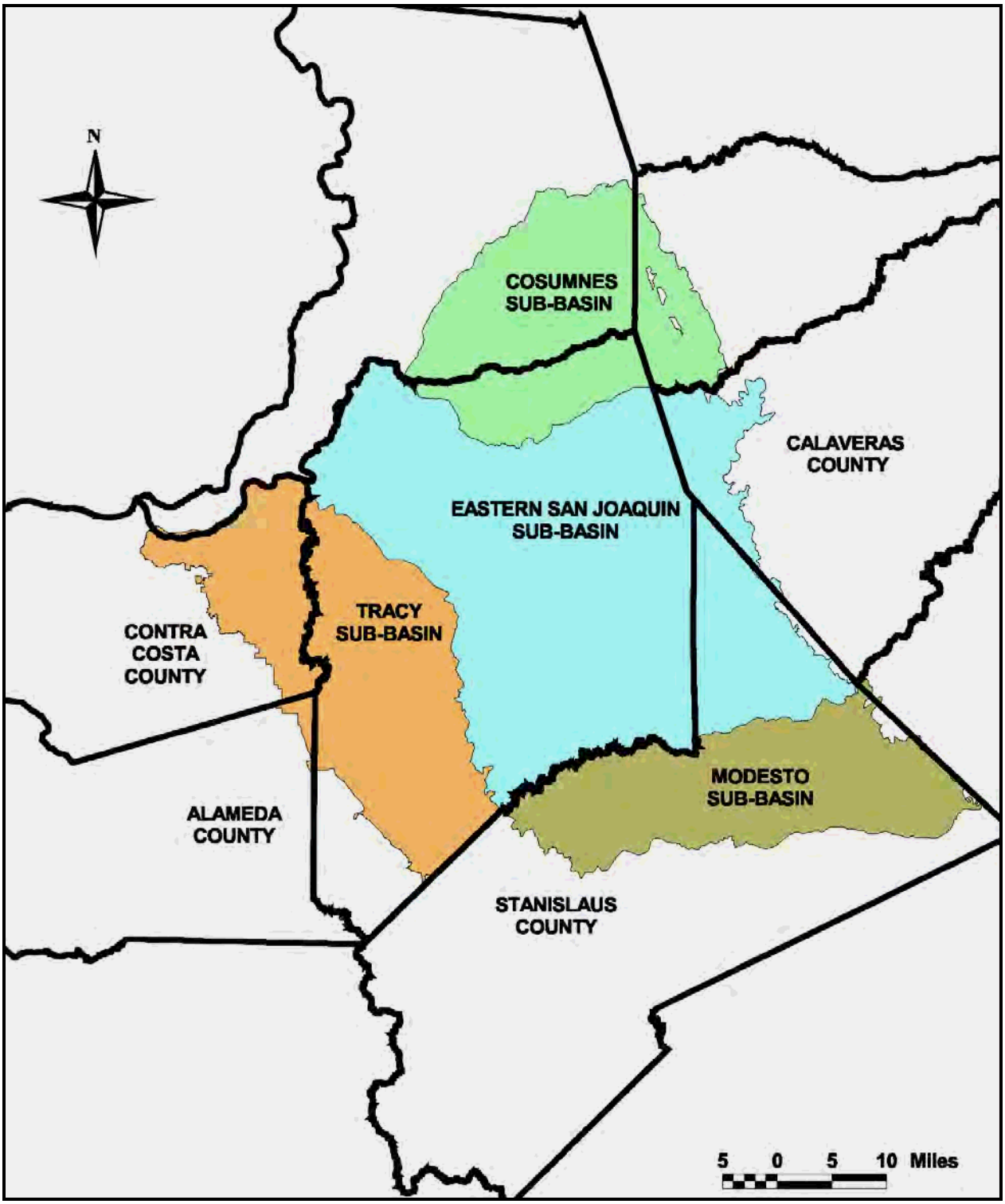


Figure 1-1 Groundwater Sub-Basins of San Joaquin County
Source: California Spatial Information Library at http://www.gis.ca.gov/

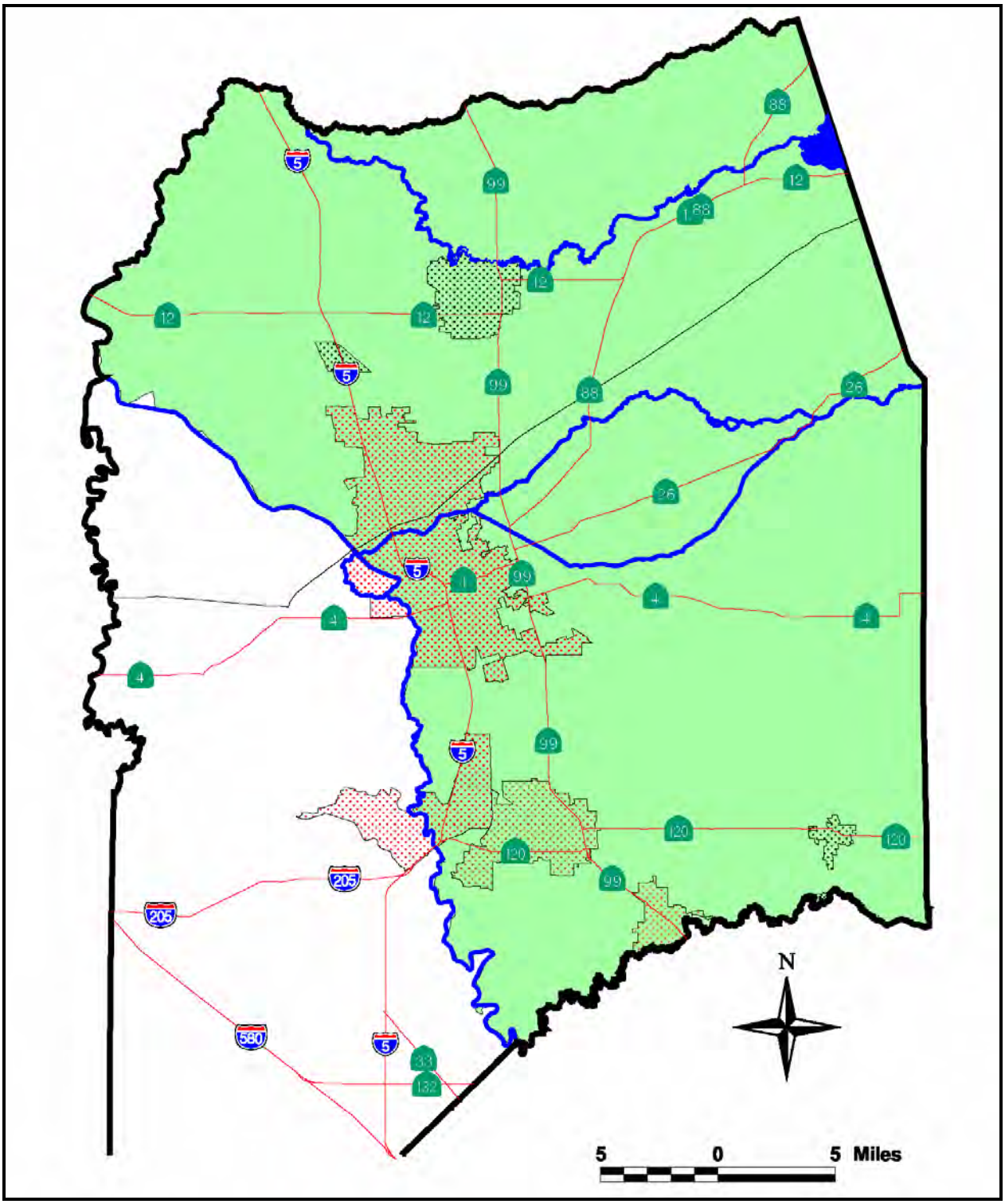


Figure 1-2 Groundwater Management Area
Source: California Spatial Information Library at http://www.gis.ca.gov/

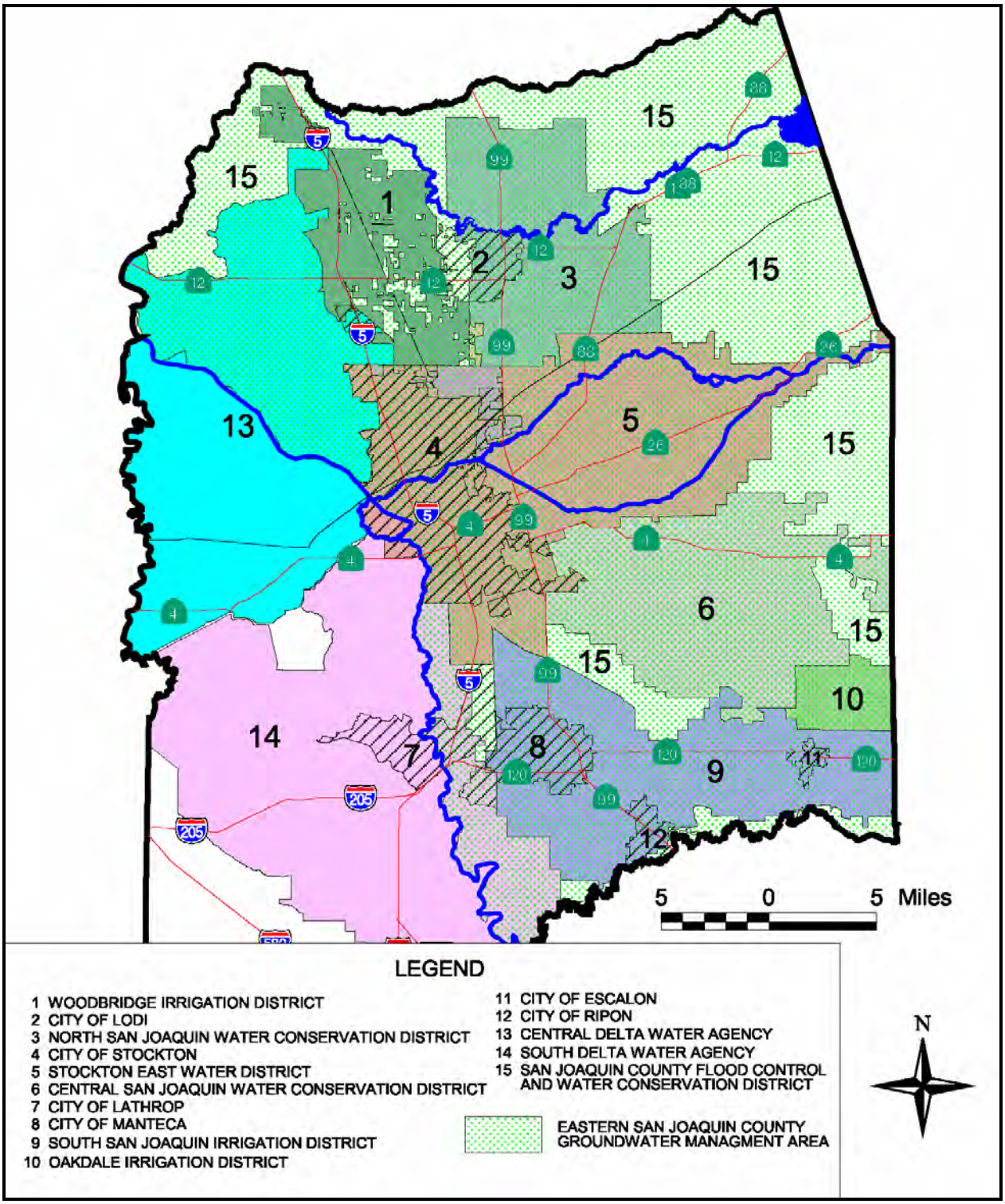


Figure 1-3 Overlying Agencies within the Groundwater Management Area
Source: California Spatial Information Library at http://www.gis.ca.gov/

1.4 Agency Participation

The physical boundaries of the Eastern San Joaquin and Cosumnes Sub-Basins extend beyond the political boundaries of San Joaquin County. Portions of Calaveras County and Stanislaus County overlie the Eastern San Joaquin Sub-basin. Recognizing the need for increased coordination between agencies outside of the GMA, in May 2003, the Authority invited a variety of interest groups from the business, environmental, agricultural, and political communities to participate in the development of the Plan. The Authority values the consensus based approach to groundwater management and strives to coordinate, integrate, and mutually benefit from the groundwater management efforts of its member agencies and those with vested interest in the social, economic, and environmental viability of Eastern San Joaquin County.

Throughout the planning process, the Authority's Coordinating Committee, a technical sub-group of the Authority, convened every 4th Wednesday of the Month to formulate the Plan. Key discussion points and decisions were debated and finalized by the Coordinating Committee and incorporated into the Plan by Authority Staff. Draft sections of the Plan were also presented to and commented on by the Coordinating Committee. The Authority Board of Directors was regularly updated on the activities of the Plan at their regular meetings on the 2nd Wednesday of the month. For the purpose of providing an atmosphere conducive to broad-based consensus building and compromise, Authority Coordinating Committee meetings were facilitated through the California Center for Collaborative Policy.

Attendees of these meetings include representatives from over 40 agencies and interest groups. Table 1-3 is a list of meeting attendees and agencies contributing to the Plan.

Table 1-3 Groundwater Management Planning Participants

Participant	Agency
Andy Christensen	Woodbridge Irrigation District
Cary Keaton	City of Lathrop
Dante Nomellini	Central Delta Water Agency
Dave Kamper	South San Joaquin Irrigation District
Ed Formosa	City of Stockton Municipal Utilities Department
Ed Steffani	North San Joaquin Water Conservation District
Gary Giovanetti	Stockton City Council
Joe Petersen	San Joaquin Farm Bureau Federation
John Herrick	South Delta Water Agency
Keith Conarroe	City of Manteca
Kevin Kauffman	Stockton East Water District
Larry Diamond	Calaveras County Water District
Loralee McGaughey	Stockton East Water District
Mark Lindseth	City of Lodi
Mark Madison	City of Stockton Municipal Utilities Department
Mel Lytle	San Joaquin County Public Works
Melvin Panizza	Stockton East Water District
Michael McGrew	San Joaquin County Counsel
Paul Risso	California Water Service Company
Ray Borges	San Joaquin County Environmental Health
Reid Roberts	Central San Joaquin Water Conservation District
Richard Prima	City of Lodi
Steve Stroud	South San Joaquin Irrigation District

Teresa Tanaka	Linden County Water District
Tom Flinn	San Joaquin County Public Works
Tom Gau	San Joaquin County Public Works
State Participants & Agencies	
Ann Jordan	Office of State Senator Charles Poochigan
Mary Bava	Office of Assemblyperson Barbara Matthews
Tim Parker	Department of Water Resources
Federal Participants & Agencies	
David Simpson	Natural Resource Conservation Service
Eric Reichard	US Geologic Survey
John Izbicki	US Geologic Survey
Patrick Dwyer	US Army Corps of Engineers
Other Participants & Agencies	
Barbara Williams	Sierra Club
Carolyn Ratto	California Center for Collaborative Policy
David Beard	Great Valley Center
Gerald Schwartz	East Bay Municipal Utility District
Gina Veronesc	Camp, Dresser, & McKee
James Cornellius	Calaveras County Water District
James Moore	Galt Economic Development Task Force
John Aud	Stanislaus County
Larry Diamond	Calaveras County Water District
Mark Williamson	Saracino-Kirby-Snow
Robert Vince	Camp, Dresser, & McKee
Ron Addington	Business Council, Inc.

The Authority will continue to seek the input of its neighbors and interest groups during the implementation of the Groundwater Management Plan and any future planning efforts.

1.5 Consistency with Water Code Section 10750 *et. seq.*

Groundwater management is the planned and coordinated effort to sustain or improve the health of a groundwater basin in order to meet the future water supply needs of groundwater users. With the passage of Assembly Bill (AB) 3030 in 1992, local water agencies were provided a systematic way of formulating groundwater management plans and a means to implement those plans through fees and assessments. AB 3030 also encourages coordination between local entities through joint power authorities or memorandums of understanding.

In 2002, the passage of Senate Bill (SB) 1938 further emphasized the need for groundwater management in California. SB 1938 requires AB 3030 groundwater management plans to contain specific plan components in order to receive state funding for water projects. Table 1-4 illustrates the recommended components of a groundwater management plan as outlined in AB 3030 and the required sections under SB 1938.

On July 9, 2003, the Authority Board of Directors held a public hearing to initiate the formulation of this Plan. The hearing was formally noticed per Water Code Section 10750 et. seq. and a Resolution of Intent to Prepare a Groundwater Management Plan was adopted by the Authority Board of Directors. Table 1-4 also indexes the sections of this Plan where the recommended or required AB 3030/SB 1938 components are addressed.

Table 1-4 Components of a Groundwater Management Plan			
Plan Component	**Recommended by AB 3030**	**Required by SB 1938**	**Plan Sections**
Control of saline water intrusion	X		2, 3, 4, 5, 8
Management of wellhead protection and recharge areas	X		4
Regulation of contaminated groundwater	X		4
The administration of a well abandonment	X		4
Elimination of groundwater overdraft	X		2, 3, 4, 5, 8
Replenishment of groundwater	X		2, 3, 4, 8
Groundwater monitoring	X	X	5
Operation of a conjunctive water management system	X		3, 8
Well construction standards	X		4
Financing groundwater management projects	X		6, 7
The development of groundwater management partnerships	X		1, 4, 7, 8
Coordination of land use planning and groundwater management	X		4
Description of participation by interested parties		X	1, 7
Plan to involve agencies overlying the basin		X	1, 7
Basin Management Objectives		X	3
Basin management entity and area map		X	1
Sources: California Department of Water Resources Division of Planning and Local Assistance http://wwwdpla.water.ca.gov/cgi-bin/supply/gw/management/hq/ab3030/main.pl California Department of Water Resources Draft 2003 Update Bulletin 118			

1.6 Current Groundwater Management Efforts

To ensure that groundwater management efforts are not duplicated or conflicting, the Authority has reviewed existing groundwater and urban water management plans of member agencies, which are attached in the Technical Appendix.

1.6.1 Overview of Existing Groundwater Management Plans

Woodbridge Irrigation District – The Woodbridge Irrigation District (WID), organized in 1924 under the California Irrigation District Act, holds extensive water rights to Mokelumne River Water dating back to the mid-1880s. The boundaries of WID encompass a gross area of approximately 42,900 acres., however, WID is discontinuous resulting in patches of non-district lands within the its boundary. WID overlaps with the North San Joaquin Water Conservation District (NSJWCD), Stockton East Water District (SEWD), and the City of Lodi.

In 1996, WID adopted an AB 3030 Groundwater Management Plan for the purpose of ensuring that groundwater levels would continue to supplement surface water supplies in order to meet the demands of the District. WID's goal for conjunctive use is to maximize the use of surface water for the protection of the underground water supply. WID was also a member agency of the East San Joaquin Parties Joint Powers Authority, a predecessor to the Authority.

WID owns and operates the aging Woodbridge Diversion Dam located on the Lower Mokelumne River northeast of Lodi and an extensive canal system serving approximately 13,000 acres. Due to the deterioration and age of the Woodbridge Diversion Dam, WID has worked very hard to obtain the necessary approvals for its replacement. Through WID's conservation efforts to convert to drip irrigation, WID has made available up to 6,000 af/yr to the City of Lodi at a cost of $200/af. WID intends to use the proceeds of the water purchase agreement to finance the current construction activities to replace the Woodbridge Diversion

Dam in order to continue to fully utilize its right to Mokelumne River water and meet the goals of their AB 3030 Plan. Also at the regional level, WID has participated as a member agency of the East San Joaquin Parties Water Authority (ESJPWA) and the Authority.

North San Joaquin Water Conservation District – The North San Joaquin Water Conservation District (NSJWCD), organized in 1948 under provisions of the Water Conservation District Act of 1931, includes approximately 53,100 acres east of the City of Lodi. Approximately 4,740 acres are within the Lodi city limits and 5,600 acres are within Lodi's sphere of influence. NSJWCD straddles the Mokelumne River and is consequently located in both the Cosumnes and the Eastern San Joaquin sub-basins as defined by the DWR Draft Bulletin 118.

In 1996 NSJWCD adopted an AB 3030 Plan to address declining groundwater levels, degradation of groundwater quality, and securing reliable surface water supplies. Actions in their AB 3030 Plan include the continued effort to seek a reliable supplemental water supply from the Mokelumne River and other sources, promotion of more efficient water application methods, participation in regional groundwater management efforts, and the maximum use of surface water supplies through the development of groundwater recharge facilities.

On July 3, 1956, Decision 858 of the California State Engineer predecessor to the State Water Resources Control Board (D-858) denied NSJWCD a water right permit to divert up to 50,000 af/yr and instead approved East Bay Municipal Utility District's (EBMUD) request to appropriate an amount greater than the request of NSJWCD. A temporary permit was issued to NSJWCD for interim water based on EBMUD's unused entitlements and future demands, but could only be diverted from December 1 to July 1. Through an agreement between both parties, EBMUD stores up to 20,000 acre-feet in the wettest years for delivery to NSJWCD during the irrigation season. The permit expired in 2002.

In order to renew the permit, NSJWCD must show the SWRCB that it can put the water to beneficial use. NSJWCD has received a $462,500 CALFED grant and has participated in the Farmington Groundwater Recharge and Seasonal Habitat Study to demonstrate their ability to utilize its full appropriation. Property owners within NSJWCD have also approved an assessment to levy up to $5/acre to further the recharge effort. NSJWCD continues to seek resolution to D-858 through requests to the SWRCB to consider a reallocation of 50,000af/yr of Mokelumne River Water from EBMUD to the District.

At the regional level, NSJWCD has participated as a member agency of the ESJPWA, the Eastern Water Alliance, and the Authority.

Stockton East Water District – The Stockton East Water District (SEWD), as currently structured, was formed in 1948 under the 1931 Water Conservation Act of the State of California. The SEWD was originally organized as the Stockton and East San Joaquin Water Conservation District, an independent political subdivision responsible for acquiring a supplemental water supply and assisting in the development of practices of water use that would promote the required balance between surface water and groundwater.

From 1948 to 1963, SEWD's efforts were in planning, evaluating groundwater conditions and determining requirements for supplemental water. As a result of the SEWD planning and with intensive efforts of part of the SEWD and local agencies, New Hogan Dam was constructed in 1964. The SEWD's first supply of supplemental surface water was contracted with the USBR in

1964 and a final agreement in 1970 guaranteeing 56.5% of New Hogan Reservoir's yield to the District.

Prior to 1963, the SEWD's basic financial structure rested upon a tax on land. In 1963, the Governor of California signed a bill that established groundwater use fees and surface water charges that could be levied by the SEWD. The additional revenues were used by the SEWD to contract for New Hogan water. The SEWD began registering wells within their boundaries. Check dams were built on the Calaveras River, Mormon and Mosher Sloughs for control of surface irrigation water and to promote groundwater recharge. SEWD became actively involved in the pursuit of projects to mitigate declining groundwater levels and to prevent the further intrusion of saline groundwater.

In 1971, SEWD boundaries were expanded to include the entire Stockton urban area. SEWD began plans for a 30 MGD treatment plant to serve the urban area. In 1975, a $25 million bond issue was passed by the SEWD wide election to fund the water treatment plant. The plant was completed in 1977 and went on line in 1978 to reduce the groundwater pumping depression under the urban area and the affects of saline intrusion on urban wells near the Delta. In 1979 the Independent Benefit Commission concluded that the treatment plant was a benefit to the planning areas. SEWD began to assess 14,000 af of additional agricultural acres. The total area within SEWD is approximately 116,300 acres, of which 47,600 acres (approximately 41%) are within the City of Stockton. WID and SEWD share approximately 9,700 acres in North Stockton.

SEWD has actively sought supplemental surface water from the American River via the Folsom South Canal and from the New Melones Reservoir. Efforts to obtain the American River supply have been thwarted by the Environmental Defense Fund (EDF), EBMUD litigation and the Freeport Regional Diversion Project litigation. The District and Central San Joaquin Water Conservation District (CSJWCD) contracted with the USBR in 1983 for 75,000 and 80,000 af of water respectively from New Melones Reservoir. In 1983, the District expanded surface water irrigation with the construction of the 12,000 gpm Potter Creek Pump Facility.

The Water Treatment Plant capacity was increased in 1991 to accommodate increased demand from the Stockton Urban areas. Construction on the New Melones Conveyance System was completed in 1994. Under the Central Valley Project Improvement Act (CVPIA), the USBR provided no water to SEWD in 1993 and 1994. In 1995 SEWD began receiving New Melones water, but less than the contracted amount because of the Miller-Bradely bill requirements regarding water quality issues on the San Joaquin River and fish flows. Legal action is ongoing.

Under current USBR operation of New Melones, SEWD and CSJWCD are provided up to 90,000 af water from New Melones annually. Water allocation is based on March-September water forecast plus February end-of-month storage in New Melones.

In 1995, SEWD adopted an AB3030 Groundwater Management Plan. The goal of their Plan is to continue past efforts to seek supplemental surface water supplies for conjunctive use, to protect existing supplies, and to further pressure the USBR to meet the contracted delivery amounts for New Melones water.

In 1997, the District entered into a water transfer agreement with Oakdale Irrigation District (OID) and South San Joaquin Irrigation District (SSJID). This agreement is for 8,000 to 30,000 af allocation based on New Melones storage and inflow as of April 1 of each year. The contract period ends 2009 with a possible 10-year renewal pending further studies.

SEWD completed the Farmington Groundwater Recharge and Seasonal Habitat Study (Farmington Study) in conjunction with the United States Army Corps of Engineers and other local agencies in 2001. The Farmington Study identified areas suitable for recharge and seasonal habitat development, evaluated recharge techniques, conducted pilot recharge tests, developed a final report and recharge guide, and developed an implementation strategy for the phased Farmington Program.

In 2003, SEWD completed the Pilot Phase of the Farmington Program, which consists of 60 acres of recharge ponds and fields adjacent to the SEWD Water Treatment Plant. The Demonstration Phase beginning in 2003 will investigate and construct up to 1,200 acres of recharge ponds and fields.

In 2003, SEWD applied for a Proposition 13 Groundwater Recharge Storage Construction Grant for the Peters Pipeline portion of the Farmington Program. The proposed project consists of a six-mile long 60-inch diameter pipeline, which will distribute irrigation and recharge water as well as water to the SEWD Water Treatment Plant.

At the regional level, SEWD has participated as a member agency of the Eastern Water Alliance and the Authority.

Central San Joaquin Water Conservation District – The CSJWCD was formed in 1959 under provisions of the California Water Conservation Act of 1931. The CSJWCD includes approximately 65,100 acres, of which 670 acres are within the sphere of influence for the City of Stockton.

CSJWCD has not adopted formally an AB 3030 Plan, however, in 1997, to mitigate declining groundwater levels, the District participated in the Goodwin Tunnel Project for the use of New Melones water subject to the contract with the USBR. The contract amount calls for 49,000 af/yr of firm yield and up to an additional 31,000 af/yr on an interim basis to the District. Under the existing New Melones Reservoir operations plan, the contracted amount has never been fully delivered. Irrigation facilities have been installed and operated by individual landowners through a surface water incentive program sponsored by the District.

At the regional level, CSJWCD has participated as a member agency of the Eastern Water Alliance and the Authority.

South San Joaquin Irrigation District – Formed in 1909 under the Irrigation District Act, SSJID comprises about 72,000 acres in the southeastern portion of San Joaquin County, all of which is located within the Basin. The cities of Manteca, Ripon and Escalon comprise approximately 10,000 acres of the District area. SSJID is allocated half of 600,000 af/yr from the Stanislaus River with the other half going to Oakdale Irrigation District. SSJID owns and operates an extensive system of conveyance structures and canals.

Adopted in 1993, the Plan outlines the efforts of the district to maintain groundwater levels and continue to utilize its surface water entitlements. As part of the plan, SSJID began regularly monitoring their irrigation wells for water quality. Before the Plan, only the municipal wells used for drinking water supply were tested because of Health Department requirements. SSJID also uses agricultural sites during the off-season for recharge and plans to implement recharge and wellhead protection areas to safeguard groundwater quality.

The estimated safe yield of the Basin within the entire District is 72,000 af/yr. Municipal usage, particularly within the City of is about 2½ times the safe yield. Based on data from 32 wells in the District, the groundwater levels have decreased between 20 to 30 feet in the last 40 years. To address the water supply needs of the urban areas of the District and the Region, SSJID will begin in 2005 the delivery of up to 44,000 af/yr of treated surface water from Woodward Reservoir to the Cities of Escalon, Manteca, Lathrop, and Tracy. The net benefit to the Basin is expected to be approximately 30,000 af/yr. SSJID and OID also provide water to the City of Stockton through a 10-year transfer agreement for up to 30,000 af/yr of New Melones Water.

Oakdale Irrigation District – Formed in 1909 under the Irrigation District Act, OID comprises about 72,345 acres mostly in the northern portion of Stanislaus County with about 12% overlying the Eastern San Joaquin Sub-basin. With the adoption of a Plan in 1995, OID has taken a proactive approach to preventing groundwater contamination from abandoned wells by educating property owners and improving enforcement policies. OID has also developed guidelines for a wellhead protection program. Flood irrigation practices in OID have helped to recharge the Basin. As stated above, SSJID and OID provide water to the City of Stockton through a 10-year transfer agreement for up to 30,000 af/yr of New Melones Water.

1.6.2 Overview of Existing Urban Water Management Plans

City of Lodi – The City of Lodi is located northeast of Stockton, along Highway 99. According to the 2001 City of Lodi Urban Water Management Plan, 24 wells provide a population of 57,935 with water from the Basin. In 1999, City of Lodi wells produced 16,587 af with a projected 2020 demand of 22,727 af assuming a 1.5 percent constant growth rate. Since 1977, the City of Lodi has enforced stringent water conservation programs and is considering implementing other economically feasible Best Management Practices (BMPs). BMPs considered include Large Landscape Conservation Programs and Incentives, Commercial, Industrial and Institutional Conservation Programs, Residential Ultra Low Flush Toilet Rebate Programs, and Water Metering.

The City of Lodi's future water use projections indicate that groundwater in the area should be sufficient to meet the City's needs over the next 20 years. However, they have recognized that groundwater levels are declining, and have participated in the East San Joaquin Parties Water Authority to discuss and be a party to solutions. In 2003, the City of Lodi approved a 40-year agreement with WID for the purchase of 6,000 af/yr of Mokelumne River Water. The City is currently considering various methods to utilize the water either through direct recharge, injection, or treatment to potable standards.

Stockton East Water District – The mission of SEWD was established by the legislature when the District was created and to insure proper management of the Basin and provide supplemental water supplies. In accordance with its mission, SEWD wholesales drinking water to the City of Stockton, Cal Water, and San Joaquin County. By contract, the District delivers a minimum of 20,000 af/yr. From 1992 to 2002, the District delivered 439,048 af of treated water or about 40,000 af/yr to these urban contractors. As a wholesaler, SEWD has no authority over mandatory prohibitions on water use for the Stockton Urban Area.

City of Stockton – The City of Stockton has a population of approximately 243,700 and has three water suppliers to serve the area: City of Stockton Municipal Utility District (Stockton MUD) (38,300 connections); California Water Service Company (42,250 connections within the city, 10,950 outside of city limits); and County of San Joaquin (2,387 unmetered connections through County Maintenance Districts). The Stockton MUD service area generally

encompasses north of the Calaveras River, however, the City also serves areas in South Stockton.

The Stockton MUD has 22 wells in North Stockton and seven wells in South Stockton providing groundwater to its customers. SEWD also provides surface water to the three suppliers. Approximately 45% of the Stockton MUD's water deliveries come from groundwater, and 55% is treated surface water from SEWD. Saline intrusion in the Stockton area is a continual concern even with surface water deliveries from SEWD to offset some pumping.

Adopted in 2000, the City of Stockton Urban Water Management Plan outlines numerous demand management measures (DMM) to promote conservation including an extensive water conservation education program. The Stockton Area Water Suppliers (SAWS) which includes SEWD, Stockton MUD, San Joaquin County, and Calwater, coordinates monthly to oversee implementation of the conservation education program. SAWS has sponsored the award winning Sally-Save-Water campaign since 1990. The Sally-Save-Water campaign actively promotes water conservation through school visits, television advertisements, educational videos, posters and handouts. The campaign has also been recognized for its achievements by receiving a San Joaquin County Council of Governments Regional Excellence Awards. SAWS is also active in the promotion of the statewide declaration of May as Water Awareness Month.

Projected growth of the City of Stockton is expected to increase from its 2000 demand of 68,000 af/yr to the 2015 General Plan build out demand of 85,330 af/yr and ultimately to 177,900af/yr in 2050. In order to address the increase in demand, the City of Stockton is currently working to perfect a water right application for a Delta water supply. Citing Water Code Section 1485 and the watershed of origin priority, the City seeks to secure up to 125,900 af/yr from the Delta to the urban area. The Delta Water Supply Project is a major component in the efforts of the Authority to restore the health of the Basin.

California Water Service Company (Associate Member of the Authority) – The California Water Service Company (Calwater) serves approximately 42,250 connections within the City of Stockton primarily south of the Calaveras River as well as 10,950 beyond the City limits. Calwater is contracted to receive 50% to 55% of SEWD treated water deliveries and supplements the supply with 34 active wells.

In 2001, an Urban Water Management Plan was adopted for the Stockton District Calwater service area. Calwater actively participates in the conservation activities of the SAWS and has implemented an ultra low flush toilet rebate program and a plumbing retrofit program. Calwater participated in the activities of the East San Joaquin Parties Water Authority and have been contributing Associate Member of the Authority. Calwater is limited in its financial participation to the Authority because it is an investor owned public utility and is stringently regulated by the California Public Utilities Commission.

City of Manteca – The City of Manteca straddles State Route 99 south of Stockton. According to the 2002 City of Manteca Urban Water Management Plan, 16 wells provide groundwater to a population of approximately 50,000 with more wells planned for construction. Manteca is currently entirely dependant on groundwater to for its municipal and industrial needs. Since 1998, the City has implemented the following BMPs: Large Landscape Conservation Programs and Incentives, Commercial, Industrial, and Institutional Conservation Programs, Residential Water Audits, Water Metering, Residential Plumbing Retrofit, Public Information and Education Programs, Conservation Coordinator, Conservation Pricing, and Water Waste Prohibition. Up

to 3.65 MGD of reclaimed waste water is applied to fodder crops on City owned and leased lands.

The City of Manteca is expected to grow to over 130,000 by 2025. Recognizing the need for a reliable water supply to meet the demands of growth, the City of Manteca will participate with SSJID in the South County Surface Water Supply Project. At build out in 2025, the City will receive up to 18,500 af/yr of high quality water from the Project.

City of Ripon – The city of Ripon is located at the southern edge of the county along State Route 99. The population in 2002 was approximately 11,500 and is expected to grow to 29,900 by 2020. All of the city's potable water is provided by groundwater wells supplying 4,565 af in 2002, and this is estimated to increase to 12,310 af in 2020 in the 2003 City of Ripon Urban Water Management Plan. In 2002, 1,400 af of non-potable water was supplied by city groundwater wells, and 500 af of non-potable water was supplied with SSJID contracted surface water. In 2020, the city's non-potable wells are expected to supply the same amount of water, and the SSJID's contract is expected to increase to 5,080 af. The plan also anticipates 960 af of non-potable groundwater supplied by Nestle in 2020.

The City of Ripon Urban Water Management Plan contains 14 demand management measures (DMM) to promote conservation. A few of these are interior and exterior water audits for single family and multi-family customers, large landscape conservation programs and incentives, school education, and water waste prohibition.

City of Lathrop – Information not received prior to release of Plan.

City of Escalon – Information not received prior to release of Plan.

1.6.3 Overview of Groundwater Management by San Joaquin County

East San Joaquin Parties Water Authority – In 1995, County water interests facilitated the ESJPWA to conceive and implement a joint conjunctive use and groundwater banking project with EBMUD. Several alternatives were developed and explored with the goal of implementing the Mokelumne Aquifer Recharge and Storage Project (MARS). In wet years, supplemental surface water obtained would be used by County interest in-lieu of groundwater or be actively recharged using various methods. In dry years, EBMUD would be allowed to extract and export from the Basin a portion of the recoverable supply for use in the EBMUD service area.

In order to technically support the concept of aquifer storage and recovery, the ESJPWA undertook the Beckman Injection/Extraction Study (Beckman Study). The Beckman Study involved the injection of water from EBMUD's Mokelumne River entitlement via the Mokelumne Aqueduct and subsequent monitoring. The Beckman Study provided insight into the Groundwater Basin's ability to accept injected water. The Beckman Study concluded that the migration of injected water is attributed to many factors including seasonal hydrogeology, regional pumping patterns, and prevailing groundwater gradients. In 2002, the Authority continued the work of the ESJPWA and completed the Beckman Test Final Report. The Report concluded water injected at the site remained in the general vicinity. Further studies are needed to evaluate long-term storage and the overall recoverability of injected water from the underlying aquifer. Further analysis has concluded that the test area is suitable for recharge and that the recoverability of injected water is high.

Northeastern San Joaquin County Groundwater Banking Authority – Organized in 2001, the Authority has provided a consensus-based forum to local, State, and federal water interests to work cooperatively with one voice to study, investigate, plan, and develop locally supported groundwater banking and conjunctive use projects in Northeastern San Joaquin County.

The System Plan, completed in 2002, outlined specific groundwater recharge options into a conjunctive water management system with the capability of recharging up to 300,000 af/yr. Projects in the System Plan included the Freeport Interconnect Project, the Farmington Groundwater Recharge and Seasonal Habitat Project, the City of Stockton Delta Diversion Project and direct groundwater recharge through well injection and seasonal field flooding. Potentially new water supplies may come from surplus flows on the American River, Mokelumne River, Calaveras River, Littlejohns Creek, Stanislaus River, and the Delta.

Also in 2002, the Authority continued the work of the ESJPWA and completed the Beckman Test Final Report. The Report concluded water injected at the site remained in the general vicinity and that the test area exhibited a high degree of injected water recoverability. Further studies are needed to evaluate long-term storage and the overall recoverability of injected water from the underlying aquifer.

For over 30 years, the EBMUD and Sacramento County Water interests have fought over the future of the American River. In 2000, the parties agreed to a joint project whereby Sacramento interests and EBMUD would receive American River water on the Sacramento River near the town of Freeport. The project, coined the Freeport Regional Water Project, is expected to deliver water to the Mokelumne Aqueducts in Northeast San Joaquin County by 2008. The EBMUD is only allowed to receive American River water in the driest 35 percent of all years. In the remaining years, San Joaquin County could divert a significant amount of water through the Freeport Project. The Authority is currently in discussions with EBMUD on the development of the San Joaquin County Freeport Interconnect, a proposed interconnecting pipeline project, which would take advantage of this opportunity. Thus far, the Authority has commissioned a water availability analysis to determine the feasibility of amending a County water right application on the American River to coincide with the Freeport Project.

County Groundwater Export Ordinance – In 2000, the Board of Supervisors adopted the Groundwater Export Ordinance to prevent the deliberate export of groundwater for use outside of the County and condition the extraction of banked groundwater by out-of-County partners without a permit. The Export Ordinance requires stringent monitoring and extraction protocols deemed necessary to protect adjacent landowners and underlying basin from adverse impacts. Ordinance Authority does not extend into the incorporated city limits of the County's municipalities. The Board of Supervisors has in the past indicated that a more workable form of the Groundwater Export Ordinance is possible should stakeholders propose changes in the context of a workable project.

San Joaquin County Water Management Plan – Adopted in 2002, the San Joaquin County Flood Control and Water Conservation District facilitated the development of the San Joaquin County Water Management Plan. Over the course of almost two-years, stakeholders representing over 30 water interests, have met to synthesize a plan that addresses overdraft conditions in the Basin, prevent further degradation of groundwater quality due to saline water intrusion, increases water supply reliability, meets the projected year 2030 County water demand, identifies viable water supply and recharge options, identifies the institutional structure to implement the options. Since the Water Management Plan's adoption, the County has

continued to promote the goals of the Plan through the support of other agencies, the facilitation of the Advisory Water Commission and the Authority.

San Joaquin County Groundwater Monitoring Program – Since 1971, the San Joaquin County Flood Control and Water Conservation District has monitored groundwater levels and groundwater quality on a semi-annual basis. Over 300 wells are sampled by the District, and data from an additional 200 wells are incorporated into the groundwater level database. Groundwater levels are published in both the spring and fall reports. Groundwater quality data is collected once a year in the fall months for publication in the Fall Groundwater Report.

In 2000, the County completed an evaluation of the existing groundwater monitoring program in order to identify its adequacy. The evaluation concluded that the groundwater monitoring program is relatively adequate for groundwater levels, but does not collect enough saline water intrusion data. The recommendation was to increase the groundwater quality monitoring effort and perform an extensive hydrogeologic investigation of the Groundwater Basin in the region of the saline front. In 2002, the County worked with the DWR to drill two multiple depth well clusters in the City of Stockton along the projected saline front. Additionally, a joint study with the US Geologic Survey, the DWR, and member agencies of the Authority could further the efforts to better understand saline groundwater intrusion and the overall hydrogeology of the Basin.

Mokelumne River Water Right Applications – In 1990, the Mokelumne River Water and Power Authority (MRWPA) filed with the State Water Resources Control Board (SWRCB) Water Right applications for unappropriated wet year flows on the Mokelumne River and obtained a Federal Energy Regulatory Commission (FERC) Preliminary Permit to further study the associated power generation potential. The application sought to capture water behind a new on-stream dam located at Middle Bar upstream of Pardee Reservoir or at a site off-stream at the proposed Duck Creek Reservoir. The Application also included the ability for County interest to divert wet year flows off of the Lower Mokelumne River from Camanche Dam to Interstate 5.

In 2003, the MRWPA retained the services of HDR Engineering, Inc. to move forward the Mokelumne River Regional Water Storage and Conjunctive Use Project (MORE WATER Project) and prepare the necessary environmental documentation to perfect the water right applications and obtain all necessary permissions. The MORE WATER Project could potentially bring 60,000 – 100,000 af/yr to the Basin.

American River Water Right Applications – In 1990, the County also filed an application for unappropriated flows on the American River. The Application seeks to divert and store water between December 1 and June 30 from Nimbus Dam via the Folsom South Canal on the Lower American River and from the South Fork of the American River via a series of proposed pipelines and reservoirs. The County has amended its application in order to divert American River water from the Sacramento River at Freeport as well. The size of the Freeport diversion limits the amount of potential water delivered San Joaquin County under the amended application. The potential annual average yield to the County using the Freeport Project capacity is estimated at 44,000 af/yr.

1.6.4 Overview of Groundwater Management Outside the GMA

Calaveras County Water District – Calaveras County Water District's (CCWD) boundaries coincide with the boundaries of Calaveras County. Approximately 70 square miles of the Camanche and Valley Springs areas in Calaveras County overly the Eastern San Joaquin Groundwater Sub-basin. In 2001, CCWD adopted an AB 3030 Groundwater Management Plan

specifically for the Camanche Valley Springs area. The goals and objectives of the Plan are to develop a better understanding of the Basin dynamic and the establishment of a groundwater management program that will ensure the sustainability of the Basin. CCWD coordinates closely with numerous local, State, and Federal agencies as well as SEWD and EBMUD.

East Bay Municipal Utility District – EBMUD provides water and wastewater services to over 1.2 million customers east of the San Francisco Bay Area in Alameda and Contra Costa Counties. EBMUD owns and operates two major reservoirs on the Mokelumne River: Pardee and Camanche Reservoirs. Pardee Reservoir, built in 1929, is the primary source of drinking water for EBMUD. Camanche Reservoir, completed in 1969, is a multipurpose reservoir serving a variety of interests on the Lower Mokelumne River including WID's water rights, in-stream flow requirements, and recreation.

In times of severe drought, Pardee and Camanche cannot meet the needs of all of its down stream requirements and its customers. For a number of years, EBMUD and ESJPWA studied the possibility of a large scale conjunctive use project in Eastern San Joaquin County beneficial to both parties. A combined project has not yet been negotiated. EBMUD has also fought for over thirty years to uphold a Federal Central Valley Project contract for water from the American River at Nimbus. Opposition to the diversion by Sacramento County interests prompted both sides to develop a mutually beneficial project to divert American River water from the Sacramento River near the town of Freeport. In 2002, the Freeport Regional Water Authority was formed to move the Project forward. EBMUD is allowed to take no more than 133,000 af in one year and no more than 165,000 af in any three year period. EBMUD is expected to divert from Freeport in one-third of all years (http://www.ebmud.com/, 2003).

Despite the Freeport Project, EBMUD must address the 20,000 af shortage in a severe drought even while imposing a 25 percent water use reduction through rationing. Several conjunctive use projects involving aquifer storage and recovery (ASR) are currently being evaluated at several sites throughout the East Bay and the Mokelumne River watershed. San Joaquin County is a potential partner for a conjunctive use project.

2 Hydrogeology

2.1 Regional Geology and Stratigraphy

San Joaquin County is situated within the Central Valley, a 400-mile long, 50 mile wide northwestward trending, asymmetrical structural trough. The Sierra Nevada Ranges, east of the Central Valley, is comprised of pre-Tertiary igneous and metamorphic rocks. The Coastal Ranges, to the west, is comprised of pre-Tertiary and Tertiary semi-consolidated to consolidated marine sedimentary rocks. The geologic formations within San Joaquin County vary in origination in geologic times ranging from Recent to Pre-Cretaceous. Six to 10 miles of sediment have been deposited within the Central Valley and include both marine and continental gravels, sands, silts and clays.

During the middle Cretaceous (~100 million years ago), parts of the Central Valley were inundated by the Pacific Ocean resulting in deposition of marine deposits. Marine conditions persisted through the middle Tertiary period after which time sedimentation changed from marine to continental. The material source for the continental deposits are the Coastal Ranges and Sierra Nevada which are composed primarily of granite, related plutonic rocks, and metasedimentary and metavolcanic rocks from Late Jurassic to Ordovician age (Bertoldi, et al, 1991). The Central Valley has one natural surface water outlet, the Carquinez Strait located east of San Francisco Bay (USGS).

Geologic formations within the Central Valley and San Joaquin County are generally grouped as either east-side or west-side formations based on their location relative to the San Joaquin River, and the source of the sedimentary material of which they are composed. Generally, Eastside formation material originates in the Sierra Nevada and Westside formation material originates in the Coastal Ranges. Table 2-1 shows a generalized stratigraphic column for San Joaquin County. The most important fresh water-bearing formations in Eastern San Joaquin County are the Mehrten, Laguna, Victor, and alluvial deposits. The formations are described below.

Mehrten

The Mehrten Formation is considered the oldest significant fresh water-bearing formation within Eastern San Joaquin County. It is exposed in the eastern most portion of the county, and slopes steeply from 90 to 180 feet per mile reaching a depth of 800 to 1,000 feet and a thickness of 400 to 600 feet in the Stockton sands, and gravels, the formation is often subdivided into upper and lower units. The upper unit is reported to contain finer grained deposits (black sands interbedded with brown-to-blue clay) and the lower unit consists of dense tuff breccia. Consequently, groundwater is reported to be semi-confined in the Stockton area. The Mehrten Formation has moderate to high permeability where black sands occur (DWR, 1967, Brown & Caldwell, 1985).

Laguna

The Laguna Formation outcrops in the northeastern part of the County and dips at 90 feet per mile (DWR, 1967), and reaches a maximum thickness of 1,000 feet. It consists of discontinuous lenses of unconsolidated to semi-consolidated sand and silt with lesser amounts of clay and gravel. The Laguna Formation is moderately permeable with some reportedly highly permeable coarse-grained beds and generally unconfined, but semi-confined conditions probably exist locally. Some studies have suggested that an extensive aquitard, namely the Corcoran Clay, extends into the Laguna Formation or separates the Laguna and Mehrten Formations (Brown & Caldwell, 1985).

Table 2-1 Stratigraphic Column for San Joaquin County

System	Series	Formation	Location	Thickness (feet)	Rock Characteristics and Environment	Hydrogeologic Description
Quaternary	Recent	Stream Channel Deposits	Eastside & Westside		Continental unconsolidated gravel, course to medium sand deposited along present stream channels.	High permeability, unimportant to groundwater except as avenue for percolation.
	Late to Pleistocene	Alluvial Fan Deposits	Westside	0 to 150±	Continental fan deposits-heterogeneous, discontinuous mixtures of gravel silt & clay.	Moderate to locally high permeability, unconfined aquifers.
		Recent Alluvium and Victor	Eastside	0 to 150±	Continental fan and interfan material, locally some basin type. Lenticular gravel, sand, silt, & clay	Moderate permeability, unconfined aquifers.
Tertiary	Plio-Pleistocene	Flood Basin Deposits	Eastside & Westside	0 to 1400±	Continental basin equivalent of Laguna, Tulare, and younger formations. Clay, silt, & sand, organic in part.	Generally low permeability, saturated environments, unconfined to confined.
	Mio-Pliocene	Tulare	Westside	0 to 1400±	Continental semi-consolidated clay, sands, & gravel. Contains Corcoran Clay member.	Moderate permeability, generally unconfined above Corcoran Clay, confined below.
	Upper Miocene	Laguna	Eastside	0 to 1000±	Continental, semi to unconsolidated silt, sands, & gravel poorly sorted, include Arroyo Seco gravel pediment of Mokelumne River area.	Moderate permeability, unconfined to locally semi-confined. Restricted perched bodies in some areas
Cretaceous		Merhten	Eastside	0 to 600±	Continental andesitic derivatives of silt, sand, & gravel & their indurated equivalents; tuff; Breccias; agglomerate.	Moderate to high permeability, where "black sands" occur. Confined to unconfined. Saline west of Stockton.
	Miocene	San Pablo Group	Westside	0 to 1000±	Continental to marine massive sandstone & shale. Westside equivalent to Merhten & Valley Springs formations, in part.	Low permeability. Saline in part. Essentially non-water bearing except along fractures & joints.
	Eocene	Valley Springs	Eastside	7 to 500±	Continental to marine rhyolitic ash, clay, sand, gravel & their induriated equivalents.	Low permeability. Saline in Stockton area. Not considered significant in groundwater studies.
Jurassic	Cretaceous	Eocene Undifferentiated	Westside	?	Marine shale, siltstone, & sandstone.	Contains saline waters except where flushed in outcrop areas. Unimportant to freshwater basin except as possible contaminant source.
		Cretaceous Undifferentiated	Westside	?	Marine shale, siltstone, & sandstone.	Contains saline waters, unimportant to freshwater basin except as possible contaminant source.
	Jurassic	Franciscan Group, Undifferentiated	Westside	?	Marine shale, sandstone, chert metamorphica, serpentine.	Unimportant to freshwater basin except as possible contaminant source.

Source: San Joaquin County Water Management Plan Volume II

Victor
The Victor Formation is of Holocene to Pleistocene Age and consists primarily of stream deposited unconsolidated gravel, sand, silt, and clay. Coarse sands and gravels are found to the east, and sands, silts and clays towards the west. This formation is generally more permeable than underlying formations, and groundwater is typically unconfined (CDM, 2001).

Alluvial/Stream channel deposits
Stream channel deposits are found along major stream and river courses within the study area. Generally they consist of unconsolidated gravel and coarse sand with high permeabilities (CDM, 2001).

2.2 Surface Water Features

San Joaquin County lies at the northwestern corner of the San Joaquin Hydrologic Region as defined by DWR and shown on Figure 2-1. The major rivers in this hydrologic region are the San Joaquin, Cosumnes, Mokelumne, Calaveras, Stanislaus, Tuolumne, Merced, Chowchilla, and Fresno. The Calaveras, Mokelumne, and Stanislaus Rivers flow through or border San Joaquin County and at times discharge directly into the Delta or into the San Joaquin River which in turn flows to the Delta. The west and southwestern portion of the County is part of the Delta, and the areas of primary and secondary concern are shown above. The Delta and other major waterways are shown on Figure 2-2 and are discussed in more detail below (DWR, 2003).

2.2.1 Delta

The Sacramento-San Joaquin Delta covers more than 738,000 acres in five counties and is comprised of numerous islands within a network of canals and natural sloughs. The Sacramento and San Joaquin Rivers come together in the Delta before they flow to the San Francisco Bay and out to the ocean. The Delta is the largest estuary on the west coast and is home to over 750 plant and animal species, many of which are threatened or endangered. The Delta provides drinking water for two-thirds of all Californians and irrigation water for over 7 million acres of highly productive farmland. Rivers in San Joaquin County all flow into the Delta as they flow out to sea. Table 2-2 provides a summary of the major reservoirs located in the region. More detailed descriptions of the rivers and the associated facilities are provided in the following sections.

Table 2-2 Major Area Reservoirs

River	Major Reservoirs	Size (acre-feet)	Owning/Operating Agencies
Mokelumne	Pardee Reservoir Camanche Reservoir	197,950 417,120	East Bay MUD
Calaveras	New Hogan Lake	317,000	U.S. Army Corps of Engineers Stockton East Water District
Stanislaus	New Melones Reservoir	2,400,000	Central Valley Project
	Beardsley Reservoir Donnells Reservoir Tulloch Reservoir	77,600 56,893 68,400	Oakdale Irrigation District, South San Joaquin Irrigation District

Source:
State of California, *California Statistical Abstract*, 2002.

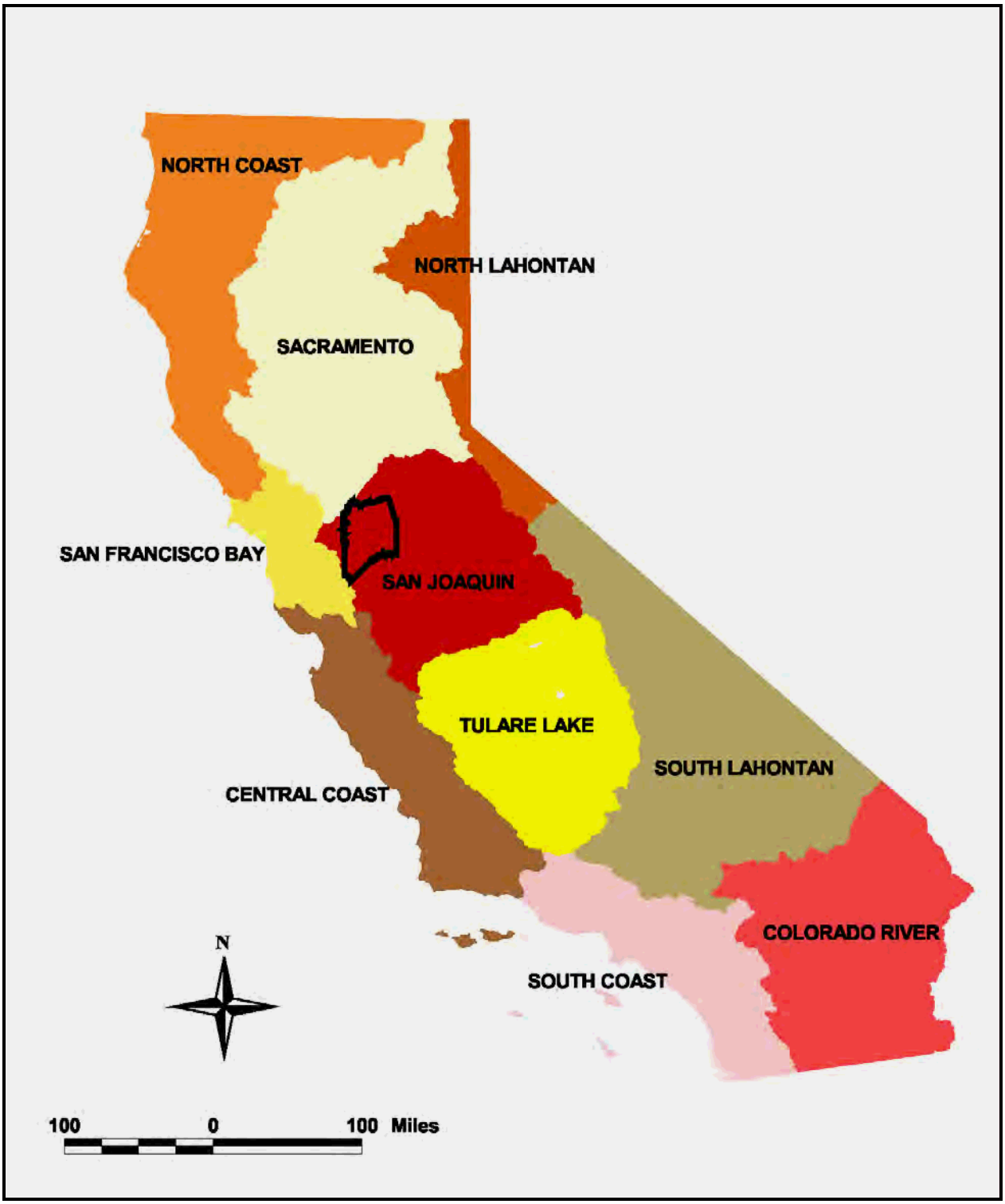


Figure 2-1 Hydrologic Regions of California
Source: California Spatial Information Library at http://www.gis.ca.gov/

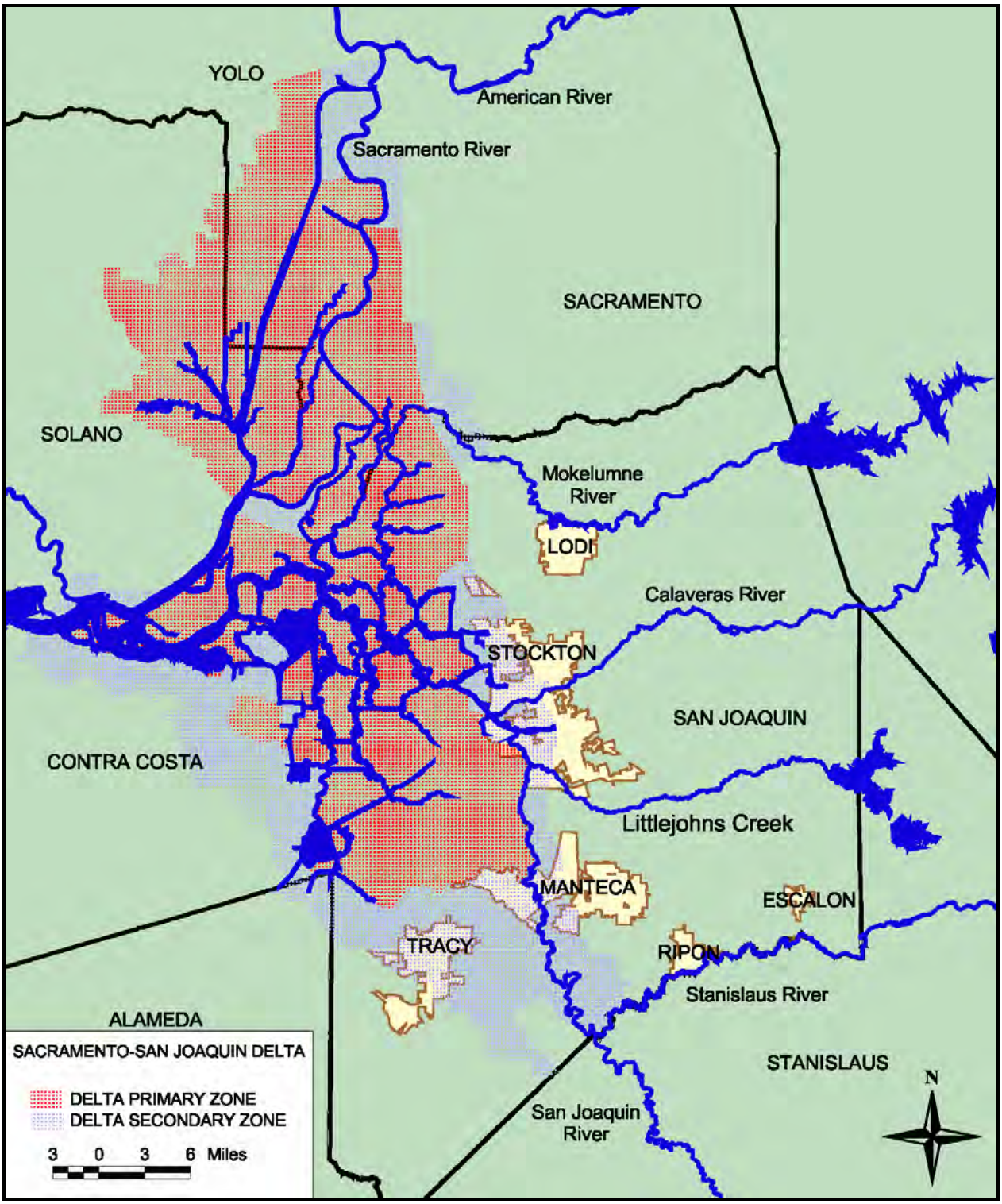


Figure 2-2 Sacramento San Joaquin Delta
Source: California Spatial Information Library at http://www.gis.ca.gov/

2.2.2 Calaveras River

The Calaveras River watershed consists of 363 square miles and stretches from the Sierra Nevada foothills to San Joaquin River in west Stockton. Flow in the Calaveras is primarily derived by rainfall with almost no contribution by snowmelt. The United States Army Corps of Engineers (USACE) constructed the multi-purpose New Hogan Dam in 1963 for flood control, municipal, industrial, and irrigation purposes. New Hogan Reservoir has a capacity of 317,000 af. The USACE controls flood control releases from New Hogan. SEWD operates New Hogan at all other times. SEWD and CCWD have rights to the yield from New Hogan. The current supply available to SEWD is subject to reductions based on CCWD's future demands. CCWD currently uses approximately 3,500 af/yr and estimates it will use up to 5,300 af/yr by 2040 (Calaveras County Water District, 1996).

2.2.3 Mokelumne River

The Mokelumne River watershed encompasses approximately 660 square miles stretching from the high Sierra Nevadas westward to the Delta. Snowmelt comprises a large portion of the watersheds runoff. Major facilities located on the Mokelumne are the Salt Springs Reservoir on the North Fork of the Mokelumne and the Pardee and Camanche Reservoirs on the rivers main stem. Salt Springs Reservoir is a PG&E facility built in 1963 and is operated for hydropower generation. Pardee and Camanche are both owned by EBMUD. Pardee Reservoir, which is upstream from Camanche, has a capacity of 197,950 af and is operated as a water supply reservoir. Reservoir water from Pardee is conveyed by the Mokelumne River Aqueducts to the EBMUD service area some 82 miles away. Camanche Reservoir, with a capacity of 417,120 af, is operated for flood control and also to meet instream flow requirements and down stream entitlements. Both Pardee and Camanche generate incidental hydro power at 30 MW and 9.9 MW respectively (EBMUD, Urban Water Management Plan 2000). Water rights on the Mokelumne form a complex hierarchy, with water rights held by Woodbridge Irrigation District, Amador County, Calaveras County, EBMUD, and North San Joaquin Water Conservation District.

2.2.4 Stanislaus River

The Stanislaus River watershed consists of approximately 904 square miles with an annual average runoff of approximately 1 million af. The majority of the runoff occurs from November to July and peaks during the summer months when snow melt is greatest. More than half the runoff is snowmelt-derived (USBR, Website, undated). The USACE constructed New Melones Dam on the Stanislaus River in 1978, replacing the original Old Melones Dam. Old Melones Dam was constructed in 1924 jointly by OID and SSJID, which hold pre-1914 water rights on the Stanislaus River. New Melones Reservoir has a capacity of 2.4 million af and is operated as part of the CVP. The average runoff at New Melones for the 74 years from 1904 to 1977 was 1.12 million af.

There are 9 additional reservoirs and two diversion canals upstream from New Melones on the Stanislaus River, including the Donnells, Beardsley, and Tulloch Reservoirs, which were constructed jointly by OID and SSJID and operated by the Tri-Dam Authority (USBR, Website, undated). Tulloch Reservoir, located several miles downstream from New Melones, is used to re-regulate releases from New Melones. SSJID, OID and SEWD divert from Goodwin Dam downstream from Tulloch Dam. Water can be diverted by gravity via Goodwin Tunnel to CSJWCD and SEWD. SSJID and OID are the principal users of Stanislaus River water in San Joaquin County. Both SEWD and CSJWCD interim CVP contracts for New Melones water.

2.2.5 San Joaquin River

The San Joaquin River originates in the Sierra Nevada and enters the San Joaquin Valley at Friant. The lower San Joaquin River is the section of the river from its confluence with the Merced River north to Vernalis. The lower San Joaquin River encompasses a drainage area of approximately 13,400 square miles. The majority of the flow in the lower San Joaquin River is derived from inflow from the Merced, Tuolumne and Stanislaus Rivers as the upper San Joaquin River contributes virtually no inflow during the summer months.

2.2.6 Other Rivers

Other rivers that have some relevance to discussions on water resources but are not located in San Joaquin County are the Tuolumne River, Cosumnes River and Dry Creek. The Tuolumne River originates in the Sierra Nevada Mountains and is the largest tributary to the San Joaquin River. It has a watershed of approximately 1,500 square miles and an unimpaired runoff of approximately 1.8 million af. Flows in the lower reaches of the Tuolumne River are regulated by New Don Pedro Dam, which was constructed in 1971 and is owned by Turlock and Modesto Irrigation Districts. New Don Pedro Reservoir has a capacity of approximately 2 million af and is operated for irrigation, hydroelectric generation, fish/wildlife protection, recreation, and flood control. Irrigation water is diverted downstream from New Don Pedro at La Grange into the Modesto Main Canal and Turlock Main Canal. The City and County of San Francisco operate several facilities in the upper water of the Tuolumne, namely O'Shaughnessy Dam at Hetch Hetchy Valley, Lake Eleanor and Cherry Lake. These facilities are operated for municipal and industrial supply as well as hydropower.

The Cosumnes River is a tributary of the Mokelumne River. It meets the Mokelumne near the town of Thornton and has a watershed area of approximately 540 miles. Flows are primarily rain/runoff-derived.

Dry Creek is a relatively minor tributary to the Mokelumne River and forms the northern boundary between San Joaquin and Sacramento Counties. The Cosumnes, Dry Creek, Mokelumne and Calaveras Rivers are collectively referred to as the Eastside Streams.

2.2.7 Surface Water Quality

Surface water quality for San Joaquin County water sources can be categorized as either an eastside or Sacramento-San Joaquin Delta source. Eastside rivers and streams are sources of high water quality with generally low total dissolved solids (TDS) loads. Reservoir storage and regulated flow on the Mokelumne, Calaveras and Stanislaus River systems reduces suspended solids as these rivers flow through San Joaquin County. However, during flood events and times of elevated flows, TDS and suspended solid levels can increase.

The Sacramento-San Joaquin Delta water quality is heavily influenced by the operations of the Central Valley and State Water Projects. Generally, the Sacramento-San Joaquin Delta water quality is best during the winter and spring months and poorer through the irrigation season and early fall. Delta Water quality is also very dependant on the ability for higher quality Sacramento River water to dilute poorer quality San Joaquin water in the South and Central Delta. Presently, the Central Valley Regional Water Quality Control Board is undertaking Total Maximum Daily Load (TMDL) proceedings for low dissolved oxygen (DO) in the Stockton Deep Water Ship Channel and salinity and Boron in the Lower San Joaquin River.

The San Joaquin River in the South Delta, experiences periods of severely degraded water quality. The SWRCB has set flow and water quality objectives at Vernalis, located just

downstream of the confluence of the Stanislaus River with the San Joaquin River. The USBR is obligated to meet the Vernalis objectives as a condition of their water right permits. Water quality in the San Joaquin River is influenced by factors such as rain and snow melt runoff, reservoir operations, and irrigation return flows in the San Joaquin River basin. The CVP service area on the Westside of the San Joaquin Valley drain agricultural return flows with significant elevated salt loads into the San Joaquin River. To meet the Vernalis objective, the Bureau of Reclamation supplements flows on the San Joaquin River with releases from New Melones Reservoir on the Stanislaus River by reducing allocations to SEWD and CSJWCD. Despite the take away, the Bureau is unable to meet the Vernalis standard in years when runoff is below average. Eastern San Joaquin County and Delta interests have pushed for the development of water quality objectives up-stream of the confluence of the San Joaquin and Stanislaus Rivers.

2.3 Regional Groundwater Flow Patterns

Regional groundwater flow patterns have been significantly altered since pre-development conditions. The pre-development and current/post-development groundwater flow patterns are discussed below.

2.3.1 Pre-Development Conditions

Groundwater was used for agriculture in the Central Valley starting around 1850, prior to which time the groundwater system was in a state of hydrologic equilibrium (Williamson, et. al., 1989). Under equilibrium, or steady-state conditions, groundwater flowed from the natural recharge areas along the perimeter of the valley towards the low areas along the San Joaquin River. The natural groundwater and surface water discharge was through the Delta westward to San Francisco Bay. Under pre-development conditions groundwater gradients within San Joaquin County were likely similar to the topographic gradient, or around 0.0012 ft/ft.

2.3.2 Post-Development Conditions

Beginning in 1850 the development of groundwater for agriculture expanded rapidly. Within the Central Valley, irrigated agriculture has grown from less than 1 million acres around the turn of the century, to an estimated 7 to 8 million acres at present. Within eastern San Joaquin County, an estimated 800,000 af/yr of groundwater was being extracted by 1993. In Bulletin 118-80, DWR designated the Basin as ‘critical overdrafted’.

Figures 2-1 through 2-4 illustrate groundwater table contours for spring and fall 1993 and 1998. The map clearly shows the significant cone of depression east of Stockton. Regional groundwater flow now converges on this low point, with relatively steep groundwater gradients (0.0018 feet/feet) westwards towards the cone of depression, and eastward gradients from the Delta area on the order of 0.0008 feet/feet. The eastward flow from the Delta area is significant because of the typically poorer quality water.

2.3.3 Groundwater Level Trends

The groundwater level trends illustrate the change in groundwater flow patterns described above. Hydrographs for selected wells and sub-regions are presented in Figures 2-7 through 2-21 and a map of the well locations is shown on Figure 2-22.

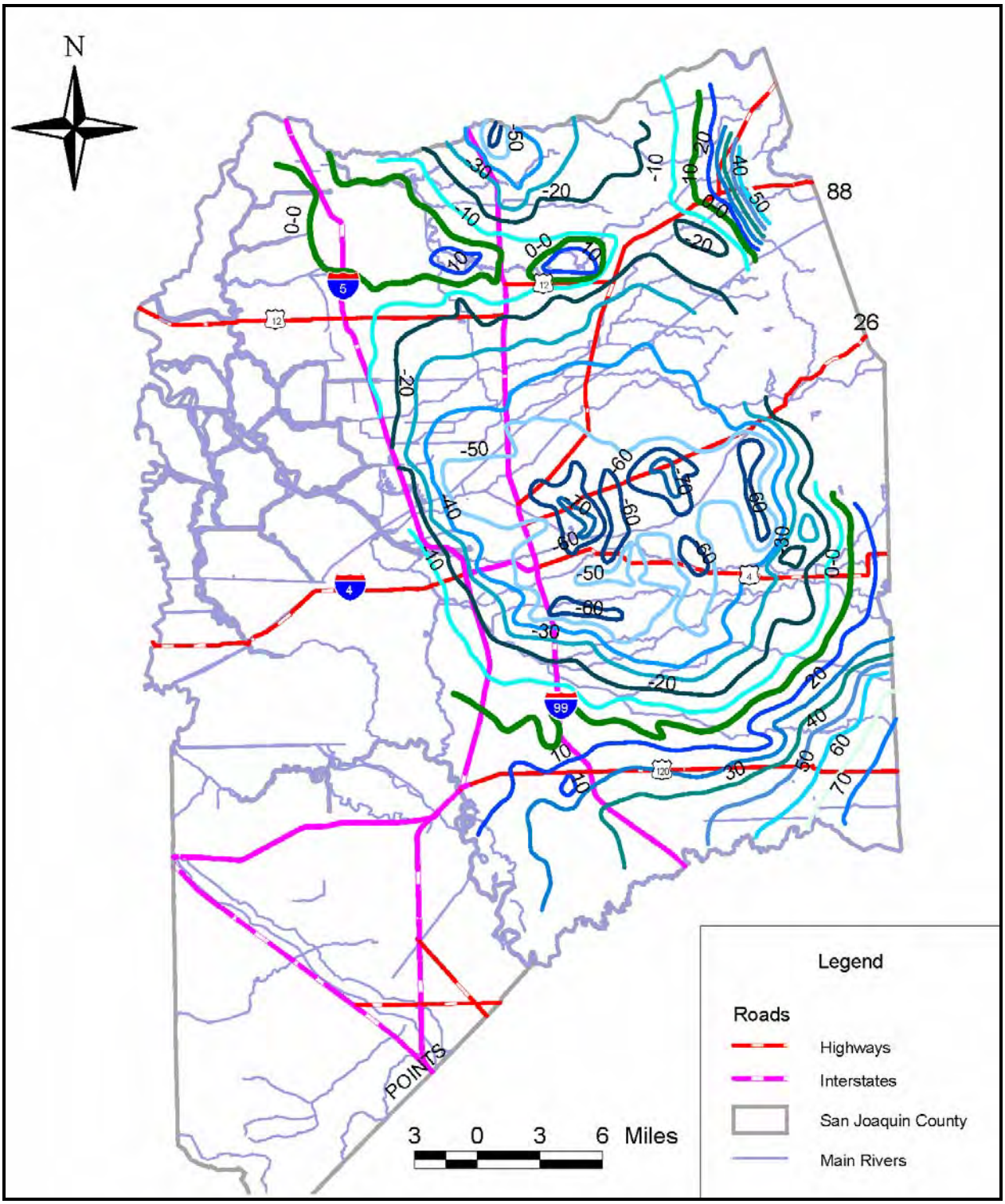


Figure 2-3 Spring 1993 Groundwater Contours
Source: Camp Dresser & McKee Inc.

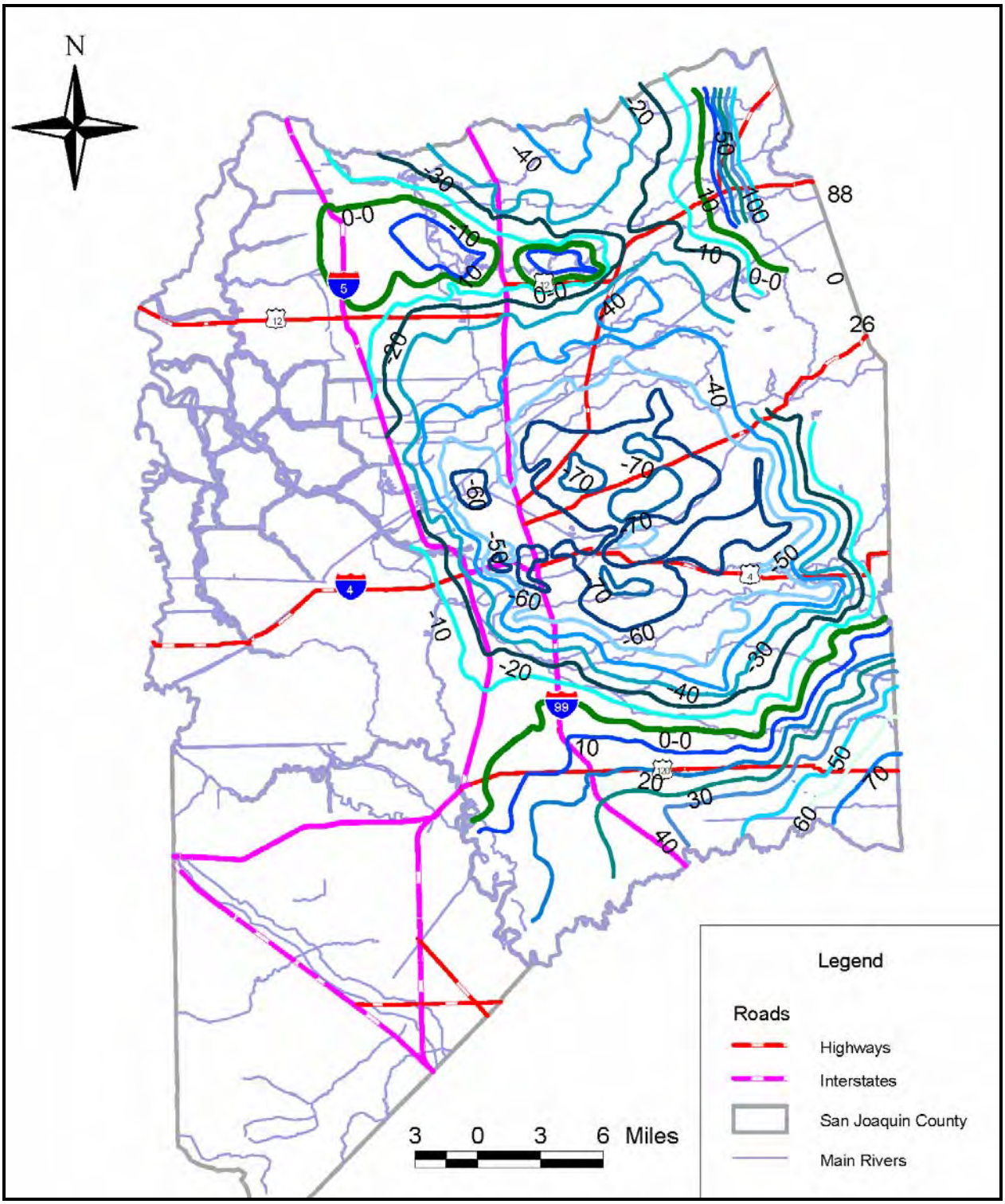


Figure 2-4 Fall 1993 Groundwater Contours
Source: Camp Dresser & McKee Inc.

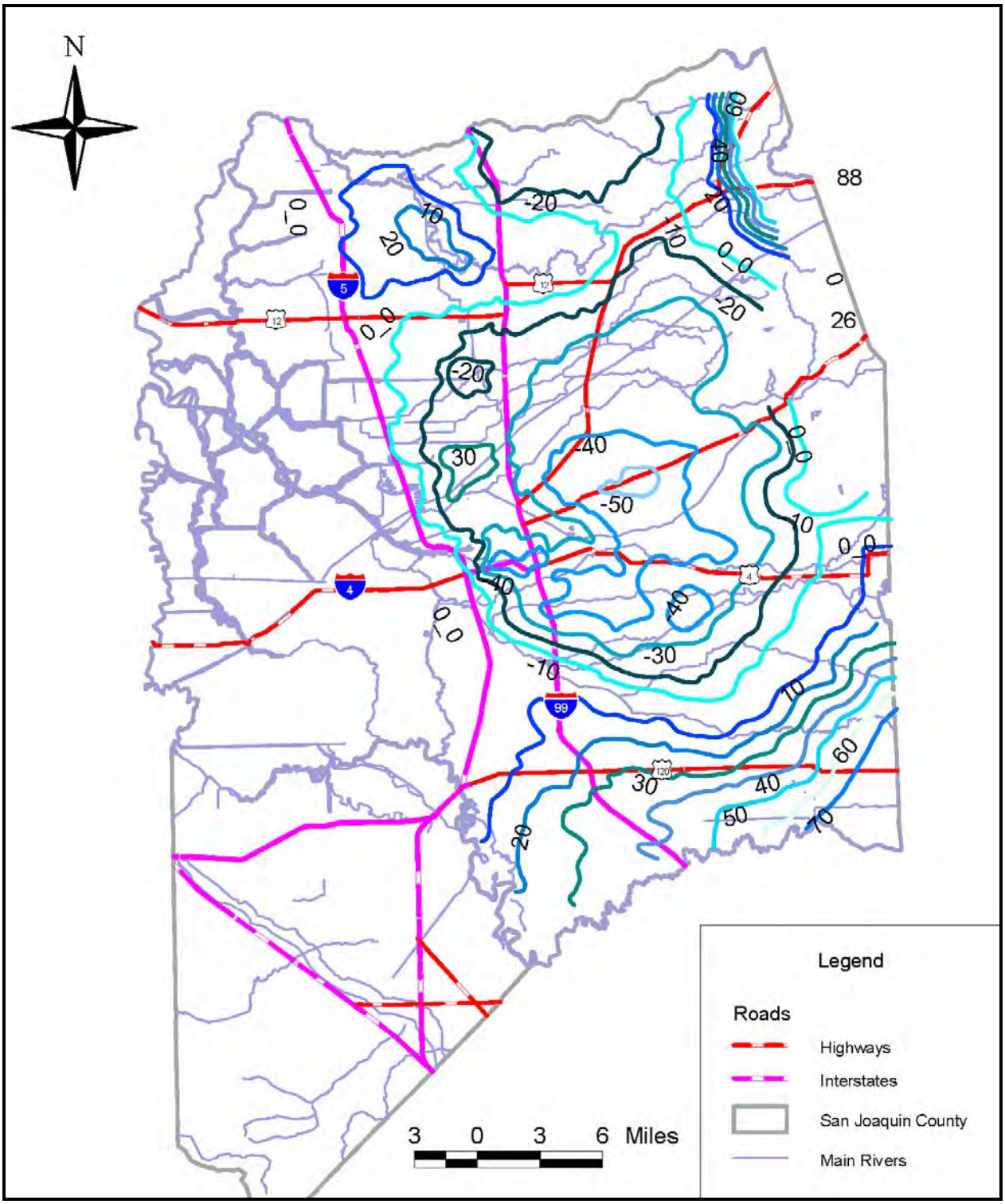


Figure 2-5 Spring 1998 Groundwater Contours
Source: Camp Dresser & McKee Inc.

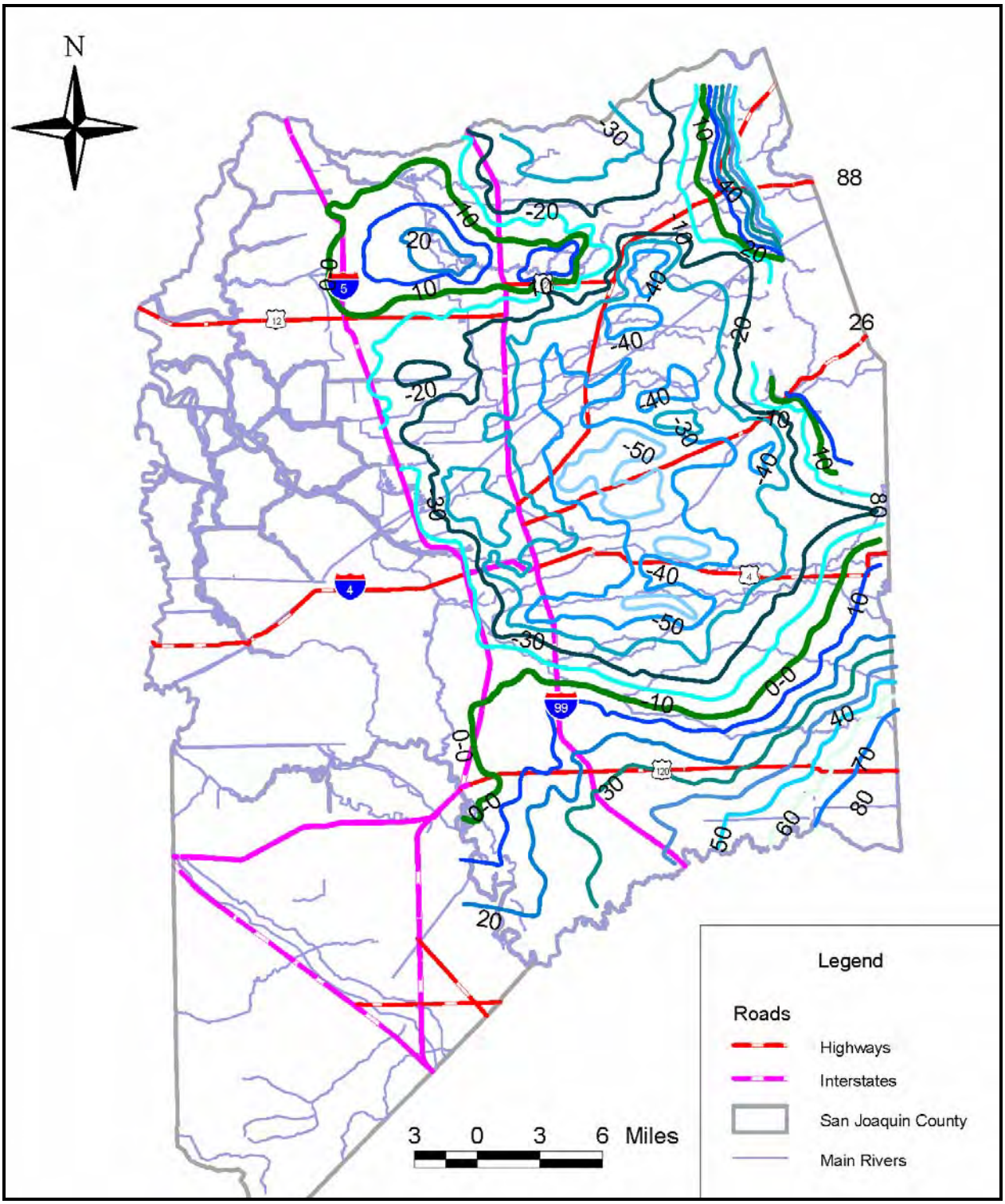


Figure 2-6 Fall 1998 Groundwater Contours
Source: Camp Dresser & McKee Inc.

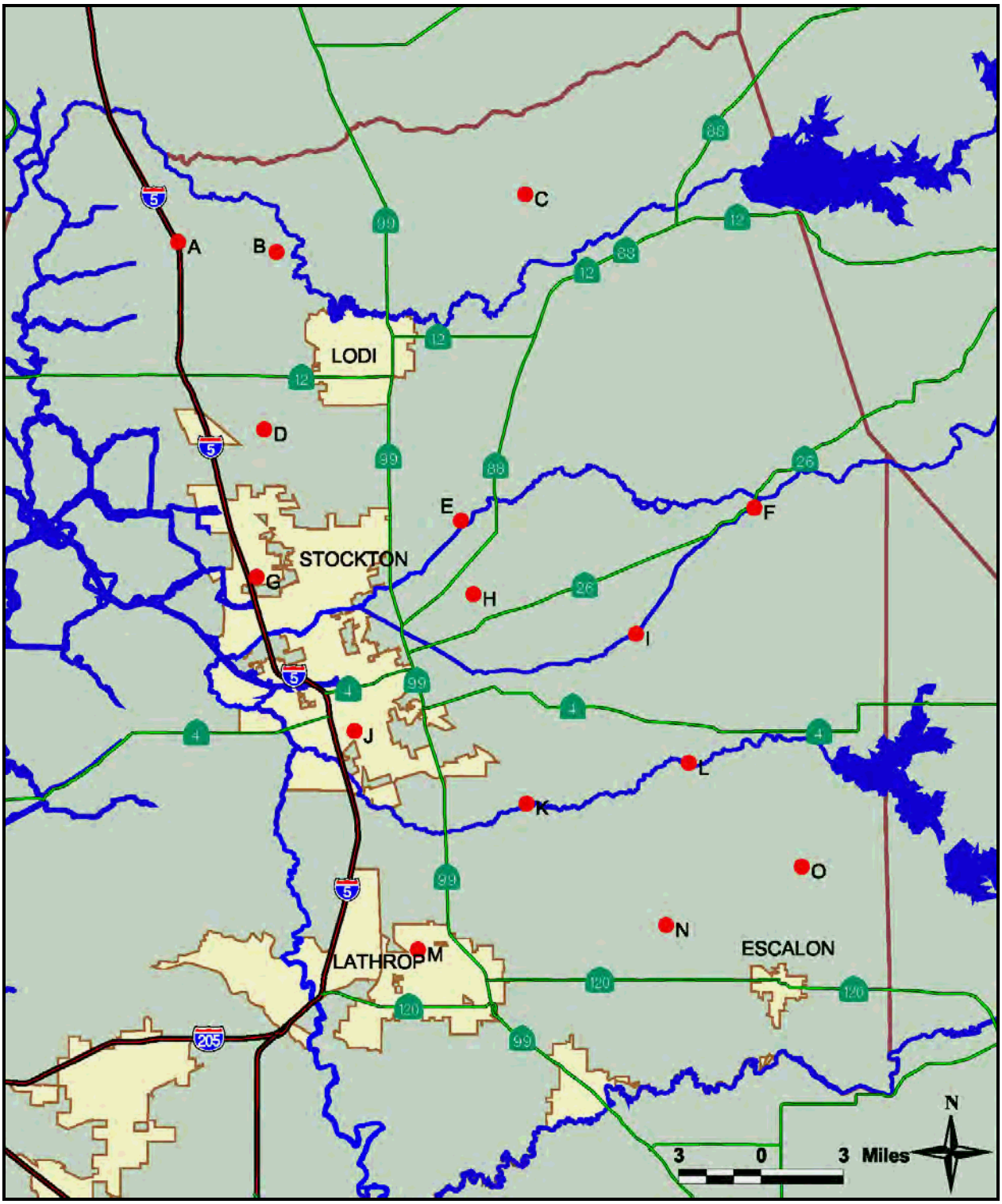


Figure 2-7 Groundwater Well Locations
Source: California Department of Water Resources, Water Data Library at http://well.water.ca.gov/

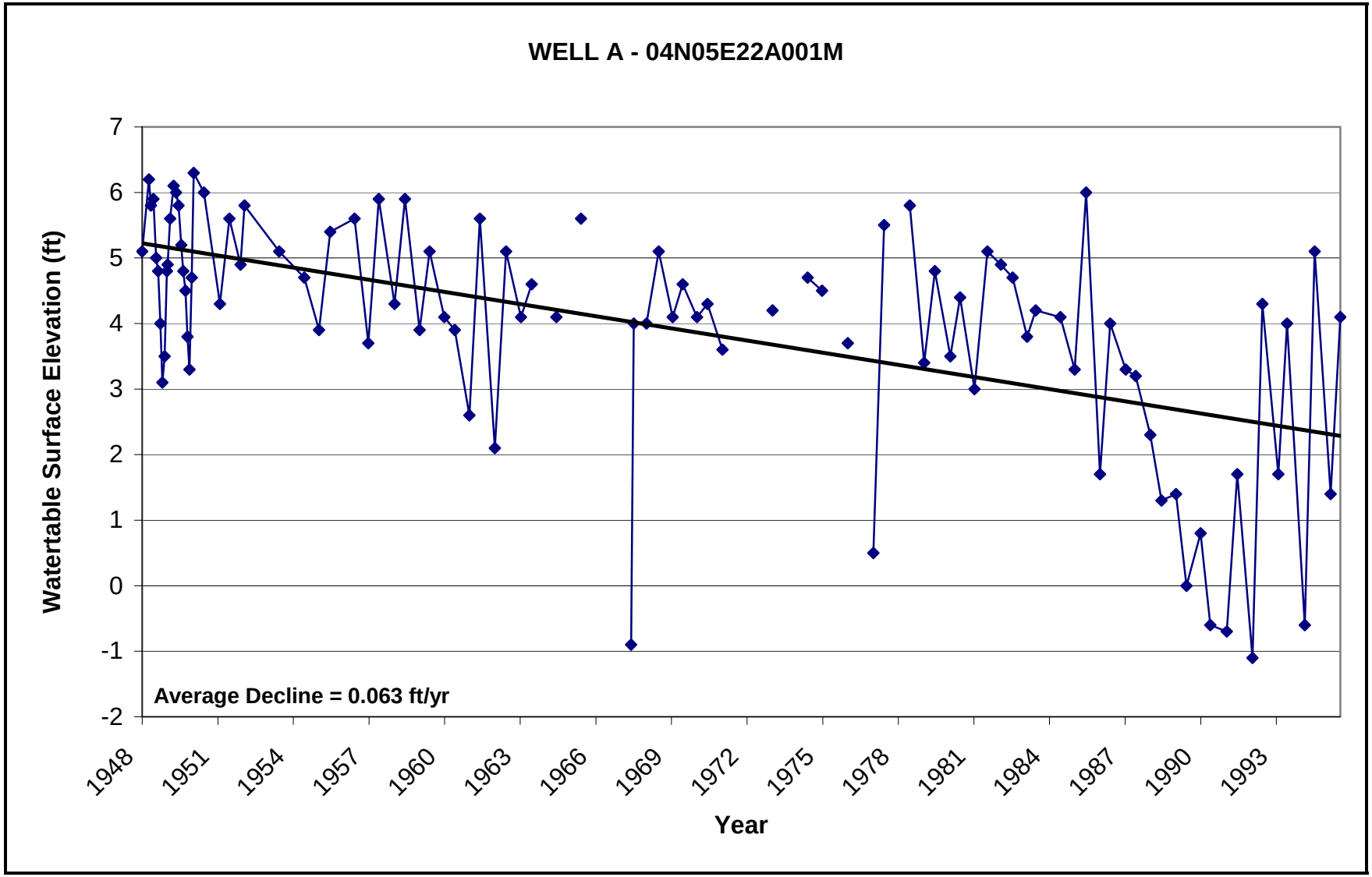


Figure 2-8 Hydrograph Well A
Source: California Department of Water Resources, Water Data Library at http://well.water.ca.gov/

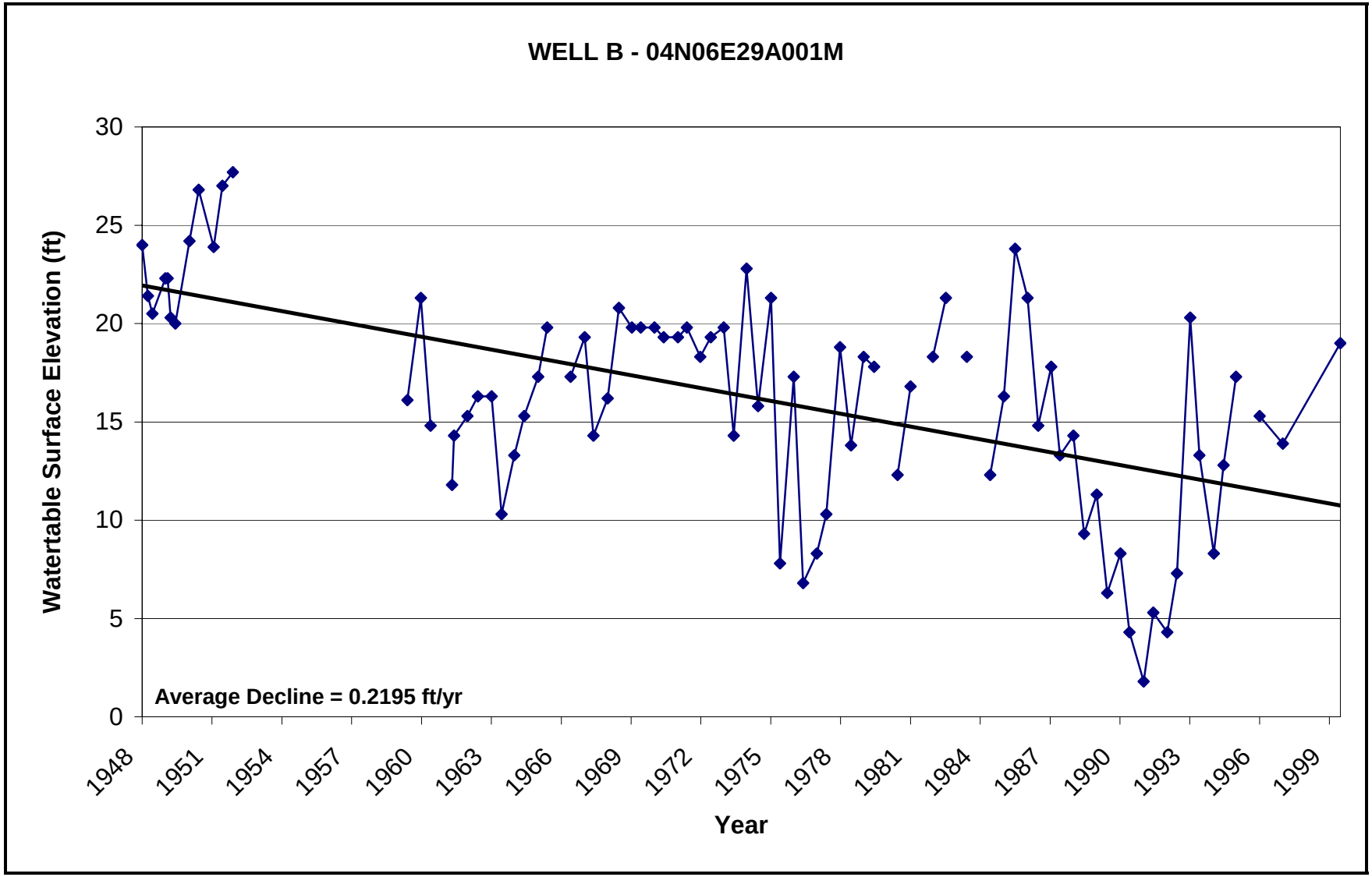


Figure 2-9 Hydrograph Well B
Source: California Department of Water Resources, Water Data Library at http://well.water.ca.gov/

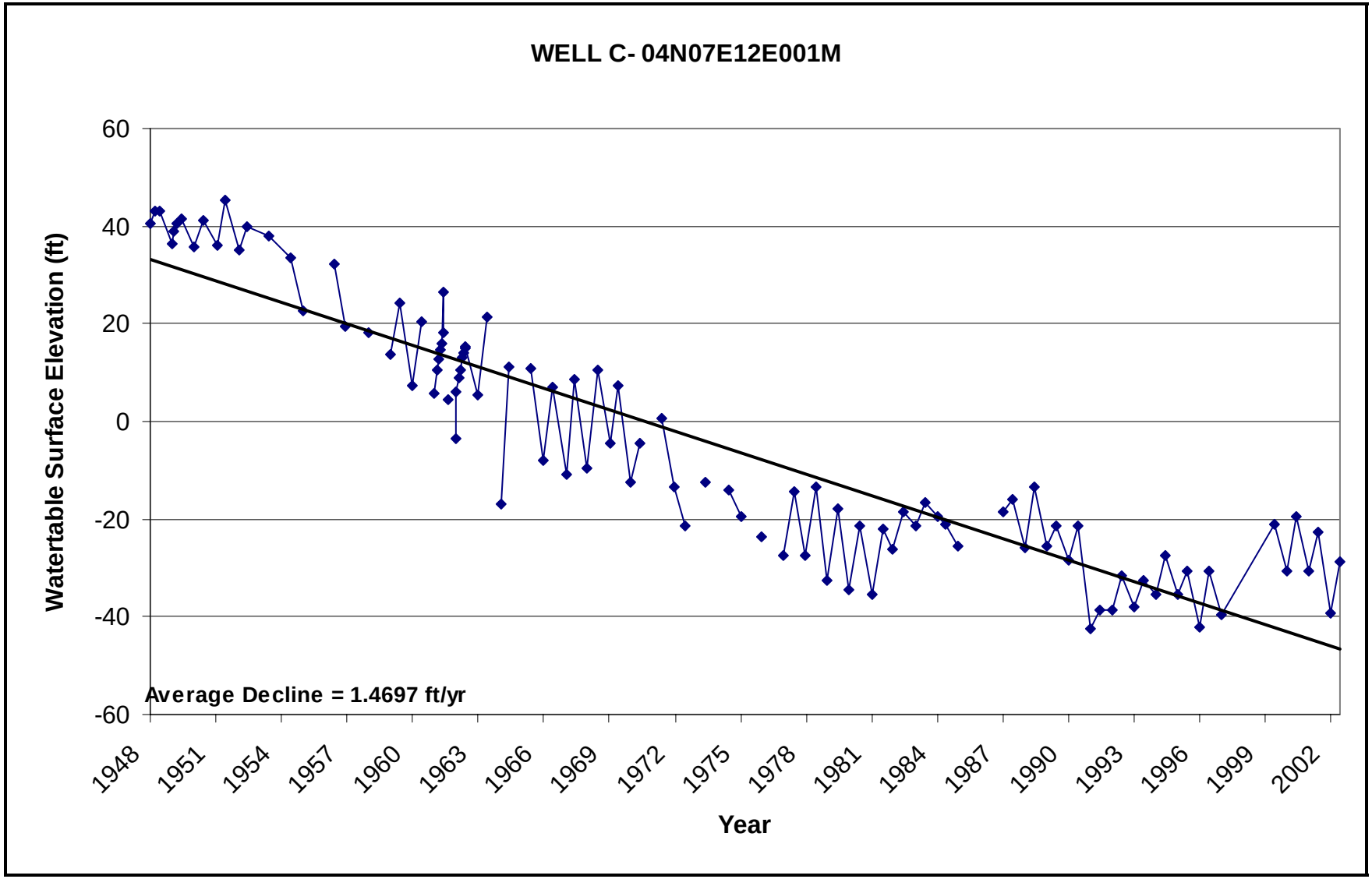


Figure 2-10 Hydrograph Well C
Source: California Department of Water Resources, Water Data Library at http://well.water.ca.gov/

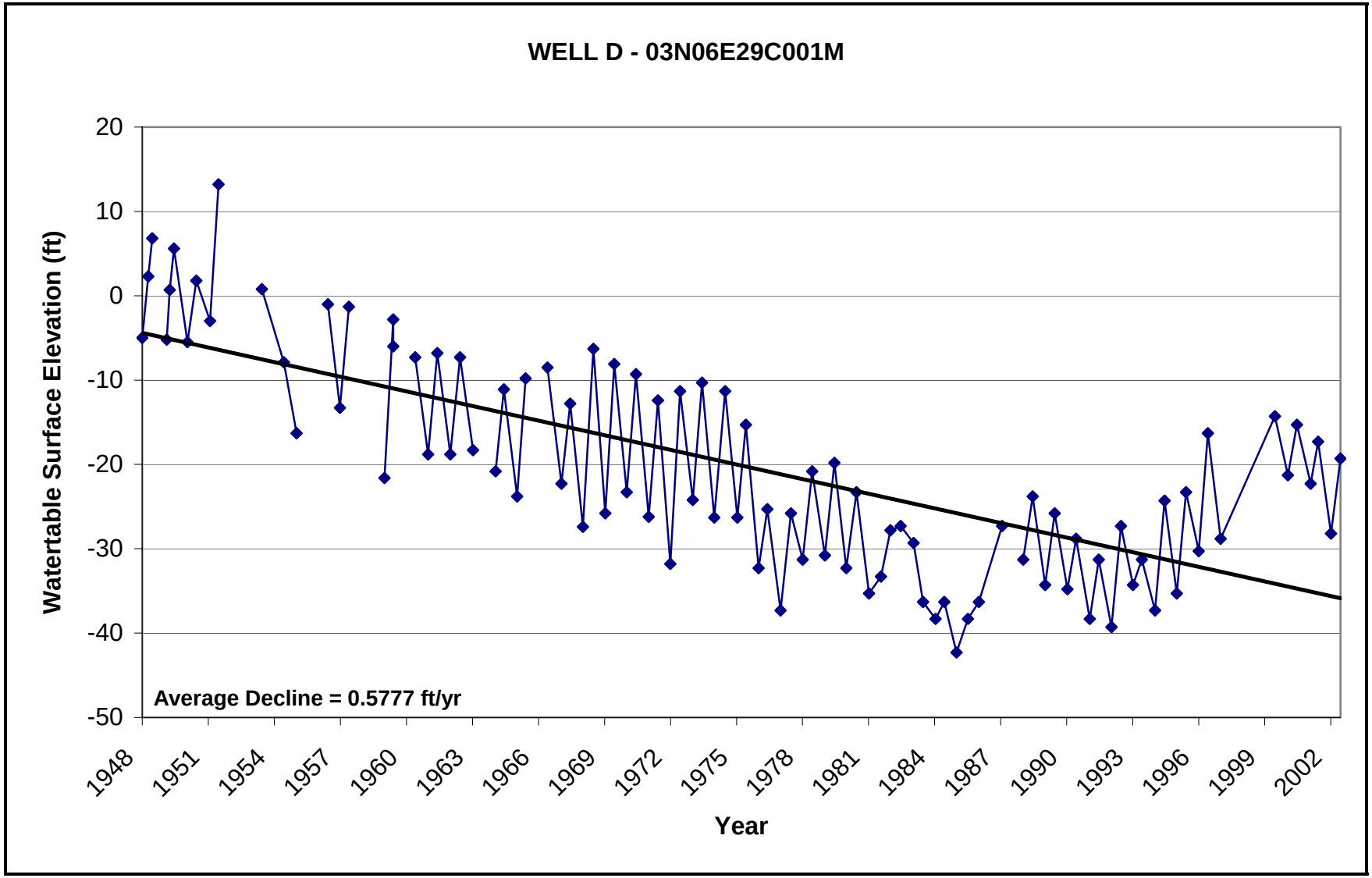


Figure 2-11 Hydrograph Well D
Source: California Department of Water Resources, Water Data Library at http://well.water.ca.gov/

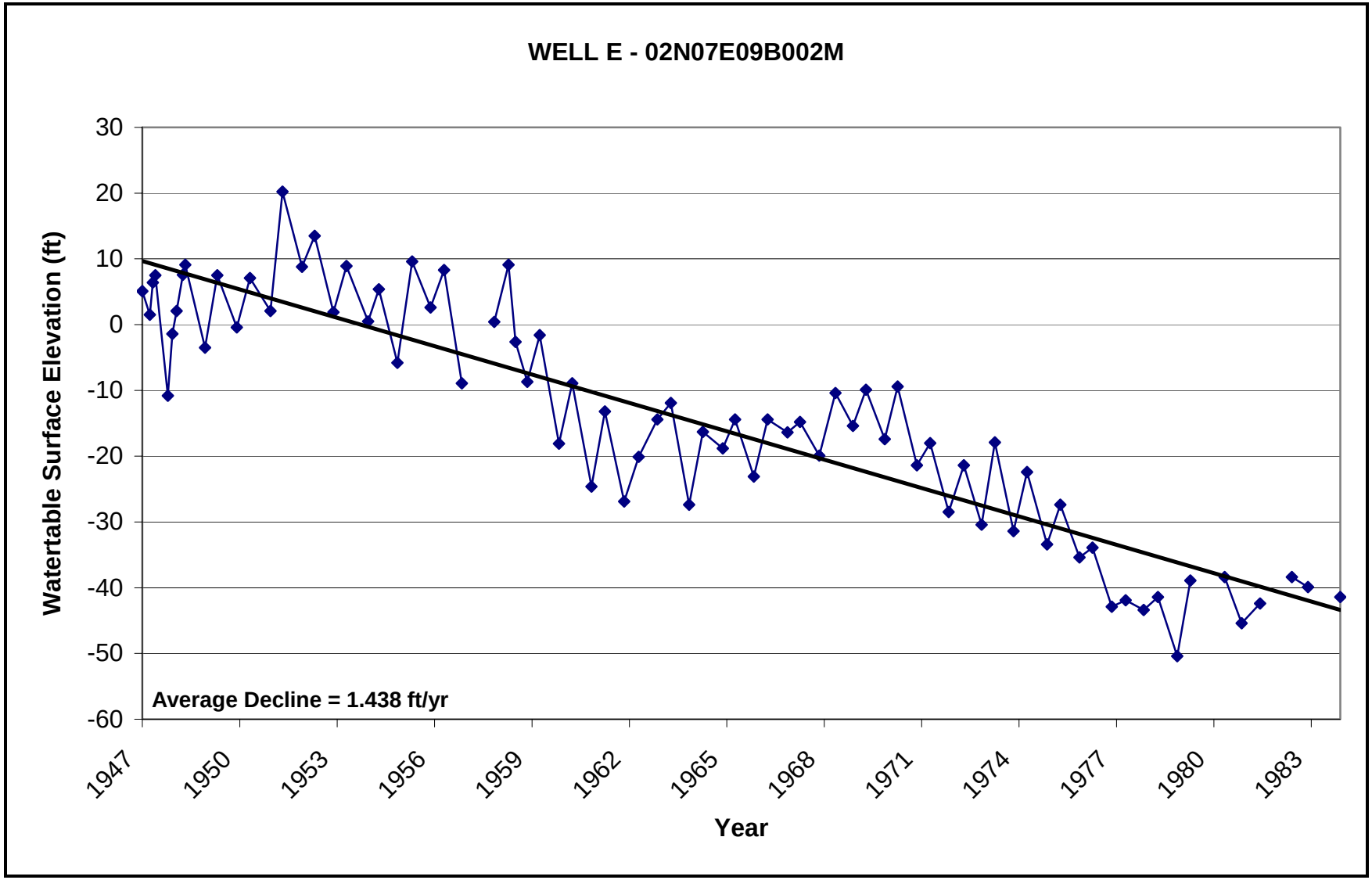


Figure 2-12 Hydrograph Well E
Source: California Department of Water Resources, Water Data Library at http://well.water.ca.gov/

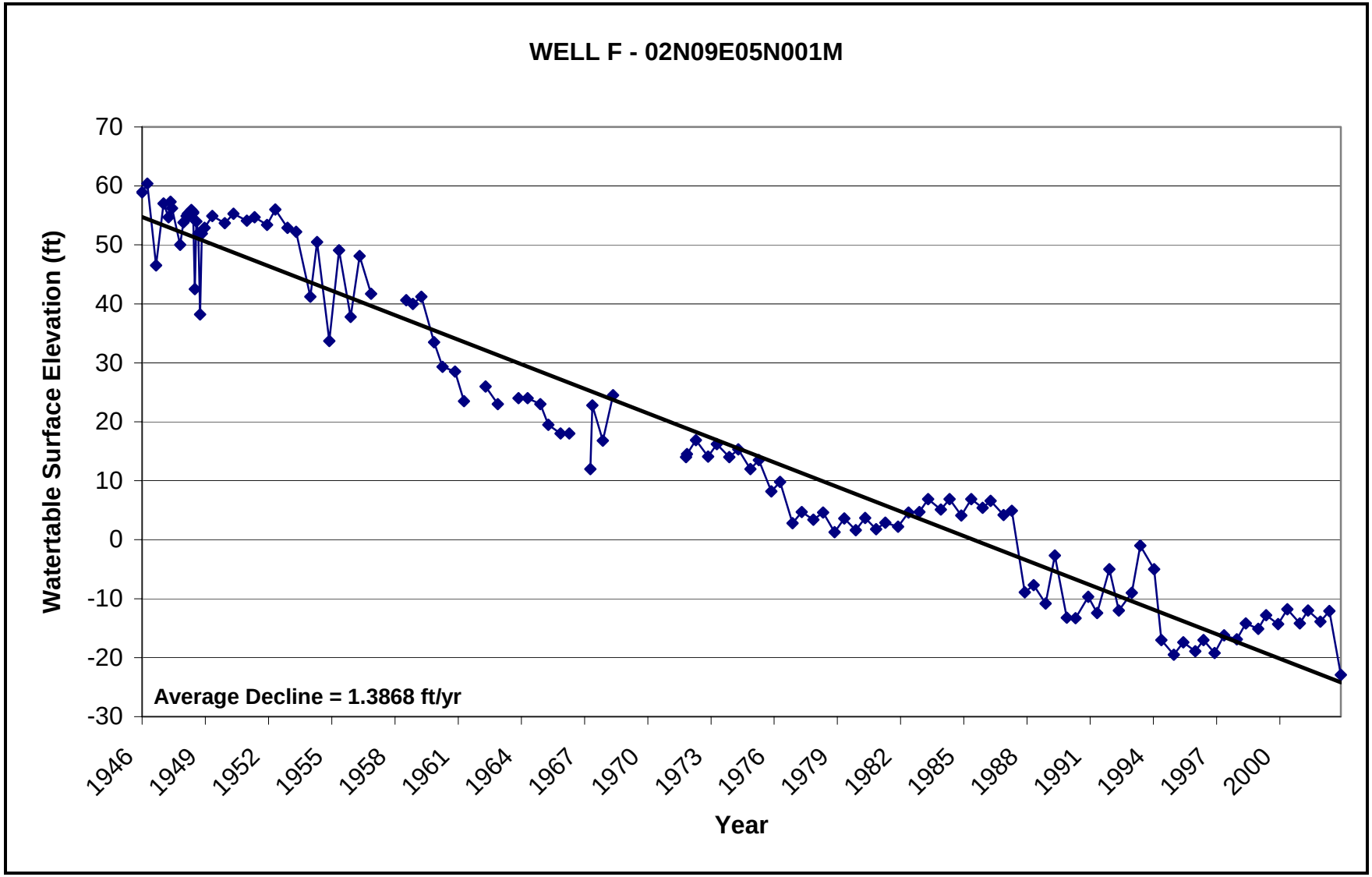


Figure 2-13 Hydrograph Well F
Source: California Department of Water Resources, Water Data Library at http://well.water.ca.gov/

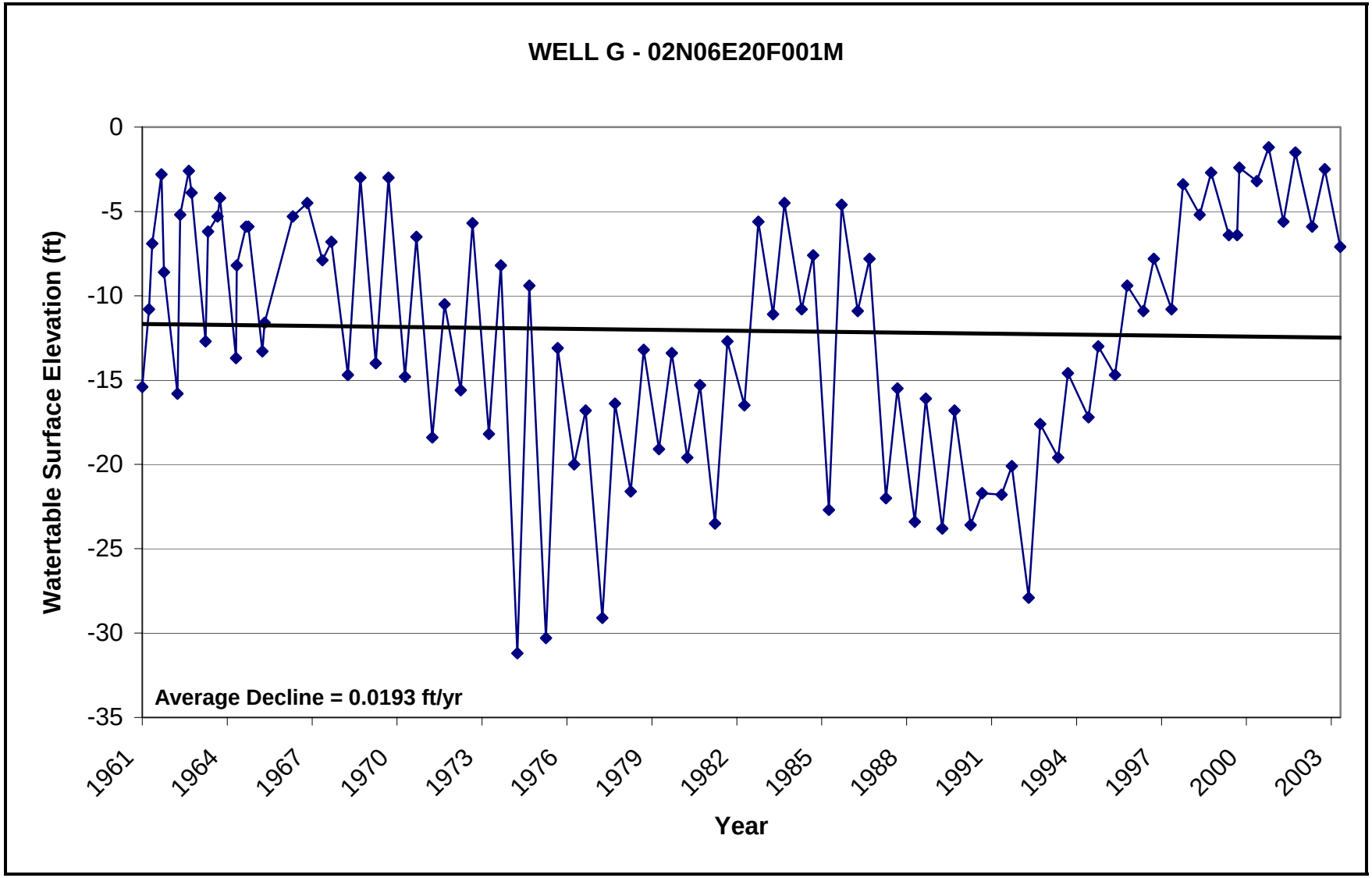


Figure 2-14 Hydrograph Well G
Source: California Department of Water Resources, Water Data Library at http://well.water.ca.gov/

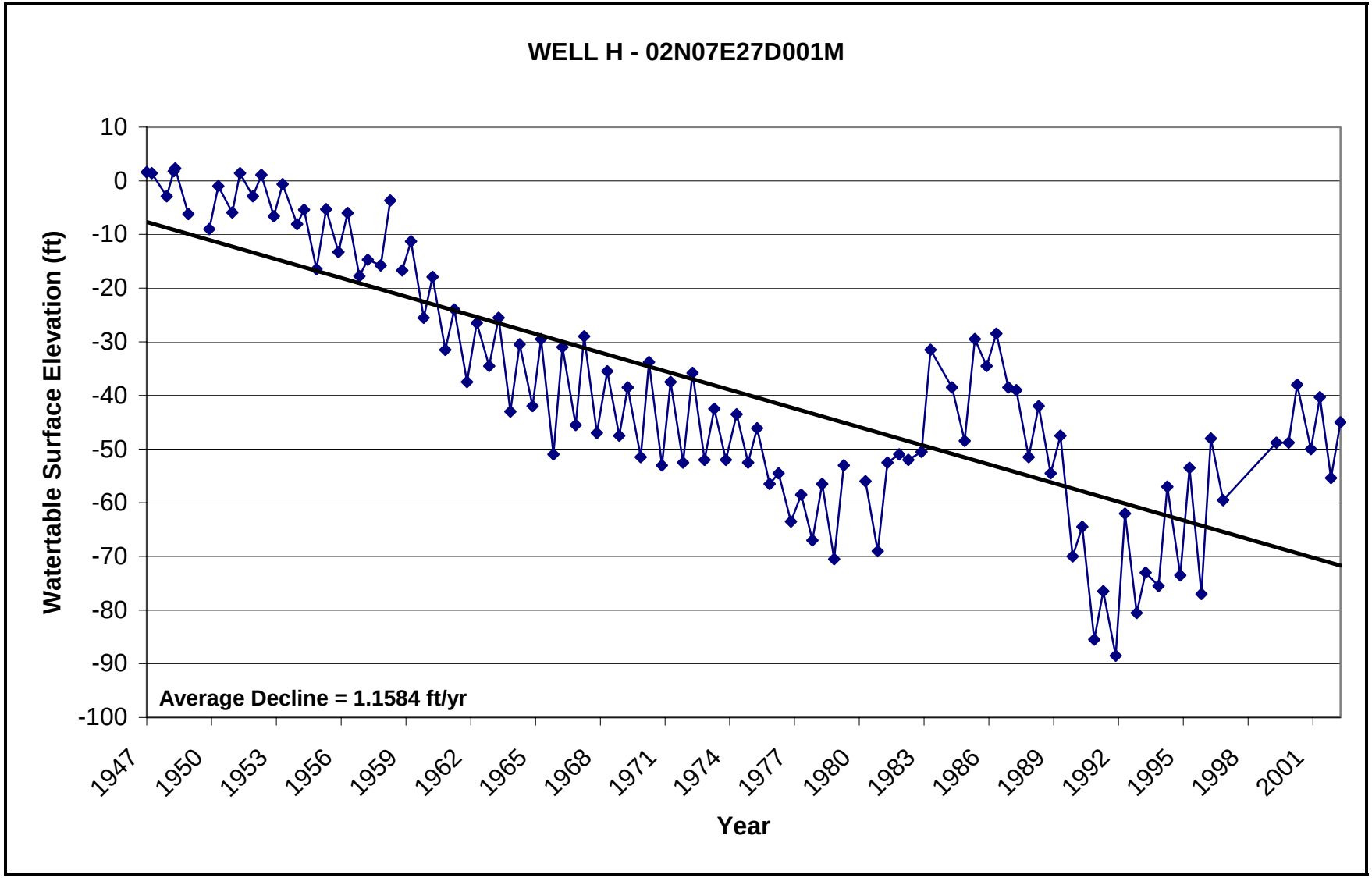


Figure 2-15 Hydrograph Well H
Source: California Department of Water Resources, Water Data Library at http://well.water.ca.gov/

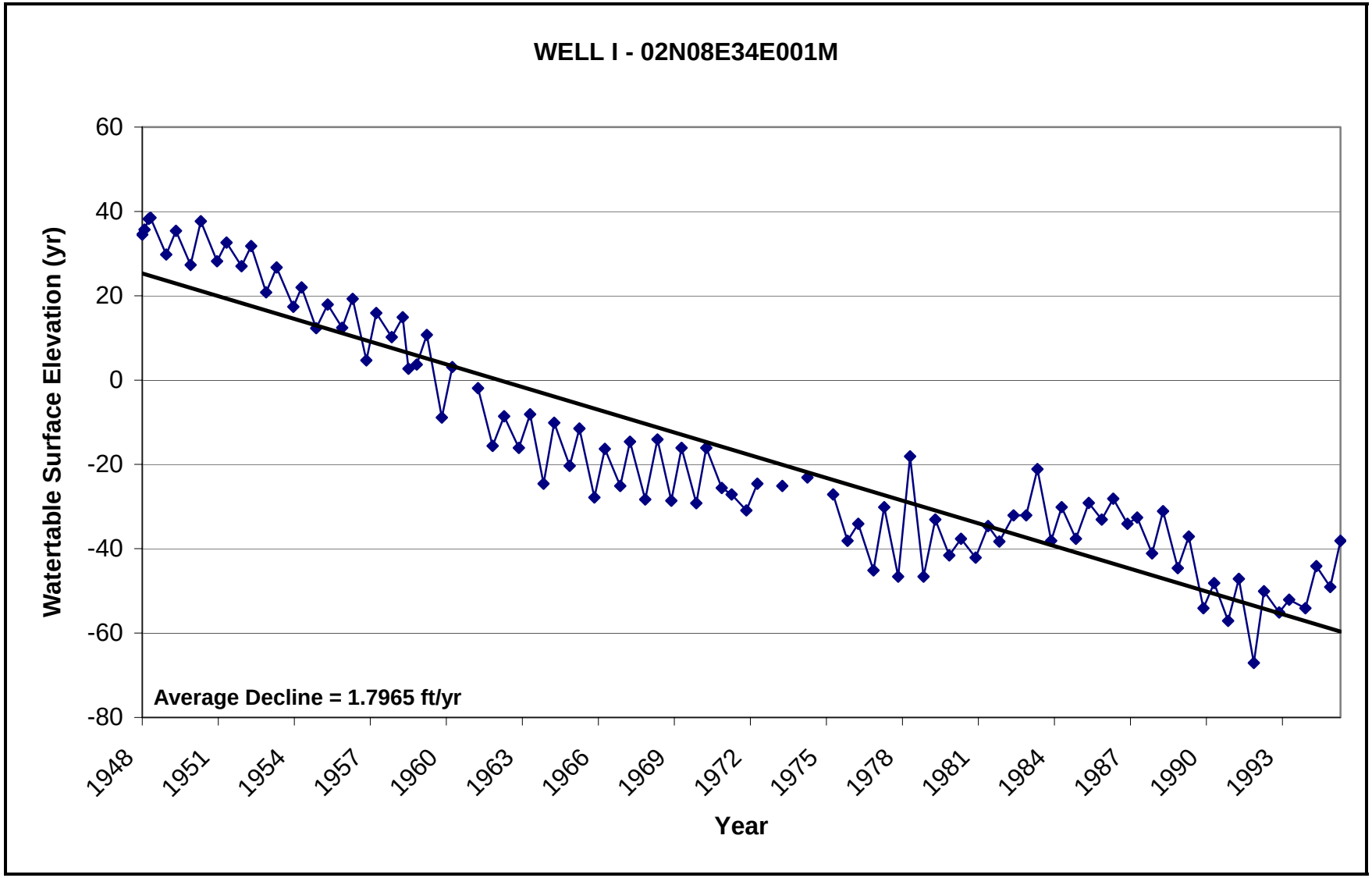


Figure 2-16 Hydrograph Well I
Source: California Department of Water Resources, Water Data Library at http://well.water.ca.gov/

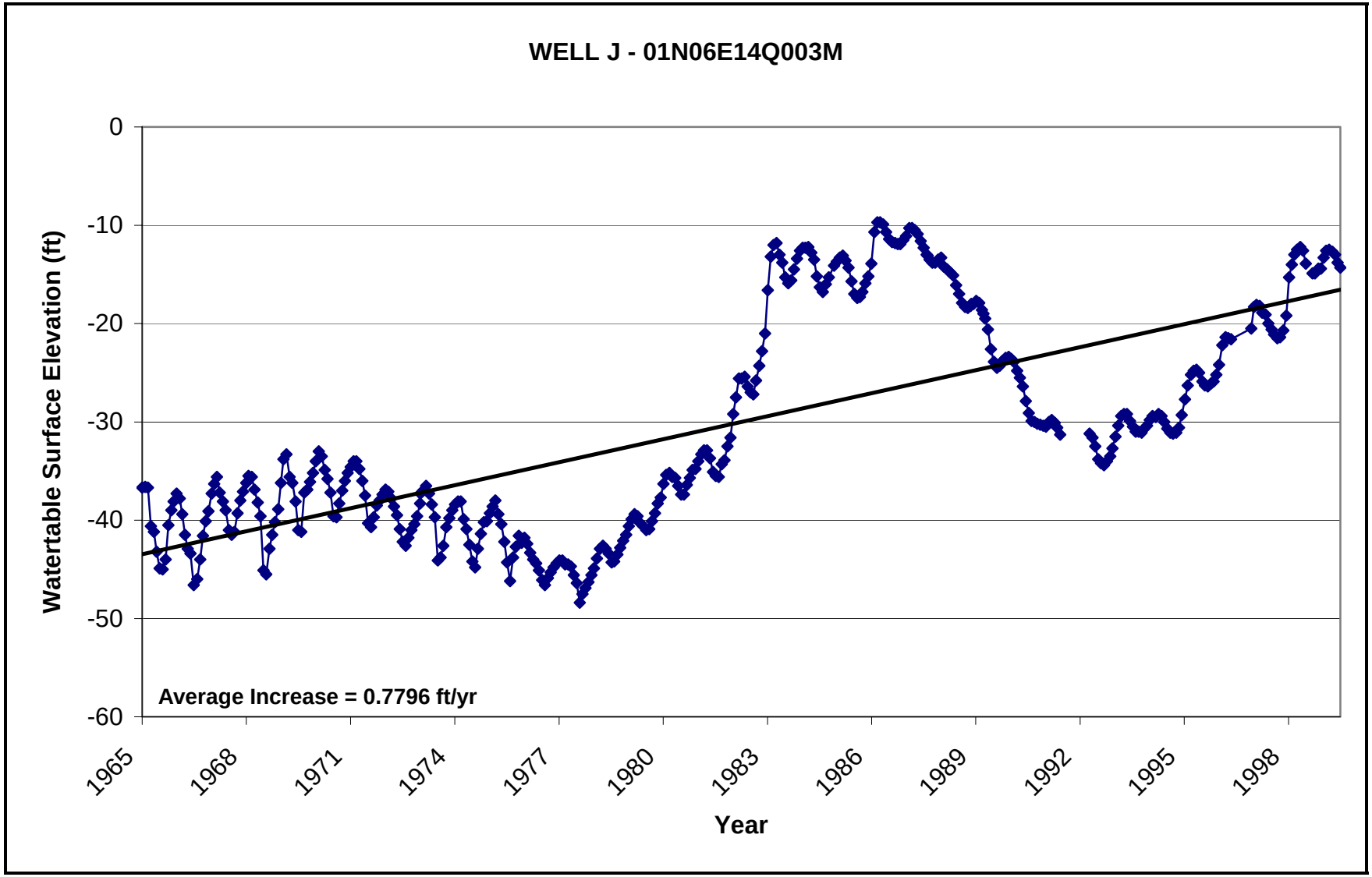


Figure 2-17 Hydrograph Well J
Source: California Department of Water Resources, Water Data Library at http://well.water.ca.gov/

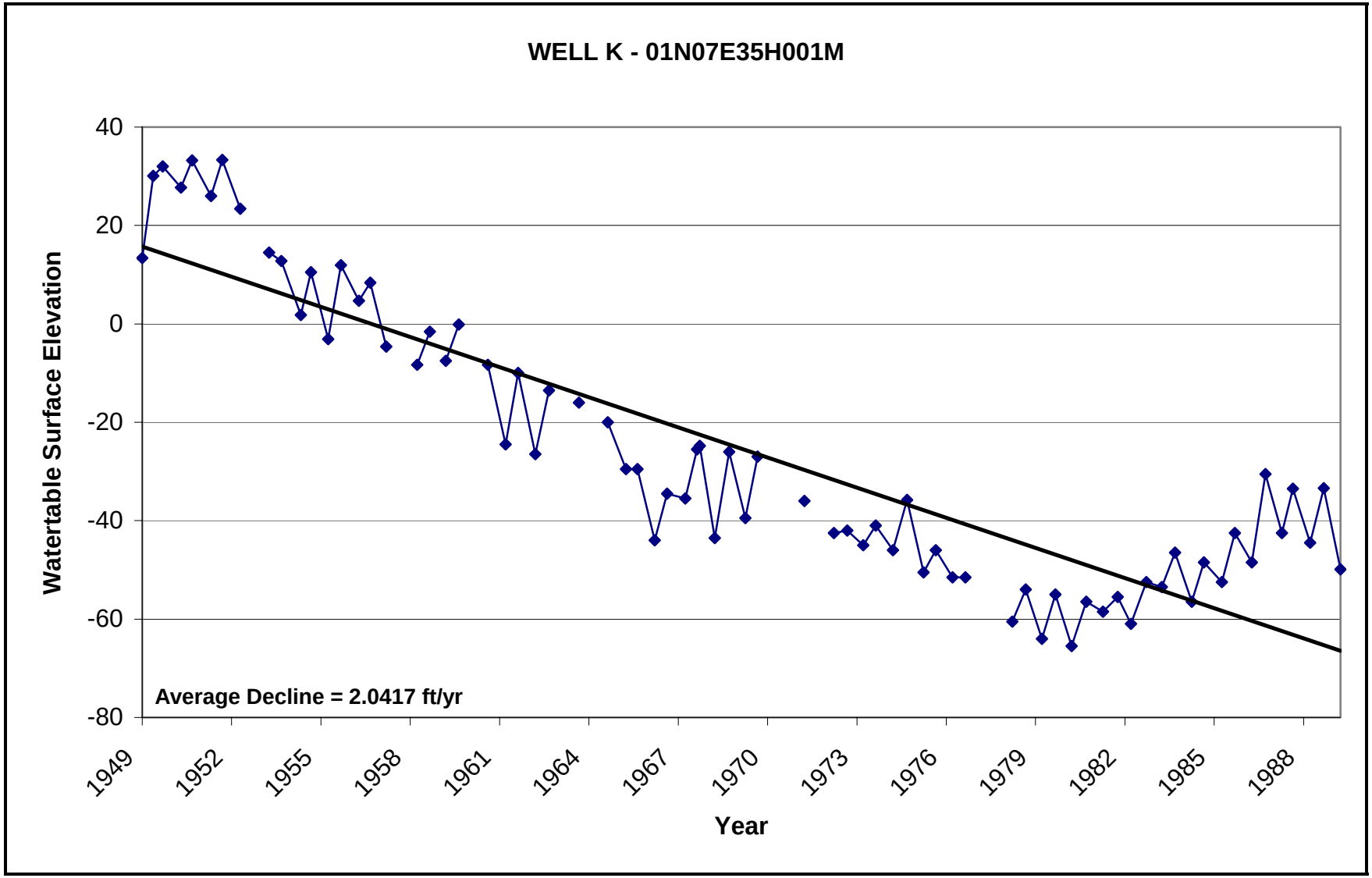


Figure 2-18 Hydrograph Well K
Source: California Department of Water Resources, Water Data Library at http://well.water.ca.gov/

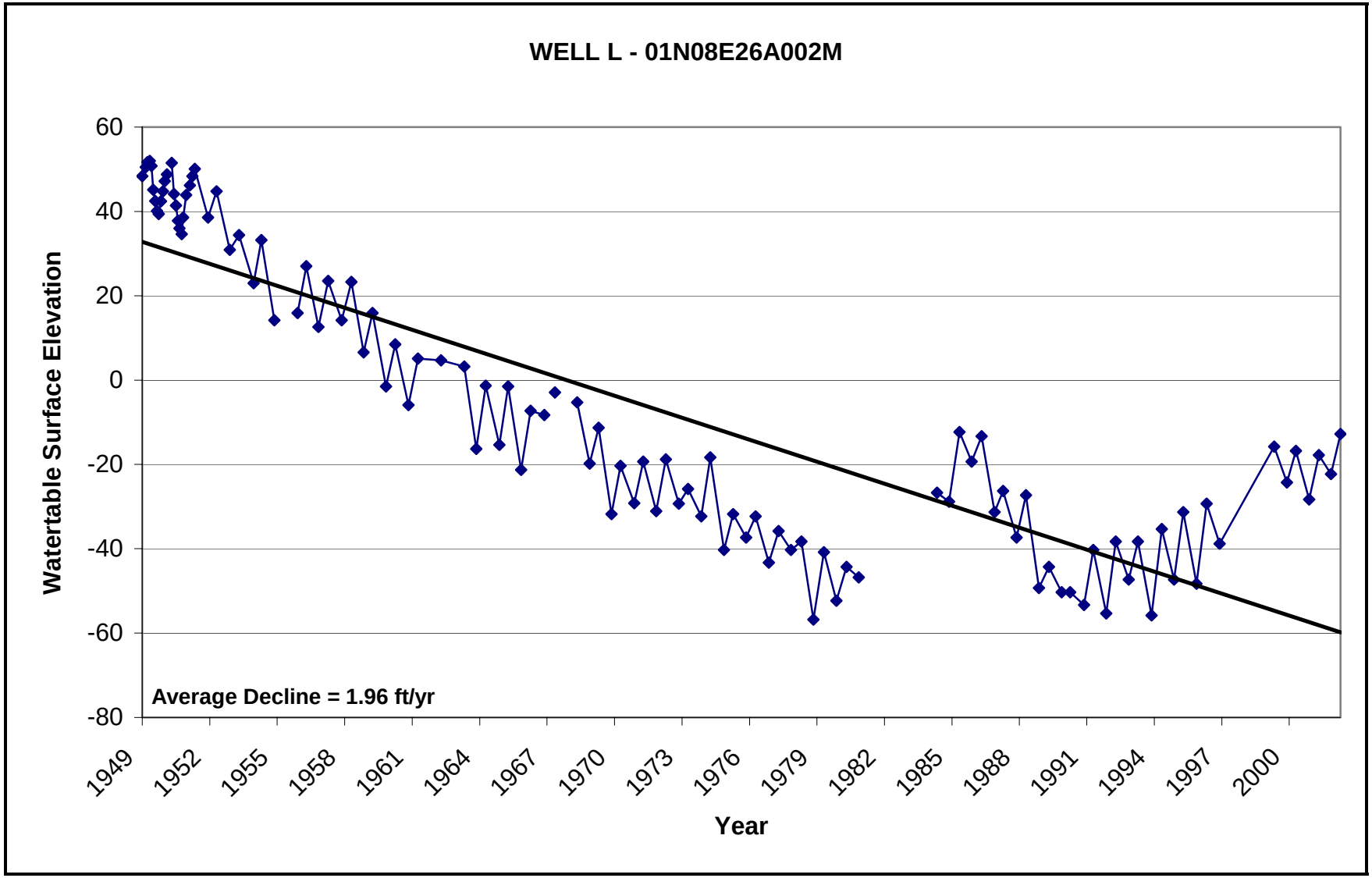


Figure 2-19 Hydrograph Well L
Source: California Department of Water Resources, Water Data Library at http://well.water.ca.gov/

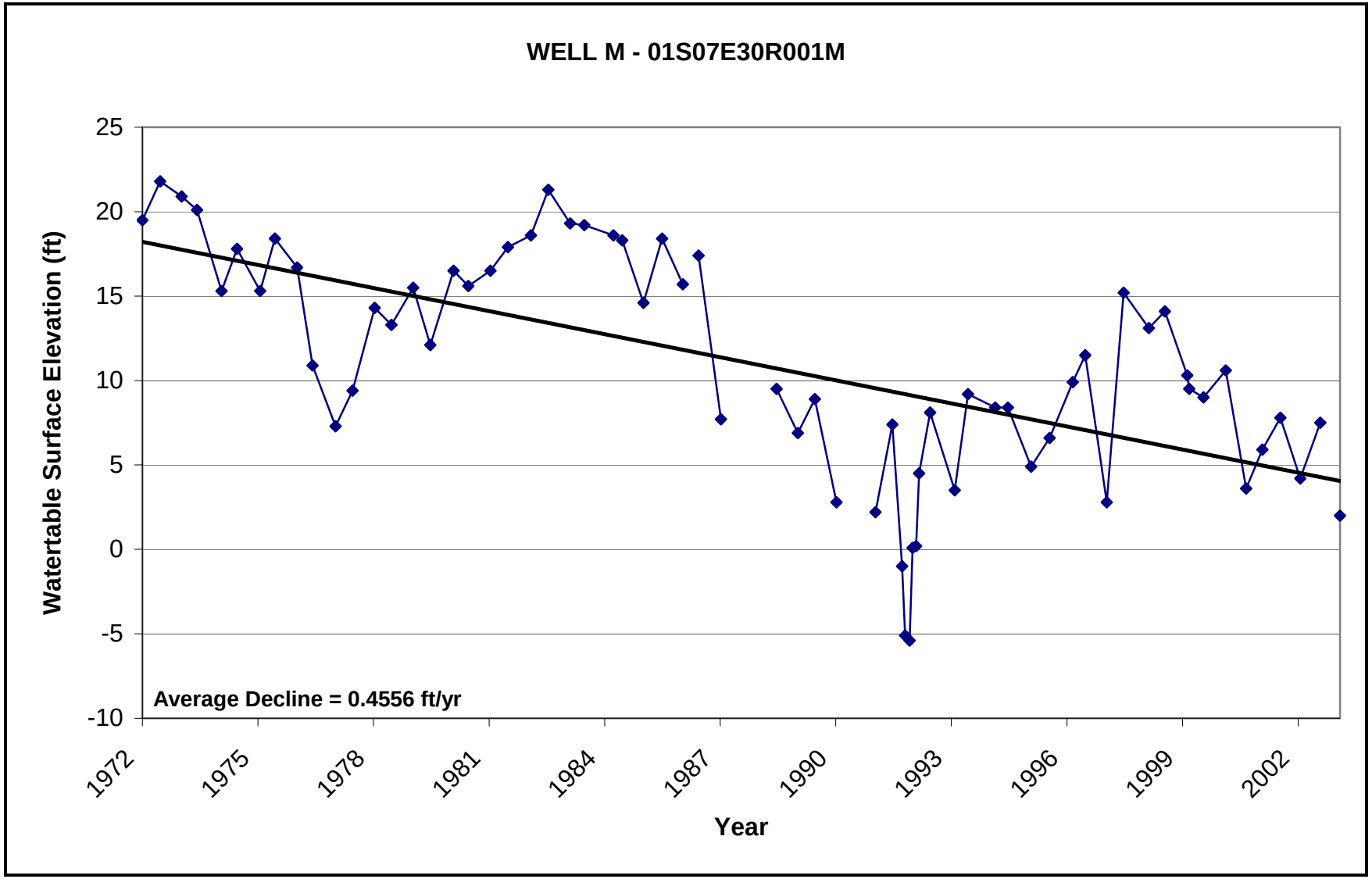


Figure 2-20 Hydrograph Well M
Source: California Department of Water Resources, Water Data Library at http://well.water.ca.gov/

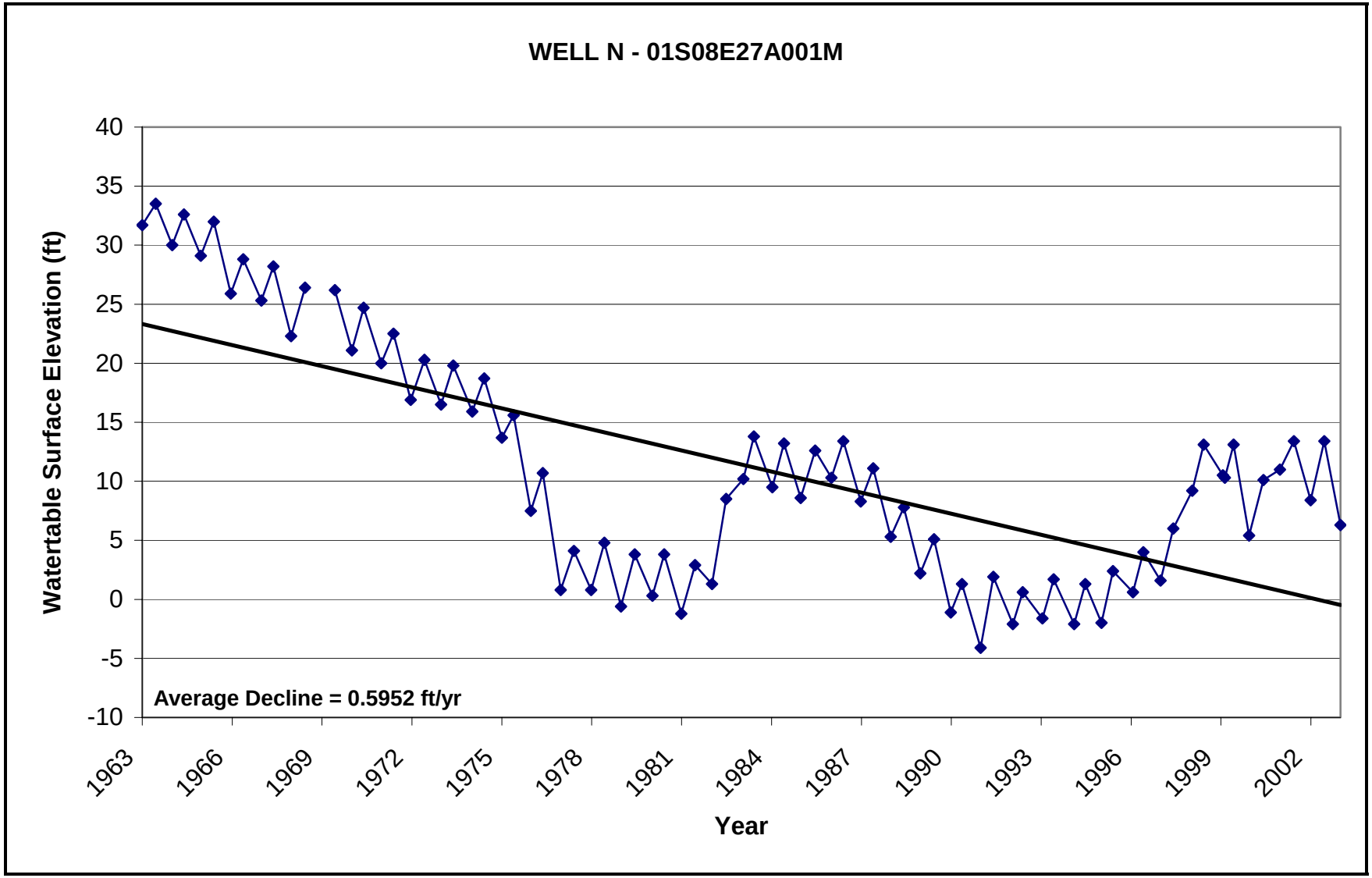


Figure 2-21 Hydrograph Well N
Source: California Department of Water Resources, Water Data Library at http://well.water.ca.gov/

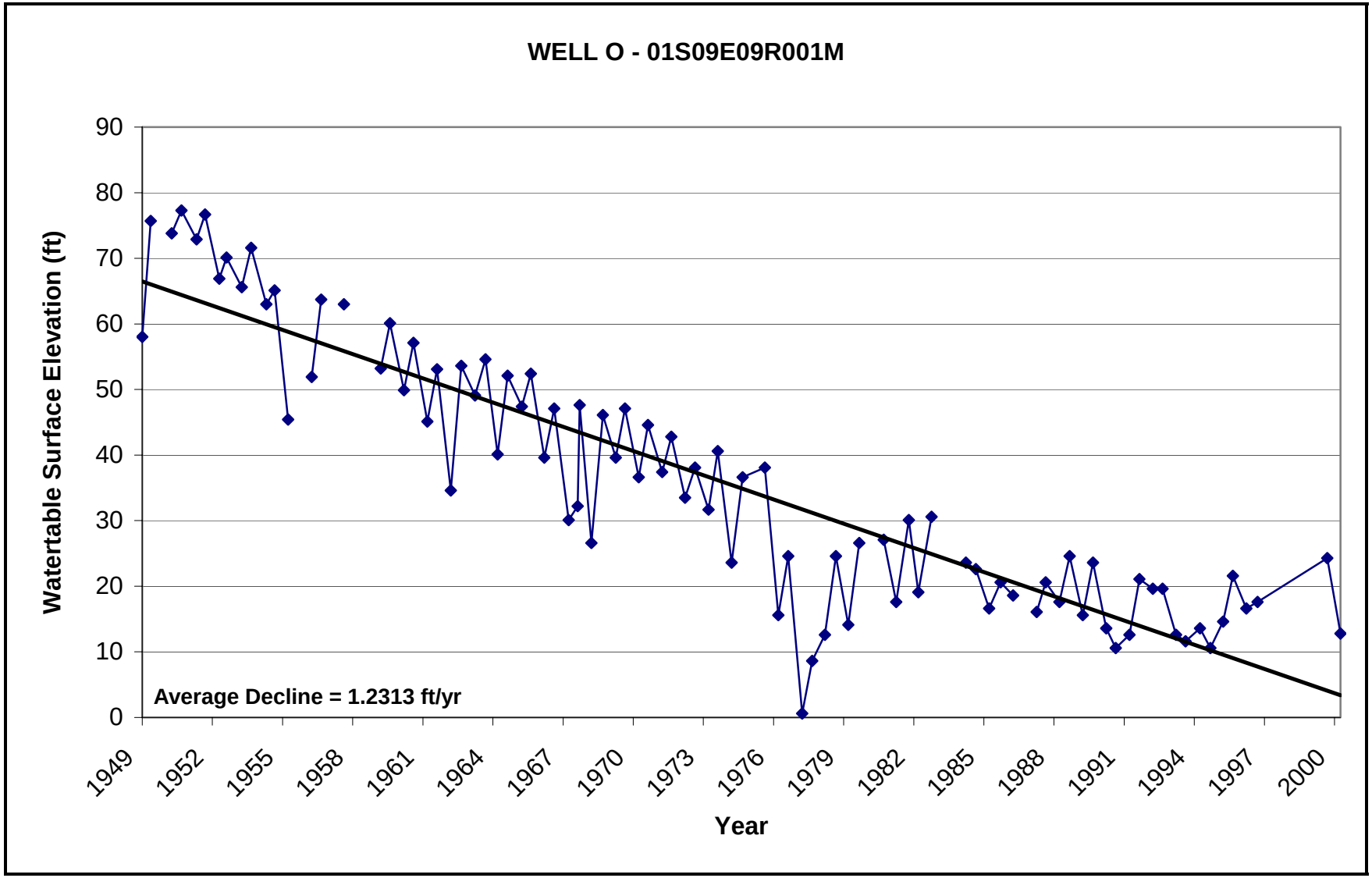


Figure 2-22 Hydrograph Well O
Source: California Department of Water Resources, Water Data Library at http://well.water.ca.gov/

Figures 2-9, 11, 12, 14, 15, 17, 18, and 21 illustrate groundwater levels for selected wells located in and around the principal cone of depression in eastern San Joaquin County. The groundwater levels in these wells clearly illustrate the significant decline in water levels since the 1960s, an average drop of 60 feet. The hydrographs of these wells illustrate average groundwater level drops of around 1.3 feet per year. In general, the lowest groundwater levels were reached in the late 1970s, recovering 10 to 20 feet, but then declined again in the mid-1990s. Wells in this area have a significant seasonal variation of 10 to 20 feet.

Figures 2-7, 8, 10, 13, 16, 19, and 20 illustrate groundwater levels for wells located further away from the main cone of depression, primarily further west and north. These wells show a less dramatic drop than the other wells, and more noticeable increase due to the wet years of 1981 through 1983 (total rainfall in 1983 was more than double the long-term average). The seasonal variation in these wells is distinct but not as pronounced as shown on the other hydrographs. In summary, the hydrographs reviewed illustrate the following general patterns:

1. In the central part of the County the groundwater table dropped continuously from the 1950s and possibly earlier to the mid 1980s. The decline was temporarily reversed due to climatic events.

2. In the northern part of the County groundwater table decline continued into the early 1990s.

3. Starting in the early 1980s a distinct drawdown and recovery cycle appears to have developed. The cycle covers a 10 to 15 year time period, and appears to be driven by climatic conditions more than long-term changes in groundwater use. This recovery and drawdown cycle may indicate that groundwater levels are beginning to equilibrate under current groundwater/surface water use patterns.

2.3.4 Groundwater Discharge and Recharge

The estimates of groundwater discharge and recharge presented in these sections are based on the modeling conducted by CDM for the San Joaquin County Water Management Plan, and the modeling originally conducted for the American River Water Resources Investigation (AWRI, 1996), and updated in 1999 for the Bureau of Reclamation by CH2MHill (CH2MHill, 1999). The results are for the Basin only.

2.3.4.1 Groundwater Pumping

Groundwater pumping records are not typically available for all wells within the study area. The approach adopted by DWR and other agencies to estimate groundwater withdrawals is based on land use. Figure 2-23 illustrates the ‘simulated’ total agricultural and municipal groundwater pumping for the model domain. Average annual groundwater withdrawal for the period from 1970 to 1993 for the Eastern San Joaquin portion of the model was 850,000 af.

2.3.4.2 Lateral Outflow

Under predevelopment conditions, lateral outflow from the Basin discharged to the San Joaquin River and the Delta area. For the period from 1970 to 1993, the net flow was positive, indicating no net groundwater outflow from study area.

2.3.4.3 Deep Percolation

The amount of water from natural and human activities that reaches the groundwater table is referred to as deep percolation. Deep percolation is the net of rainfall, applied irrigation water,

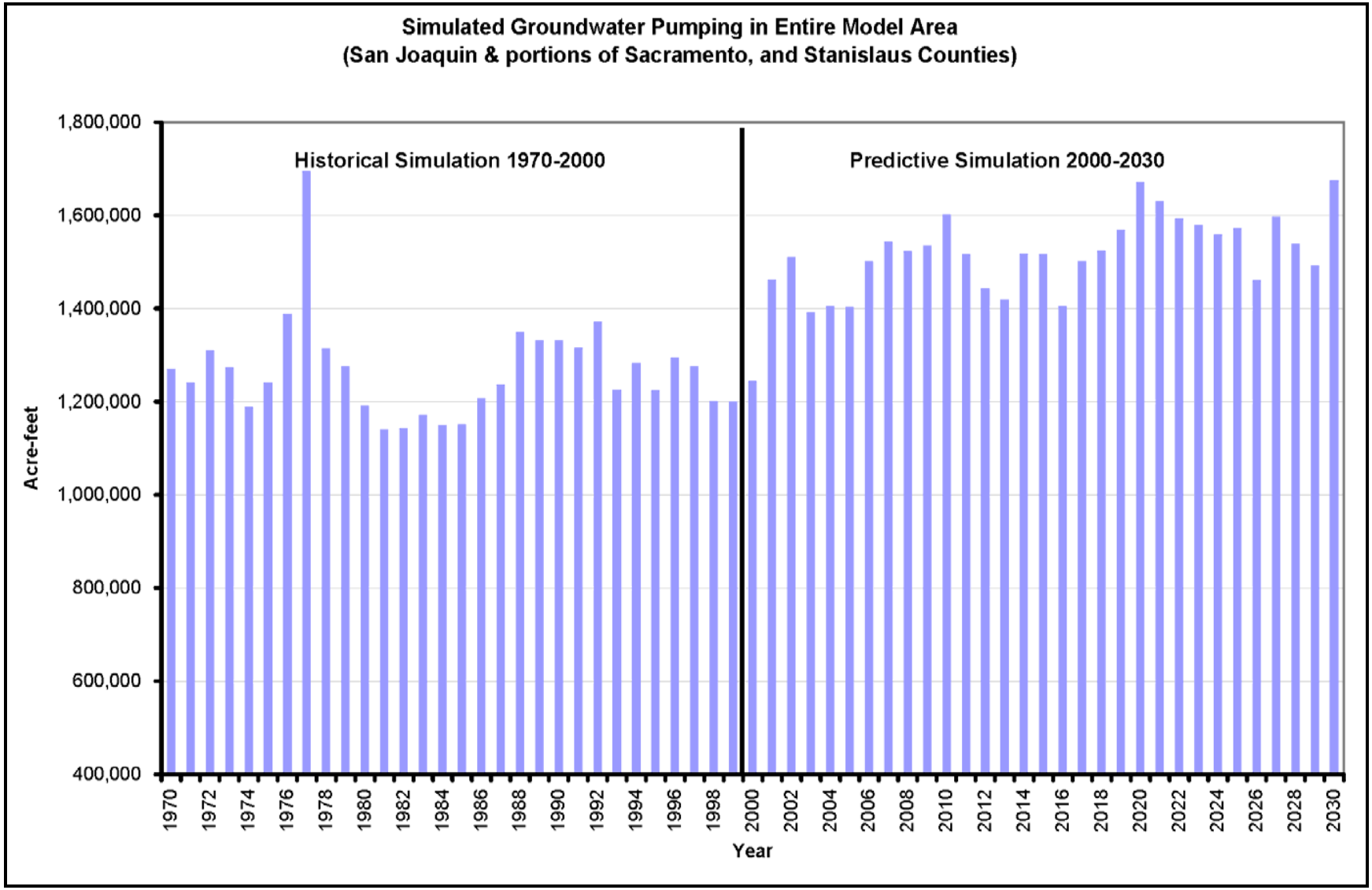


Figure 2-23 Simulated Groundwater Pumping
Source: Camp Dresser & McKee Inc.

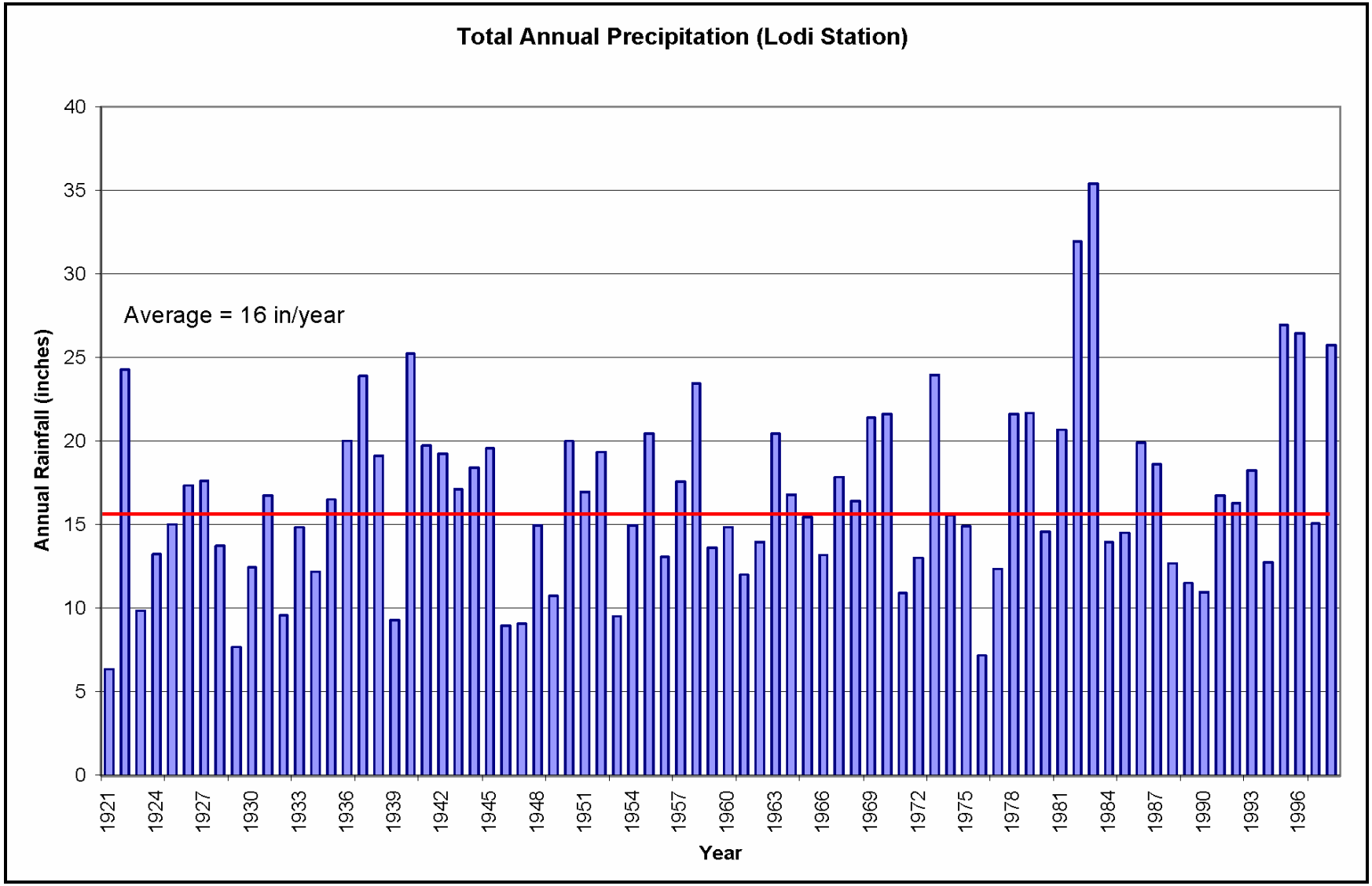


Figure 2-24 Annual Precipitation (Lodi Station)
Source: Camp Dresser & McKee Inc.

consumptive use, evapotranspiration, runoff, and unsaturated zone retention. Average rainfall within the study area is 14-16 inches per year. Figure 2-24 illustrates total annual rainfall for the Lodi Station. Within the Basin the estimated net deep percolation based on the modeling results is 590,000 af. Figure 2-25 illustrates the deep percolation for eastern San Joaquin County.

2.3.4.4 Lateral Inflow

Lateral inflow into the study area occurs primarily across the northern, western and southern boundaries. Under predevelopment conditions a net outflow existed, however due to the changed hydraulic conditions in eastern San Joaquin area there is now a net groundwater inflow. The groundwater model estimates net lateral inflow to be 120,000 af for the 1970 to 1993 period.

2.3.5 Surface Water Interaction

A large number of streams and rivers dissect the study area. The rivers that have a regional impact on the hydrogeology are Cosumnes River, Mokelumne River, Dry Creek, Calaveras River, Stanislaus River, Tuolumne River, and San Joaquin River.

Based on modeling results for the five-year period from 1989 to 1993, the Tuolumne and the upstream reaches of the Mokelumne and San Joaquin Rivers were gaining rivers – that is groundwater discharged into the rivers. The Calaveras, Dry Creek, Stanislaus, and the downstream reaches of the Mokelumne and San Joaquin Rivers were all losing rivers – i.e. surface water recharged the groundwater. On average from 1970 to 1993, there was a groundwater gain from streams of 140,000 af and a groundwater loss to streams of 100,000 af. The net gain to the groundwater system was 40,000 af.

2.3.6 Groundwater Balance

Current and historical groundwater pumping rates exceed the sustainable yield of the underlying groundwater basin on an average annual basis. Based on a simplified groundwater balance, as shown in Table 2-3, the net groundwater overdraft over the historic hydrologic record is estimated to be approximately 150,000 to 160,000 af/yr. The net groundwater overdraft is defined as the difference between total basin outflow and inflow plus the estimated accretions from the San Joaquin River and lateral basin inflow in west Stockton. Because much is unknown about the source and rate of migration of the saline front, the conceptual groundwater model assumes that all basin inflow in west Stockton is saline.

The result of long-term groundwater overdraft is two fold: significant decline in groundwater levels and increased accretions from area waterways. Although increased accretions to the groundwater basin from high quality surface water sources are desirable, accretions in the western fringes of the Basin and the Lower San Joaquin River are undesirable due to elevated salinity levels. Saline groundwater intrusion has forced the closure of several wells in the Calwater service area.

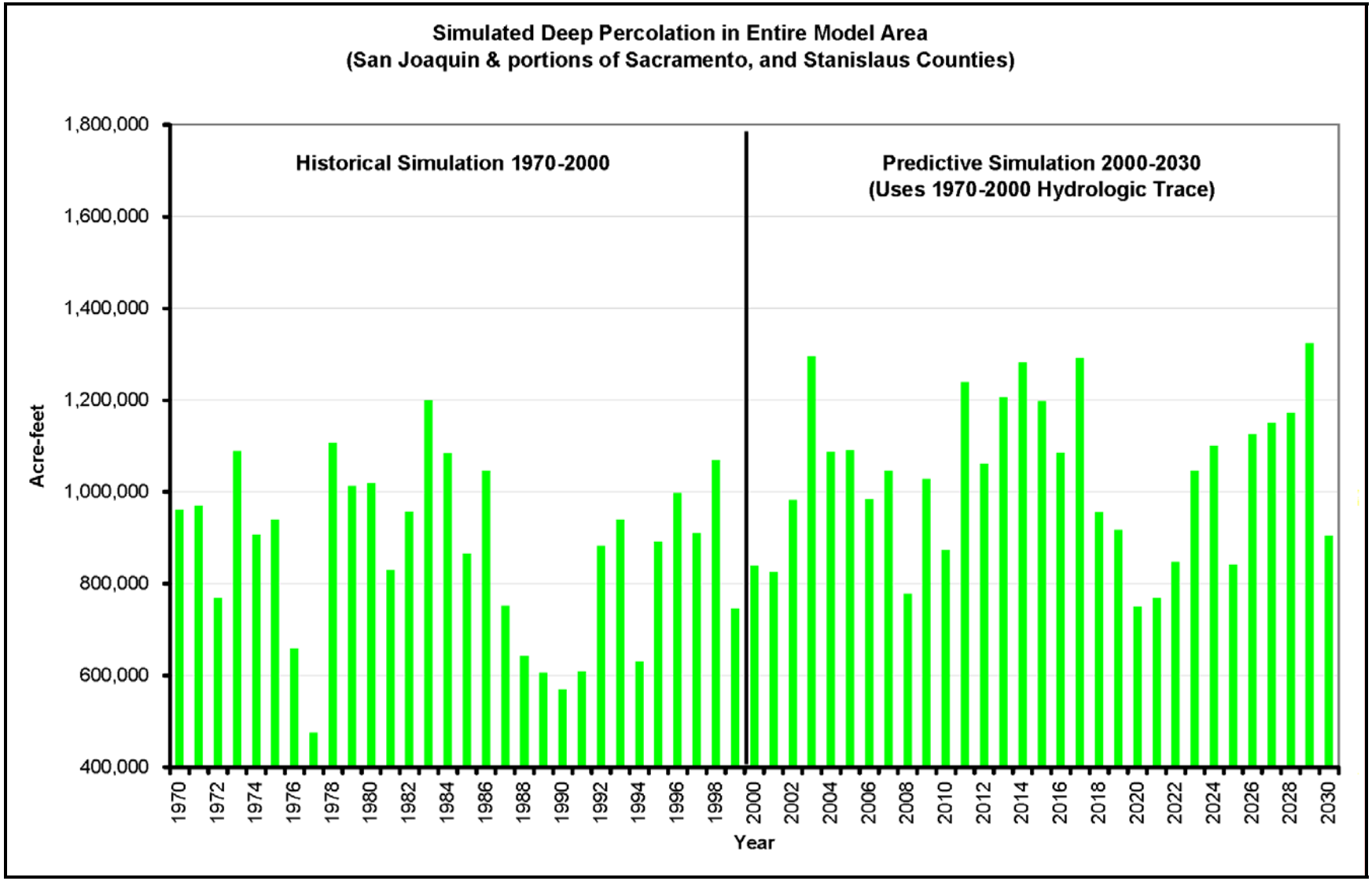


Figure 2-25 Simulated Deep Percolation
Source: Camp Dresser & McKee Inc.

Table 2-3 Simplified Groundwater Balance for Eastern San Joaquin County		
Groundwater Flow Component	**Average Value**	**Explanation**
Inflows (af)		
Deep Percolation/Recharge	608,400	Net infiltration from rainfall, irrigation, canal leakage etc.
Gain from Streams	198,170	Net inflow from streams to groundwater system
Lateral Inflow	98,000	Net of subsurface inflows and outflows.
Total Inflows	**904,577**	
Outflows (af)		
Groundwater Pumping	867,600	Net agricultural, municipal and industrial pumping
Loss to Streams	108,898	Net outflow from groundwater system to streams
Lateral Outflow	35,300	Subsurface Outflows
Total Outflows	**1,011,815**	
Groundwater Overdraft (af)		
Mined Aquifer Storage	107,238	Total Inflows minus Total Outflows
Estimated Saline Intrusion	42,000*	Lateral Saline Intrusion into the Stockton Area
Total Estimated Overdraft	**150,700**	Sum of Mined Aquifer Storage and Saline Intrusion
Notes		
Source: San Joaquin County Water Management Plan Volume I		

2.3.7 Saline Groundwater Intrusion

Groundwater flow in the Basin now converges on the depression with relatively steep groundwater gradients eastward from the Delta toward the cone of depression as depicted in Figures 2-3 and 2-4. The eastward flow from the Delta area is significant because of the typically poorer quality water now moving eastward in the Stockton area. Increased lateral inflow from the west is undesirable, as this water is typically higher in TDS and chloride levels and causes the degradation of water quality in the Basin. Figure 2-9 illustrates the approximate location of the 300 mg/L isochlor as measured in 2000. Projections indicate that the rate of eastward migration of the saline front is approximately 150 to 250 feet per year. Figure 2-9 also shows the projected 2030 location of the 300 mg/L isochlor under no-action conditions.

Degradation of water quality due to TDS or chloride contamination threatens the long-term sustainability of a very important water resource for San Joaquin County, since water high in TDS and/or chloride is unusable for either urban drinking water needs or for irrigating crops. Damage to the aquifer system could for all practical purposes be irreversible due to saline water intrusion, withdrawal of groundwater from storage, and potentially subsidence and aquifer consolidation. The saline intrusion problem is not well understood by the Authority. Further studies and monitoring methods are necessary to ensure the problem is addressed and monitored adequately. Section 4 discusses further the current groundwater monitoring program and future actions to be undertaken by the Authority and its member agencies.

2.3.8 Baseline Conditions

A no-action, or baseline simulation, was conducted to predict how current groundwater and surface management practices, projected out to 2030, would impact the Basin. Groundwater modeling has shown that unless there is a change in how groundwater is used or managed, levels will continue to decline and storage will continue to be reduced. Figure 2-26 shows the corresponding simulated groundwater table for the year 2030 under baseline conditions. A large portion of the Basin is shown to have groundwater levels 60 to 80 feet below sea level.

Further exacerbating the groundwater conditions, as already mentioned, is the lateral inflow of saline water from the west, which could render parts of the aquifer unusable. Figure 2-27 illustrates the approximate location of the 300 mg/l chloride concentration contour as of 1996 as well as the projected 2030 contour. Groundwater modeling has indicated that the rate of eastward movement of this line is approximately 150 to 250 feet per year. Figure 2-27 also shows the projected location of the 300 mg/L chloride concentration line by the year 2030 under baseline conditions.

In other portions of California's Central Valley, declining groundwater levels have also resulted in land subsidence. Generally, this is not a widespread problem in the Basin, but may be a localized issue in some areas.

2.4 Urban Water Demands

The population of San Joaquin County is growing rapidly. The current population is expected to increase by approximately 83 percent by 2030 from nearly 600,000 to 1.1 million. While increases in urban water demands will largely be offset by the development of agricultural lands, the changes in differing water quality needs and demand patterns will further stress the ability of urban purveyors to meet the areas water needs. Because water use per acre varies by city, an analysis of each cities acreage and usage was undertaken. The area for each city was determined from 1996 DWR Land Use Surveys.

In consideration of planned growth, future water demands are based on each city's sphere of influence. Future water demands assume that by the 2030 planning horizon, each city's sphere of influence will be fully developed and will maintain a similar water demand. Table 2-4 indicates that the total 1996 urban demand was 82,600 af annually, which is projected to increase by 146,000 af/yr to 241,100 af/yr by 2030. Unforeseeable changes such as general plans revisions, changes in population density and increased water conservation can affect the accuracy of the projected water demand. It is recommended that the projections be updated as DWR Land Use Surveys for San Joaquin County become available.

2.5 Agricultural Water Demands

The agricultural water demands presented in this Plan are based on the 1996 DWR Land use survey. Based on the associated land use and crop type, applied water demands under average conditions were identified and summarized by Water District in Table 2-5. The entire applied water demand for non-urban and non-riparian vegetative areas in San Joaquin County in 1996 is approximately 1,522,000 af/yr, 954,000 af of which is needed in Eastern San Joaquin County. Table 2-5 assumes that agricultural lands outside of the urban spheres of influence will remain in production and that any agricultural lands within the urban spheres of influence will be developed by the 2030 planning horizon. The decrease in agricultural demand within city's sphere of influence is estimated to be 132,000 af. With this decrease, the projected agricultural demand in 2030 is estimated to be 1,390,000 af per year.

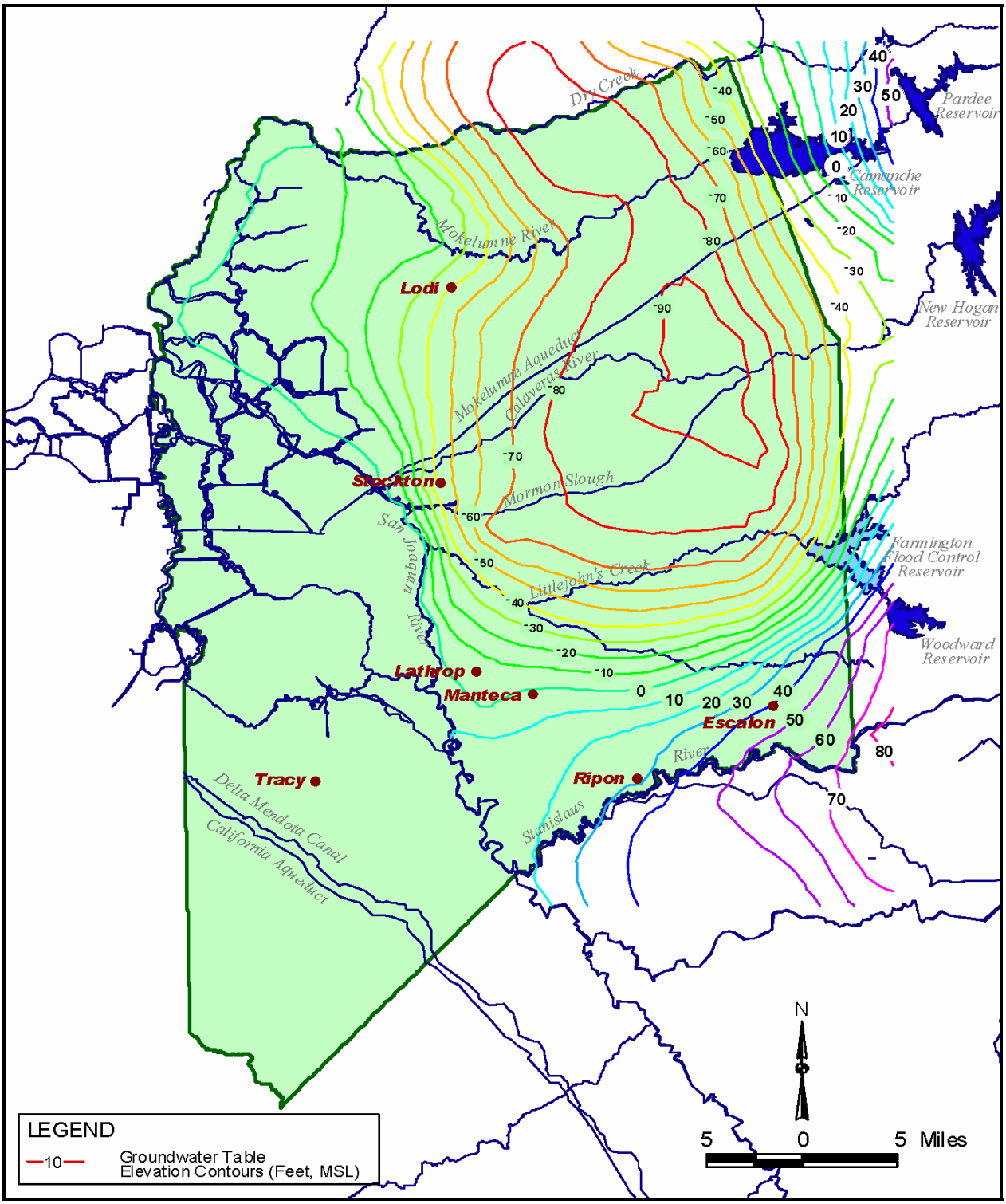


Figure 2-26 Simulated 2030 Groundwater Table Under Baseline Conditions
Source: Camp Dresser & McKee Inc.

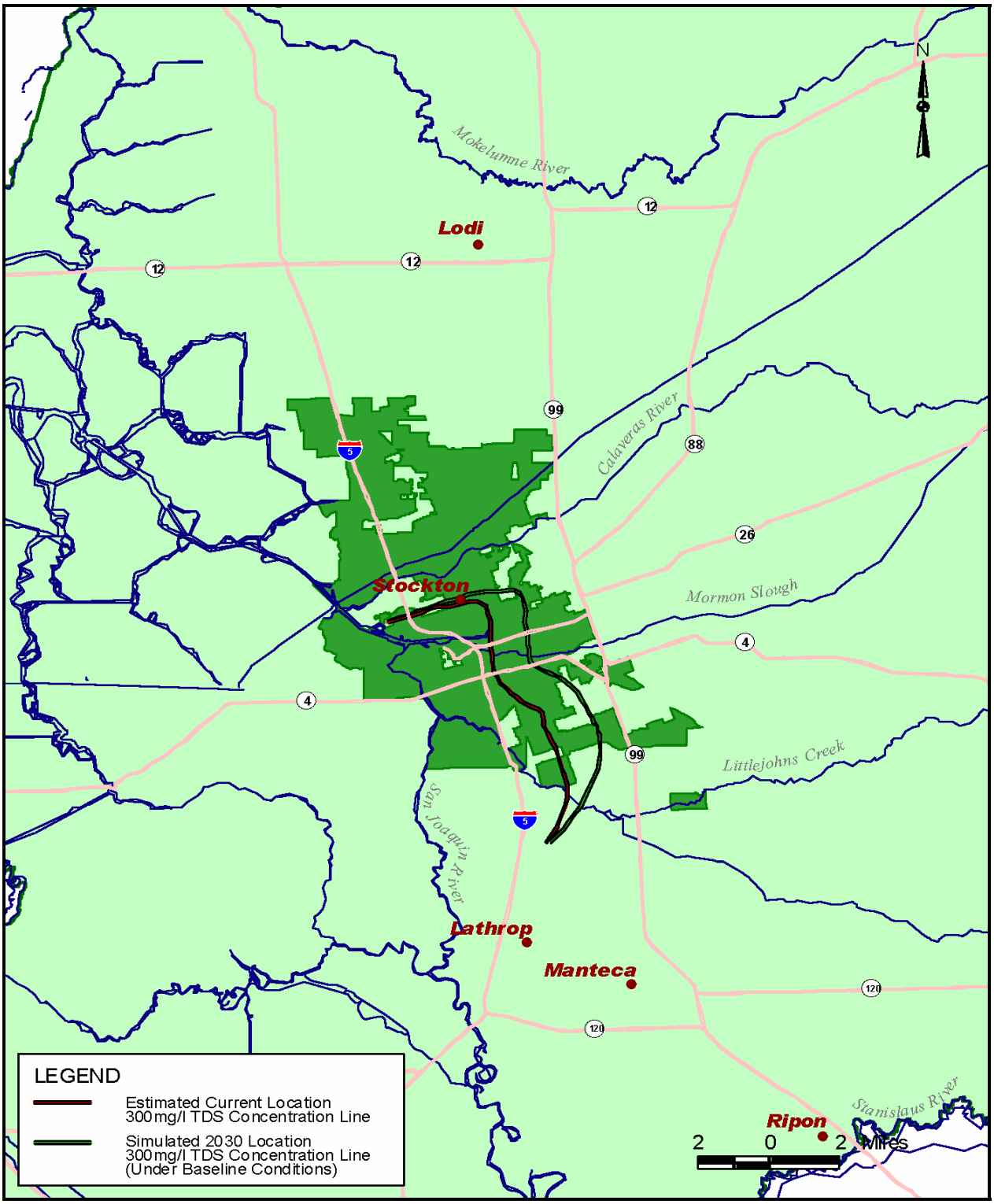


Figure 2-27 Estimated 2000 and Projected 2030 Saline Front
Source: Camp Dresser & McKee, Inc.

Table 2-4 Future Urban Water Demands

City	"1996" Current Demand[3] (af)	Current Land Use (acres)	Water Use/ Acre[4] (af/ac)	Future Land Use (acres)	Future Demand (af)	Net Increase in Demand (af)
Escalon	1,400	932	1.5	2,106	3,200	1,800
Lathrop [1]	2,900	3,409	0.85	13,254	11,300	8,400
Lodi	16,600	6,071	2.7	9,650	26,400	9,800
Manteca	11,200	5,056	2.2	14,140	31,300	20,100
Ripon	3,500	1,764	2.0	6,676	13,200	9,700
Stockton [2]	47,000	29,746	1.6	61,353	96,900	49,900
Total	**82,600**				**241,100**	**146,600**

Source: San Joaquin County Water Management Plan Volume I

Notes:

1. Lathrop water use per acre is lower than the remainder of the cities because their developments are less dense than other cities. The city's future projections indicate that their water use per acre will increase to 1.4 ac-ft/ac. To maintain consistency, the water use per acre has been calculated as if it will stay the same over time. It is difficult to predict how development patterns will change, and the error that could be associated with this assumption is less than 0.5 percent of the future County demand.
2. The demand for the city of Stockton only reflects the water use within city limits. Water providers for the Stockton area also provide significant water to the urban areas outside of the city limits. Total water deliveries for the Stockton urban area are approximately 62,000 ac-ft.
3. Current year represents "1996". Individual city water usage data is based on information gathered during the development of the San Joaquin County Water Management Plan, 2001.
4. Water usage on a per acre basis is used to simulate groundwater withdrawals in the Camp Dresser & McKee developed DYNFLOW Groundwater Model for Eastern San Joaquin County.

The estimated and projected water demands presented are based on the following assumptions:

1. Drastic changes in cropping patterns will not change drastically.

2. Applied water demands include evapotranspiration, system losses, tailwater drainage, and percolation to groundwater.

3. Applied water demands do not include conveyance losses or off-farm demands. The applied water demand is the information necessary for the groundwater model, which also takes into account the differences in consumptive use for each parcel of land. Urban areas have different consumptive use than agricultural areas, and consumptive use also varies between different types of crops. Therefore, the applied water demand will usually be less than the diversion amounts maintained by each district.

The decrease of 132,000 af of agricultural water use can be compared to an increase in urban water use of 146,000 af. In terms of net demand, this is not a significant change. This similarity in demand is due to an approximate one-to-one conversion rate between urban and agricultural use for each acre. The usage rates for agricultural and urban water use are similar, with urban water use slightly higher per acre. Most land around urban areas is currently farmed; thus, in order for the urban areas to expand, agricultural land would be converted at an approximate one-to-one ratio. Because each acre of new urban land results in 1 less acre of agricultural land, and the water use figures are similar, the water demands are projected to remain essentially constant throughout the planning period.

Table 2-5 Estimated and Projected Agricultural Water Demands
(Applied Water Requirement under Average Conditions)

District (Within San Joaquin County Only)	1996 Estimated Applied Water Demand (af/yr)	2030 Projected Applied Water Demand (af/yr)
North Delta Water Agency	**37,244**	**37,244**
Central Delta Water Agency	**209,622**	**209,622**
South Delta Water Agency	206,759	206,759
West Side ID	17,205	17,205
City of Tracy	34,192	-
Banta-Carbona	42,585	42,585
Lathrop	21,225	-
South Delta Area (Total)	**321,966**	**266,549**
Del Puerto WD	**15,529**	**15,529**
Plain View WD	**11,217**	**11,217**
North San Joaquin WCD	**88,022**	**88,022**
Woodbridge ID	**102,517**	**102,517**
Lodi	**5,124**	**-**
Stockton East WD	151,210	151,210
Stockton	38,701	-
SEWD (Total)	**189,911**	**151,210**
Central San Joaquin WCD	**159,554**	**159,554**
Oakdale ID	**48,391**	**48,391**
South San Joaquin ID	126,709	126,709
Manteca	21,663	-
Escalon	1,761	-
Ripon	9,508	-
SSJID (Total)	**159,641**	**126,709**
Unincorporated Areas	**173,390**	**173,390**
Total	**1,522,128**	**1,389,954**

Notes:

1. This table was modified based on comments received on the Draft SJCWMP. It was compiled from the DWR land use information linked to Private, State and Federal water district outlines in a GIS system. There are significant areas of overlap between city limits, spheres of influence, and between water districts themselves. Bearing this in mind, there are bound to be variations and differences between these estimates and those compiled using different methodology. The figures in this table represent theoretical applied water requirements for average conditions.
2. The quantity of water actually pumped, diverted and applied will be significantly different due to a variety of factors including distribution system inefficiencies and losses (ranging from 10 to 20 %), climate, soil conditions, etc. The loss of agricultural land to urban expansion is illustrated by the reduction in agricultural acreage currently located within urban spheres of influence.
3. Agricultural lands in urban areas and urban spheres of influence are phased out completely by 2030. Other changes are likely to impact water demand, such changes in cropping patterns, irrigation methods, and farming of previously vacant land. However, these changes have not been quantified in any systematic or reliable basis.
4. Urban development will be undertaken by increasing urban densities through infill of spheres of influence. Development according to this guideline has yet to gain market acceptance and widespread application in the County. However, current development patterns, and their associated average unit water usage rates, are assumed to apply in the future.
5. Local urban development practices will result in new developments with similar water use rate. Water use figures were calculated for each individual urban area, and these figures were applied to future development. Each urban area has a unique unit water use rate based upon local factors, such as amounts of open space and conservation practices. As best management practices are implemented with respect to water conservation, projected water demands for urban developments may actually be conservative as compared to past conservation efforts.
6. The urban spheres of influence reflect 2030 development. The urban spheres reflect the local plans for where expansion could occur in the future, but it is possible that the development will occur in different areas, or in different amounts than predicted. The State Department of Finance predicts future populations; the projected 2030 population can fit within the spheres at current urban densities.

The assumptions in Table 2-5 simplify the process of predicting future water demands. The analysis undertaken does in no way imply that other changes in urban development and agriculture are not likely, nor are the assumptions intended to discourage implementation of structural or policy changes that improve water use efficiency. For the purposes of the Plan, extensive analysis of the sensitivity of the assumptions on the projected water demand was not

undertaken. From a water resources planning perspective, the demands presented are sufficient.

2.6 Water Supplies

The California water rights system, considered a dual system, recognizes both riparian and appropriative rights. Appropriative rights date back to the mid-1800's during the California Gold Rush under the "*First-in-Time, First-in-Right*" doctrine. The Water Commission Act of 1913 required that a permit be issued for appropriation of surface water and that the right be assigned a priority based on the date issued. Today, the SWRCB is the regulatory agency through which surface water rights are appropriated. Water rights acquired prior to December 14, 1914 are not subject to State Board regulation; however, Article X, § 2 of the California Constitution mandates that water must be put to "…reasonable and beneficial use…" or risk loss of water right. (http://ceres.ca.gov/, 2003)

The State defines groundwater as either the underflow of a surface stream, a definite underground stream, or percolating waters. The appropriative water rights system applies to the first two definitions, but does not apply to percolating waters. Percolating waters are treated similarly to riparian water rights in that groundwater may be put to beneficial use in an amount proportional to the size and needs of the property. Only relatively recently have local public agencies and the State begun to look at the management of groundwater to prevent excessive overdraft. Disputes in groundwater rights have created adjudications in some basins whereby groundwater is extracted by court order.

2.6.1 Surface Water Supplies

Water supplies in San Joaquin County are subject to the complex system of riparian and appropriative rights and are further complicated by numerous agreements and water service contracts. Table 2-6 provides a synopsis of the major water rights and contracts held by San Joaquin County water agencies. It is estimated that San Joaquin County has approximately 1.2 million af/yr of surface water available. This amount includes approximately 500,000 af/yr applied by farmers in the Delta.

The actual quantity of water delivered varies significantly from year to year due to contractual and water right conditions. The actual quantities utilized within San Joaquin County also vary significantly with climatic fluctuations, infrastructure limitations, and facility operation. For example, although SEWD has an interim contract with USBR for 75,000 af/yr from New Melones Reservoir, this full quantity has yet to be made available to SEWD.

Surface water supplies are likely to decrease in the future. As shown in Table 2-6, there are several current contracts for "interim" supplies, which are available subject to requirements of upstream or senior rights holders. As development increases in areas with senior water rights, San Joaquin County's surface water supplies will be reduced.

2.6.2 Groundwater Supplies

Groundwater pumping quantities in San Joaquin County are not recorded at the water district or county level. Consequently, an accurate assessment of the quantity of groundwater used is difficult to establish. The approach adopted by DWR and other agencies to estimate groundwater withdrawals is based on land use and population. Using a similar approach with groundwater modeling, CDM estimated that the total agricultural and municipal groundwater pumping in Eastern San Joaquin County has averaged approximately 870,000 af/yr for the last 20 to 30 years. Sustaining the current rate of groundwater pumping in Eastern San Joaquin

County will further decline groundwater levels and saline groundwater will continue to migrate east into the Basin as described in Section 2.2.8.

Table 2-6 Summary of Current Water Rights and Contracts[1]

District/Agency	Source River/Reservoir	Wet Year Quantity	Dry Year Quantity	Comments
SEWD	Calaveras/ New Hogan	40,115	<40,115	Firm, dry[2]
		27,000	<27,000	Estimated unused portion of CCWD's 43,500 af allocation
	Stanislaus/ New Melones	75,000	<75,000	Interim, subject to other users requirements and availability
WID	Mokelumne/ Camanche	60,000	39,000	Firm
		See note[3]	0	Nonfirm
NSJWCD	Mokelumne/ Camanche	20,000	0	Subject to EBMUD supply and future requirements
CSJWCD	Stanislaus/ New Melones	80,000	<80,000	49,000 af firm supply, 31,000 af interim supply subject to other user's requirements
SSJID/OID	Stanislaus/ New Melones	320,000	<320,000,	Estimated use in County. [4]
CDWA	Delta	226,000	226,000	Estimated based on current demand.
SDWA	Delta	225,000	225,000	
City of Tracy	Delta Mendota Canal/CVP	10,000	10,000	CVP Contract and water purchase agreements with Local Irrigation Districts
		7,500	7,500	
West Side ID	San Joaquin River	30,000	30,000	Dependent on flow
	Delta Mendota Canal/CVP	7,500	7,500	CVP Contract
Plain View WD	Delta Mendota Canal/CVP	21,000	21,000	CVP Contract
Banta-Carbona WD	Delta Mendota Canal/CVP	25,000	25,000	CVP Contract
	San Joaquin River	30,000	30,000	Depends on flow
Hospital WD	Delta Mendota Canal/CVP	34,000	34,000	CVP Contract

Notes:

1. The figures in this table are not necessarily authoritative and are provided for general information purposes only. The actual quantity of water available from year to year and the quantity that is actually used vary significantly.
2. New Hogan Reservoir has an estimated yield of 84,100 af/yr. SEWD contract with the Bureau of Reclamation is for 56.5% of the yield, and Calaveras County Water District rights to the remaining 43.5%. CCWD currently uses approximately 3,500 af of its allocation, and riparian demand is 13,000 af. Based on an agreement between CCWD and SEWD, SEWD currently has use of the unused portion of CCWD's allocation.
3. Under the WID-EBMUD water right settlement agreement, 60,000 af per year is the firm portion of the Woodbridge Irrigation District Water Rights. 60,000 af is the minimum amount available to WID during any year when the inflow to Pardee Reservoir is greater than 375,000 af. When the Pardee inflow is less than 375,000 af, the minimum amount available to WID is 39,000 af. WID is entitled to divert water in excess of the 60,000 af under the priority of its water right licenses when such water is available at WID's point of diversion and is surplus to EBMUD's downstream commitments under the Joint Settlement Agreement.
4. OID and SSJID share equally rights to 600,000 af/yr when available. Of its 300,000 af/yr share, OID applies approximately 20,000 af/yr in Eastern San Joaquin County. SSJID is located completely within San Joaquin County. In years when the full allotment is not available, the amount is less than 320,000 af and is based on a formula which is part of the agreement with USBR.

3 Basin Management Objectives

Senate Bill (SB) 1938, created in 2002, requires that agencies that elect to, "Prepare and implement a groundwater management plan that includes basin management objectives for the groundwater basin that is subject to the plan. The plan shall include components relating to the monitoring and management of groundwater levels within the groundwater basin, groundwater quality degradation, inelastic land surface subsidence, and changes in surface flow and surface water quality that directly affect groundwater levels or quality or are caused by groundwater pumping in the basin." In addition, local agencies that do not adopt or participate in a plan fulfilling the requirements of SB 1938 shall not be eligible for State funding intended for groundwater projects. The Authority has developed the following qualitative Basin Management Objectives (MO) for the GMA.

3.1 Groundwater Levels

Management Objective #1: Groundwater Levels

Maintain or enhance groundwater elevations to meet the long-term needs of groundwater users within the Groundwater Management Area.

Groundwater Management Plan elements contributing to the success of Basin MO #1:

1. Increased use of available and new surface water supplies;
2. Implementation of local and regional conjunctive use programs and projects;
3. Urban and agricultural incentive based conservation and demand management programs;
4. Basin-wide monitoring and science programs;
5. Development of operations criteria for protection against prolonged droughts and the prevention of Basin mismanagement; and
6. Development of sufficient local and outside revenue sources for projects and programs to meet the Basin MO #1.

3.2 Groundwater Quality

Management Objective #2: Water Quality

Maintain or enhance groundwater quality underlying the Basin to meet the long-term needs of groundwater users within the Groundwater Management Area.

Groundwater Management Plan elements contributing to the success of Basin MO #2:

- Development and implementation of saline groundwater intrusion control projects and programs;
- Increased coordination with regulatory agencies to better protect against and mitigate groundwater contamination;

- Monitoring and science programs focused on the source and migration of saline groundwater;
- Development of operations criteria for protection against prolonged droughts and the prevention of Basin mismanagement; and
- Development of sufficient local and outside revenue sources to meet Basin MO #2.

3.3 Surface Water Quality and Flow

Management Objective #3: Surface Water Quality

Minimize impacts to surface water quality and flow due to continued Basin overdraft and planned conjunctive use.

Groundwater Management Plan elements contributing to the success of Basin MO #3:

- Utilization of surface water supplies when available in a regional groundwater recharge program or conjunctive use program that is sensitive to downstream users and the environment;
- Avoidance or mitigation of projects that detrimentally affect surface water quality and flow;
- Increased understanding of the interaction between surface water and groundwater through basin-wide monitoring and science programs;
- Regular updates to the Eastern San Joaquin County Groundwater Model as new data becomes available; and
- Development of sufficient local and outside revenue sources for projects and programs to meet the Basin MO #3.

3.4 Inelastic Land Subsidence

Management Objective #4: Water Quality

Prevent inelastic land subsidence in Eastern San Joaquin County due to continued groundwater overdraft.

Groundwater Management Plan elements contributing to the success of Basin MO #4:

- Continue to monitor observations of datums and bench marks in order to assess if an inelastic land subsidence problem exists in Eastern San Joaquin County; and
- Should problems exist, the Authority will re-evaluate the need for inelastic land subsidence monitoring and prevention programs.

4 Groundwater Management Options

4.1 Conjunctive Use Options

Conjunctive Use, as defined by the DWR 2003 Draft Bulletin 118, is:

> "The coordinated and planned management of both surface and groundwater systems in order to maximize the efficient use of the resource; that is, the planned and managed operation of a groundwater basin and a surface water storage system combined through a coordinated conveyance infrastructure. Water is stored in the groundwater basin for later and planned use by intentionally recharging the basin during years of above-average water supply."

In order to successfully implement a conjunctive use program that will meet the goals of this Plan, the Authority must first identify and develop a list of water management options. An option, in the context of this Plan, is the method, program, or policy suitable for the broader conjunctive use program for Eastern San Joaquin County. The following section defines the concepts for the acquisition of new and maximization of existing surface water supplies, groundwater recharge techniques, and other options dealing with demand management and water reuse.

4.1.1 Surface Water Options

4.1.1.1 New Surface Water Supplies

Opportunities to obtain new surface water rights within California are limited. The SWRCB has designated most rivers in the region as generally fully appropriated in the summer months when demands for water are at their peak. Methods to acquire new surface water are described below.

Wet Year Flows

Wet year water, also known as flood-flows or unregulated flows, are defined as either releases made from upstream storage reservoirs to maintain adequate flood storage capacity or flows in excess of in-stream flow requirements. Developing cost effective methods to capture and store flood water is a major challenge due to the intensity and infrequency of major storm/runoff events. Capturing flood-flows are often associated with new or expanded reservoir storage either off-stream or on-stream. Major rivers and streams accessible to Eastern San Joaquin County have generally unappropriated flows in the late fall through spring months and are subject to water right permit approval by the SWRCB.

Water Transfers from Out-of-Basin

Water transfers have become a key component in water resources planning throughout the State. Entities import water from willing sellers to supplement their supplies. Water transfers often benefit both parties by helping sellers recover water development costs at prices often far below the cost of developing new supplies. The water rights of the sellers are not impacted by water transfers, which is an incentive for entities to promote conservation and water use efficiency. An example of a water transfer agreement in California is the transfer of Colorado River water from Imperial Irrigation District to the City of San Diego in return for irrigation system improvements and compensation for lost revenue due to land fallowing. Water transfers are subject to approval by the SWRCB except in the case of existing Pre-1914 water rights.

Exercise of Area of Origin Priority

The system of appropriated surface water rights in California is based on a system of hierarchy

and priority. However, protected areas or Areas of Origin within the Sacramento/San Joaquin Delta watershed receive priority when considering water right appropriations. Water code §1216 states that, "A protected area shall not be deprived directly or indirectly of the prior right to all the water reasonably required to adequately supply the beneficial needs of the protected area… by a water supplier exporting or intending to export water for use outside a protected area…" Historically, the interpretation of the statute has favored those who export water from the Delta, nevertheless pending legal action and political pressure could increase water allocations to Eastern San Joaquin County and give priority to future water right applications.

4.1.1.2 Maximizing Existing Surface Water Supplies

Agencies within Eastern San Joaquin County have existing water rights and contracts that cannot be fully utilized for a variety of factors including supply reliability and infrastructure limitations. The following section describes methods to maximize the use of existing supplies.

Re-operation of Existing Facilities

The re-operation of existing reservoirs is the intentional drawdown of stored water below the minimum capacity required for flood control purposes. In the context of a conjunctive use program, reservoir re-operation potentially utilizes a reservoir's carryover storage for groundwater recharge allowing for greater flood control capacity and a reduction in the foreseeable frequency of reservoir spills. Changes in the mode of operation could detrimentally affect other reservoir benefits such as hydropower, water supply, temperature control, and recreation. These impacts can vary the reservoirs ability to be re-operated for increased water supply benefits.

In-Basin Water Transfers and Purchases

Similar to water transfers from out-of-basin entities, agencies with extensive surface water rights could make water available to other agencies with limited water rights overlying more depressed groundwater levels within Eastern San Joaquin County. Additional investments in infrastructure resulting in increased efficiency could facilitate the transfer or sale of water. In order to avoid the loss of water rights through non-use, water districts and agencies could transfer their rights to other in-basin users. Examples of in-basin water transfer include purchases by the City of Tracy from the West Side and Banta-Carbona Irrigation Districts and by the City of Stockton from SSJID/OID.

4.1.2 Groundwater Recharge Options

In 2001 SEWD, in conjunction with the USACE and other local sponsors, completed the Farmington Groundwater Recharge/Seasonal Habitat Study. This Study explored the feasibility of groundwater recharge methods in the context of San Joaquin County's available surface water supplies and availabilities. The Study explores the benefits and drawbacks of the various methods used to recharge groundwater including detailed cost comparisons. The groundwater recharge methods are discussed below and summarized in Table 4-1.

4.1.2.1 Direct Recharge to Groundwater

Field Flooding

Field flooding consists of ponding surface water on seasonally fallowed agricultural areas in the late fall, winter, and early spring months for the purpose of recharging the groundwater Basin. In general this option could be used in fields with permeable soils and with little or no vertical impediments. Very few minor site preparations are necessary to percolate substantial amounts of water, making this method economical. Recharge efficiencies can also be increased with the addition of internal berms and check structures creating recharge cells for the purpose of

keeping water from draining from the field too quickly. Field flooding is not effective on permanent crops such as orchards, but is very feasible on vineyards and certain row crops. There could be additional environmental benefits to this approach, such as providing seasonal habitat to migratory waterfowl.

Spreading Basins and Recharge Ponds

Unlike field flooding, spreading basins or recharge ponds are dedicated facilities constructed solely for recharge and seasonal habitat. Spreading basins are not rotated into production during the growing season. Spreading basins consist of relatively shallow basins, which are excavated to a depth of several feet. If present, shallow fine-grained sediment, hardpan, or clay may be excavated to provide more favorable recharge conditions in recharge ponds.

Recharge Pits

Recharge pits are similar to spreading basins and recharge ponds but are generally deeper and may be located in an existing natural or manmade depression such as a gravel quarry or flood control detention basin. Recharge pits require extensive excavation making them well suited for areas with an extensive aquitard or hardpan layer. Although not as cost effective as field flooding or spreading basins, existing quarries and flood control detention basins could serve as seasonal recharge pits with minor site improvements and minor changes in operation.

4.1.2.2 Injection Wells

Injection wells pump water directly into the groundwater aquifer. Injecting water into the aquifer system is an effective option for providing hydraulic control in well-defined hydrogeologic and hydraulic conditions. Complex injection/extraction well systems can be used for aquifer storage and recovery (ASR) projects. ASR systems often use treated water sources such as municipal supplies meeting safe drinking water requirements. Injection wells are also applicable in coastal settings where high quality reclaimed wastewater is injected to create a hydraulic barrier to seawater intrusion. Capital costs for ASR facilities include conveyance, treatment, and well construction costs.

4.1.2.3 In-lieu Recharge

In-lieu recharge is the direct substitution of surface water for groundwater creating a reduction in amount of groundwater pumped. Surface water can be substituted for groundwater in both urban and agricultural areas.

Agricultural In-lieu

Agricultural in-lieu recharge offers significant opportunities within Eastern San Joaquin County. To successfully implement agricultural in-lieu, the delivery capacity of the conveyance system needs to be expanded and on-farm dual irrigation systems constructed. In the past water supply reliability and availability have deterred the use of surface water. If additional firm entitlements are not obtained for diversion during the irrigation season, additional storage and conveyance would be needed to meet the demands of growers. Successful in-lieu programs are often incentive based and will require the financial and political support of the community.

Urban In-lieu

Urban in-lieu recharge consists of utilizing surface water to meet municipal and Industrial (M&I) demands. Should reliable surface water sources become readily available to urban areas, urban in-lieu recharge programs can be achieved on the order of current water service costs. Although urban areas require capital investments for treatment facilities, cities often have existing distribution facilities or the means to construct them through connection and development fees.

4.1.3 Regional Groundwater Banking

Groundwater overdraft and the resulting decline of groundwater levels in Eastern San Joaquin County have created an estimated at 1 to 2 million af of operable groundwater basin storage. In addition, Eastern San Joaquin County's proximity to major waterways and reservoirs, existing and proposed regional conveyance facilities, and the Sacramento-San Joaquin Delta has the potential to become a major groundwater bank for regional and statewide interests.

Groundwater banking partnerships are recognized as key water management options for water agencies throughout the State to balance water needs. Currently, the DWR Conjunctive Water Management Branch supports the activities of San Joaquin County and the Authority through in-kind services and direct financial assistance to encourage the full utilization of the underlying basin. The benefits of a fully operable groundwater bank in Eastern San Joaquin County to the State and other regional interests are appreciable and have prompted interests for further information. Interested agencies include the DWR, Bureau of Reclamation, CALFED Environmental Water Account, CALFED Storage, Metropolitan Water District of Southern California, State Water Contractors, EBMUD, Amador County Water Agency, and Calaveras County Water Agency.

Groundwater banking partnerships involving the exportation of groundwater in unincorporated San Joaquin County is governed by the San Joaquin County Groundwater Export Ordinance. County ordinance authority does not extend into the incorporated city limits of the municipalities. The Ordinance requires stringent monitoring and extraction protocols deemed necessary to protect adjacent landowners and underlying basin from the potential adverse impacts of groundwater export. The Board of Supervisors has indicated that a more workable form of the Groundwater Export Ordinance is possible should stakeholders propose positive changes that would facilitate banking partnerships while maintaining principle protections for groundwater users.

Other factors deemed important to local stakeholders include the establishment of Basin Operations Criteria. Originally tied to the development of Basin Management Objectives, Basin Operations Criteria would set quantitative target groundwater levels and descriptive basin condition levels. Basin Operations Criteria could potentially consist of a series of groundwater levels that would correspond to basin condition levels (similar to the US EPA Air Quality Index and the US Department of Homeland Security Advisory System) to indicate the effectiveness of groundwater recharge programs and also potentially when and how much groundwater could be exported. The development of Basin Operations Criteria is a collaborative process that will be undertaken by the Authority immediately following the adoption of the Plan and is expected to be completed by summer 2005.

The Authority will also explore potential governance structures that would facilitate the implementation and enforcement of Basin Operations Criteria within the principals and intentions of the Export Ordinance and with adequate local control and oversight. Basin Operations Criteria developed with the framework of the Authority could ultimately provide the basis for a revised Export Ordinance and a new Groundwater Management Ordinance. Potential groundwater management governance structures are further explored in Section 7 of the Plan.

Table 4-1 Groundwater Option Comparisons

Option Type	Recharge Method	Improvement Costs ($/af)	Infrastructure Requirements	Land Requirements	Effectiveness	Operation/ Maintenance
Surface Supply Options	Wet Year Flows	~$500	On or off-stream regulating reservoir	Extreme for new reservoir	Very effective based on reservoir size and frequency	Very high requirements
	Water Transfers - Out of Basin	$200-400	Conveyance and storage	Potentially land intensive	Effective based on quantity of water and agreement duration	Varies with infrastructure requirements and year to year availability
	Area of Origin Priority	$0-$350	Use of existing or new infrastructure	Potentially land intensive	Very effective	Varies with infrastructure requirements
	Reservoir Re-operation	~$100	Use of existing infrastructure and storage	Minimal	Less effective	Minimal based on existing facilities
	Water Transfers - In Basin	~$100-$200	Minor conveyance	Minimal	Less effective	Varies with infrastructure requirements and year to year availability
Groundwater Recharge Options	Field Flooding	$50 - $100	Uses Existing Infrastructure	Uses seasonally fallow areas	Somewhat effective only available seasonally	Significant effort
	Spreading Basin/ Recharge Pond	$100 - $150	New Infrastructure	Requires relatively large dedicated areas	Potentially effective, requires detailed field testing	Significant effort
	Recharge Pit	$400 - $450	New Infrastructure	Requires dedicated areas	Potentially effective, requires detailed field testing	Significant effort
	Leaky Canal	Varies	New Infrastructure	Land intensive	Potentially effective, conveyance benefits	Significant effort
	Injection Wells	$150 - $200	New Infrastructure	Requires dedicated areas	Potentially effective, requires extensive well field	Significant effort
	Agricultural In-lieu	$200 - $250	New / Or Existing Infrastructure	Existing Land Use	Very effective based on quantity of water	Additional effort required by owner and district
	Urban In-lieu	~$250-$400	New / Or Existing Infrastructure	Existing Land Use	Very effective based on quantity of water	Requires treatment plant O&M costs
	Regional Groundwater Banking	$200-$300	New / Or Existing Infrastructure	Potentially land intensive	Very effective, financial assistance through third party	Significant effort
Other Options	Water Reclamation	$300-$500	Retrofit of existing facilities	Minimal	Less effective due to treatment costs and public perception	Requires treatment plant O&M costs
	Agricultural Water Conservation	$200-$250	New Infrastructure	Minimal	Potentially effective	Significant effort

	Urban Water Conservation	$200-$250	New Infrastructure	Minimal	Potentially effective	Minimal
	Crop Rotation/Land Fallowing	~$50	None	Potentially land intensive	Potentially effective if mitigated	Minimal
Source: San Joaquin County Water Management Plan Volume I						
Farmington Groundwater Recharge and Seasonal Habitat Study						

4.1.3 Water Reclamation

Water reclamation or water reuse is the treatment of water that has been used previously and would otherwise be discharged out of the Basin. Municipal and industrial wastewater reclamation is becoming increasingly prevalent throughout the State as a viable alternative for compliance with regulatory waste discharge requirements. As municipalities and industries move to meet these waste discharge requirements with tertiary treatment, high quality supplies may become available for irrigation or other non-potable uses. Pending further growth of the reclaimed water market, Eastern San Joaquin County could put to beneficial use a substantial non-potable water supply; however, the resulting reduced supply to downstream users would need to be mitigated.

4.1.4 Water Conservation

Demand management is a key component for long-term planning and management of water resources. Implementation of best management practices (BMPs) can be more economical than developing new water sources and less damaging to the environment.

Urban Water Conservation

Active urban water conservation programs throughout the State potentially save 10 to 20 percent of the historical demand. BMPs included in such programs include water metering, tiered water pricing, rebates for water saving appliances and amenities, water-saving household plumbing devices, and education and outreach. Urban water conservation programs are eligible for State and Federal grants.

Agricultural Water Conservation

Crop science has determined that plants consumptively use a fraction of the total water applied during irrigation. Agricultural water conservation relates mainly to the use of more efficient irrigation technologies that reduce the amount of water applied while still meeting the consumptive needs of the plant. Increasing irrigation efficiency decreases the amount of water that is lost through evaporation during conveyance or application and the discharge of tailwater to surface streams. Growers moving from flood irrigation to drip and sprinkler systems often report irrigation efficiencies upwards of 90 percent.

It should be noted that the conversion to drip and sprinkler irrigation is not suited for all crop types and in some cases does not provide its intended benefits. Some crops are sensitive to changes in irrigation methods and may either produce crops of poorer quality or, in some cases, actually increase the consumptive demand of the plant. Excess applied surface water resulting in tailwater drainage is a benefit to the groundwater Basin when allowed to percolate and may be a major source of water for downstream users who depend on return flows. Extensive analysis should be undertaken prior to implementation of agricultural water conservation measures to ensure the intended benefits are realized.

Voluntary Crop Rotation

A voluntary crop rotation program is intended to be exclusively at the discretion of the local grower. Removing acreage from production does in fact save water; however, the economic consequences are not acceptable to the member agencies of the Authority. As an incentive based program, growers opting for crop rotation could be compensated based on conserved water thus reducing the economic impacts. Substantial analysis must be undertaken to ensure that crop rotations do not adversely impact the agribusiness of Eastern San Joaquin County, downstream users depending on return flows, or the environment.

4.2 Groundwater Contamination

Groundwater contamination and the continued degradation of groundwater quality is a global threat to all groundwater users. The Authority recognizes that the long-term sustainability of the underlying Basin cannot be accomplished without adequate groundwater quality protection, contamination prevention, and remediation programs. As depicted in Table 3-2, numerous local, State, and Federal agencies currently regulate activities with potential impacts to groundwater quality and enforce monitoring and remediation requirements.

The Authority has discussed the issue of managing groundwater protection and contamination programs in Eastern San Joaquin County. A major concern of the Authority is that undertaking regulatory oversight will only duplicate the existing efforts of other regulatory agencies while financially burdening the community beyond its abilities. Increased coordination with regulatory agencies and a concerted effort to ensure its activities do not degrade water quality is potentially less resource intensive for the Authority and a more efficient method of protecting groundwater quality throughout the Basin. The Authority will continue to lead the pursuit against saline groundwater intrusion.

The following policies reflect the Authority's desire to address groundwater contamination and groundwater quality degradation:

1. Coordinate with local, State, and Federal agencies to ensure the underlying Basin is adequately protected against groundwater contamination and to ensure all contaminated sites are documented and mitigated by the responsible parties.

2. Continue to manage efforts to combat saline groundwater intrusion.

3. Strive to improve groundwater quality when technically and economically feasible. Authority actions degrading groundwater quality are not acceptable.

4. Require recharge projects to identify and evaluate impacts to groundwater quality and the potential for mobilization of soil and source water contaminants.

5. Consider current and future water quality standards in the planning and design of projects identified in this Plan.

Table 4-2 Local, State, and Federal Regulatory Agencies Involved in Groundwater Quality Protection and Remediation

	Agency	Well Standards	Direct Groundwater Recharge	Land Fills	Pesticide Use	Ag/Urban Runoff	Database	Underground Storage Tanks	Water Quality Standards	Groundwater Remediation	Standardized Laboratory Analysis	Groundwater Monitoring and Science
Local	San Joaquin County - Environmental Health	X	X	X			X	X		X		
	Local Solid Waste Agencies			X						X		
	San Joaquin County - Agricultural Commissioner		X		X	X	X					
State	Department of Water Resources	X	X				X		X			X
	State Water Resources Control Board		X	X	X	X	X	X	X	X		
	Central Valley Regional Water Quality Control Board		X	X	X	X	X	X	X	X		
	Integrated Waste Management Board			X						X		
	Department of Pesticide Regulation		X		X	X	X					
	Department of Health Services		X						X		X	
Federal	Environmental Protection Agency		X	X	X	X	X	X	X	X	X	X
	US Geological Survey	X	X							X		X

5 Groundwater Monitoring Program

Marked changes in groundwater levels and groundwater quality during the 1960's prompted the DWR to initiate a groundwater investigation in Eastern San Joaquin County. Completed in 1967, DWR Bulletin No. 146 San Joaquin County Groundwater Investigation recommended that a groundwater monitoring program be established to track changes throughout the Basin. In the fall of 1971, the San Joaquin County Flood Control and Water Conservation District (County) initiated the collection and management of groundwater data and the production of semi-annual groundwater reports.

In December of 2000, Montgomery Watson Harza (MWH) performed an evaluation of the County's groundwater monitoring program and recommended improvements to better assess groundwater level conditions and saline intrusion and to develop measurement and sample collection protocols. Since that time the County has continued to implement the recommendations of the evaluation and will work closely with and meet the monitoring needs of the Authority.

5.1 Current Groundwater Monitoring Program

The current groundwater level monitoring program includes semi-annual groundwater level measurements of over 550 wells (exact number varies from year to year) of which approximately 300 are measured by County staff. Water level measurements are taken in October and April in order to capture groundwater levels after and before peak groundwater pumping occurs. According to the MWH evaluation, both the frequency of measurement and the spatial adequacy of the monitoring well network are sufficient to determine regional groundwater trends throughout the Basin.

The data collected is stored electronically in a database for further analysis. DWR posts a portion of the data on the internet at http://wdl.water.ca.gov/gw/admin/main_menu_gw.asp. In 2003, San Joaquin County Public Works Staff, in conjunction with Kennedy/Jenks Consultants, reformatted the database to facilitate advanced analysis of groundwater data in a Geographic Information System (GIS). Future upgrades include electronic data collection and the availability of the groundwater database and analysis capabilities over the internet.

As documented in Section 2, saline intrusion from the west threatens the health of the underlying Basin. The County supports a limited effort groundwater monitoring program which includes the annual groundwater quality sampling of approximately 40 municipal and domestic supply wells (exact number varies from year to year) measured by County staff or obtained from the various urban water purveyors. The analysis typically includes chloride, electrical conductivity (EC) and total dissolved solids (TDS). Water quality sampling occurs in October when chloride levels are generally highest during the year. According to the MWH evaluation, the spatial adequacy of the monitoring well network is not sufficient to determine the source, aerial and vertical extent, and the rate of migration of saline groundwater. The data collected is stored electronically in a database for further analysis.

5.1.1 San Joaquin County Groundwater Data Center

The San Joaquin County Groundwater Data Center (GDC) is a Countywide centralized interactive groundwater information vehicle that provides access to groundwater data collected and shared by agencies throughout San Joaquin County. Over half of the water used in San Joaquin County comes from groundwater. It is vital that we protect and ensure the long-term health and sustainability of the underlying groundwater basin. The San Joaquin County GDC is the foundation for Countywide groundwater management efforts pursued by its water interests.

The GDC is essential to the groundwater management activities of the County. Currently, there is no centralized groundwater information source for San Joaquin County. Monitoring efforts undertaken by the San Joaquin County Flood Control and Water Conservation District (SJCFC&WCD), the San Luis and Delta-Mendota Water Authority (SLDMWA), the Northeastern San Joaquin County Groundwater Banking Authority (GBA), and other individual agencies and water districts generate data that reside in separate databases. The GDC would become the repository for groundwater data and would facilitate groundwater analysis essential to the groundwater management objectives of San Joaquin County. The GDC is not only a technical tool, but a public outreach tool as well. Through the internet, water users including County and agency staff, industry professionals, decision makers, and the general public will have access to groundwater data and historic semi-annual reports. Additionally, the concept of the GDC will extend into ongoing groundwater programs including the joint GBA/DWR/USGS Groundwater Recharge and Salinity Study and the Farmington Recharge Program.

Over the next 20-30 years, hundreds of millions of dollars will be invested for the management of groundwater in San Joaquin County. Water demand projections, basin health, and groundwater management effectiveness is based on groundwater data. The GDC is also a commitment to the development of a comprehensive quality assurance and quality control plan (QA/QC) that increases confidence in the quality and reliability of groundwater data.

The overall goals and objectives of the GDC are:

1. Create and maintain a working groundwater database for San Joaquin County.
2. Develop the tools necessary to analyze groundwater data.
3. Make groundwater information available to decision makers, agency staff, and the general public through the internet.
4. Create an efficient and enforceable QA/QC plan.
5. Utilize the proven and supported technologies in groundwater monitoring, database management, and Geographic Information Systems (GIS).

GDC Features:

1. <u>Create and maintain a working groundwater database for San Joaquin County.</u>

The backbone of the GDC is the groundwater database. From the database, groundwater information can be queried and exported to groundwater analysis programs and applications. The groundwater database should have the following characteristics:

- Secure from inadvertent or malicious deletions or manipulations
- Efficiently designed to limit extraneous information
- Expandable to include additional water quality fields, geologic data, well construction information, etc.
- Portable data entry forms
- Maintainable by existing staff with intermediate level database expertise

2. *Develop the tools necessary to analyze groundwater data.*

GIS applications used to perform groundwater analysis are increasingly powerful. ESRI, the leader in GIS technology, has developed proven GIS tools that are capable of performing the following:

- Groundwater level and water quality contouring
- 3-D visualization of groundwater characteristics
- Geospatial report generation
- Relational data analysis

3. *Make groundwater information available to decision makers, agency staff, and the general public through the internet.*

GIS is now available via the internet. Users will be able to access the database through the internet and will be able to query selected well data and view graphical representations of groundwater conditions. This eliminates the need for users to be trained in GIS and also the associated software license costs. The following is a list of on-line features:

- Downloadable historic semi-annual groundwater reports
- Graphical user interface (GUI)
- County base map with crop information, well locations, agency boundaries, recharge areas, well fields, water level contours, etc.
- Data query and download into MS Excel or HTML

4. *Create an efficient and enforceable QA/QC plan:*

To effectively manage groundwater, decision makers need to know what is physically going on in the sub-surface. Over the next 20-30 years, San Joaquin County will invest hundreds of millions of dollars for projects in restoring and protecting the underlying groundwater basin. Therefore, confidence in the integrity and accuracy of groundwater data is of utmost importance. Also, State law mandates that agencies adopt groundwater monitoring protocols for quality assurance and quality control (QA/QC). By eliminating manual data entry through electronic data logging and utilizing advances in portable Global Positioning Systems, we can reduce human errors, create a monitoring system with quality assurance tests, and minimize labor costs associated with data entry and database correction. The new QA/QC plan will include:

- Electronic data logging using Palm Pilots
- Electronic data upload to database
- Remote database entry forms
- Location checks using hand-held GPS units
- Telemetry and remote data logging
- Monitoring protocols
- Sampling techniques
- Acceptable laboratory methods
- Health and safety
- Database security

5. *Utilize proven and supported technologies in groundwater monitoring, database management, and Geographic Information System (GIS).*

   Proven software and hardware technologies continue to redefine the field of environmental monitoring. The following applications will power the GDC:

   - ArcView 3.x/8.x
   - ArcView Spatial Analyst
   - ArcView 3-D Analyst
   - ArcPad
   - ArcIMS Application
   - Dedicated Server
   - ArcInfo
   - MS Access
   - MS SQL Server
   - Pendragon Forms
   - Personal Data Assistant (PDA)
   - Global Positioning System (GPS)

The GDC is expected to be publicly available in 2005.

5.1.2 Status of Monitoring Network Enhancements

As part of the monitoring program evaluation, MWH recommended that the depth specific monitoring well clusters be installed along the estimated saline front to capture better the geologic factors and physical flow driving saline intrusion. The report envisioned five general locations along Interstate 5 from North Stockton to the Lathrop and Manteca. Of the 5 recommended well clusters, two have been installed by the DWR at the Swenson Golf Course and the Sperry Road/McKinley Avenue stormwater detention basin in the City of Stockton. The County and the DWR continue to coordinate monitoring and installation efforts.

5.1.3 USGS and DWR Partnership

The Authority and its member agencies are co-participants with the United States Geological Survey (USGS) and DWR for the Groundwater Recharge and Distribution of High-Chloride Groundwater from Wells Study (Study). The purpose of the Study is to quantify the source, aerial extent, and vertical distribution of high-chloride groundwater and the sources, distributions, and rates of recharge to aquifers along selected flow paths in Eastern San Joaquin County. The information gained from the Study will answer many questions with respect to future water levels, water quality, and storage potential under current and future management of the Basin.

Historically, high-chloride groundwater along the San Joaquin River boundary of the Eastern San Joaquin Sub-basin (Basin) has been defined by interpolating the 300 mg/L isochlor based on limited groundwater quality data. Samples have measured in excess of 2,000 mg/L chloride. Consequently, the aerial and vertical distribution of high-chloride groundwater is poorly defined and the source of the high-chloride groundwater is unknown. Postulates on the origins of high-chloride groundwater include the accretion of poor-quality water from the San Joaquin River, incidental recharge of applied irrigation water and return flow, and upwelling of groundwater from beneath the base of freshwater. Also, local efforts to augment the natural recharge rate

are ongoing; however, the cumulative effect of ongoing groundwater recharge projects on water levels and water quality in aquifers is unknown. The scope of Study is explained in detail below.

1. Assembly and review of existing geologic, hydrologic, and water-quality data

Existing well logs, groundwater level, and groundwater quality data will be compiled and assembled into a GIS database. The GIS database will be used, updated, and revised throughout the study and will be the basis for a 3-D visualization. The GIS database will be used to evaluate the aerial extent of high-chloride water, and to draw geologic sections through the study area that define the aerial and vertical extent of aquifer deposits along three selected flow paths from sources of recharge to discharge areas near the delta. The aerial extent of high-chloride water and the geologic sections will be used to define data gaps that guide test-drilling and installation of observation wells. Existing water-quality data in the area of high-chloride water and along the three study flow paths will be used to define the quality of native ground water and its geochemical evolution prior to collection of new data.

2. Collection of geochemical and geophysical data

Water chemistry data will be collected from up to 60 existing production and the 12 observation wells installed as part of this study. The data will be used to define the source, movement, and age of water from wells and the aerial and vertical extent and source of high-chloride water to wells along the three study flow paths. Samples will be analyzed for major ions, nutrients, selected trace elements, and stable oxygen and hydrogen isotopes.

Selected trace elements including bromide, iodide, boron, and barium will be used in conjunction with chloride data to determine the source of high-chloride water in wells. The stable isotopic composition of water from wells also will be used to determine the hydrologic and evaporative history of the Basin. Selected samples will be analyzed for tritium, carbon-14, and carbon-13 to determine the age of groundwater. Selected samples will also be analyzed for noble gasses to determine the recharge mechanism as either focused recharge from stream infiltration or aerial recharge from precipitation or irrigation return.

Electromagnetic logs will be collected from existing observation wells and at the multiple-well sites drilled as part of this study. The logs will be used to determine if saline water is present at depths not sampled by well screens. Sequential logs done annually as part of this study will be used to determine if chloride concentrations are increasing at depths where screens are not located.

Well-bore flow and depth-dependent water quality data (Izbicki and others, 1996) will be collected from selected production wells to determine at what depths high-chloride water enters the well under pumping conditions. Water movement through selected abandoned wells will be measured using low-flow current meters (such as an electromagnetic or heat-pulse current meter) to determine the direction and rate of water movement through the well casing under non-pumping conditions.

3. Test drilling and well installation

Three multiple-well sites, each containing three to four 2-inch diameter wells, will be drilled along one study flow path. The wells will define movement of recharge water laterally and vertically through the flow system. Deeper wells at each site will define potential high-chloride source water from underlying bedrock. Similarly, shallower wells at each site will define potential high-chloride source water from irrigation return and, at the down gradient site, brackish water from delta sediments.

4. Telemetry

Selected wells (as many as 10) will be instrumented to provide real-time water-level data and potentially water-quality data (such as pH and specific conductance). Data will be output through satellites using the Geostationary Observational Environmental System (GOES) and uploaded to the Automatic Data Acquisition System (ADAPS) on California District computers. Graphical and tabular data will be available in near-real time through the Internet. Where available the data also will be output through local Supervisory Control and Data Acquisition (SCADA) systems. Equipment will be calibrated and serviced at 15-week intervals by U.S. Geological Survey personnel.

5. 3-D Visualization

Spatial data will be stored in a GIS which will be the basis of a 3-D visualization of the ground water flow system using Earth Vision computer software. The visualization will incorporate hydrogeologic units and spatially connect data in the area of high-chloride water and along study flow paths. The visualization will be a tool to evaluate data uncertainty and illustrate the effects of aquifer hydraulic properties and ground-water flow on the movement of high-chloride water toward wells.

6. Data Interpretation and Report Preparation

Sources of high-chloride water to wells will be determined primarily from trace-element to chloride ratios and further refine by ^{18}O and Deuterium analysis. Results will be compared to similar data collected in coastal aquifers elsewhere in California. The recharge temperature and tritium/helium-3 age of younger ground water will be estimated using the computer program NOBLEGAS. Recharge temperature will be used to evaluate focused sources (such as infiltration from stream flow) and diffuse sources (such as infiltration of precipitation, and irrigation return) of ground-water recharge. Changes in ground water chemistry and the age of older ground water interpreted from carbon-14 data will be evaluated along selected flow paths using the computer program NETPATH.

Interim papers describing the source of high-chloride water to wells and the movement and age of water from wells will be published during the course of the study. Annual progress meetings with cooperators and stakeholders will be held. A final report integrating information from all aspects of the study including data review, well installation, data collection, telemetry, and 3-D visualization will commence at the end of the Study.

7. Project Costs

The total cost of the study is $2,579,350. The proposed USGS contribution will be $625,000 over 5 fiscal years as well as an additional $625,000 from the DWR over the first 3 fiscal years. Member agencies within the Authority will contribute the remaining $1,322,350 over next 5 fiscal years.

5.2 Monitoring Protocols

In order to ensure that groundwater data is collected in a systematic and consistent manner, the Authority has adopted the Groundwater Monitoring Program Quality Assurance/Quality Control (QA/QC) Plan, prepared by MWH in 1998. The QA/QC Plan addresses the following items: monitoring and sampling preparations, sample collection procedures, chain-of-custody procedures, sample transport, laboratory procedures and methods, and data validation and reporting. The QA/QC Plan can be obtained at the San Joaquin County Department of Public Works Stormwater Management Division. The revised QA/QC plan proposed as part of the GDC is expected to be completed by the spring of 2005.

6 Financing Options

The development of new water supplies and the necessary infrastructure is a major financial undertaking. It is absolutely necessary for the Authority and its member agencies to leverage as much support for outside funding. The following section is intended to provide stakeholders with a general overview of the potential funding sources, programs, and project partnerships available to the Authority.

6.1 Funding Sources

6.1.1 Federal Funding

Federal funds can be made available to the Authority and its member agencies through a variety of mechanisms including, but not limited to, subsidies, appropriations, in-kind services, grants, loans and cost-sharing agreements. Securing these funds is accomplished through the following processes.

Legislative Approach - Federal funding can be secured through the legislative process to directly fund an approved project. This approach is initiated by a request by the Authority to a local congressional representative. The project may require the establishment of Federal interest through an act of Congress and funded in subsequent years (e.g. Farmington Program). If, however, the project is consistent with the goals and objectives of an existing Federal program, an appropriation can be made that same year (e.g. MORE WATER Project). Competition for funds through Congress is fierce and will require the broad support of local, regional, and State interests.

Federal Agency Interest - Funding can also be secured for projects directly from Federal agencies. Local projects, consistent with the goals and objectives of an agency, are eligible for funds and in-kind services through directed actions and partnerships (e.g. Joint USGS/DWR/Authority Groundwater Recharge and Distribution of High-Chloride Groundwater from Wells Study). Federal agencies commit to projects during their respective internal budgeting processes and have the flexibility to disperse funding over several years.

Federal Assistance Programs - Finally, a third option is to apply for project funding under an existing grant, loan, or assistance program administered by any of the various Federal agencies. Potential partnering agencies include the USBR, Environmental Protection Agency (EPA), USACE, United States Department of Agriculture (USDA), National Fish and Wildlife Service (NFWS), and the National Oceanic and Atmospheric Administration (NOAA). Eligibility, cost sharing, and application requirements vary between the programs.

6.1.2 State Funding

State funds are similar to Federal funds in that they can also be secured through the legislative process, state agency interest, and through competitive grants and assistance programs. The availability of State funds for water resources projects is a reflection of the current fiscal climate and can vary significantly. Voter approval of Proposition 50, the $3.4 Billion Water Security, Clean Drinking Water, Coastal and Beach Protection Act of 2002, is expected to carry many of the water resources development programs of interest to the Authority for the next few fiscal years including CALFED, Integrated Storage Investigations, and other groundwater recharge construction grants and loans.

Legislative Approach – Although the dollar amounts available from the State are usually not as substantial as Federal, the State process can be somewhat more streamlined than the

Federal approach. Appropriating funds through the State legislature is extremely competitive and subject to the State budget climate.

State Agency Interest – Discretionary funds may be available in the form of directed action assistance or in-kind services. Partnerships with the agencies such as the DWR Division of Planning and Local Assistance (DPLA) and CALFED may yield monies and services to projects (e.g. Joint USGS/DWR/Authority Groundwater Recharge and Distribution of High-Chloride Groundwater from Wells Study).

State Assistance Programs - Finally, a third option is to apply for project funding under an existing grant, low interest loan or assistance program administered by any of the various State agencies. Under Proposition 13, the Safe Drinking Water, Clean Water, Watershed Protection, and Flood Protection Act of 2000, approximately $200 million statewide for groundwater management and recharge projects were provided through the DWR DPLA. Similarly, Proposition 13 provided a major source of funding for the CALFED Bay-Delta Program and other such programs administered by SWRCB. Most recently, voters approved the $3.44 Billion Proposition 50, the Water Quality, Supply and Safe Drinking Water Projects, Coastal Wetlands Purchase and Protection Act of 2002. Proposition 50 is expected to provide similar funding opportunities for the next few years.

6.1.3 Local Funding

Local funds are available from a variety of sources including general funds, water rates, developer fees, connection fees, capital improvement programs, acreage or *ad valorem* assessments, and taxes. Local funds can be raised by individual agencies and districts or through more regional efforts such as the San Joaquin Council of Governments (SJCOG). The implementation of assessments and taxes is subject to Proposition 218 voting requirements. The Authority member agencies have the power to issue bonds for capital projects separately or jointly as the Authority. The following sections briefly explore the revenue generating mechanisms available for bond repayment and annual operations and maintenance costs.

Assessments – The Authority has the power to implement a number of funding mechanisms available including the exercise of provisions set forth in Water Code Sections 10750 *et. seq*. Upon adoption of the Plan, the Authority could choose to equitably assess parcels within the GMA for the purpose of implementing the Plan subject to a Proposition 218 vote. The Authority does not have a time table by which this particular funding mechanism will be exercised. In addition, benefit assessments consistent with the existing statutory authorities of the member agencies could be used to generate revenues.

Sales Tax – Local sales tax measures such as Measure K, the ½ % regional transportation sales tax initiative, could be pursued by the Authority for the implementation of the Plan. The Authority or a similar broad stakeholder based Authority is necessary to garner the support of the voters. Through 2011, over its 20 year life span, Measure K is expected to generate over $750 million.

Water Service Fees – The Authority or its member agencies could revise or formulate a fee structure for the water served either at the wholesale or retail level. Revenue generated could be directed towards the debt service of capital projects or for the implementation of the Plan.

Developer Fees – Mitigation fees paid by new urban developments are currently collected by cities and counties. Specifically, a Water Impact Mitigation Fee is collected per new residential building permit within a defined area to finance capital repayment of bonds used to construct the

Goodwin Tunnel Project and the New Melones Conveyance Project. Similar development fee structures could be developed by the member agencies of the Authority to ensure that urban growth is apportioned their fair share for future water resources in Eastern San Joaquin County.

Groundwater Banking and Transfer – Enormous opportunity exists for the utilization of the underground storage potential of the underlying Basin estimated at 1.2 – 1.5 million acre-feet. To regional and Statewide interests, the benefits of a conjunctive use program involving over a million acre-feet of underground storage is undeniable. Constructing and financing the infrastructure necessary to accommodate a groundwater bank of this magnitude will require several sources of funding for capital recovery, operations and maintenance, and mitigation. The evolving California water market could potentially enable Eastern San Joaquin County to provide economic alternatives to regional and statewide water interests while also concurrently meeting the Basin Management Objectives. The San Joaquin County Groundwater Export Ordinance currently protects Basin users from the potential ill-effects of export, however the San Joaquin County Board of Supervisors are amenable to proposed amendments made by Basin stakeholders and banking partners.

7 Plan Governance

Water interests in San Joaquin County have historically been fragmented, but have realized that projects developed in a collaborative process have the potential to exhibit greater and more far reaching benefits to all involved parties while increasing its implementability and fundability. Implementation of the water management options can best be achieved by continuing to work in a collaborative fashion to develop a broad base of political and financial support. Currently, the powers and term of the Authority are limited thus, if the Authority member agencies decide that the Authority should implement the Plan, then additional powers are necessary. The Authority has explored numerous options concerning the appropriate organization and powers needed to implement the plan and the best management framework that addresses the concerns of the Authority member agencies.

7.1 Member Agency Concerns

Throughout the development of the Plan, the Stakeholder group voiced their concerns over the purpose and need for a new or expanded Authority. The following concerns are presented as follows:

- Does the purpose, goals, and objectives of the current Authority provide for the implementation of the Authority Plan?
- What powers are necessary for the implementation of the Authority Plan?
- Does expanding the powers of the Authority threaten projects previously set in motion by individual agencies or smaller partnerships?
- How will stakeholders be represented in the new Authority?
- How can we engage all Basin stakeholders including those who showed no interest in participating in the past?
- How do we include Cal Water in a Joint Powers Authority?
- How will individuals and special interest groups be allowed to participate?
- How will the Authority relate to other groundwater management efforts in San Joaquin County (e.g. San Joaquin County Groundwater Export Ordinance, Mokelumne River Water and Power Authority – MORE WATER Project, Eastern Water Alliance – SEWD, NSJWCD, & CSJWCD)
- How will the Authority coordinate with Basin neighbors outside of the Groundwater Management Area?
- How will the new Authority be funded?
- Should the Authority be allowed to construct projects or should the member agencies be the ones to construct projects?
- Should votes be weighed by acreage, water use, monetary contribution, or not weighted at all?

With the above concerns in mind, the Authority is currently exploring a number of potential governance models suitable for the unique situation in Eastern San Joaquin County.

7.2 Organizational Structures

Organized stakeholder groups come in all shapes and sizes and hold varying degrees of authority and powers. The form of a stakeholder group is entirely dependant on its function or activities. Stakeholders can be coordinated under one of various organizational structures for representation, including 1) Joint powers agreement (JPA), 2) Memorandum of understanding, 3) various types of water districts (e.g., water replenishment district, water conservation district). The following subsections discuss each type of organizational structure in more detail.

7.2.1 Joint Powers Agreement

Pursuant to Government Code Section 6500 *et. seq*., two or more public agencies may enter into a joint powers agreement for the purpose of exercising those powers common to each of the member agencies. Powers include but are not limited to: execution of contracts; employment of staff; issuance of bonds, acquisition of property, construction, operation and maintenance of facilities, and incurrence of debt. JPAs have the authority to prepare, adopt, and implement groundwater management plans developed pursuant to Water Code section 10750 *et. seq.* JPAs may also seek additional powers through the legislature.

Case Study: San Joaquin Council of Governments – The San Joaquin Council of Governments (SJCOG) is a joint powers authority comprised of the County of San Joaquin and the Cities of Stockton, Lodi, Manteca, Tracy, Ripon, Escalon and Lathrop. SJCOG serves as the regional transportation planning agency for San Joaquin County. SJCOG also analyzes population statistics, airport land use, habitat and open space planning, and other regional issues. SJCOG fosters intergovernmental and public coordination within San Joaquin County, in neighboring jurisdictions, and with other various State and federal agencies.

Measure K, the half-cent sales tax measure passed in 1990 for San Joaquin County, is administered by SJCOG and overseen by its Board of Directors. The SJCOG Board of Directors consists of one voting member from each of the member agencies and an additional member from San Joaquin County. Over the twenty-year life of Measure K, an estimated $750,000,000 will have been generated for regional transportation projects.

7.2.2 Memorandum of Understanding

A memorandum of understanding (MOU) is a somewhat more flexible organizational structure that allows signatory agencies to pursue a common purpose or goals. The organization formed by the MOU cannot directly enter into any contracts, incur debt, or employ staff directly. An organization formed under an MOU is adequate for consensus building and facilitation.

Case Study: : The Butte Basin Water Users Association - The Butte Basin Water Users Association in Butte County is an example of a group formed under an MOU who share common interests. In response to water management challenges encountered during consecutive drought years through the mid-1990's, agricultural and urban water purveyors organized themselves to combine financial and technical resources to better understand and manage the surface water and groundwater resources. In addition to promoting improved water management by individual agencies through the collective sharing of information, the organization was able to demonstrate broad local support for their efforts.

7.2.3 Various Types of Water Districts

The State of California recognizes the formal organization of various water districts as political subdivisions of the State. Examples of water districts include County water agencies, County water districts, resource conservation districts, water districts, water conservation districts, irrigation districts, water storage districts and water replenishment districts. In addition, specific legislation may also be sought to create a special district or to enhance its powers. Many of the individual entities represented on the water management plan stakeholder committee have utilized one of these acts as the basis for their organizational structure. Stakeholders may chose to annex adjacent lands, organize as a new special water district, or be incorporated into an existing district to exercise its powers. Additionally, a specific benefit zone can be created under the San Joaquin County Flood Control and Water Conservation District for the purpose of implementing a groundwater management program in Eastern San Joaquin County.

7.3 Management Framework Models

A Management framework model is a depiction of the relationship between the basin stakeholders, Authority, Groundwater Management Plan, and the Groundwater Export Ordinance. The following management framework models are depicted below.

7.3.1 Individual Interest-based

Depicted in Figure 7-1, an individual interest-based management framework reflects a philosophy whereby stakeholders would govern and develop water resources projects individually. Historically, this has been the approach to groundwater management and water resources development in San Joaquin County.

In the individual interest-based model, water districts, cities, and other mutual partnerships are free to develop and implement projects independently. Input from the public and comments from other affected agencies are dealt with during regular or mandated outreach opportunities or progress meetings. Individual entities may choose to develop projects pursuant to a regional groundwater management plan. However, project decision-making authority would remain exclusively within the jurisdiction of the entity sponsoring the project. Fund raising would also be the sole responsibility of the sponsoring entity.

The individual interest-based management approach allows agencies to focus their resources on projects specific to its needs; however, this approach may hinder the ability for agencies to coordinate project development in order to best meet the needs of the involved agencies and the region. Competition for State and federal funding is also an issue as projects demonstrating broad benefits to multiple agencies are given funding priority over narrowly scoped projects developed by individual entities.

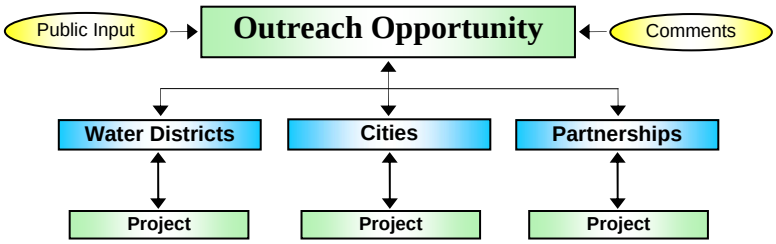


Figure 7-1 Individual Interest-based Model

7.3.2 Mutual Interest-based

The mutual interest-based model reflects a governance framework that creates a stakeholder group of common interests with the powers to undertake specific goals and objectives. The current Authority structure is a form of the mutual interest based approach. A stakeholder group such as a JPA or coalition, represented by individual agencies overlying the Basin, would be responsible for providing a consensus based forum in which projects can be developed by Basin stakeholders in a manner that maximizes benefits to all involved parties and the region as a whole. Projects developed with input from the stakeholder group would ensure consistency with the Plan.

The distinct advantage to this approach is the benefit of regionalism. Broad based support for a project is a deterrent to litigation, protest, and opposition. In addition, regional projects are more competitive in the funding arena both at the State and federal levels. A potentially negative aspect of this management framework is the perceived loss of control over a project. Nonetheless, a project will be weighed and measured on its merits and its fate decided on by its constituents. It is highly unlikely that a mediocre project without broad based consensus will survive an onslaught of political, legal, and regulatory challenges.

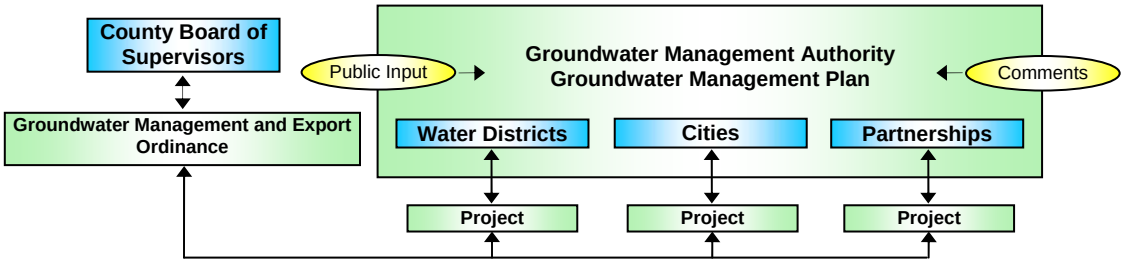


Figure 7-2 Mutual Interest-based Model

Presented in Figure 7-2 is an example of a mutual interest-based governance framework in the context of the current Authority governance structure and groundwater management efforts. The Authority is a forum for its member agencies to develop groundwater recharge and banking projects and programs. The forum creates accountability for its member agencies to health of the underlying Basin. Development within the Authority ensures that projects are consistent with the Basin Management Objectives developed in this Plan to sustain the health of the Basin. The Authority would not be governed by the County Board of Supervisors, however, as currently structured, should a Groundwater Export Permit be necessary for an export project, Board of Supervisor approval would be required. The Board of Supervisors of San Joaquin County would remain a member agency of the Authority.

7.4 Dispute Resolution

The Authority has served as a regional planning body and a forum for member agencies to share their groundwater management efforts and ensure that those efforts do not detrimentally affect other member agencies. In order to avoid potential conflicts between Basin stakeholders, the Authority employs the following:

- **Expanded Membership:** Authority membership is diverse as are the myriad of water challenges and issues facing Eastern San Joaquin County. In 2001, the Central Delta Water Agency and the South Delta Water Agency became full contributing and voting member agencies to the Authority. In 2004, amendments to the Authority JPA included

language to include California Water Service Company as an appointed voting member to the Authority Board of Directors. Associate membership (ex-officio) was also extended to the San Joaquin Farm Bureau Federation as their input and support is essential to the success of the Authority. Other members have been contemplated such as SSJID, OID, City of Lathrop, Manteca, Escalon, and Ripon, Calaveras County Water District, Stanislaus County, DWR, Freeport Regional Water Authority, and EBMUD.

- **Continued Use of the Authority as a Forum:** As the Authority looks to implement the Plan, the member agencies will move the outlined projects through the planning, permitting, and design stages and ultimately to construction. In a forum, implementing member agencies will be able to quantify the benefits of its projects to stakeholders and receive comments and suggestions before disputes arise.

- **Continued Facilitation by the California Center for Collaborative Policy:** The California Center for Collaborative Policy (Center) has been an integral part to the success of the Authority's consensus based process. The Center's presence has maintained an atmosphere conducive to openness, compromise, and agreement. It is expected that the Center will continue to facilitate Authority meetings and throughout the implementation of the Plan.

8 Integrated Regional Conjunctive Use Program

The following section describes the options available to the Authority in the development of the Integrated Regional Conjunctive Use Program. The Conjunctive Use Program is the key element in fulfilling the purpose of the Plan to ensure the sustainability of Groundwater resources in Eastern San Joaquin County. For organizational purpose, project options are grouped into water supply elements by source, surface water storage and major conveyance projects, and groundwater recharge components by program or entity.

8.1 Supply Elements

Supply elements are grouped by river system and are a combination of reallocations, new water, and transfers. Entitlements to water are supported by legal claims based on existing water right permits, water service contracts and agreements, and pending water right applications. A map of the waterways discussed can be seen in Figure 8-1.

8.1.1 Stanislaus River

As listed in Table 2-5, Stanislaus River supplies are available to the SSJID and OID via pre-1914 water rights and to the Stockton East Water District and Central San Joaquin Water Conservation District through Central Valley Project (CVP) contracts. SSJID and OID are senior water right holders to 600,000 af per year from the yield of New Melones Reservoir, 320,000 af of which are used directly in the GMA. SEWD and CSJWCD hold junior contracts for a total of 155,000 af subject to other users requirements.

The Stanislaus River watershed consists of approximately 904 square miles with an annual average runoff of approximately 1 million af. The majority of the runoff occurs from November to July and peaks during the summer months when snow melt is greatest. More than half the runoff is snowmelt-derived (USBR, Website, updated). The USACE constructed New Melones Dam on the Stanislaus River in 1978, replacing the original Old Melones Dam constructed in 1924 jointly by OID and SSJID. New Melones Reservoir has a capacity of 2.4 million af and is operated as part of the CVP under the USBR's Interim Operations Plan. The average annual runoff at New Melones for the 74 years from 1904 to 1977 was 1.12 million af.

Urban growth in South San Joaquin County in the Cities of Lathrop, Manteca, Escalon and Ripon and the increased irrigation efficiencies made over the years have made water available for transfer by SSJID and OID. Beginning in 2005, SSJID will serve the urban communities of Escalon, Manteca, Lathrop, and Tracy with surplus water through the South County Surface Water Supply Project. SSJID and OID also currently make available to SEWD up to 30,000 af/yr through the New Melones Conveyance System specifically for urban use as part of a 10-year water transfer agreement which expires in 2009. The agreement is renewable pending future water availability and negotiation. SSJID and OID have also made on occasion water available to CSJWCD for irrigation.

In 1978, New Melones Dam was completed and the reservoir was filled. At the time of development and construction of New Melones, the expected yield of the project was fully allocated to meet the needs of the contracts in the Eastside Unit of the CVP. SSJID and OID held the most senior of rights and were allocated their full historic diversion amount. CSJWCD executed both a firm and interim CVP contract and SEWD an interim CVP contract; both are junior to other CVP contract for New Melones water. The CVP contracts provide up to 155,000 af per year subject to inflow, storage, and senior requirements. CSJWCD would receive up to 49,000 af of firm yield and an additional 31,000 af when available. SEWD would receive up to 75,000 af when available.

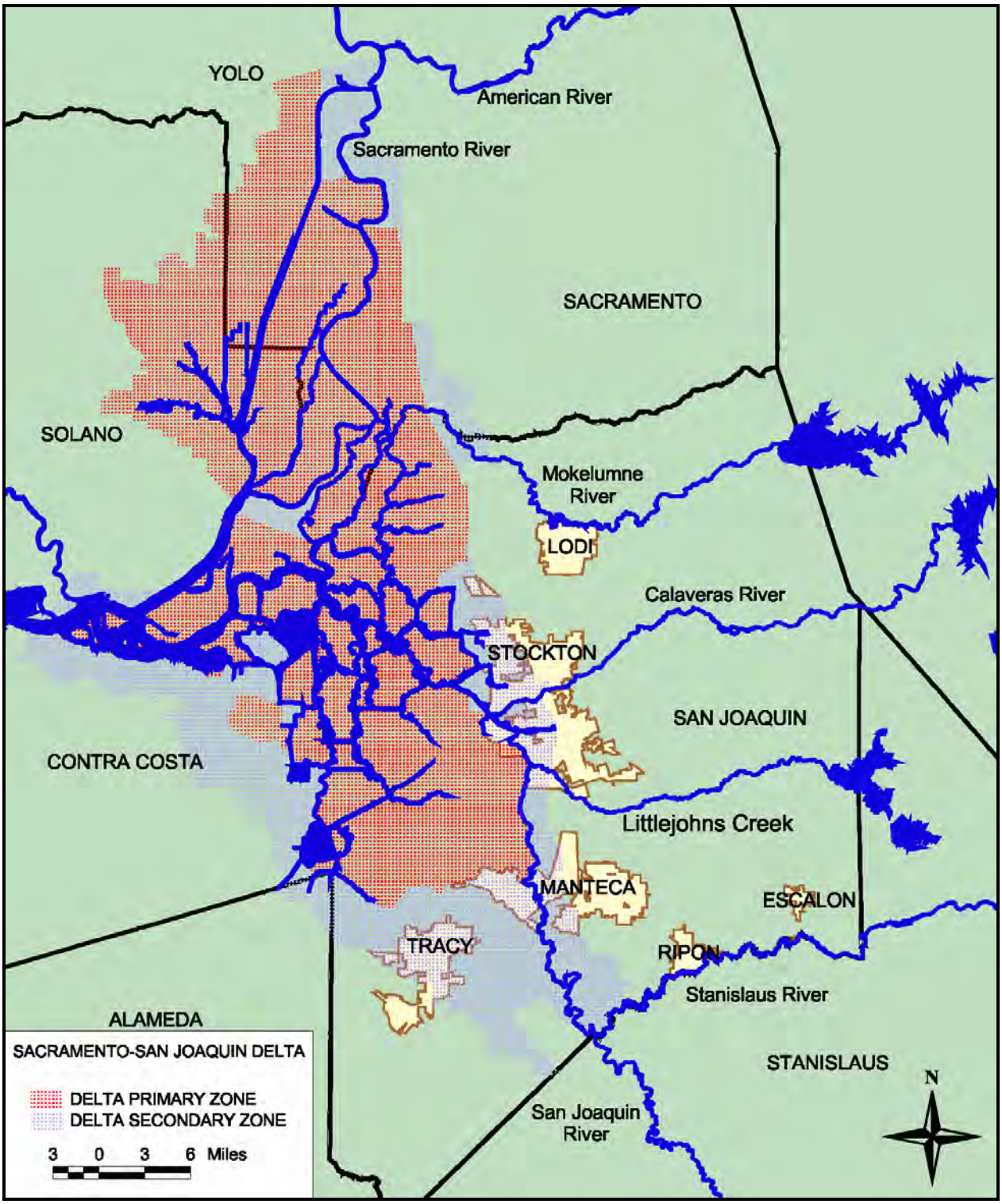


Figure 8-1 Regional Waterways

The severity in the quantity and quality of flow in the San Joaquin River directly affects the operation of New Melones Reservoir. Quality and flow of the San Joaquin River has seriously deteriorated since the completion of the Friant Dam, the Delta Mendota Canal, and California Aqueduct. Inflow to the Delta from the San Joaquin River consists primarily of high saline drainage from farmlands and wetlands in the CVP's Westside service area. As a result, hundreds of thousands of tons of concentrated salt flow into the San Joaquin River each year. The SWRCB established flow and water quality standards on the San Joaquin River near Vernalis and directed the USBR to meet these standards. Consequently, the USBR has elected to meet the Vernalis standards with substantial releases from New Melones Reservoir. These releases for water quality purposes directly reduce the amount of water available for the Stockton East Water District and the Central San Joaquin Water Conservation District under their respective CVP interim contracts. The USBR and the Central Valley Regional Water Quality Control Board have shown little interest in addressing salt drainage or the restoration of flows in the San Joaquin River in a manner that does not harm San Joaquin County interests.

Additionally, the Central Valley Improvement Act of 1992 (CVPIA) required more releases from the CVP for fish and wildlife system wide. The resulting actions have disproportionately affected New Melones Reservoir thus reducing the amount of water available for SEWD and CSJWCD. The USBR has made no real substantial progress towards revising the Interim Operations Plan for New Melones Reservoir, implementing source control programs for salinity in the CVP Westside service area, nor finding alternative sources for meeting the SEWD and CSJWCD water service contracts.

CDWA and SDWA are directly affected by the quantity and quality of flow in the San Joaquin River. CDWA and SDWA have been the lead proponents of alternative means for the USBR to meet the Vernalis flow objective. While CDWA and SDWA recognize the use of New Melones to improve water quantity and flow in the San Joaquin River at Vernalis, it is neither a permanent solution nor a solution that is acceptable economically to San Joaquin County as a whole. San Joaquin County, Delta interests, and Eastern San Joaquin County have been supportive of measures that would restore the San Joaquin River through in-stream releases at Friant Dam, the establishment of water quality and flow standards upstream of Vernalis, and recirculation of Delta exports through the Delta-Mendota Canal and the San Joaquin River. Modeling has shown that any of the above options if implemented would free up water in New Melones for the SEWD/CSJWCD contract entitlements.

8.1.2 Calaveras River

The Calaveras River is the primary surface water supply for the City of Stockton and SEWD. In 1963, the USACE constructed New Hogan Dam for flood control, recreation, and water supply purposes. The Calaveras River watershed consists of 363 square miles and stretches from the Sierra Nevada foothills to San Joaquin River in west Stockton. New Hogan Reservoir is primarily derived from rainfall and has a capacity of 317,000 af. The USACE operates New Hogan when flood control releases are necessary and reserves approximately 165,000 af of reservoir capacity for flood control storage. SEWD operates New Hogan and schedules releases at all other times. By agreement, SEWD is entitled to 56.5% of the yield to New Hogan with the remaining yield reserved for Calaveras County Water District (CCWD). Currently, SEWD utilizes CCWD’s unused supply. CCWD currently uses approximately 3,500 af per year and estimates it will use up to 5,300 af per year in 2040; however, growth in Calaveras County could spur interest in expanding use of its New Hogan supply (CCWD, 1996).

8.1.3 Mokelumne River

The Mokelumne River watershed encompasses approximately 660 square miles stretching from the high Sierra Nevadas westward to the Delta. Major facilities located on the Mokelumne are the Salt Springs Reservoir on the North Fork of the Mokelumne and the Pardee and Camanche Reservoirs on the rivers main stem. Salt Springs Reservoir, the largest of seven Pacific Gas & Electric (PG&E) reservoirs (Project 137), was built in 1963 and is operated for hydropower generation. Pardee and Camanche are both owned by EBMUD. Pardee Reservoir, which is upstream from Camanche, has a capacity of 197,950 af and is operated as a water supply reservoir. Reservoir water from Pardee is conveyed by the Mokelumne River Aqueducts to the EBMUD service area some 82 mile away. Camanche Reservoir, with a capacity of 417,120 af, is operated for flood control and also to meet instream flow requirements and down stream entitlements. Snowmelt comprises a large portion of the watersheds runoff. Both Pardee and Camanche generate incidental hydro power at 30 MW and 9.9 MW respectively. (EBMUD, Urban Water Management Plan 2000)

In-stream flow requirements and water rights on the Mokelumne form a complex hierarchy of entitlements. Under the Joint Settlement Agreement on the Lower Mokelumne River Project (JSA), minimum in-stream flows, reservoir pool elevations, and fisheries enhancements are implemented conditional to the FERC Permit of Pardee and Camanche Reservoirs. Subsequently, the D-1641 of the SWRCB reaffirms the validity of the JSA commitment to establishing adequate Bay-Delta flows and water quality. Additionally, provisions in the Lodi Decree protect groundwater levels in the City of Lodi from flow related deficiencies and inadequate groundwater levels. Table 8-1 depicts the target JSA release and in-stream flow requirements.

Table 8-1 Lower Mokelumne In-stream Flow Requirements

Year Type	Requirements (cfs)	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Annual (af)
Normal	Minimum Camanche Reservoir Release	325	325	325	325	325	325	325	325	325	100	100	100	194,000
Below Normal		250	250	250	250	250	250	250	250	250	100	100	100	154,000
Dry		220	220	220	220	220	220	220	220	100	100	100	100	130,000
Critical		115	130	130	130	130	130	130	100	100	100	100	100	80,000
Normal	Expected Flow below Woodbridge Diversion Dam	100	100	100	100	100	100	150	300	300	25	25	25	86,000
Below Normal		100	100	100	100	100	100	150	200	200	20	20	20	73,000
Dry		80	80	80	80	80	80	150	150	20	20	20	20	52,000
Critical		75	75	75	75	75	75	75	15	15	15	15	15	52,000

Note: Minimum releases from Camanche Reservoir are approximately and should not be used to determine the actual available quantity of water available for new uses on the Mokelumne River.

Source: MORE WATER Project Phase I - Reconnaissance Study Summary Report, 2004

EBMUD must also meet the requirements of both upstream and downstream water right holders. Increasing demands of upstream developments in Alpine, Amador, and Calaveras Counties are recognized by the SWRCB as having priority to Mokelumne River water. Downstream users served by Camanche Reservoir include WID and NSJWCD. WID holds both pre and post-1914 water rights. In years when Mokelumne inflow is greater than 375,000 af, WID is entitled to 60,000 af. When Mokelumne inflow is less that 375,000 af, WID is entitled less than 60,000 af to a minimum of 39,000 af. Through conservation and irrigation efficiency efforts, WID has made 6,000 af per year available to the City of Lodi. Under the agreement, the

City of Lodi will pay WID $200 per af for water delivered by the existing WID canal system. WID will use the proceeds to replace the aging WID Dam. The new WID Dam will allow Lodi Lake to remain full year round thus enabling WID to serve recharge areas during the late fall and winter months. The dam will also feature state of the art fish ladders making it easier for spawning salmon to reach the Fish Hatchery at Camanche Reservoir.

NSJWCD has attempted to acquire a firm supply from the Mokelumne River through the SWRCB, however, in D-858 of 1956, the State Engineer gave priority to EBMUD for Mokelumne River water and cited the Folsom South Canal (FSC) as the preferred surface water supply for NSJWCD. The FSC was planned as part of the Auburn-Folsom South Unit of the CVP for the conveyance of American River Water stored behind Folsom Dam and the proposed Auburn Dam. Auburn Dam and the remaining reaches of the FSC were never completed. The USBR has no plans or intentions to extend the FSC into San Joaquin County to its planned terminus 20 miles southeast of Stockton.

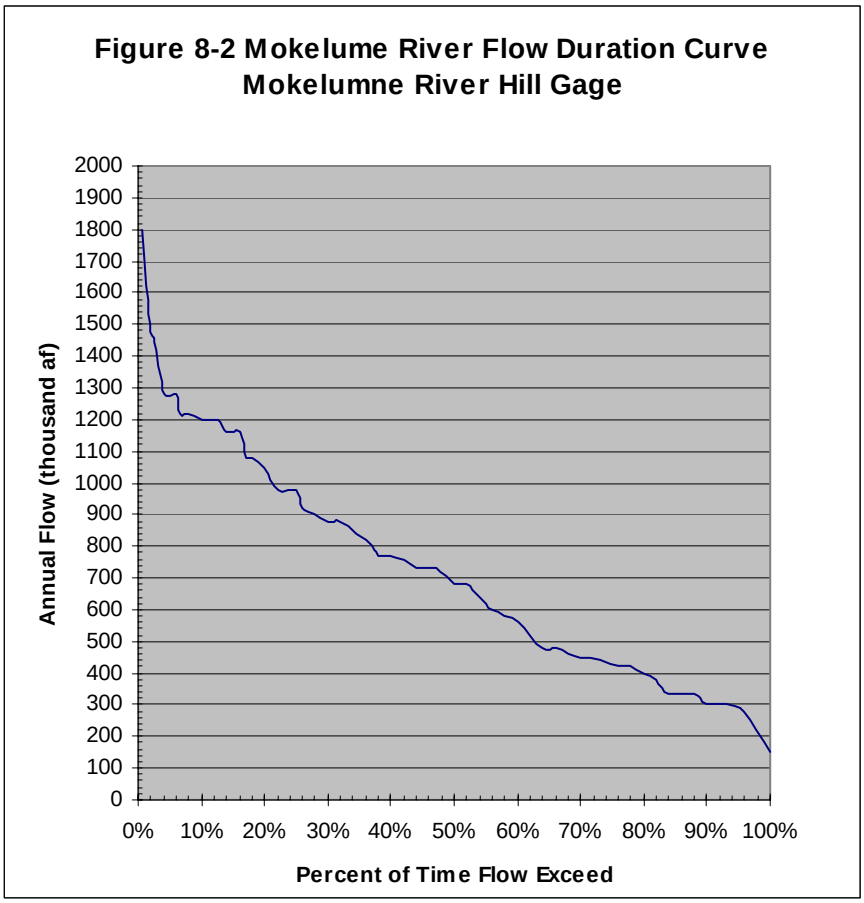
Also in D-858, the State Engineer granted NSJWCD a permit to divert Mokelumne River water from December 1st to July 1st which is surplus to EBMUD's needs until the FSC is completed as envisioned by the CVP or until EBMUD uses its full entitlements. EBMUD has agreed to store up to 20,000 af per year pursuant for NSJWCD subject to inflow and other requirements. The interim nature of the water supply and the extensive use of private groundwater wells have reduced the

Table 8-2 Water Available from the Mokelumne River (af)

Year	Total		Year	Total	
1922	194,274		1961	0	
1923	7,909		1962	0	
1924	0		1963	0	
1925	0		1964	0	
1926	0		1965	316,779	
1927	0		1966	6,968	
1928	0		1967	289,774	
1929	0	13-year Period	1968	0	
1930	0		1969	463,970	
1931	0		1970	209,374	
1932	0		1971	93,591	
1933	0		1972	0	
1934	0		1973	0	
1935	0		1974	272,910	
1936	0		1975	97,983	
1937	19,096		1976	0	
1938	519,170		1977	0	
1939	0		1978	0	
1940	0		1979	0	
1941	119,569		1980	156,188	
1942	274,525		1981	0	
1943	286,933		1982	656,659	
1944	0		1983	1,146,269	
1945	0		1984	380,946	
1946	33,755		1985	4,503	
1947	0		1986	378,552	
1948	0		1987	0	
1949	0		1988	0	
1950	0		1989	0	
1951	453,705		1990	0	8-year Period
1952	603,929		1991	0	
1953	18,421		1992	0	
1954	0		1993	0	
1955	0		1994	0	
1956	341,038		1995	500,787	
1957	0				
1958	322,485		**Minimum:**	**0**	
1959	0		**Maximum:**	**1,146,269**	
1960	0		**Average:**	**43,173**	
Number of diversion years in 74-yr period:				**26**	**(35%)**

Source: MORE WATER Project Phase I – Reconnaissance Study Summary Report, 2004

demand for surface water to less than 3,000 af per year. Water demands in the EBMUD service area are not expected to rise considerably over the next 20 to 40 years. Water for NSJWCD is available from the Mokelumne River in above average and wet years.



Additional supply from the Mokelumne River is possible in a major regional conjunctive use project. The Mokelumne River Regional Water Storage and Conjunctive Use Project (MORE WATER Project) is currently being studied by the Mokelumne River Water and Power Authority (MRWPA). In 1990 the MRWPA submitted applications to the SWRCB for unappropriated flood flows on the Mokelumne River from December 1 to June 30. The application seeks to divert up to 1000 cfs to storage and up to 620 cfs for direct use. Historic alternatives for capturing the water include Middle Bar Dam and on-stream reservoir, Duck Creek Reservoir and off-stream diversion, and direct diversions on the Lower Mokelumne River from Camanche Reservoir to Interstate 5. Preliminary studies have shown that substantial 'new water' is available for use in Eastern San Joaquin County; however, the facilities necessary to capture water intermittently are expensive and may remain idle in some years. Table 8-2 depicts the available water from the Mokelumne River surplus to all in-stream and user requirements over the historic 74-year hydrologic record. Based on the historic Mokelumne Hill gage record, there is substantial water available on an interim basis as depicted in Figure 8-2.

8.1.4 Sacramento-San Joaquin Delta

The City of Stockton has long looked to the Sacramento-San Joaquin Delta as a potential source of water to meet long-term needs. In 1996 the City of Stockton submitted an application to the SWRCB seeking an increasing amount of water from 20,000 af initially up to 125,900 af per year. The Delta Water Supply Project seeks to replace existing surface supplies subject to future reductions, protect and restore groundwater levels to within a target safe yield of 0.6 af per acre, and provide a reliable water supply for planned growth outlined in the 1990 City of Stockton General Plan. The basis for the water right is Water Code Section 1485 whereby an agency may appropriate water from the Delta in a like amount to water discharged upstream into the San Joaquin River less any losses and the Area of Origin and Delta Protection Statutes which were enacted to protect against water exports. Any new diversion from the Delta is extremely contentious.

The health of the Delta is also linked to the water supply of Eastern San Joaquin County. Inflow into the Delta from the San Joaquin River is of poor quality and is diluted by higher quality flows from the Sacramento River. A number of Total Maximum Daily Load (TMDL) actions are underway for the San Joaquin River. The Regional Board is required to establish a TMDL load allocation for high priority impaired water bodies under the Federal Clean Water Act. A low dissolved oxygen TMDL is currently being formulated for the Stockton Deepwater Ship Channel which includes effluent from the City of Stockton Regional Water Quality Control Facility (Wastewater Treatment Plant). Additionally, a TMDL for salt and Boron is being formulated to control salt drainage into the San Joaquin River to meet the Vernalis standard. Improvement in delta water quality is the highest priority for both Delta interests and the City of Stockton Diversion Project.

8.1.5 American River

Eastern San Joaquin County has long been promised water from the American River by both the State and Federal Governments. The planned construction of the Auburn Dam, FSC and other smaller regulating reservoirs never came to fruition. The USBR's inaction and the current regulatory restrictions on water resources development have forced Eastern San Joaquin County to weigh other more expensive alternative water sources.

In 1990 San Joaquin County submitted an application to the SWRCB to appropriate wet-year water from either the South Fork of the American River via the completed Auburn-Folsom South Unit of the CVP or from Lake Natomas on the Lower American River. The application requests a diversion of up to 620 cfs between December 1 and June 30 subject to availability of unappropriated flow. The construction of the Auburn Dam, the Countyline and Clay Station Reservoirs, and the extension of the Folsom South Canal into San Joaquin County were never undertaken. In addition Sacramento County and environmental interests have long opposed the substantial delivery of water from Nimbus Dam to the detrimental health of the Lower American River.

In August 2003, San Joaquin County amended its American River application to move and consolidate the points of diversion on the South Fork of the American River and Nimbus Dam to the Sacramento River to coincide with the point of diversion of the Freeport Regional Diversion Project (Freeport Project) at a diversion rate of 350 cfs. In order to maintain the priority filing date, San Joaquin County needed to demonstrate that the amended amount requested at Freeport on the Sacramento River would be available on the South Fork American River. To support the amendment of the water right application, the Authority co-sponsored the San Joaquin County Amended Water Right Application 29657 South Fork American River Water Availability Study (Water Availability Study).

The Water Availability Study explores the hydrologic, regulatory, and water right constraints of the American River System. The Water Availability Study concluded that substantial water is available on the South Fork of the American River and would likewise be available for diversion downstream at Freeport on the Sacramento River in normal and wet years. The Water Availability Study also concluded that the 155 cfs Freeport Project capacity severely limits the amount available to San Joaquin County. By increasing the capacity of the diversion and conveyance elements of the Freeport Project to 350 cfs, the Authority could maximize its use of the American River Water Right Application.

The Water Availability Study concluded that the average annual yield available to San Joaquin County is limited by the physical capacity of the Freeport Project capacity of 155 cfs or approximately 44,000 af per year. An increase in capacity to 286 cfs could potentially increase

the average annual yield to 72,000 af per year. In the months of July-November, other supplies available either from the American or Sacramento Rivers through exchanges, transfers, banking partnerships, federal contracts, and additional water right fillings could significantly increase the yield to San Joaquin County. A more detailed description of the Freeport Project is found in Section 8.2.1.

8.2 Surface Storage and Major Conveyance Elements

The water sources described above require substantial investments in storage and conveyance in order to capture and put to beneficial use substantial amounts of water. The following elements are considered major reservoirs or new conveyance facilities. Final use is discussed in Section 8.3.

8.2.1 Freeport Regional Water Project

The Freeport Regional Water Authority (FRWA) was created by exercise of a joint powers agreement between Sacramento County Water Agency (SCWA) and EBMUD. FRWA's basic project purpose is to increase water service reliability for customers, reduce rationing during droughts, and facilitate conjunctive use of surface water and groundwater supplies in central Sacramento County. The Freeport Project will also provide EBMUD with flexibility in the event of an emergency or during Pardee System maintenance. The Freeport Project will provide up to 85 mgd of surface water to SCWA to be used conjunctively with groundwater to meet future supply needs of central Sacramento County and provide up to 100 MGD to EBMUD in dry years.

In 1970, EBMUD entered into a contract with the USBR for delivery of CVP water from the American River to be taken at Nimbus through the FSC to the Mokelumne Aqueduct. Legal challenges by American River interests culminated in the 1990 ruling of Alameda Superior Court Judge Richard Hodge (Hodge Decision). The Hodge Decision conditioned EBMUD's diversion from Nimbus on maintaining minimum in-stream flow requirements on the Lower American River necessary to protect the fishery. EBMUD continued to work with Sacramento County interests on diversion alternatives that could meet the dry year needs of EBMUD, protect and uphold the National Wild and Scenic Rivers designation of the Lower American River, and provide benefits to the region.

In 1993 the Sacramento Area Water Forum (Water Forum), a diverse group of water interests from the business, agricultural, environmental, citizen, and local government communities, began a collaborative process to devise a comprehensive plan to "Provide a reliable and safe water supply for the region's economic health and planned development to the year 2030, and Preserve the fishery, wildlife, recreational, and aesthetic values of the Lower American River." (Water Forum Agreement, 2000) In the context of the Water Forum, EBMUD and Sacramento County successfully developed a project that would move EBMUD's American River Diversion from Nimbus to the Sacramento River near the town of Freeport. In January 2001, EBMUD, Sacramento County interests, and the USBR executed a Memorandum of Agreement to fully explore the engineering feasibility of joint use facilities under the Freeport Project concept.

On July 20, 2001, EBMUD executed an Amendatory Contract with the USBR for water from the American River. Under the terms of the Amendatory Contract, EBMUD is entitled to divert its CVP supply from the Sacramento River only if its March 1st forcast of the expected October 1st total system storage is less than 500,000 af. The Amendatory Contract entitles EBMUD to divert up to 133,000 af in any one year and no more than 165,000 af total in any three-consecutive year period. While the Amendatory Contract allows for the diversion of up to

133,000 af in any one year, the diversion and transmission system is sized to convey no more than 112,000 af annually to the Mokelumne Aqueducts. Hydrologic records predict that the condition is expected to occur in the driest one-third of all years. EBMUD American River entitlements are also subject to curtailments pursuant to CVP drought conditions and regulatory requirements. The Freeport Project concept consists of the following facilities:

- a 185 MGD (286 cfs) intake facility and pumping plant on the Sacramento River near the community of Freeport;
- an 84-inch pipeline to convey water east to an 85 MGD SCWA water treatment plant;
- a 66-inch pipeline from the SCWA turnout east to the existing FSC;
- a 100 MGD (155 cfs) pumping plant near the terminus of the FSC;
- a 100 MGD (155 cfs) 66-inch pipeline from the terminus of the FSC to the Mokelumne Aqueducts; and
- an aqueduct pumping plant and pre-treatment facility near Camanche Reservoir.

The total preliminary cost of the Freeport Project is estimated at $690 million, $439 million of which will be funded by EBMUD (Freeport Regional Water Authority Website, 2004). Additional operations and maintenance costs are estimated to be approximately $130 per af. (Williamson, 2003)

In August 2003, the FRWA released the Freeport Regional Water Project (Freeport) Draft Environmental Impact Report/Environmental Impact Statement DEIR/EIS. The Freeport DEIR/EIS discloses potential environmental impacts of various alternatives to the Freeport Project. The preferred Freeport Project Alternative is depicted in Figure 8-3. The Final EIR/EIS was released in March 2004 and was certified on April 15, 2004. Construction of the intake and EBMUD portion of the Freeport Project is set to begin in 2007 and be completed in 2009 (Freeport Regional Water Authority Website, 2004).

Following the execution of the amendatory contract with the USBR, over 100 agencies served by the State Water Project (SWP) and CVP opposed the concept of EBMUD diverting water from the Delta in dry years. In 2003 State and Federal Contractors agreed to drop all but one suit and have pledged support for the Freeport Project through its construction. The terms of the settlement included provisions to include the EBMUD Amendatory Contract as an export under the Coordinated Operations Agreement. The settlement reduces the water supply impacts to the State and Federal Contractors. A separate settlement with the Santa Clara Valley Water District (SCVWD) would defer 6,500 af of EBMUD's diversion entitlement during the 1st year of a drought. Should the drought continue into a 2nd consecutive year, SCXWD would make available a like amount for EDMUD to divert.

On January 27, 2004, Contra Costa Water District (CCWD) became the last CVP Contractor to settle litigation against the Freeport Project. Under the terms of the settlement, the FRWA would use the joint Freeport project facilities to wheel up to 3,200 af per year under an existing CCWD CVP contract to the Los Vaqueros Reservoir near Brentwood. The settlement terms would offset the effects of lower quality water at the Los Vaqueros Reservoir intake in the Delta in years when EBMUD is diverting through the Freeport Project. The settlement with CCWD is the first allocation of EBMUD's unused capacity in the Freeport Project (California Water Law and Policy, 2004).

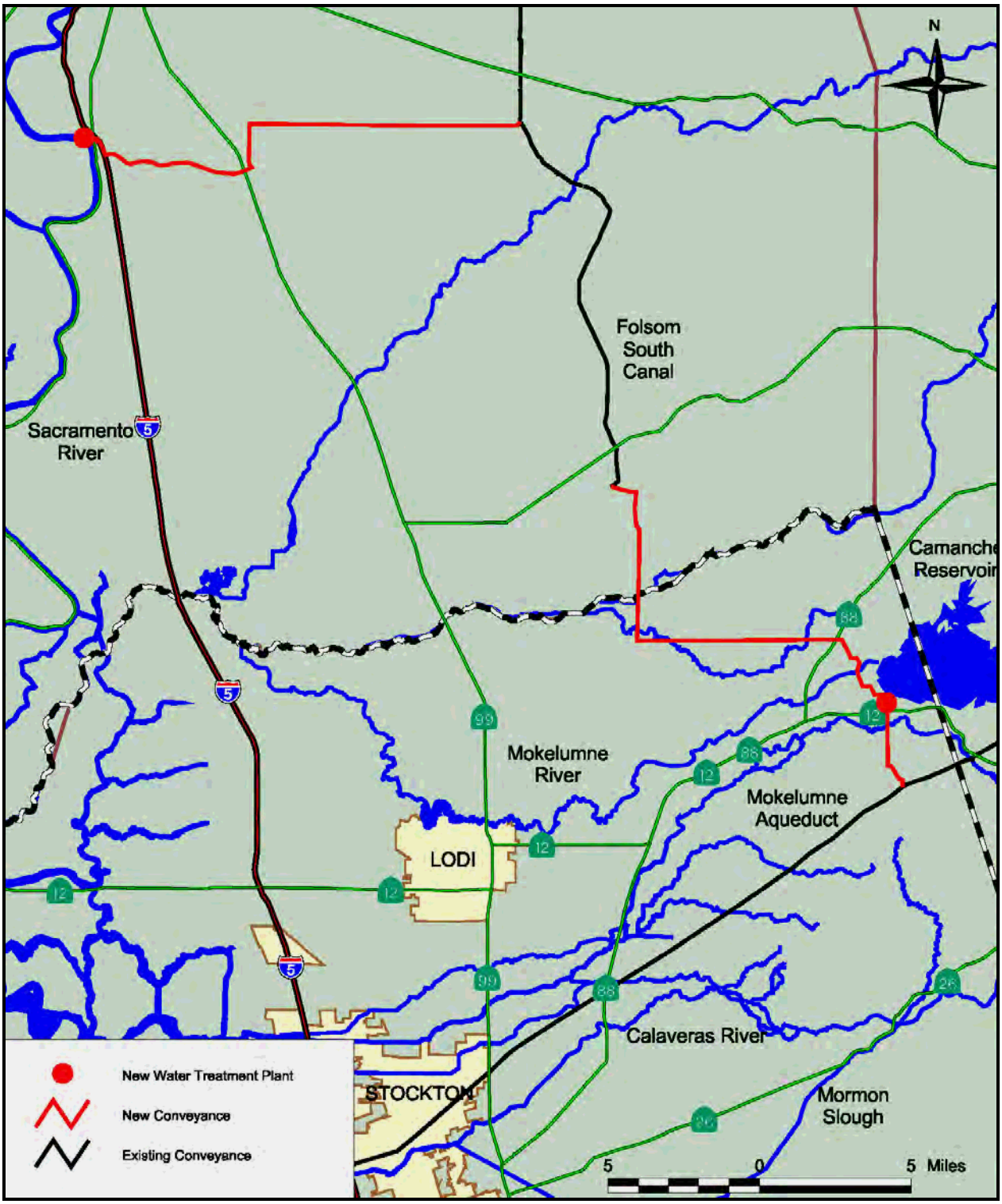


Figure 8-3 Freeport Regional Water Project
Source: Freeport Regional Water Authority at http://www.freeportproject.org

Assuming the Freeport Project is utilized by EBMUD in one-third of all years and the County is able to secure a wet-year water right on the American River, the maximum annual diversion amount would be approximately 65,000 af/yr at an average annual yield of 44,000 af/yr. The Water Availability Study suggests that in years when EBMUD is not utilizing the Freeport Project, the full amount will be available to the Authority under the County Water Right. Additional supplies obtained through third party groundwater banking and water transfers could also increase the yield to the Authority.

8.2.2 MORE WATER PROJECT

In 1990 the Mokelumne River Water and Power Authority (MRWPA) filed a water right application with the SWRCB for unappropriated wet year flows on the Mokelumne River. The application cited three alternatives for the capture of water at the proposed Middle Bar Reservoir, a new "On-stream" 40,000 to 434,000 af reservoir, the proposed Duck Creek Reservoir, a new "Off-stream" 100,000 to 150,000 af regulating reservoir, or through direct diversions off the Lower Mokelumne River between Camanche Reservoir and Interstate 5. The classic alternatives are collectively known as the Mokelumne River Regional Water Storage and Conjunctive Use Project (MORE WATER Project).

The MRWPA filed an additional water right application for power generation at the proposed Middle Bar Dam with an estimated power generation capacity of approximately 85 megawatts (MW) per year. The MRWPA also obtained 3 consecutive Preliminary Permits from the Federal Energy Regulatory Commission (FERC) for the proposed Middle Bar Dam alternative. The fourth consecutive Preliminary Permit, obtained for the proposed Duck Creek Reservoir alternative on January 22, 2004, is current for a period of three years through December 2006. The Preliminary Permit protects the MRWPA's priority to study the power generation potential of the proposed Duck Creek Reservoir (FERC, 2004).

In 2003 the MRWPA retained the services of HDR, Inc. in order to fully evaluate the engineering feasibility of the MORE WATER Project and devise and implement a strategy that would satisfy the requirements of CEQA, NEPA, the Water Right Applications, and all applicable permits. Funding for HDR services have come from contributions by the City of Stockton, the City of Lodi, and the MRWPA. The Authority is also looking to secure funding assistance through the Congressional appropriations process, State grants, and other interested agencies.

In May 2004, the MRWPA completed Phase I – Reconnaissance Study of the MORE WATER Project. Phase I evaluated all historic information available regarding the water right applications, the FERC filings, Mokelumne River hydrology, and any past studies done on the classic alternatives. From the information gained, the classic alternatives and other alternatives meeting the MORE WATER Project purpose and need were conceptualized and evaluated. The following alternatives were considered in Phase I:

- Pardee Dam and Reservoir Replacement/Enlargement
- Middle Bar Dam and Reservoir
- Mokelumne River Storage System Re-operation
- Devil's Nose Dam and Reservoir Construction
- Duck Creek Reservoir – Pardee Diversion
- Duck Creek Reservoir – Camanche Diversion

- South Gulch Dam and Reservoir with New Hogan Reservoir and Pardee Diversion
- Alliance Canal
- Lower Mokelumne River Diversions – Structural and Non-Structural

The list of alternatives was further reduced by eliminating projects too contentious to implement under the current regulatory and political climate. The historic Middle Bar Dam and Reservoir alternative was eliminated from the list due to numerous adverse impacts to whitewater rafting opportunities, riparian upland areas, oak savannah habitat, and wildlife. The Devil's Nose Dam was also eliminated from further consideration likewise due to the impacts on pristine up-county areas. The remaining alternatives were ranked based on a variety of factors weighing the benefits and likelihood of implementation. Table 8-3 shows the weighed screening criteria and evaluation results. The top five ranking alternatives will be carried forward and further explored in a detailed engineering feasibility analysis as part of the next phase of the MORE WATER Project and are described below.

Table 8-3 MORE WATER Project Alternatives Screening Results

Weight	0	3	3	1	2	1	5		
ALTERNATIVE	**Cost per acre-foot**	**Regulatory Feasibility**	**Political Feasibility**	**Financial Feasibility**	**Environmental Feasibility**	**Water Quality**	**Benefits Achieved**	**Sum Product**	**Relative Ranking**
Duck Creek Dam - Pardee Reservoir Diversion	H	M	M	H	M	H	H	37	1
Duck Creek Dam - Camanche Reservoir Diversion	H	M	M	H	M	H	H	37	2
Lower Mokelumne River Diversions-Non structural	L	H	H	H	H	H	L	35	3
Lower Mokelumne River Diversion-Structural	L	M	H	M	M	H	M	34	4
Mokelumne River Storage System Re-operation	L	H	M	M	H	H	L	31	5
New Hogan Reservoir Diversion with South Gulch Dam Reservoir Construction	H	L	M	M	M	H	M	29	6
Pardee Dam and Reservoir Replacement/Enlargement	M	L	L	M	L	H	H	28	7

Cost: Relative cost per acre-foot for each alternative. High = $$$ per af. Medium = $$ per af. Low = $ per af

Regulatory Feasibility: High: Good chance for regulatory support (i.e., regulatory agency concurrence). Medium: Moderate chance for legal support. Low: Low chance for support (i.e. regulatory agencies opposed).

Political Feasibility: High: Good chance for political support (i.e., elected officials/powerful interest groups support). Medium: Moderate chance for political support. Low: Low chance for support (i.e. elected officials/powerful interest groups opposed).

Financial Feasibility: High: High chance for financing partners outside of the Authority. Medium: Moderate chance for partners. Low: Low chance for partners outside of the Authority.

Environmental Feasibility: High: Limited environmental impacts that can be mitigated to level of insignificance. Medium: Adverse environmental impacts that can be mitigated. Low: Adverse environmental impacts that cannot be mitigated.

Water Quality: High: No effect to downstream or County users. Medium: Potential effect to downstream users that can be mitigated. Low: Adverse effect to downstream or County users.

Benefits Achieved: High: High Yield Medium: moderate yield. Low: low yield.

NOTE: Sum Product = high, medium, low ranking of 3,2, and 1 respectively, multiplied by weighted factor (ranging form 1 to 5) for each screening criterion.

Source: MORE WATER Project Phase I - Reconnaissance Study Summary Report, 2004

Mokelumne River Storage System Re-operation

This alternative includes re-operating Pardee Dam and Reservoir, Camanche Dam and Reservoir, and Project 137 systems to generate additional water supply. Working with the USACE, it may be possible to redefine the flood control operating guidelines for the Mokelumne River. The latest trends in weather forecasting and hydrologic modeling could be utilized to operate the flood control capabilities of the Mokelumne storage system less conservatively to allow for greater conservation storage capacity. Re-operation could also consist of allocating more flood control storage to PG&E Project 137 thus reducing the required flood control storage defined by the rule-curves of Pardee and Camanche Reservoirs. The yield of the re-operation alternative is on the order of 10,000 af.

Duck Creek Reservoir (Pardee or Camanche Diversions)

The proposed Duck Creek Reservoir is an off-stream reservoir located in Eastern San Joaquin County in the Duck Creek watershed which drains into the Calaveras River at divergence of the Calaveras River and Mormon Slough at Bellota. The Duck Creek dam system would consists of a 6000' earthen main dam at the south end and a series of smaller coffer dams to the west. The optimal size of the reservoir will be determined in the engineering feasibility study. Figure 8-4 is the elevation-area-capacity curve for the proposed Duck Creek Reservoir.

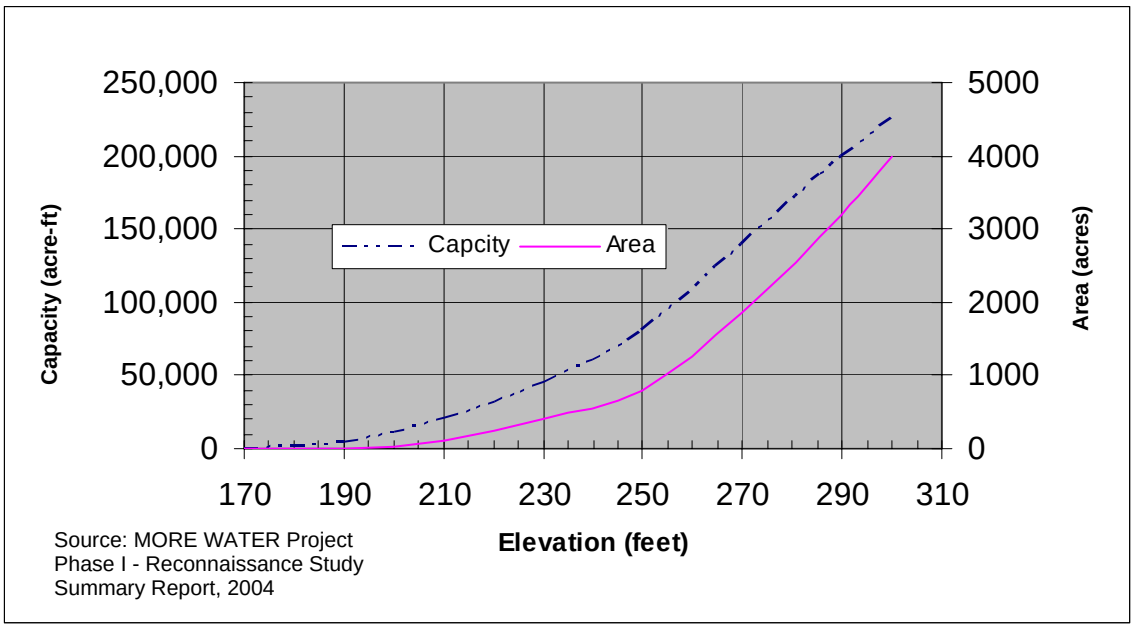


Figure 8-4 Duck Creek Reservoir Elevation-Area-Capacity Curve

Water would be diverted at either Pardee Reservoir or Camanche Reservoir for storage in Duck Creek Reservoir. A map and diagram of the Pardee Reservoir alternative are shown in Figure 8-5 and Figure 8-6, respectively. A diagram of the Camanche Reservoir alternative is shown in Figure 8-7, and a diagram of the proposed reservoir is shown in Figure 8-8. The water right application seeks to divert up to 1,000 cfs to storage and 620 cfs by direct diversion. The total maximum diversion capacity is 1,620 cfs from either Pardee or Camanche Reservoirs. Water diverted from Pardee Reservoir at a rate of 1,620 cfs would require a Regulated releases from

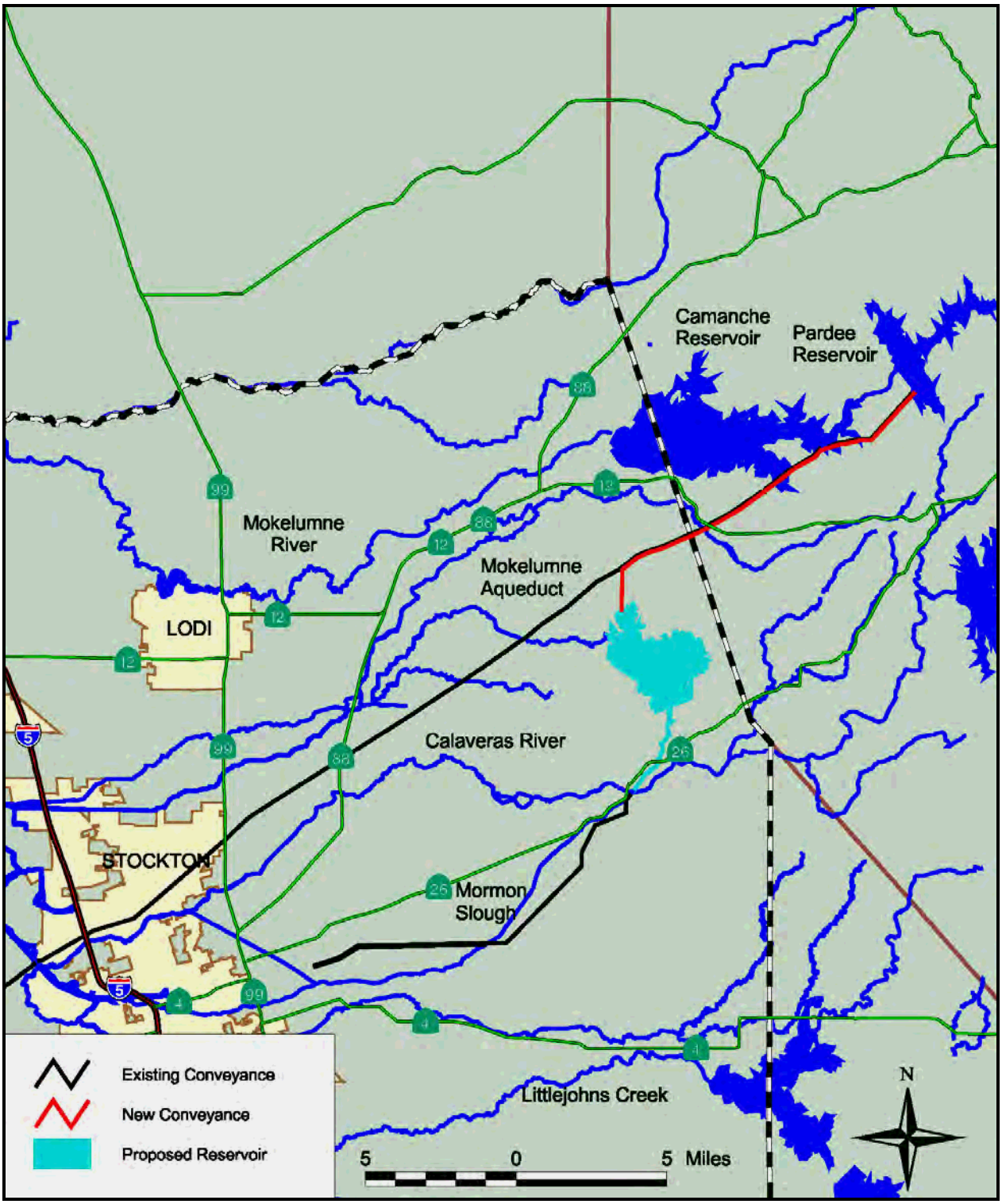


Figure 8-5 Duck Creek from Pardee Reservoir

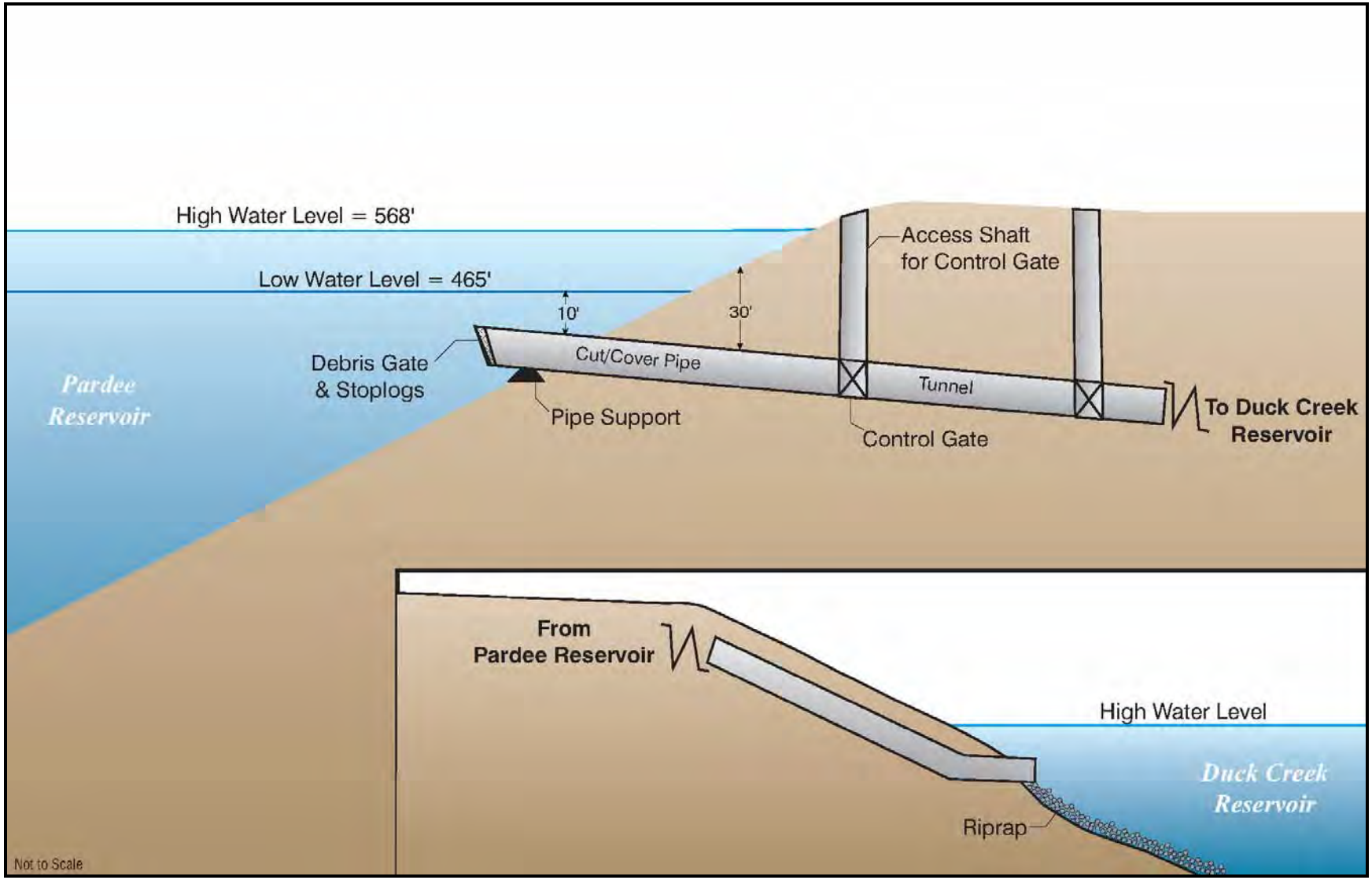


Figure 8-6 Duck Creek from Pardee Reservoir Inlet and Outlet Diagram
Source: HDR, Inc.

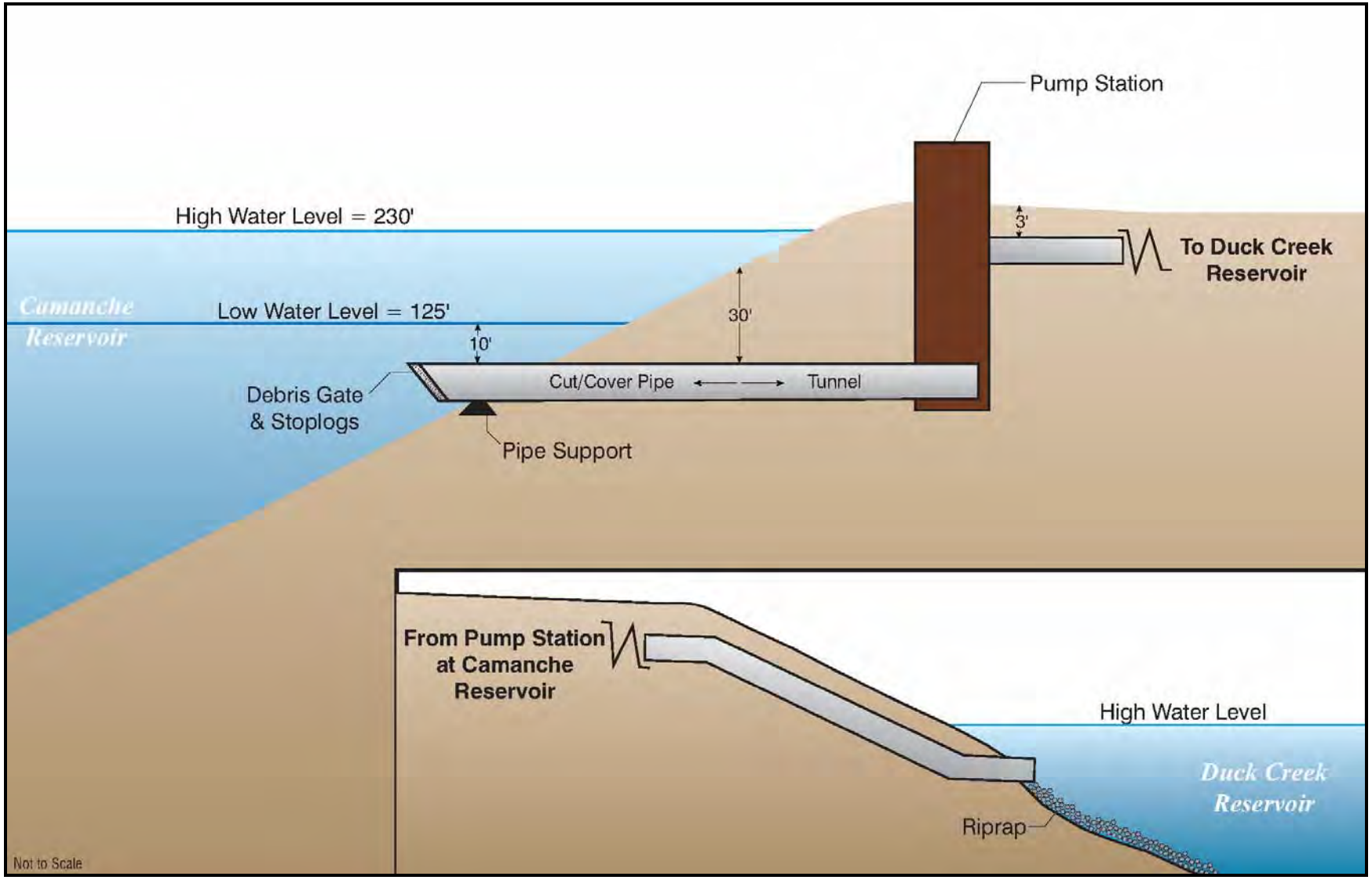


Figure 8-7 Duck Creek from Camanche Reservoir Inlet and Outlet Diagram
Source: HDR, Inc.

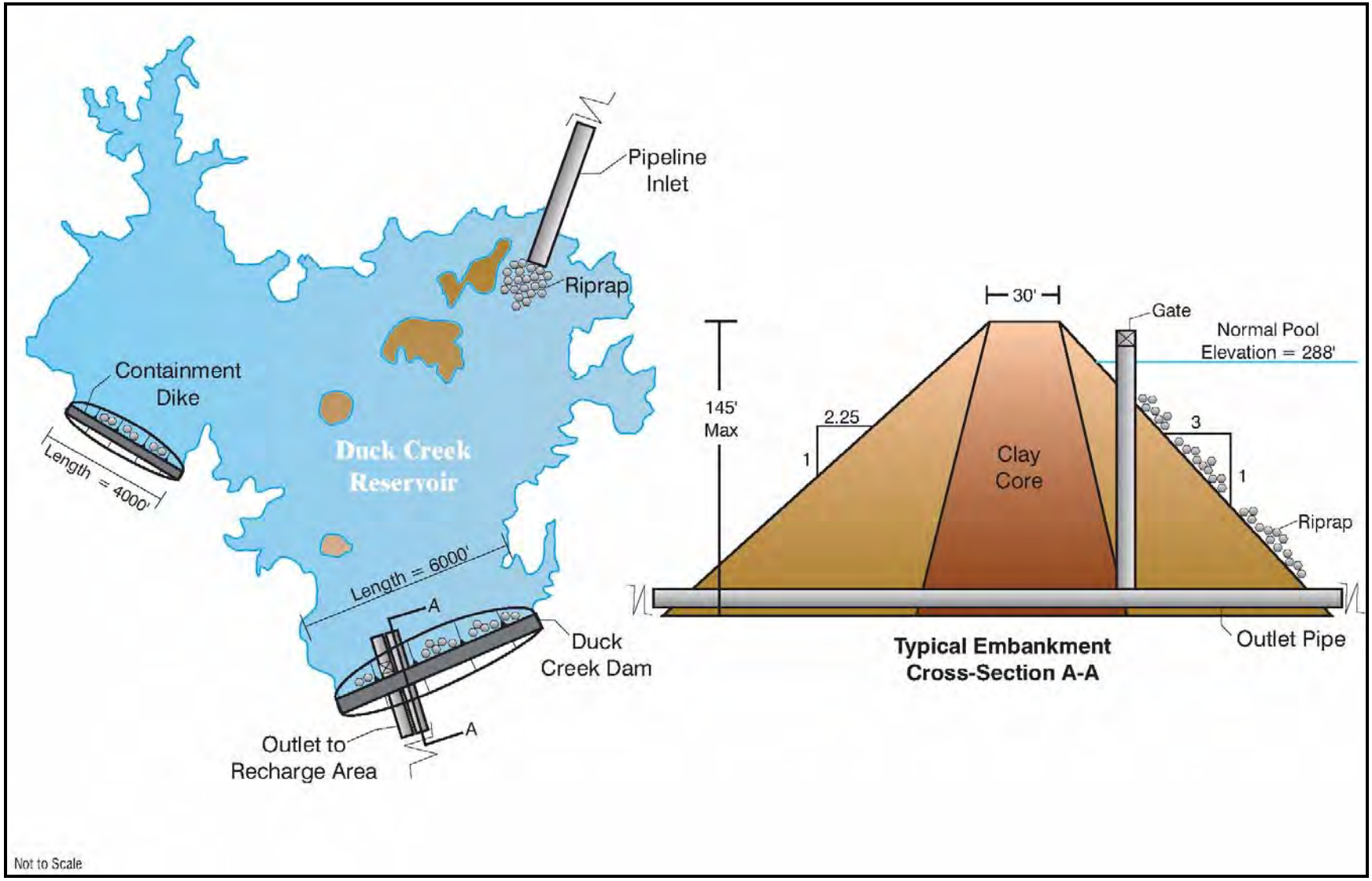


Figure 8-8 Proposed Duck Creek Reservoir Diagram
Source: HDR, Inc.

the Reservoir to Bellota would be re-diverted to the SEWD water Treatment Plant, Mormon Slough, Potter Creek, Mosher Slough, the Lower Calaveras River, and potentially the proposed Alliance Canal for beneficial use or direct groundwater recharge. Evaporation is potentially a major concern for shallow large surface area reservoirs; however, the operation of the proposed Duck Creek Reservoir would completely drain Duck Creek Reservoir to maximize use in anticipation for the next season's divertible flows. Evaporation rates for the duck creek area are shown in Figure 8-9.

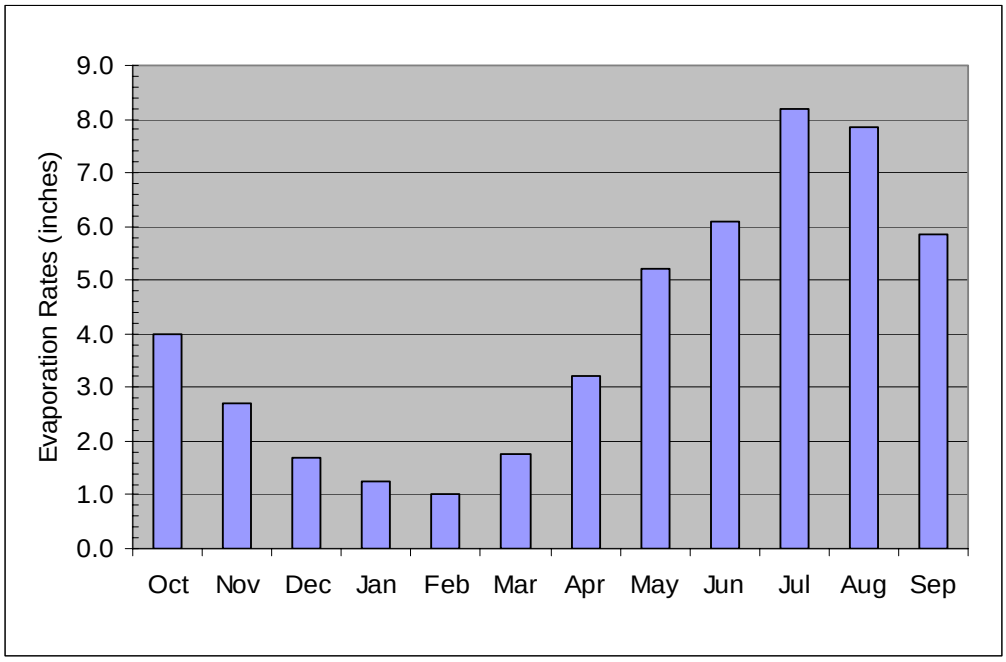


Figure 8-9 Duck Creek Reservoir Evaporation Rates

Lower River Diversions – Non-Structural and Structural

The water right application includes diversions along the lower Mokelumne River from below Camanche Reservoir to Interstate 5. Non-Structural implies the use of existing facilities with minor improvements. Under the non-structural alternative, NSJWCD existing diversion pumps and irrigation systems could be used to maximize recharge and in-lieu distribution. Additionally, the new Woodbridge Dam when completed will be able to supply the WID canal system year round, thus enabling groundwater recharge from Lodi to north Stockton. Structural alternatives consist of new diversion structures such as check dams, pump stations, and fish screens where flows would be diverted to supply direct recharge facilities or irrigation in-lieu deliveries. A diagram of the structural lower river diversion schematic can be seen in Figure 8-10.

During the course of Phase I, numerous agencies from the regulatory community warned that the MRWPA would be vulnerable to legal opposition because other less environmentally damaging alternatives to reversing the historic overdraft in Eastern San Joaquin County (i.e. agricultural and urban water conservation, water recycling, tiered water rate systems, etc.).

To evaluate the alternatives carried forward, the MRWPA developed the MORE Model of the Mokelumne River System based on the EBMUDSIM proprietary software package. Figure 8-11 is a schematic of the MORE Model. The MORE Model preliminary yield and cost estimates are presented in Table 8-4.

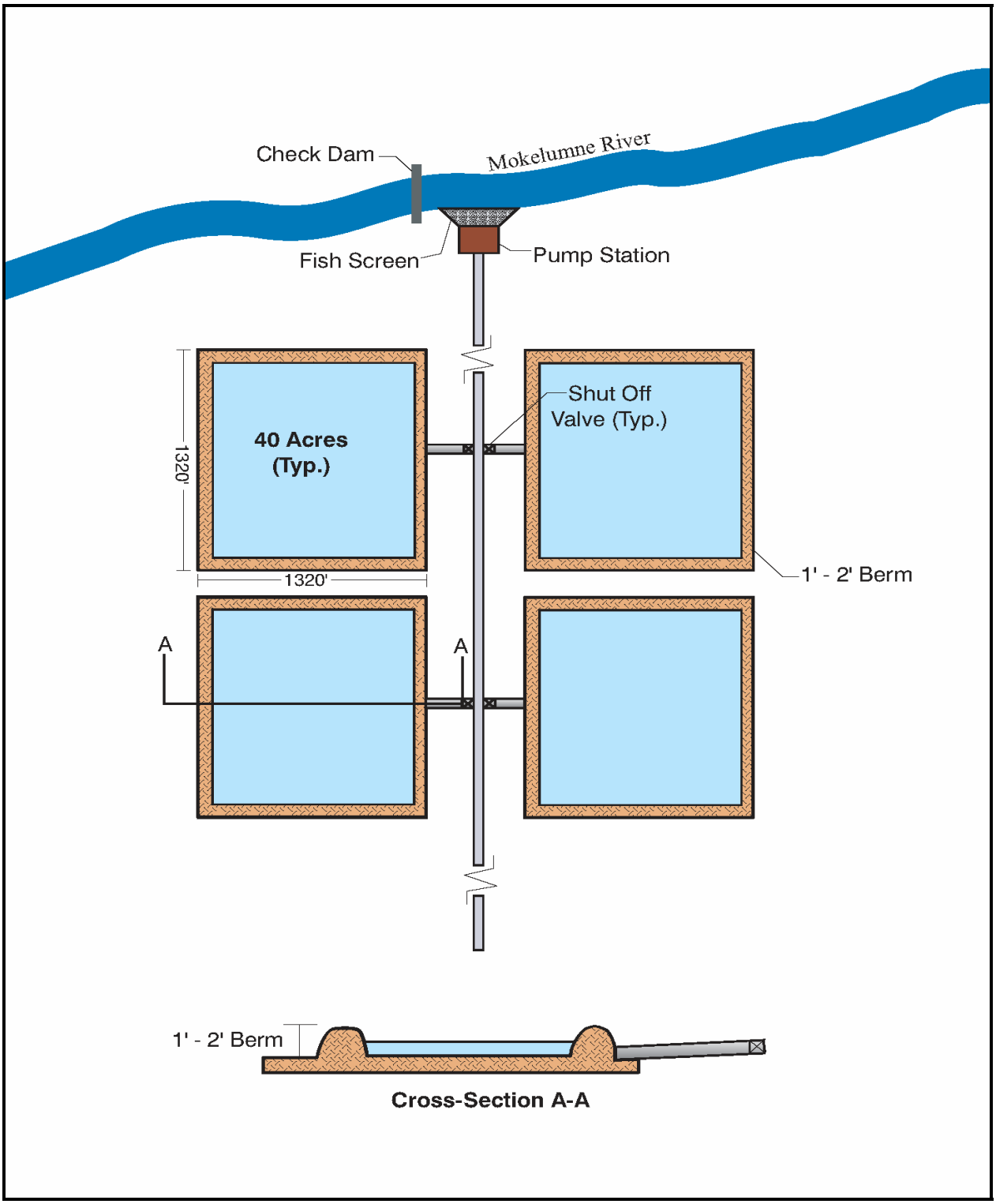


Figure 8-10 Structural Lower River Diversion Schematic
Source: HDR, Inc.

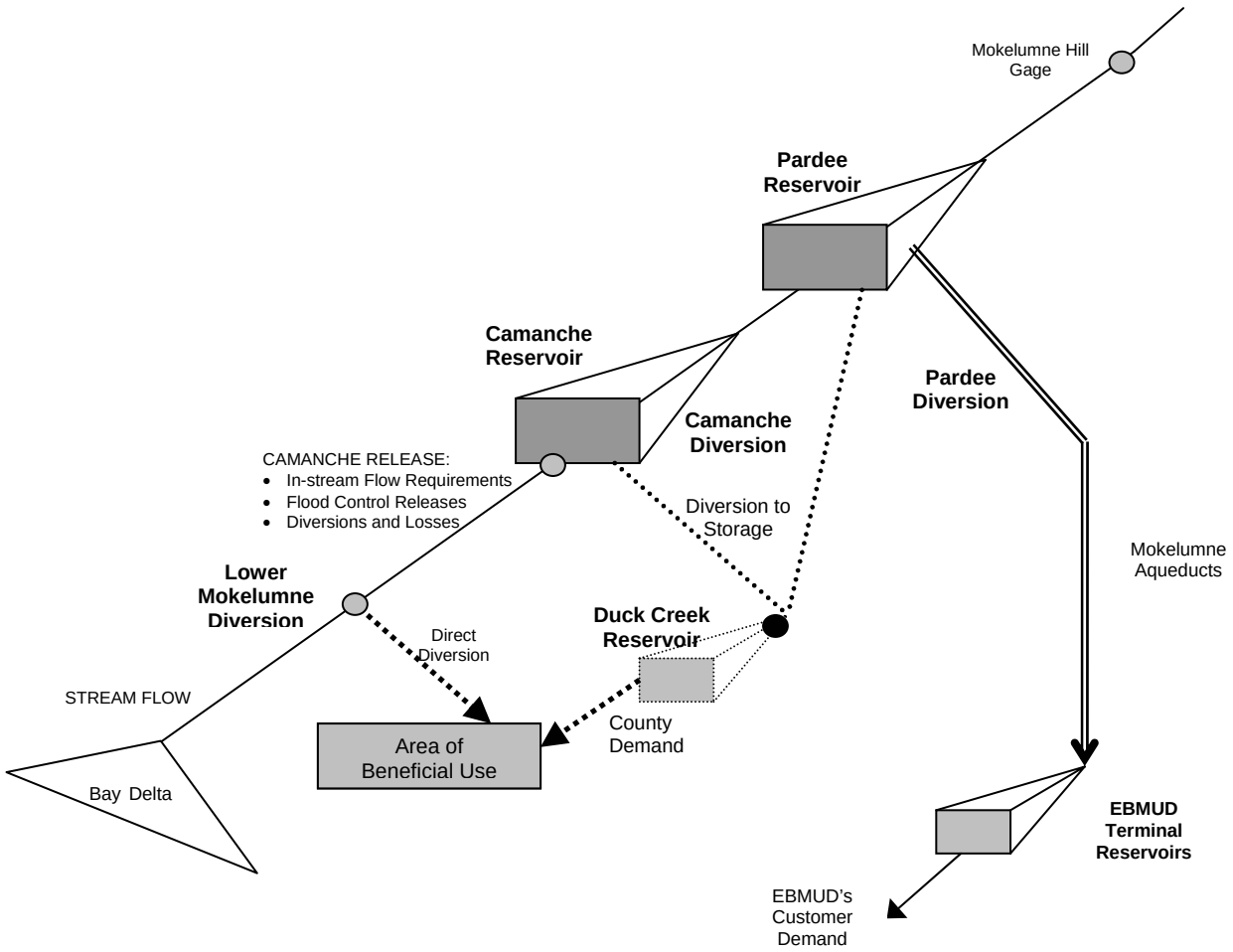


Figure 8-11 Schematic Diagram of the MORE Model

Table 8-4 MORE WATER Project Preliminary Average Annual Yield and Cost Analysis Results					
	Lower Mokelumne River Diversion - Structural	Duck Creek Dam and Reservoir Construction			
		Camanche Reservoir Diversion		Pardee Reservoir Diversion	
		No Hydropower Impacts	Hydropower Impacts	No Hydropower Impacts	Hydropower Impacts
Annual Project Yield (af)	49,200	82,300	90,300	82,300	90,300
Annual Cost ($ per af)	$150	$213	$196	$156	$147
Source: MORE WATER Project Phase I - Reconnaissance Study Summary Report, 2004					

8.2.3 New Melones Conveyance Project

The New Melones Conveyance Project was constructed in order to deliver contractual CVP entitlements to CSJWCD and SEWD from New Melones Reservoir on the Stanislaus River. Water is diverted through the Goodwin Tunnel and conveyed through the Upper Farmington Canal and a series of natural creeks to the Farmington Flood Control Reservoir. The Lower Farmington Canal conveys water from the Farmington Flood Control Reservoir to its terminus

near the community of Peters. The Lower Farmington Canal is connected to Mormon Slough by a 78-inch pipeline where water can be re-diverted for irrigation. The 78-inch pipeline also interconnects with the Bellota Pipeline enabling high-quality New Melones water to be conveyed to the SEWD Water Treatment Plant for delivery to customers in the City of Stockton. Figure 8-12 illustrates the New Melones Conveyance System.

The Goodwin Tunnel, completed in 1992, is approximately 3.3 miles long and 14 feet in diameter, with a design flow capacity of 850 cfs. It originates on the north bank of the Stanislaus River, just upstream from Goodwin Diversion Dam in Calaveras County. The Goodwin Tunnel connects with the Upper Farmington Canal, an open trapezoidal channel that extends approximately 7.9 miles to its current terminus near Shirley Creek. Water then flows through the natural creek system of Shirley, Hoods, and Rock Creeks where it finally enters the Farmington Flood Control Reservoir. The maximum capacity of the Natural Canal system is approximately 550 cfs. The Upper Farmington Canal was envisioned to extend northward to the proposed South Gulch Reservoir where excess water from the Stanislaus River could be stored and conveyed through the Calaveras River System (Farmington , 2000).

The Peters Pipeline is a proposed addition to the New Melones Conveyance System. The Peters Pipeline is a 6-mile, 60-inch diameter pipeline that will be located parallel to the existing 54-inch diameter Bellota Pipeline from the 78-in pipeline at Mormon Slough to the Water Treatment Plant. Figure 8-13 illustrates the proposed Peters Pipeline route. Water conveyed in Peters Pipeline will be used to increase the delivery capacity at the SEWD Water Treatment Plant. A series of turnouts and laterals from the Peters Pipeline will enable SEWD to serve surface water to areas traditionally reliant on groundwater through integration with the Farmington Program. The average annual increase in water delivery by the New Melones Conveyance System is approximately 7,500 af/yr. The total cost of the Peters Pipeline Project is $7,401,260. SEWD has been selected to receive a Proposition 13 grant for 50% of the project cost. Local cost share for the Peters Pipeline Project will come from available funds of the New Melones Conveyance Project.

8.2.4 South County Water Supply Program

The South County Water Supply Program (South County Program) is a cooperative effort between SSJID and the cities of Escalon, Manteca, Lathrop, and Tracy. The goals of the South County Water Supply Program are to:

1. Provide a safe and reliable supplemental water supply for South San Joaquin County;
2. Put to beneficial use conserved water from SSJID entitlements;
3. Keep conserved water within SSJID and San Joaquin County; and
4. Reduce the heavy reliance on groundwater for the urban areas of South San Joaquin County.

As previously noted, SSJID has pre-1914 rights to Stanislaus River water. Water served to the participating cities is made available from the implementation of conservation practices, more efficient means of irrigation by SSJID, and through the loss of irrigated agriculture to planned urban growth. The South County Program consists of an intake facility at Woodward Reservoir, a 44 MGD state-of-the-art membrane filtration water treatment plant just west Woodward Reservoir near Dodds Road, and over 40 miles of pipe ending in the City of Tracy. A map of the project can be seen in Figure 8-14. Phase I of the South County Program will serve up to

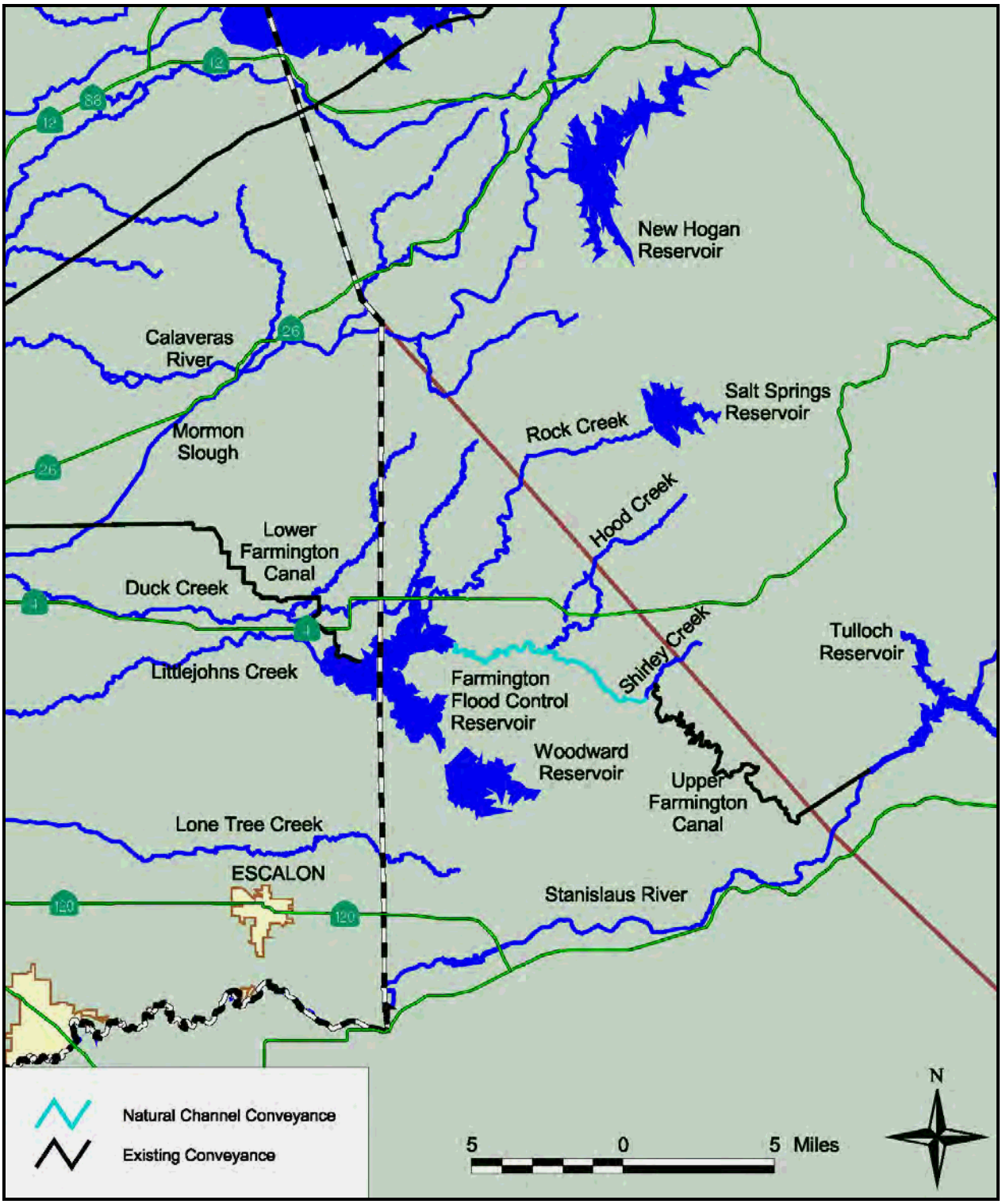


Figure 8-12 New Melones Conveyance System
Source: Farmington Groundwater Recharge/Seasonal Habitat Study, 2001

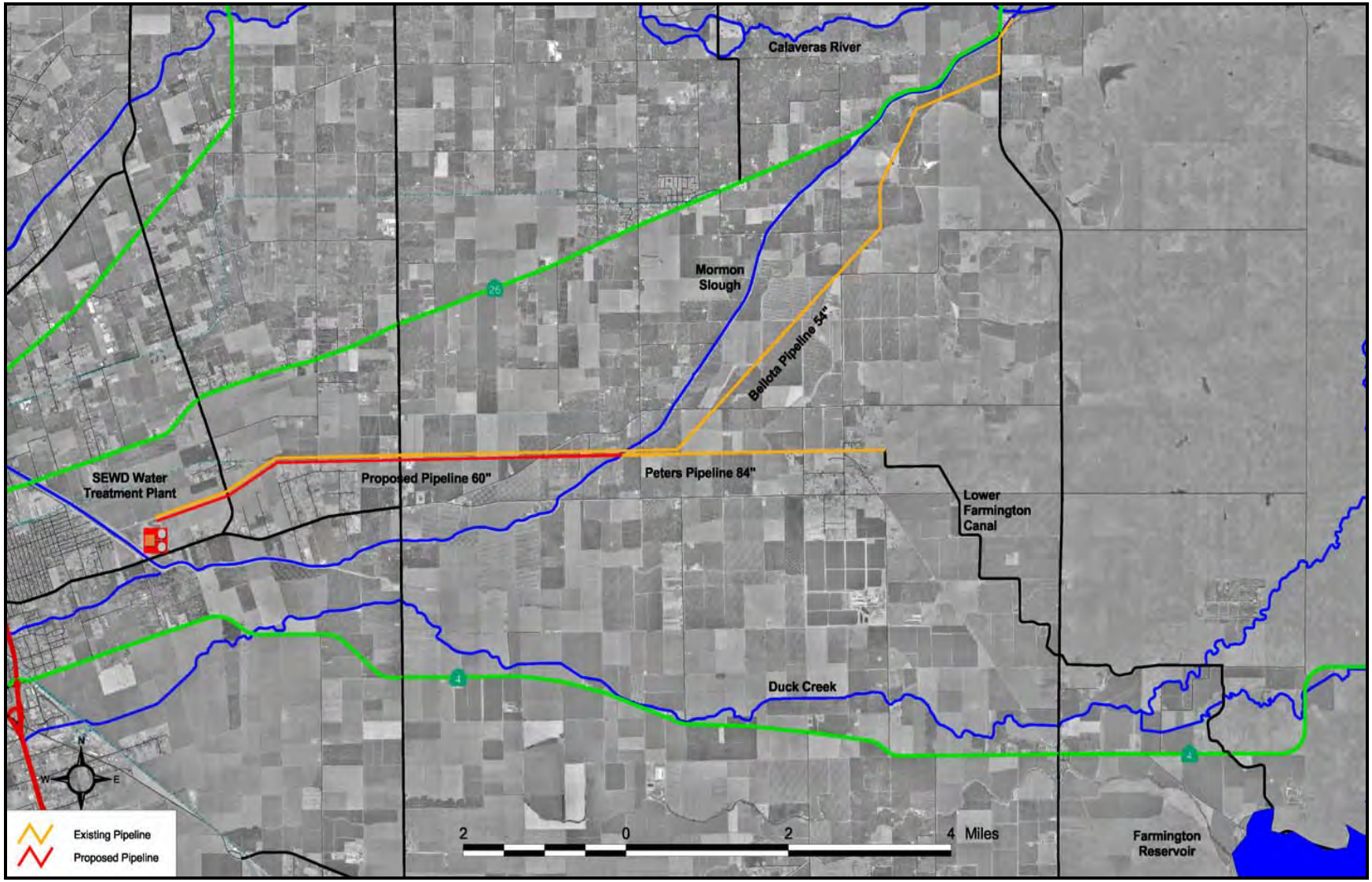


Figure 8-13 Proposed Peters Pipeline Alignment
Source: Farmington Groundwater Recharge/Seasonal Habitat Study, 2001

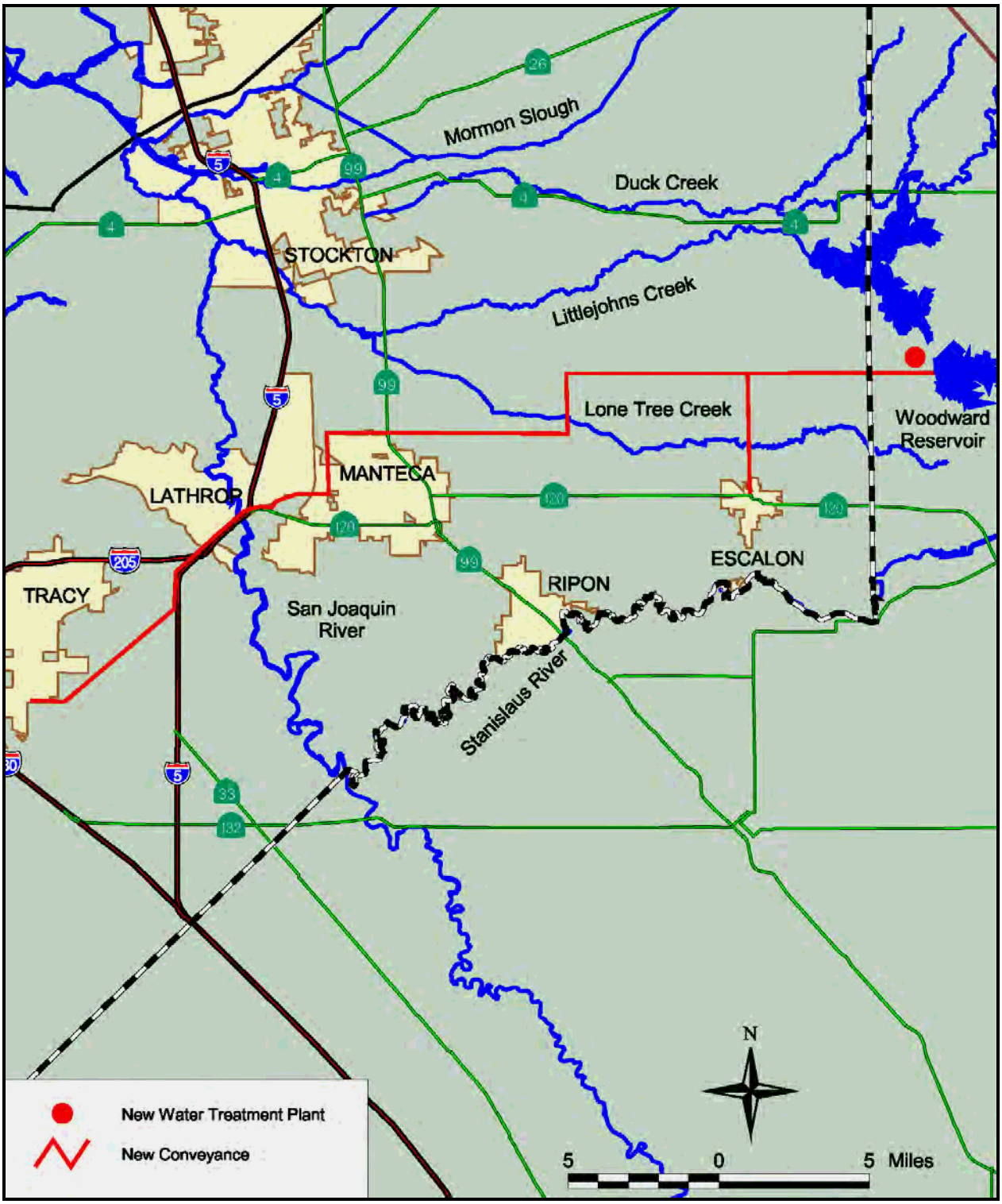


Figure 8-14 South County Water Supply Project
Source: SSJID, 2003

30,000 af per year though 2010. Phase II will increase deliveries to 44, 000 af annually and provide a net reduction of groundwater pumping from the underlying Basin of approximately 30,000 af annually. The total cost of the project is estimated at $126 million. (SSJID, 2001) The Cities of Escalon, Lathrop, and Manteca typically exceed the 1.0 af per acre safe yield of the Basin. The South County Program would allow those cities to pump groundwater within the safe yield (SSJID, 1994).

8.2.5 Woodbridge Dam Replacement and Canal System

The Woodbridge Diversion Dam (Woodbridge Dam) is a 12-foot tall removable flash board dam built in 1910. The Woodbridge Dam is operational from March to October at which time Lodi Lake is heavily used for recreation. The Woodbridge Dam feeds a 100-mile series of canals west of Lodi to Northeast Stockton. The location of the dam and canals is shown in Figure 8-15. The Woodbridge Dam itself is considered an impediment to anadromous fish and is recognized as a key area for the restoration of fall run Chinook Salmon by the National Marine Fishery Service (NMFS) and the California Department of Fish and Game (CDFG) (CDM, WMP, 2002).

In 2000, WID completed the Lower Mokelumne River Restoration Program Final EIR/EIS for new improved fish passage facilities. The project consists of the removal of the old flash board dam and the construction of a new adjustable weir dam with state of the art fish ladders and a monitoring station for migrating anadromous fish. Additionally, a fish screen and new diversion pipeline extending form Lodi Lake to the canal system will prevent incidental takes of salmon smolts and juveniles without the loss of water deliveries to WID customers. The proposed improvements exceed Lower Mokelumne River environmental restoration goals while maintaining irrigated agriculture in Woodbridge. The new Woodbridge Dam will operate year round keeping Lodi Lake full in all months. Year round diversions could facilitate groundwater recharge and interim deliveries to other in-basin partners including the City of Stockton and SEWD. (http://www.spk.usace.army.mil/pub/outgoing/co/reg/pn/199900057.pdf, 2002)

In 2003, the City of Lodi and WID reached an agreement by which the City of Lodi would purchase 6,000 af/yr at a cost of $200 /af for a term of 40-years. Through a drip irrigation conversion incentive program, WID was able to conserve 6,000 af of water for the sale. The annual payment of $1.2 million dollars per year is fixed even if the City of Lodi is ready to put its water to beneficial use; however, a three year banking clause allows the City of Lodi to gain credit for the undelivered water up to a total of 18,000 af. The City of Lodi is currently exploring various alternatives to put the water to beneficial use including drinking water treatment and distribution, groundwater recharge, or injection. (http://www.lodi.gov/city-council/html/body_2003-03-11s.htm, 2003)

8.2.6 Eastern Water Alliance Canal

The Eastern Water Alliance Canal is essentially a locally driven completion of the Folsom South Canal. In concept, the Alliance could construct an open canal along the 100-ft contour or pipeline equivalent in order to connect the FSC to the Mokelumne River, Calaveras River, and New Melones Conveyance System. The proposed alignment is shown in Figure 8-116. The Alliance Canal would facilitate water transfers and the diversion of wet year flow to the recharge basins and irrigated lands throughout Eastern San Joaquin County. The ultimate capacity of the Alliance Canal varies; however, the Alliance Canal would transport water both from north to south and vice versa. If left unlined, the canal could also double as a groundwater recharge facility. Preliminary discussions have suggested that a canal 300-feet wide would provide the equivalent recharge of over 1000 acres of recharge basins. Capital costs for the originally envisioned 85-ft wide, 8-ft deep, 2:1 side sloped, 6-mile long unlined canal constructed from the

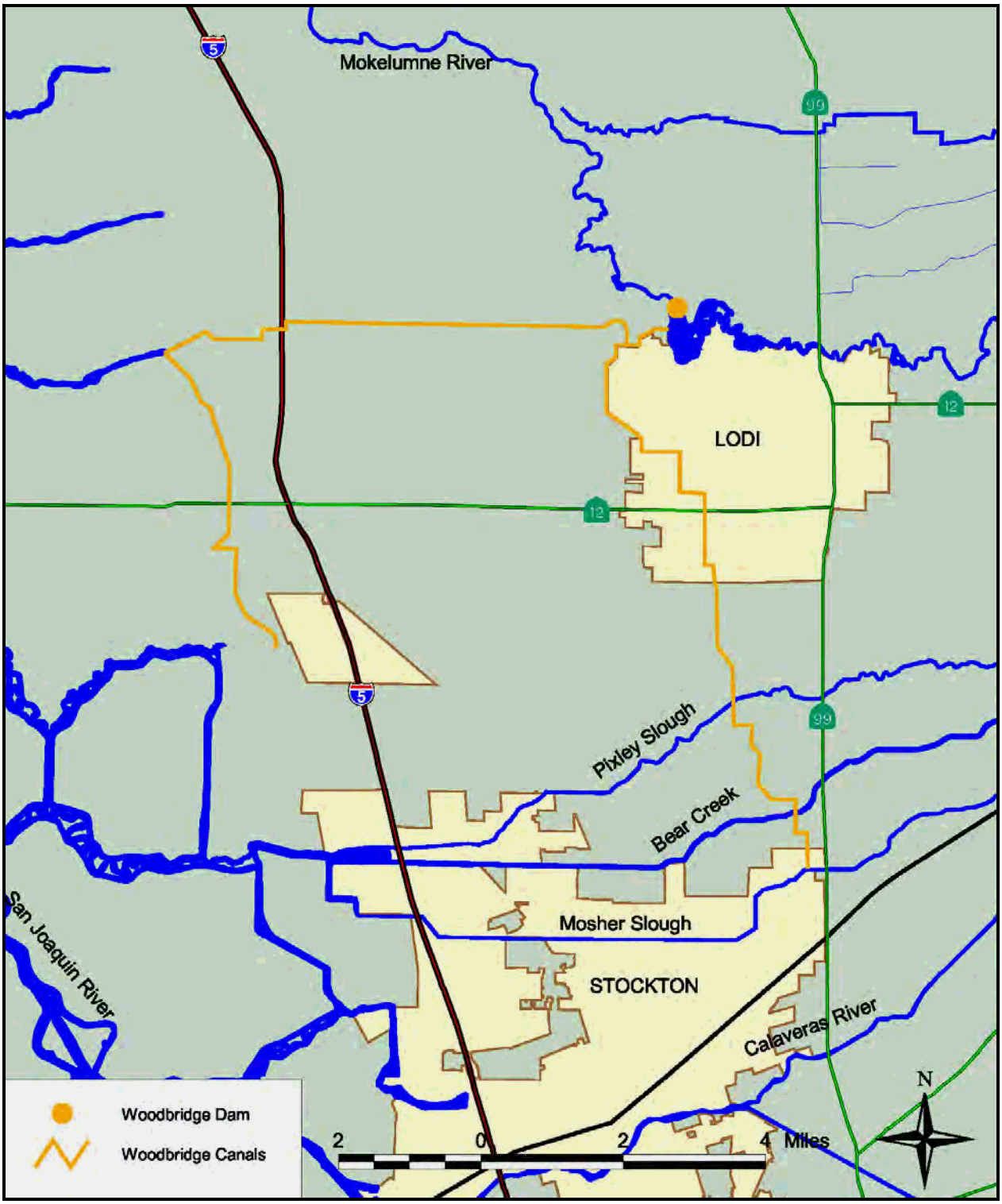


Figure 8-15 Woodbridge Irrigation District Diversion Dam and Canal System

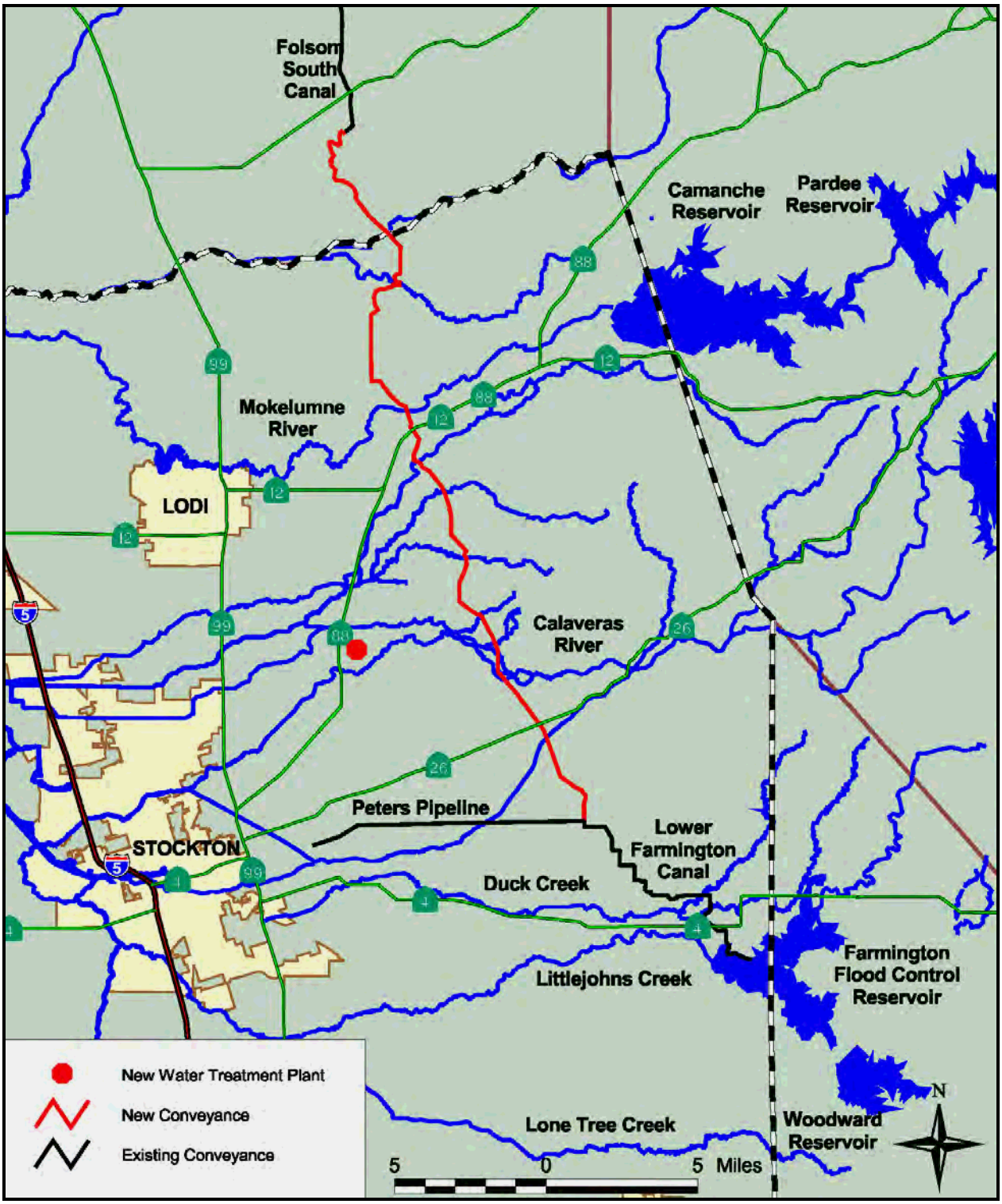


Figure 8-16 Alliance Canal Alignment

Mokelumne River to the Lower Farmington Canal would cost approximately $15 to $20 million (SEWD, 2000).

8.2.7 Gill Creek and Woodbridge Road Flood Control Improvements

The Gill Creek and Woodbridge Road watersheds are located approximately four miles north of the City of Lodi and cover about 14.4 square-miles of relatively flat terrain. The area has a history of drainage deficiencies resulting in long-duration shallow flooding including infill or disking of natural drainage ways, changes in land use, rural residential development, and undersized culvert crossings and pump stations. Historically, the proposed solution focused on increased channel capacities along Gill Creek; however, current regulations regarding down stream impacts, stormwater quality, and permitting present challenges to a diversion focused project. In 2004 the San Joaquin County Department of Public Works Stormwater Management Division completed the Gill Creek and Woodbridge Road Watersheds Reconnaissance Study (Gill Creek Study) to identify and recommend a project that would provide a 100-year level of protection to structures and a 25-year level of protection to agriculture in the study area.

The Gill Creek Study explored three alternatives with the following focuses: channel enlargement, detention, and diversion into the Lower Mokelumne River. The Gill Creek Study identified detention as the preferred alternative which includes minor channel improvements and the construction of up to 15 detention basins covering a total area of 65 acres spread throughout the watersheds. A map of the preferred alternative can be seen in Figure 8-17. The preferred alternative also has the potential to provide addition benefits as the channels and detention basins could be used to convey Mokelumne River Water for irrigation and direct recharge. The NSJWCD owns an existing 30 cfs irrigation system near Tretheway Road extending west along Acampo Road. Improvements to the NSJWCD North Irrigation System or an additional system could serve the conjunctive water management needs of the area. The preferred alternative is expected to cost approximately $25 million with an expected benefit of close to $30 million in prevented structural and agricultural damages. The next step is to perform a feasibility study where the conjunctive use and flood control operation can be explored further and the benefits quantified (San Joaquin County Department of Public Works, 2004).

8.2.8 South Gulch Reservoir

In 1984, SEWD completed the South Gulch Water Conservation Project Technical Reconnaissance Report to evaluate the feasibility of the proposed South Gulch Reservoir. South Gulch Reservoir is located approximately 22 miles east of Stockton, California, and approximately seven miles southwest of New Hogan Dam. The proposed dam location is six-tenths of a mile upstream from the South Gulch and Calaveras River confluence. The South Gulch Reservoir surface area is approximately 3,000 acres with a storage capacity of 130,000 to 180,000 af. In conjunction with the construction of the South Gulch Dam, the Upper Farmington Canal would be completed to supply excess water from the Stanislaus River. Additionally, a diversion structure on the Calaveras River just down stream of New Hogan Reservoir would convey excess water to the proposed South Gulch Reservoir in wet years. A map of the proposed reservoir can be seen in Figure 8-18. The project is one of the key proposed facilities of the Eastern Water Alliance. (Aqua Resources, Inc. *et al*, 1984)

8.2.9 Lyon's Dam

The Tuolumne Utilities District (TUD) obtains the majority of its water supply from the South Fork of the Stanislaus River. In 1983 TUD entered into an agreement with PG&E for the use of

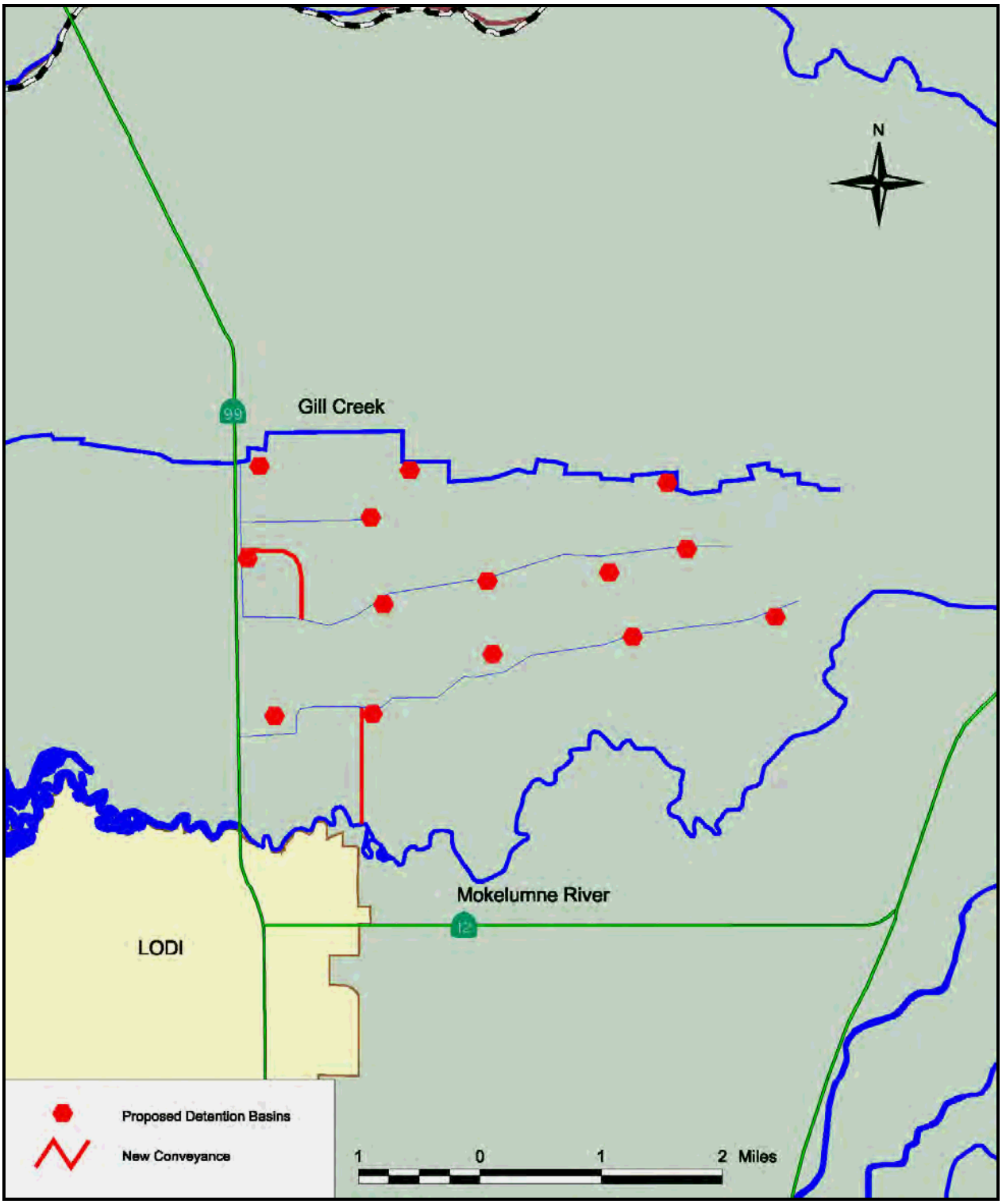


Figure 8-17 Gill Creek and Woodbridge Road Flood Control Improvements
Source: San Joaquin County Department of Public Works, 2004

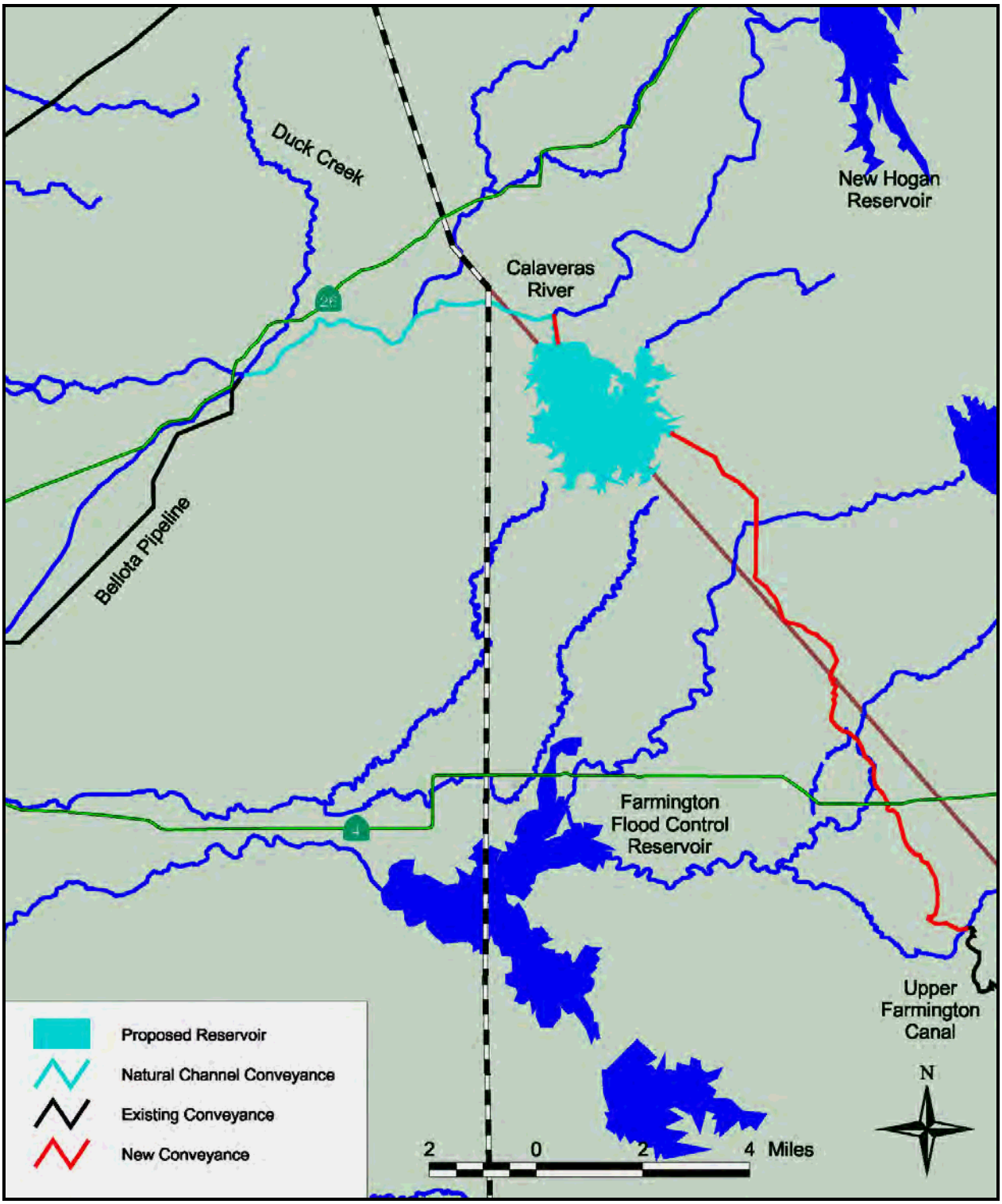


Figure 8-18 Proposed South Gulch Reservoir
Source: Aqua Resources, Inc. *et al*, 1984

all water diverted through Strawberry (Pinecrest) Reservoir and Lyons Reservoir in excess of the required in-stream flows. The amount of water available annually is dependent upon the natural flow of the South Fork of the Stanislaus River which has an average annual yield of approximately 100,000 af including 24,000 af combined storage in Strawberry and Lyons Reservoirs (http://www.tuolumneutilities.com/uwmp.pdf, 2000).

TUD is currently evaluating the possibility of replacing the existing Lyons Dam to create a larger reservoir to provide enough water for future development. The current capacity of Lyons Reservoir is 6,219 af, and the current spillway elevation is 4,214-ft. TUD has contemplated either a 25,000 af or 50,000 af reservoir with surface elevations of 4,285-ft and 4,328-ft respectively. Both options would be located 800-ft downstream of the current dam. The estimated cost of a new 50,000 af reservoir is $26 million. A map of the 50,000 af option is shown in Figure 8-19. SEWD has expressed interest in partnering with TUD for supplemental water supplies from the Lyons Reservoir enlargement (http://www.cserc.org/news/newsletter/2003winter/Lyons.html, 2003).

8.3 Groundwater Recharge Components

For planning purposes, the following descriptions represent the final use of water. The components include groundwater recharge infrastructure and improvements, drinking water treatment facilities, and agency conjunctive use programs.

8.3.1 Farmington Program

In 1997, the USACE completed the Farmington Dam and Reservoir Conjunctive Use Study, which evaluated potential structural and operational changes at Farmington Dam and Reservoir as part of a conjunctive use program. The study found that long-term storage at Farmington Reservoir is not cost-effective; however, operational modifications and the construction of groundwater recharge facilities are cost-effective. Consequently, the USACE, SEWD, and local water interests embarked on the development of a groundwater recharge program. In 1999 the U.S. Congress authorized up to $25 million for construction of groundwater recharge and conjunctive use projects in Eastern San Joaquin County.

In 2001, SEWD completed the Farmington Groundwater Recharge/Seasonal Habitat Study (Farmington Study) to evaluate the physical and financial feasibility of a groundwater recharge program in Eastern San Joaquin County. Through pilot testing, the study team found that the most effective area for groundwater recharge is the area bounded by Highway 99, Jack Tone Road, the City of Manteca, and the Mokelumne River. A map of the general area is shown in Figure 8-20. The Farmington Study also explored the feasibility of various recharge techniques and concluded that the most efficient method of groundwater recharge in Eastern San Joaquin County is the use of field flooding, recharge basins, and excavated pits. Each method varies in average water depth from a few inches to several feet. Figure 8-21 illustrates the various methods of recharge used in the Farmington Program. Existing structures and improvements such as flood detention basins, quarry excavations, canals, and clarifiers can also be easily modified and incorporated in to the project.

In November of 2003, the District received $1.3 million from the DWR for a Proposition 13 grant to complete the first pilot project facilities adjacent to the SEWD Treatment Plan. The pilot project is a permanent facility consisting of one 19-acre pond and three recharge basins totaling 35 acres. These facilities are expected to recharge 7,000 af/yr. In February of 2004, the pilot project was named the Water/Environment Project of the Year, 2003, by the American Society of Civil Engineers.

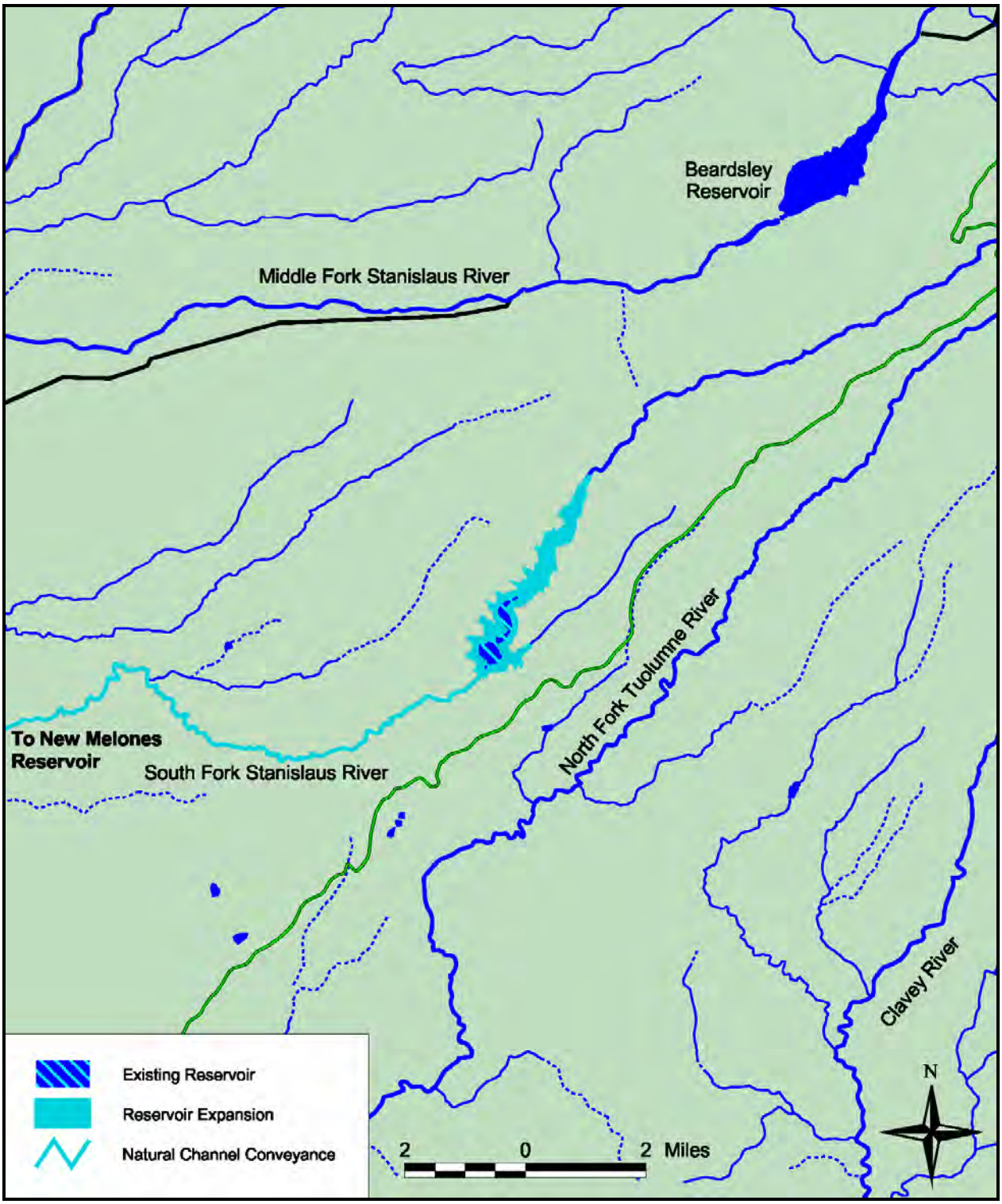


Figure 8-19 Lyons Reservoir Expansion
Source: http://www.tuolumneutilities.com/uwmp.pdf, 2000

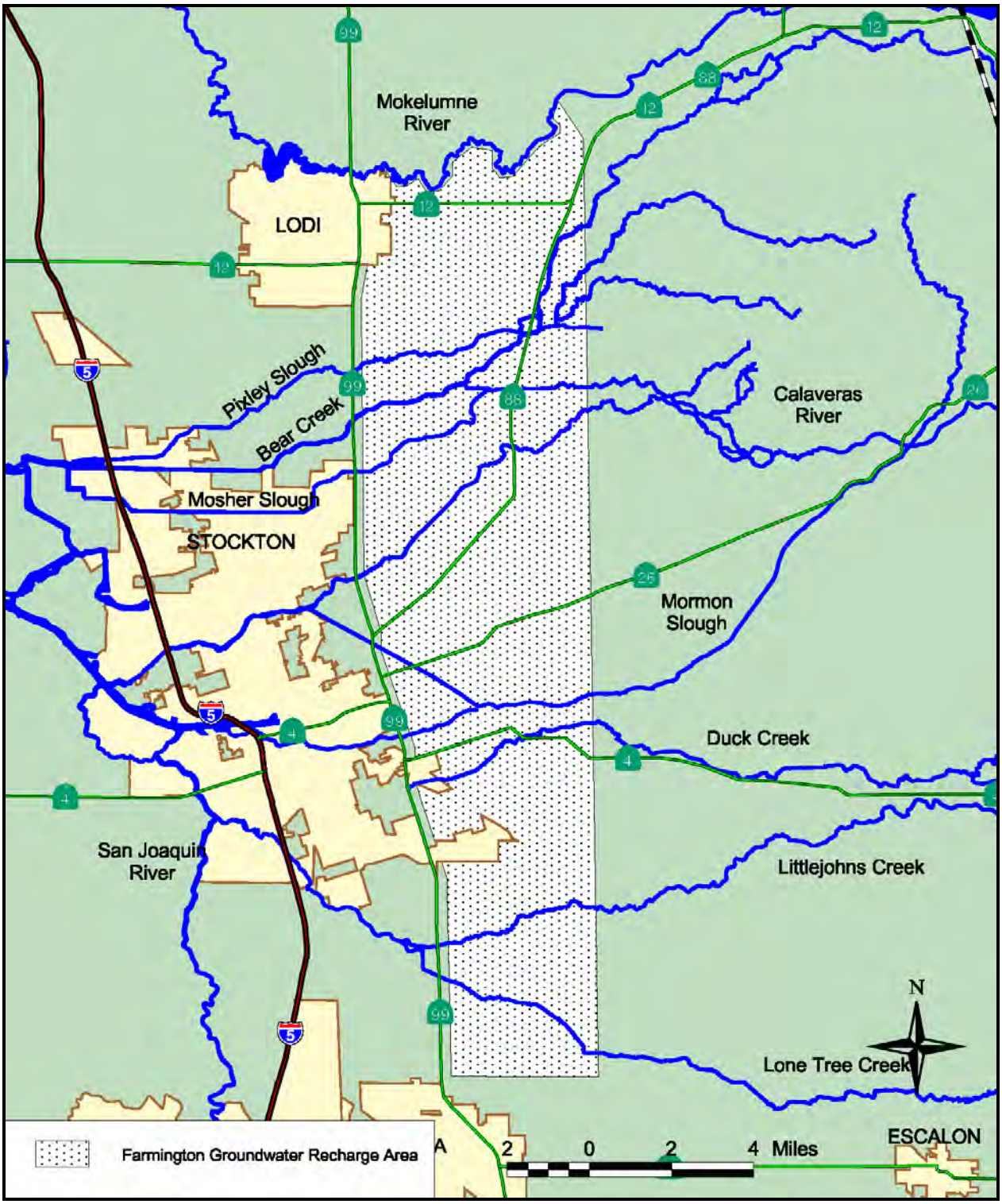


Figure 8-20 Farmington Groundwater Recharge Area
Source: Farmington Groundwater Recharge/Seasonal Habitat Study, 2001

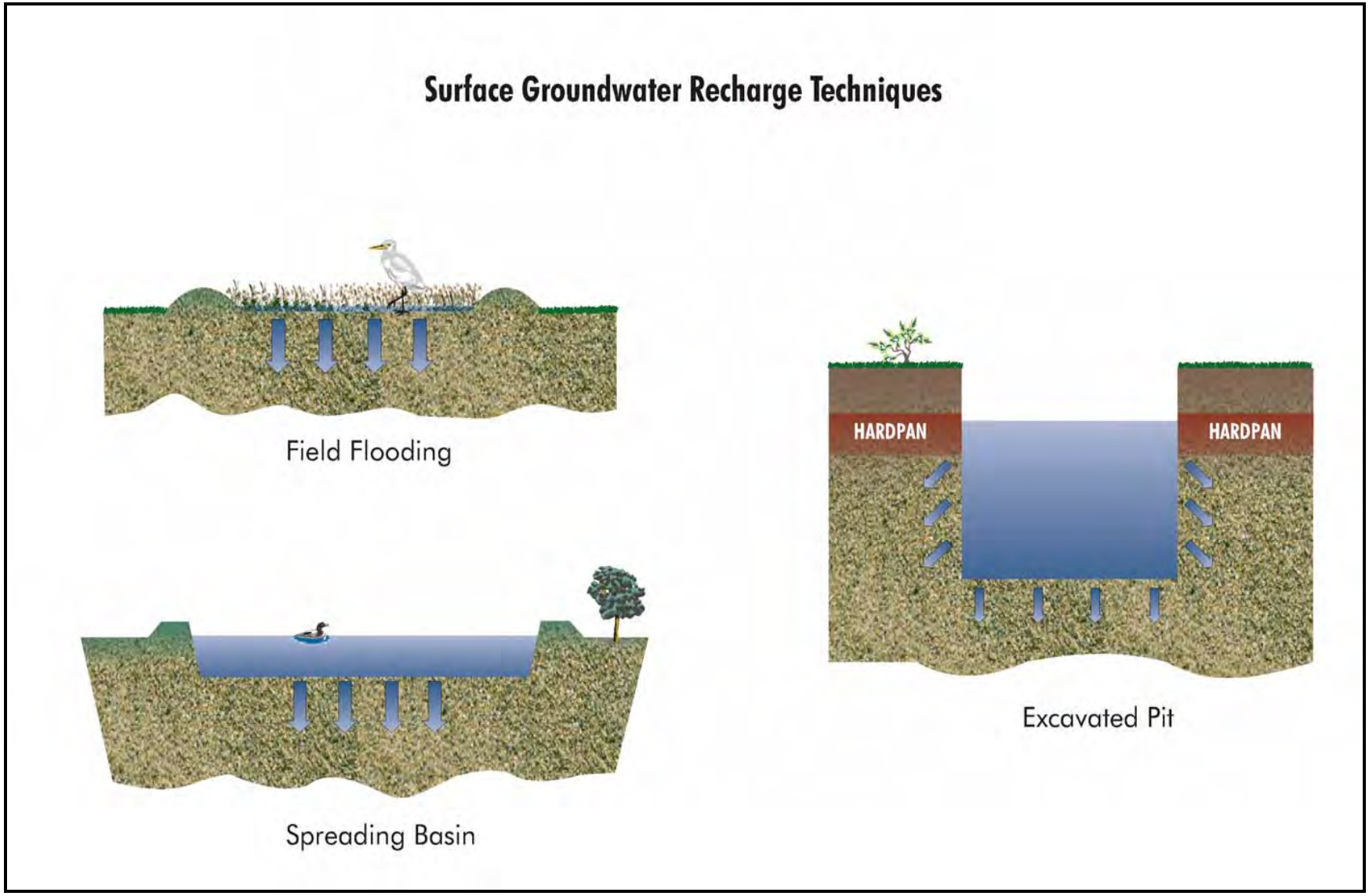


Figure 8-21 Surface Groundwater Recharge Techniques
Source: Farmington Groundwater Recharge/Seasonal Habitat Study, 2001

The Farmington Program Base Project (Farmington Program) objective is to recharge an average of 35,000 af of water annually by directly recharging surface water on 800 to 1,200 acres of land in the area described above. The Farmington Program is a flexible program by which willing landowners with 20 to 100 acre parcels may enter into short-term and long-term agreements and receive market-based compensation for the use of their land for groundwater recharge. In addition all improvements are paid for through the Farmington Program. The arrangement allows the rotation of groundwater recharge practices with traditional land use making water a cash crop for farmers in the program. The Farmington Groundwater Recharge Program is currently seeking out landowners who are willing to participate in the program by providing fields that can be flooded.

The planned capacity of the Farmington Program is approximately 35,000 af/yr. The following water sources are assumed available for the Farmington Program:

- 10,000 af/year from Stanislaus River
- 10,000 af/year from Littlejohns Creek
- 5,000 af/year from Calaveras River
- 10,000 af/year from Mokelumne River

8.3.2 City of Stockton Delta Water Supply Project

In 1996, the City of Stockton filed a water right application with the SWRCB seeking to appropriate initially 20,000 are-ft per year of water from the Delta, increasing to 125,900 af per year in 2050. The application specifies a place of use that coincides with the adopted 1990 City of Stockton General Plan boundary as shown in Figure 8-22. The city filed the water right application under two legal authorities: California Water Code Section 1485, the recapturing of treated wastewater discharge in the Delta, and California Water Code Sections 11460 and 12200 *et seq.*, area of origin provisions and the Delta Protection Act, respectively. The city currently discharges approximately 35,000 af per year of treated wastewater into the San Joaquin River. Diversions from the Delta are extremely contentious and therefore somewhat restrictive due to constraints under the State and the federal Endangered Species Act (ESA). The City of Stockton also expects to be limited by SWRCB Term 91 conditions, which limits diversion to when Delta outflow is higher than regulatory minimum requirements. (City of Stockton, 2003) In 2003 the City of Stockton completed the Delta Water Supply Project (DWSP) Feasibility Report.

The DWSP consists of a new diversion structure in the delta at the southwestern tip of Empire Tract on the San Joaquin River, a raw water conveyance pipeline, a new water treatment plant along Eight Mile Road, treated water transmission facilities, and groundwater injection and extraction wells, as shown in Figures 8-23 and 8-24. The estimated capital costs of the facilities are:

- River Intake and Pumps: $18 million
- Raw Water Conveyance: $35 million
- Water Treatment Plant (30 MGD): $59 million
- Treated Water Pipelines: $9 million

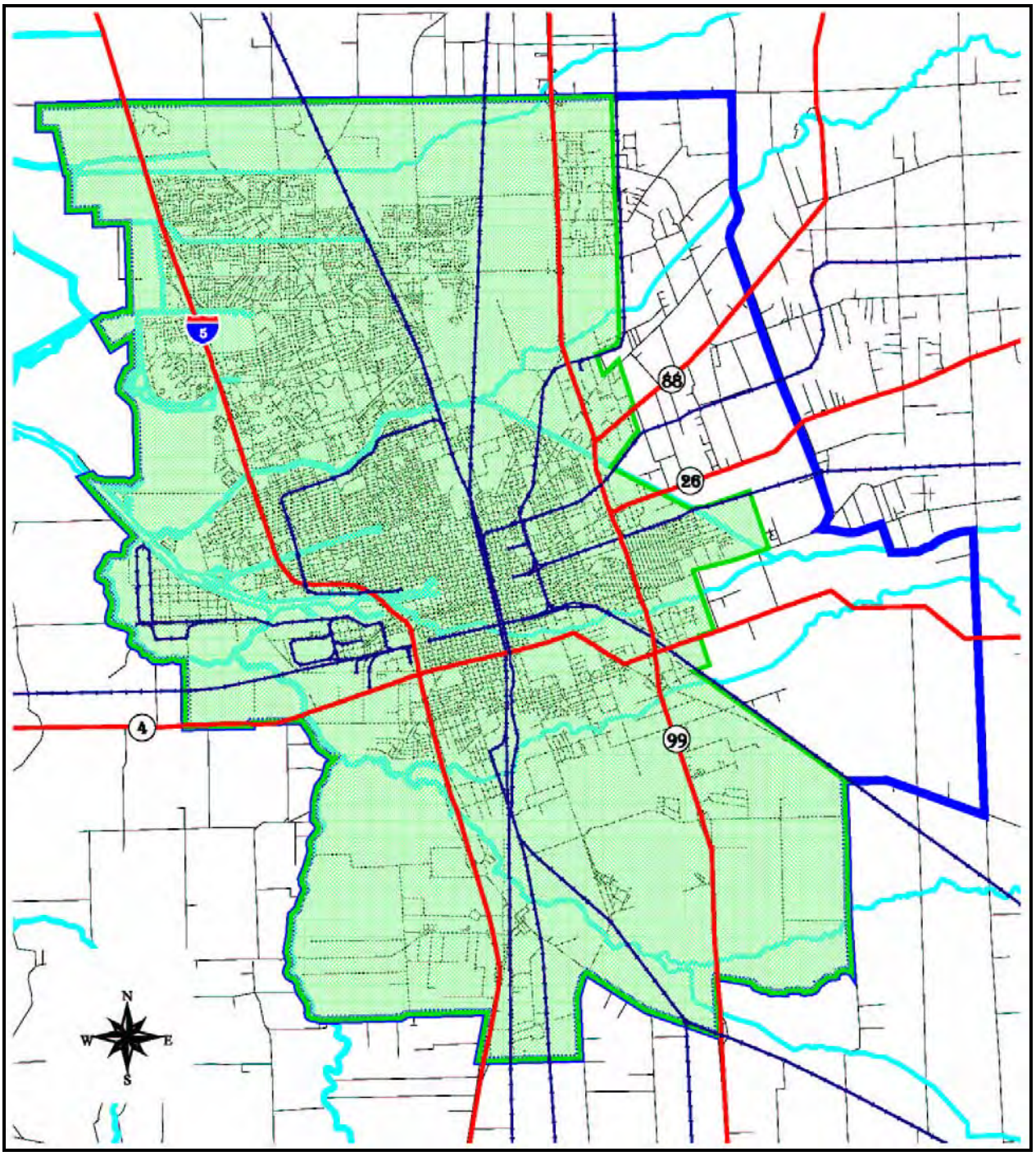


Figure 8-22 City of Stockton General Plan Boundary
Source: City of Stockton Delta Water Supply Project Engineering Feasibility Study, 2003

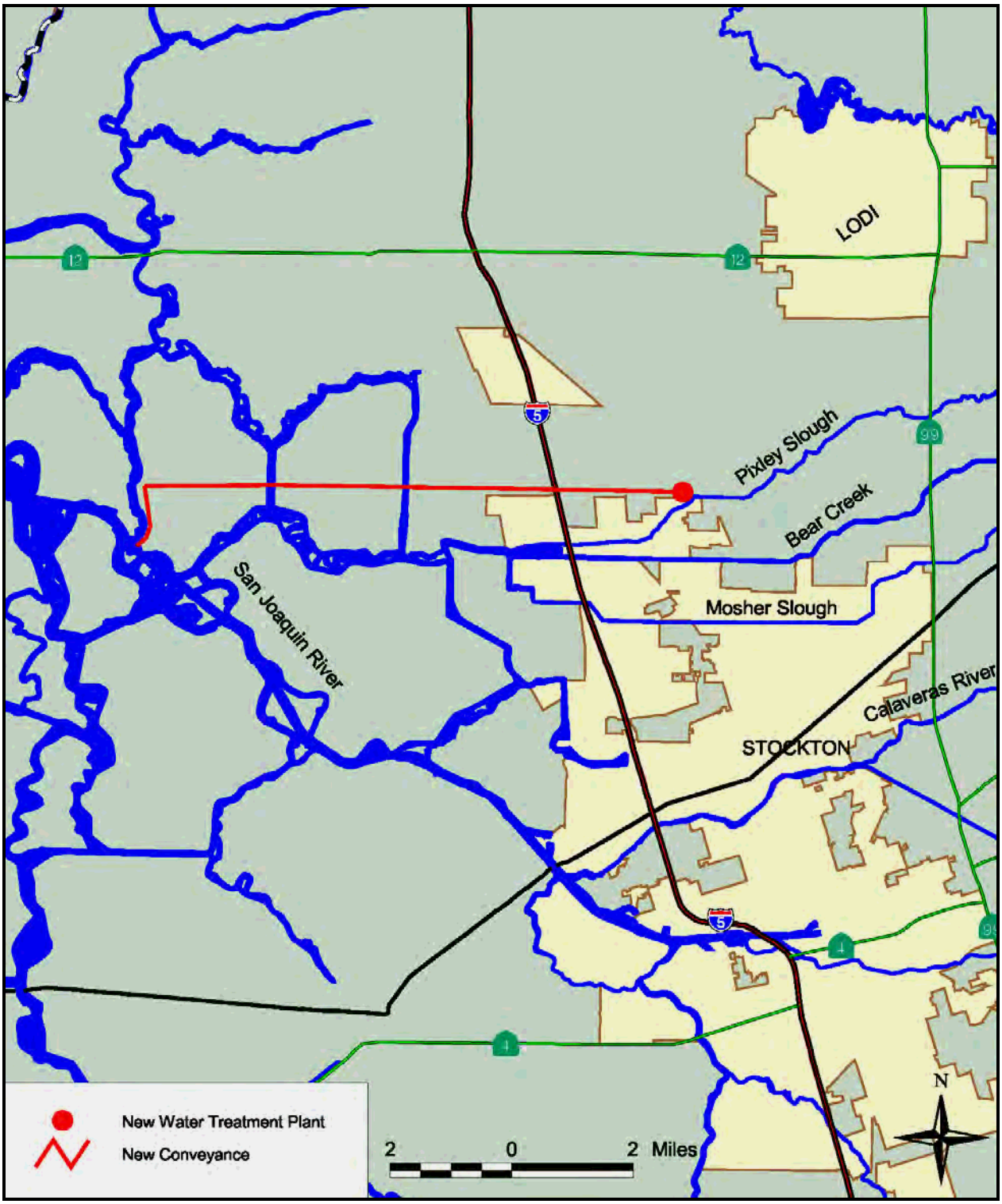


Figure 8-23 Delta Water Supply Project Intake and Treatment Plant
Source: City of Stockton Delta Water Supply Project Engineering Feasibility Study, 2003

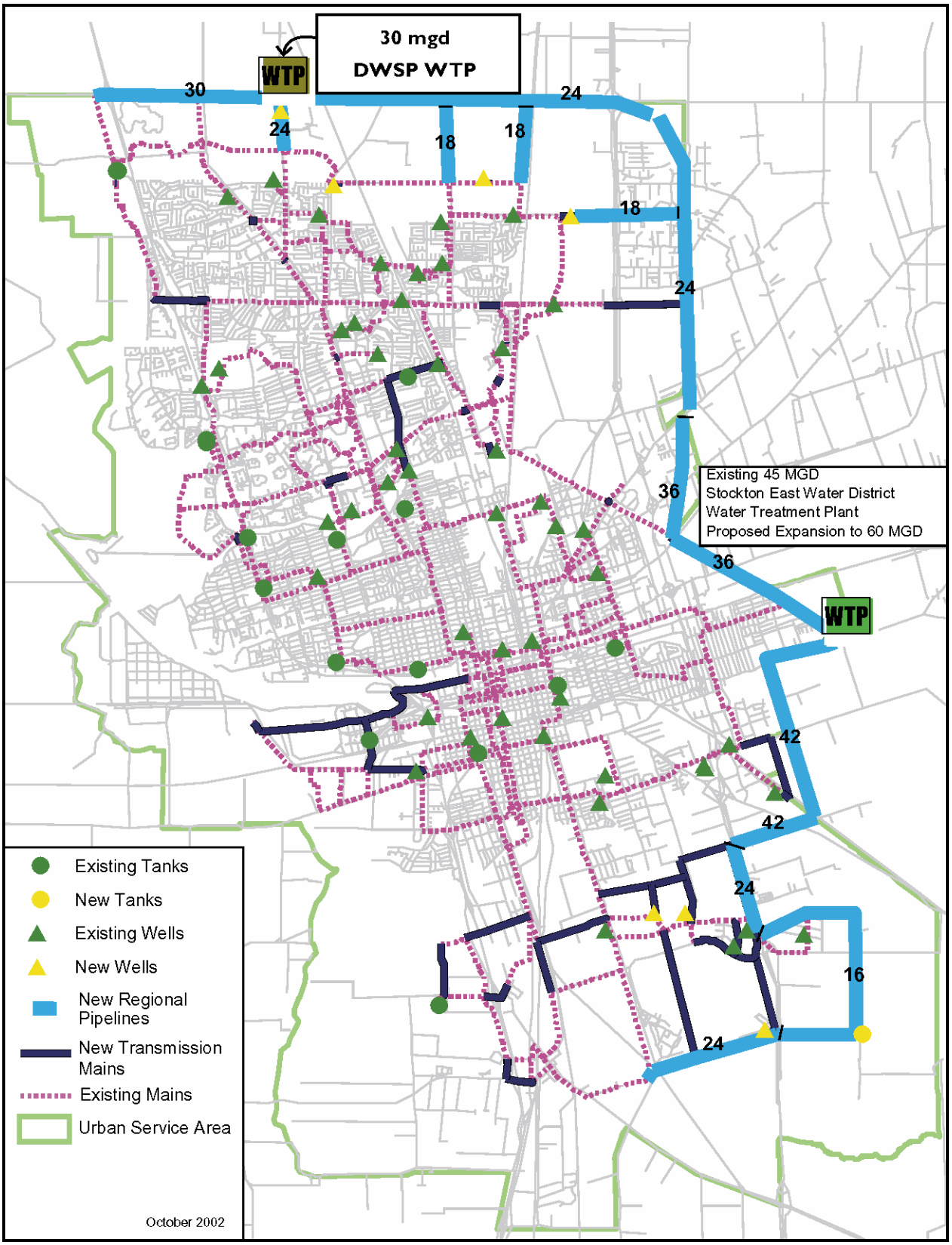


Figure 8-24 Delta Water Supply Project Distribution System
Source: City of Stockton Delta Water Supply Project Engineering Feasibility Study, 2003

Operations and Maintenance costs are expected to steadily increase to $5.75 million by 2015. The cost of the groundwater injection and extraction facilities is unknown at this time. The estimated cost of raw water delivery is approximately $200 per af, and the cost of delivery of fully treated water is expected to be about $350 per af.

Past groundwater studies in the region show that the maximum, sustainable, long-term yield from the aquifer is 0.75 to 1 acre-foot per acre per year. The City of Stockton selected 0.6 af per acre per year as the target groundwater extraction rate which corresponds to an extraction amount of 40,000 af per year to combat historic overdraft conditions and the intrusion of saline groundwater into the underlying Basin. The DWSP will also include an aquifer storage and recovery (ASR) program to better meet long-term needs of the City of Stockton.

The City of Stockton is currently preparing a project level EIR/EIS with an anticipated groundbreaking date of 2008 and water delivery scheduled for 2010. The aggressive schedule is indicative of the uncertainty in final revised State Maximum Contaminant Level (MCL) for arsenic. At present the City of Stockton meets or exceeds the Federal MCL for arsenic; however, more conservative State regulations may force numerous well closures forcing the City of Stockton to rely more heavily on the DWSP and alternative sources.

Subsequent phases include a 10 MGD pilot ASR program to bank treated surface water in the underlying aquifer. The pilot ASR program involves retrofitting up to 10 existing wells for injection and extraction at an estimated cost of $200,000. After the completion of the pilot program, costs will be determined for an expanded program to serve as a groundwater bank. In the Feasibility Study, three potential banking sites were identified: Site A, north of Alpine Road and west of Highway 99, site B, south of Alpine Road and west of Highway 99, and site C, located along the Southern Pacific Railroad - Figure 8-25 (City of Stockton, 2003).

8.3.3 SEWD Water Treatment Plant Expansion

The current capacity of the Dr. Joe Waidhofer Water Treatment Plant (SEWD Treatment Plant) is 45 MGD, and the capacity of the planned expanded facility is 60 to 65 MGD. Currently turbidity occasionally limits production to 30 MGD resulting in an average yearly production of approximately 41,000 af. An expanded SEWD Treatment Plant is expected to supply up to 62,000 af per year. Currently, raw water sent to the SEWD Treatment Plant originates from either New Hogan Reservoir on the Calaveras River or New Melones Reservoir on the Stanislaus River. The combination of available water from these sources totals 90,099 af per year. The additional 28,000 af could be used for groundwater recharge and extracted during dry years. The estimated cost for the expansion is $26.9 to $33.4 million (SEWD, 2003).

8.3.4 CSJWCD Surface Water Delivery Program

CSJWCD holds CVP contract entitlements for water from New Melones Reservoir with the USBR. The total amount available to CSJWCD under the contract is 80,000 af/yr, 49,000 of which is said to be a firm supply. Because of current USBR operations of the New Melones Reservoir, in water year 2003, an above normal year for precipitation in the Stanislaus River watershed, the contract amount received was 10,000 af. CSJWCD delivered this amount in its irrigation system while SEWD did not receive any allocation in water year 2003. The CSJWCD irrigation system currently has the infrastructure capabilities to deliver approximately 35,000 af/yr for direct irrigation through a series of ditches and natural creeks, including Littlejohns, Temple, Lone Tree and Duck Creeks. The current system can be expanded to deliver up to 50,000 af/yr should water become available. Figure 8-26 depicts the CSJWCD irrigation system.

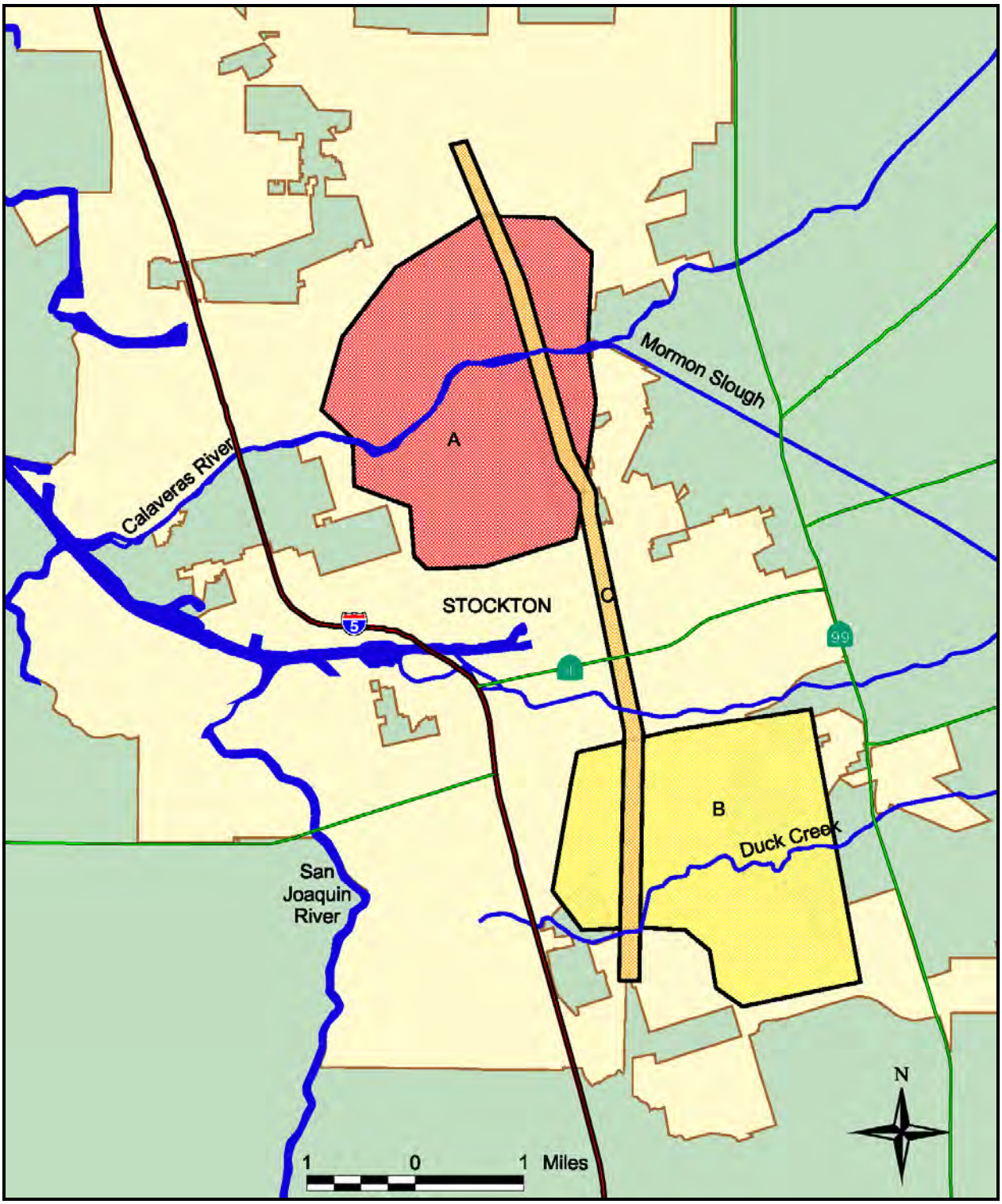


Figure 8-25 Delta Water Supply Project Potential Banking Sites
Source: Delta Water Supply Project Engineering Feasibility Study, 2003

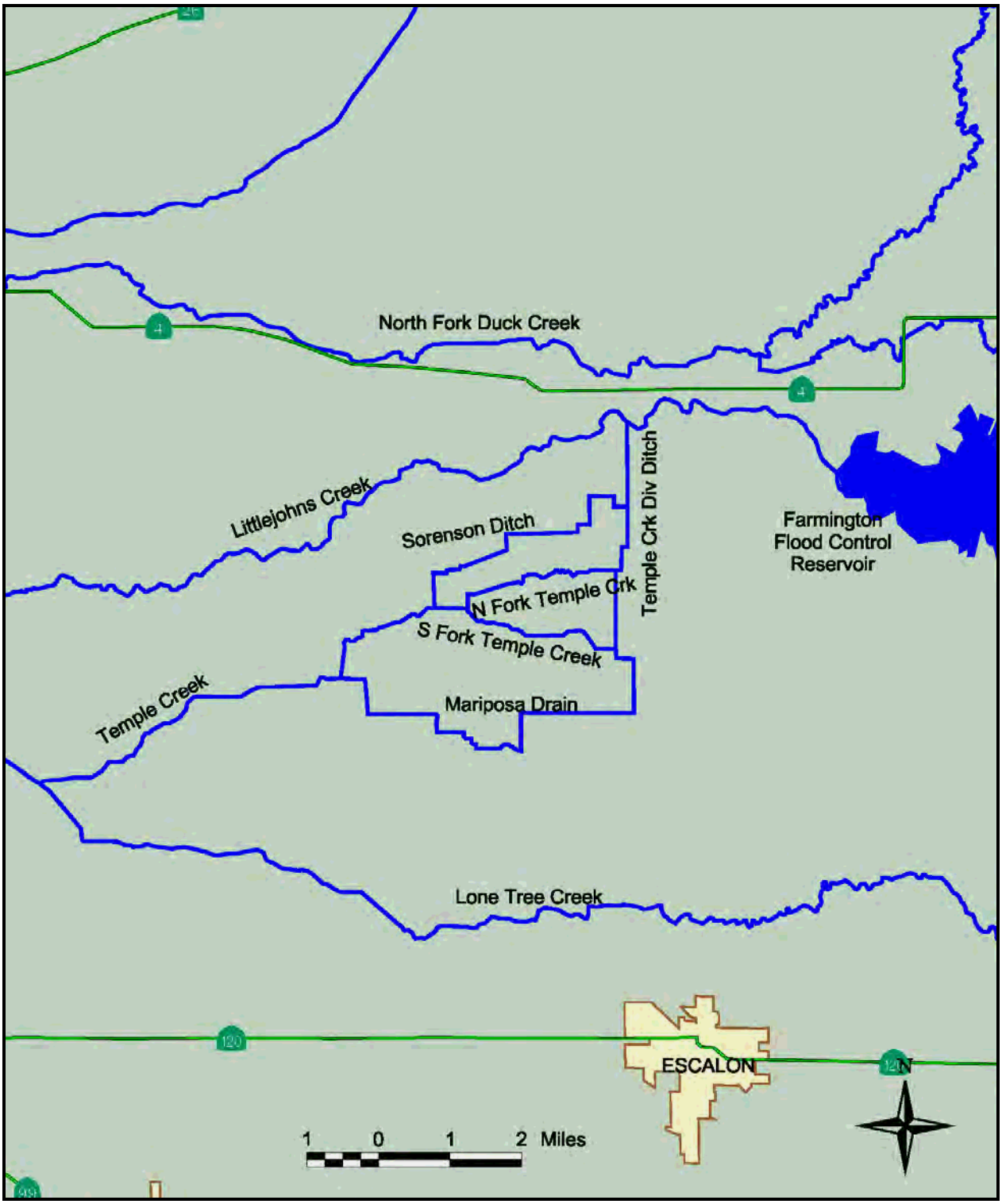


Figure 8-26 CSJWCD Irrigation System

Since the completion of the New Melones Conveyance System, surface water deliveries have elevated groundwater levels by as much as 15-ft in some areas within the CSJWCD.

8.3.5 NSJWCD Conjunctive Use Program

NSJWCD owns and operates two surface water irrigation systems on the Lower Mokelumne River. NSJWCD holds interim water rights and relies on EBMUD to store its divertible allotment at Camanche for use during the irrigation season. The interim nature of the water requires farmers to maintain two irrigation systems thus reducing the demand for surface water to less than 3,000 af/yr. NSJWCD has rights to divert up to 20,000 af/yr when available at an average annual yield of approximately 11,000 af/yr.

The north system consists of a 30 cfs pipeline and intake pump near Trethway Road where it veers west along Acampo Road. The north system pipeline is in disrepair and requires extensive improvements. Repair and expansion of the north system is highly compatible with the Gill Creek and Woodbridge Road Flood Control Improvements Project. The South system is much larger and consists of pump station and a series of laterals that discharge into both Bear Creek and Pixley Slough. Growers along either the natural drainages or the pipeline are able to divert for irrigation. Both systems can be easily integrated into the MORE WATER Project direct diversion alternative should permanent or long-term groundwater recharge facilities be constructed. A map of NSJWCD's distribution system is shown in Figure 8-27.

In 2000, NSJWCD was selected to receive $462,500 from a CALFED grant to study groundwater recharge in the Mokelumne River watershed. The project includes a five-year pilot study involving the spreading of wet-year water on two four-acre ponds. Up to 50 percent of the recharged water, minus losses, would be available for extraction by wells for discharge into the Delta during dry and critically dry years. The impact of dibromo-chloro-propane (DBCP) on groundwater quality and its implications for larger-scale conjunctive use projects would also be evaluated.

In 2003, land owners in NSJWCD approved an acreage assessment dedicated to groundwater recharge. Beginning in 2003, land owners would be assessed $1 per acre up to a maximum of $5 per acre. Revenues generated in 2003 and 2004, estimated at $50,000, were used to construct a series of two pilot recharge ponds; one north of the Mokelumne River and one to the south. NSJWCD is also a local participant in the Farmington Program and a member of the Eastern Water Alliance.

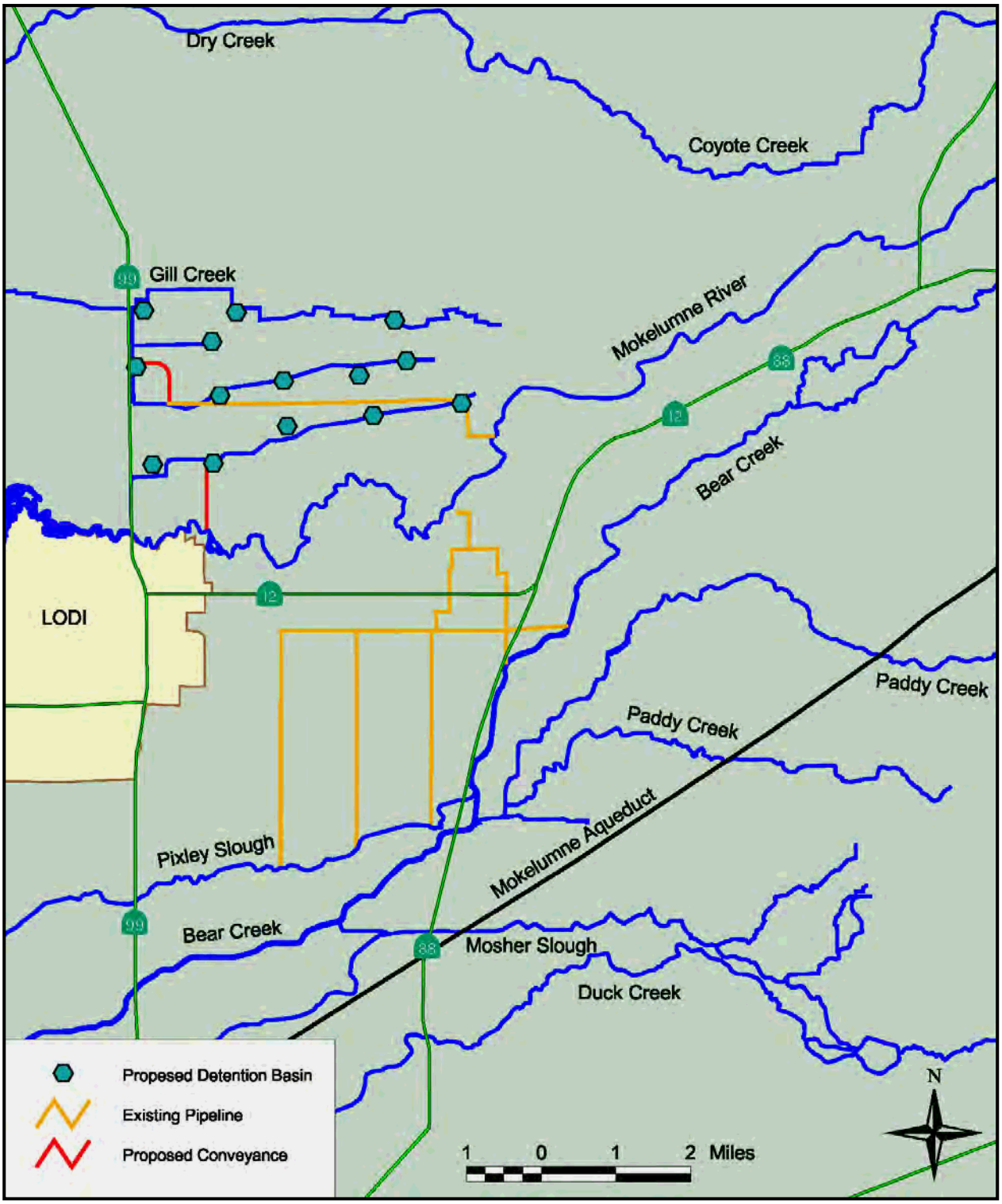


Figure 8-27 NSJWCD Distribution System

9 Plan Implementation

The Authority is committed to adopting a Plan implementation strategy that is adaptive and incentive driven. This Plan is the first step in the development of a regional document that details how the groundwater basin will be managed and initiates the process that will ultimately define the guidelines and conditions that water districts and others will follow to achieve basin management objectives. Following the adoption of this Plan, the Authority and its members will work to implement the management objectives. The objectives coupled with regular groundwater monitoring and the development of basin operations criteria will establish a framework and the foundational information for future groundwater banking and recharge project operations in the Basin.

9.1 Plan Implementation Reports

To encourage the continued implementation of the Plan, the Authority will complete a periodic assessment of the progress, direction and recommendations regarding Plan objectives. Basin hydrogeologic conditions are currently measured by groundwater level and quality monitoring on a semi-annual basis. This assessment activity will be coupled with the annual review of Plan implementation activities and project development in the basin.

To ensure that the Authority is constantly striving to better manage groundwater resources, the following actions will be undertaken:

1. Produce an annual report by March 1st of each year that outlines the accomplishments of the previous year's groundwater management efforts and report the current state of the Basin;

2. Review changes in political, institutional, social, or economic factors affecting groundwater management; and

3. Based on the information gained in the above actions, provide recommendations for any required amendments to the Plan.

9.2 Future Activities

The adoption of the Plan is merely the beginning of a series of actions the Authority will undertake to help meet future basin demands. As such, many of the identified actions will likely evolve as the Authority takes a more active approach to manage the basin and meet the outlined objectives. Many additional actions will also be identified in the annual summary report described above. The Plan is therefore intended to be an iterative document, and it will be important to evaluate all of the actions and objectives over time to determine how well they are meeting the overall goal of the plan. The Authority plans to evaluate this entire plan within five years of adoption. In the immediate future, the Authority and its member agencies will undertake the following planned activities described below subsequent to the adoption of the Plan.

9.2.1 Integrated Conjunctive Use Program CEQA Review

The California Environmental Quality Act (CEQA) allows agencies to prepare a Programmatic Environmental Impact Report (EIR) for a proposed course of action. The Integrated Conjunctive Use Program is a grouping of stand alone projects that could have very different specific environmental impacts, but would also have to address many of the same global environmental

impacts requiring disclosure under CEQA. The Program EIR will support the implementation of future site-specific projects by:

- Allowing proper consideration of broader scale impacts, alternatives, and mitigation criteria that would extremely difficult in individual site-specific project level EIR.
- Focusing on cumulative impacts and growth inducing impacts with the implementation of the Conjunctive Use Program.
- Addressing policy, design, and management issues at the program level rather than repeatedly considering them at the project level.
- Considering broad policy alternatives and programmatic mitigation measures at an early stage in the development of the Conjunctive Use Program when policy flexibility is greatest.
- Conserving resources and promoting consistency by encouraging the reuse of data.
- Providing the basis for National Environmental Policy Act (NEPA) review and Federal permitting approval processes should federal interest be established in the Conjunctive Use Program or any of the Program elements.

The Program Environmental Impact Report (EIR) would also include a healthy technical appendix that would speak to the feasibility of specific Conjunctive Use Program projects, demand management measures, and other policy alternatives. The Program EIR will also analyze the potential environmental effects of the Basin Management Objectives, assumptions and technical methods, policy alternatives to achieving identified objectives, broad-scale impacts, and establish mitigation criteria for the overall Plan. The Programmatic EIR effort is expected to begin in 2005 and continue for 18 to 24 months.

9.2.2 Basin Operations Criteria

Originally tied to the development of Basin Management Objectives, Basin Operations Criteria would set quantitative target groundwater levels and descriptive basin condition levels. Basin Operations Criteria could potentially consist of a series of groundwater levels that would correspond to basin condition levels (similar to the US EPA Air Quality Index and the US Department of Homeland Security Advisory System) to indicate the effectiveness of groundwater recharge programs and also potentially when and how much groundwater could be exported. The development of Basin Operations Criteria is a collaborative process that will be undertaken by the Authority immediately following the adoption of the Plan and is expected to be completed by summer 2005. Basin Operations Criteria developed with the framework of the Authority could ultimately provide the basis for a revised Export Ordinance and a new Groundwater Management Ordinance.

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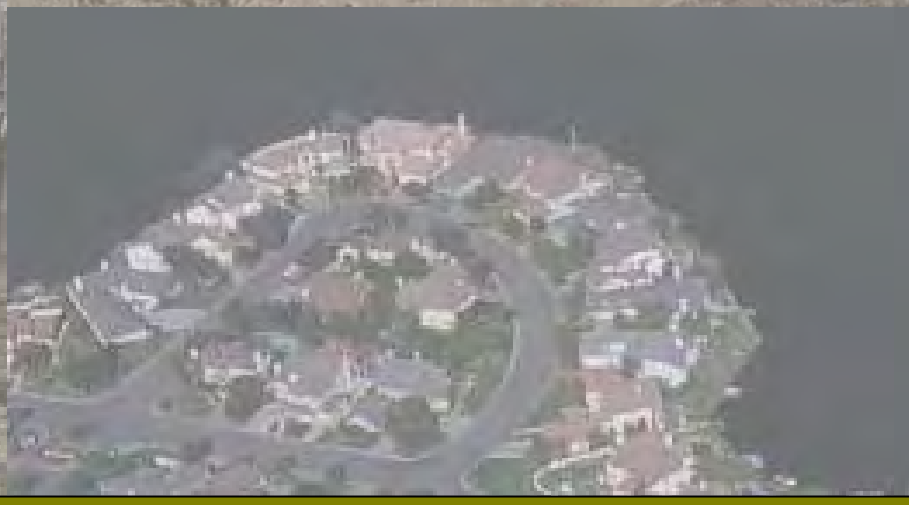

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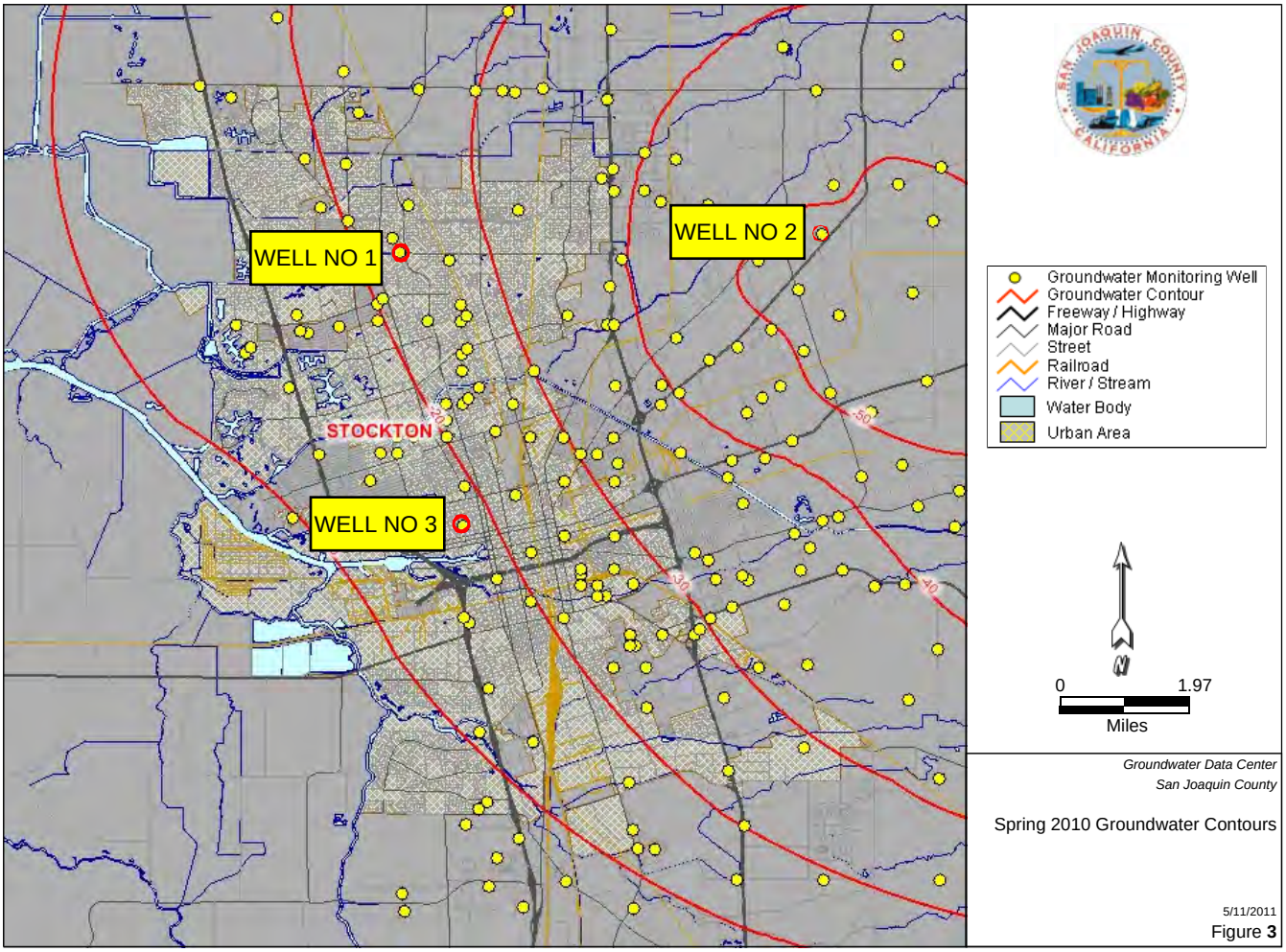
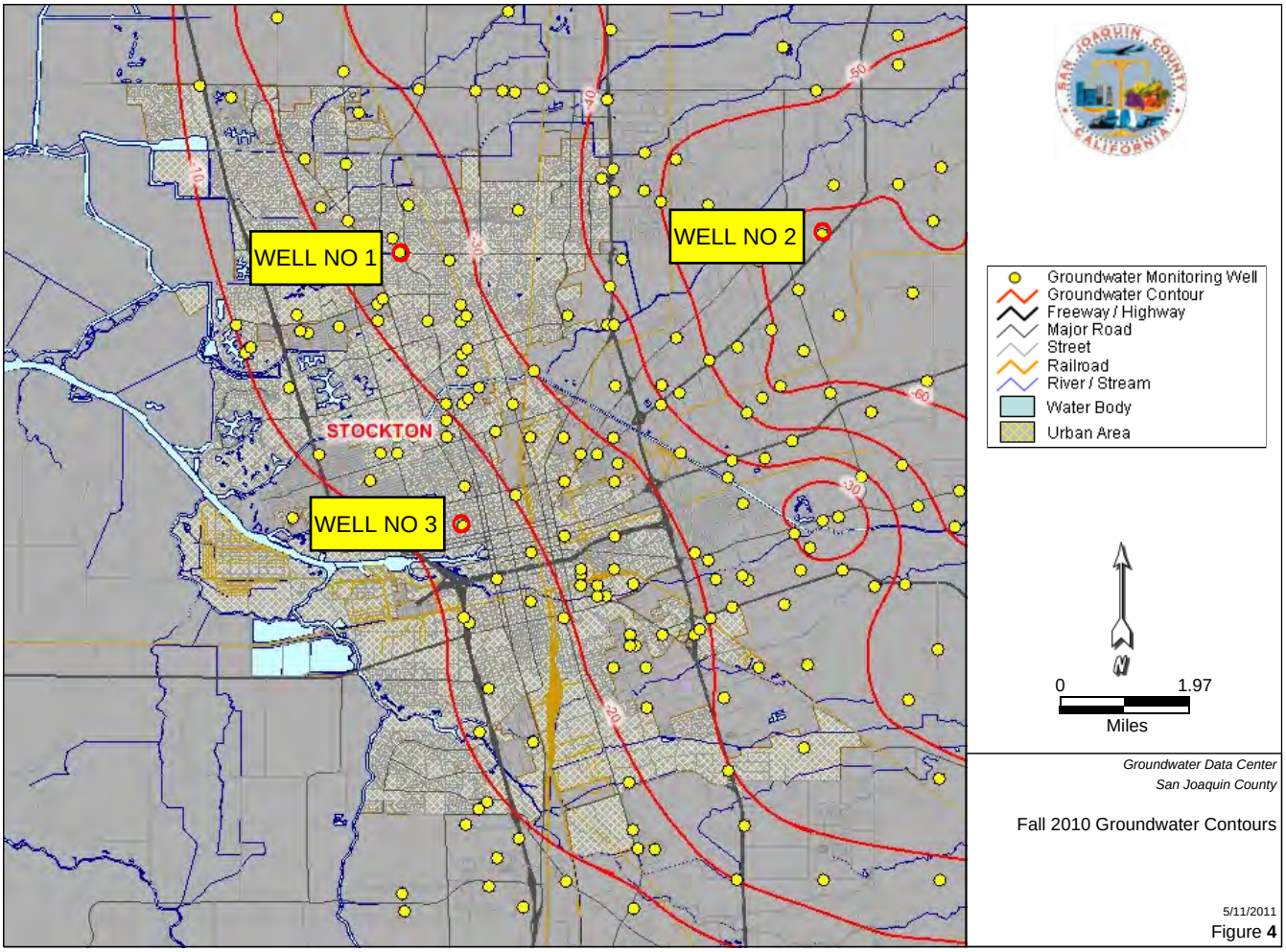
Public Works
San Joaquin County
Working for YOU

Appendix I

Groundwater Contour Maps


WELL NO 1
WELL NO 2
WELL NO 3
STOCKTON
-20
-30
-40
-50
Groundwater Monitoring Well
Groundwater Contour
Freeway / Highway
Major Road
Street
Railroad
River / Stream
Water Body
Urban Area
N
0
1.97
Miles
Groundwater Data Center
San Joaquin County
Spring 2010 Groundwater Contours
5/11/2011
Figure 3


WELL NO 1
WELL NO 2
WELL NO 3
STOCKTON
-70
-40
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Groundwater Monitoring Well
Groundwater Contour
Freeway / Highway
Major Road
Street
Railroad
River / Stream
Water Body
Urban Area
N
0
1.97
Miles
Groundwater Data Center
San Joaquin County
Fall 2010 Groundwater Contours
5/11/2011
Figure 4

Appendix J

Samples of Public Information Materials

CITY OF STOCKTON NEWS RELEASE

FOR IMMEDIATE RELEASE: **Contact:** **Connie Cochran**
Monday, March 14, 2011 **Public Information Officer**
(209) 937-8827
connie.cochran@ci.stockton.ca.us

City of Stockton Promotes EPA's "Fix a Leak Week"
March 14 through 20, 2011

(Stockton, CA) – As part of the U.S. Environmental Protection Agency's (EPA's) ongoing We're for Water campaign, this year's Fix a Leak Week encourages Americans to help put a stop to the more than 1 trillion gallons of water wasted from household leaks each year.

Sponsored by EPA's WaterSense® program, Fix a Leak Week is March 14 through March 20, 2011. In support of We're for Water, the City of Stockton's Water Conservation Program is promoting finding and fixing residential leaks.

"Leaks can account for more than 10,000 gallons of water in an average home every year—enough water to wash nearly 10 months' worth of laundry," said Robert Granberg, the City's Deputy Director of Water Resources. "As a WaterSense partner, we are encouraging consumers to find and fix leaks to save water in our community."

To help save water for future generations, the City of Stockton is asking consumers to check, twist, and replace:

-more-more-more-

- **Check for leaks.** Look for dripping faucets, showerheads, and fixture connections. Also check for toilets with silent leaks by putting a few drops of food coloring into the tank and seeing if it appears in the bowl before you flush. Don't forget to check irrigation systems and spigots too.
- **Twist and tighten pipe connections.** To save more water without a noticeable difference in flow, twist on a WaterSense labeled faucet aerator.
- **Replace the fixture if necessary.** Look for WaterSense labeled models, which are independently tested and certified to use 20 percent less water and perform as well as or better than standard models.

In many cases, fixture replacement parts pay for themselves quickly and can be installed by handy do-it-yourselfers, or contact your favorite plumbing professional. WaterSense also partners with certified landscape professionals who can check irrigation systems for leaks. Visit www.epa.gov/watersense to find WaterSense labeled products or an irrigation partner in your area.

For more information on Fix a Leak Week, visit www.epa.gov/watersense/fixaleak.

During Fix a Leak Week, City of Stockton water customers can enter to win a WaterSense labeled toilet. This high efficiency toilet uses only 1.28 gallons of water per flush. Entries are available during regular business hours at City Hall, 425 N. El Dorado Street.

-more-more-more-

Water conservation is encouraged year-round and the City's Water Conservation Program has several incentives for residential and business customers. For more information on programs and services, visit: www.stocktongov.com/mud or call 866.STOKWTR (866.786.5987)

###

WaterSense, a partnership program sponsored by the U.S. Environmental Protection Agency, seeks to protect the future of our nation's water supply by offering people a simple way to use less water with water-efficient products, new homes, and services. For more information on WaterSense, visit www.epa.gov/watersense.

#

MAY 2011

Stockton Water News

Water Conservation Still Important As Drought Is Officially Over

For the past three years, California's water supply has been lower than average and statewide reductions and conservation efforts have been encouraged. However, this winter season provided large amounts of rainfall, snow pack, and eventual snowmelt, thus, Governor Jerry Brown has officially declared California's drought over.

Although the drought is over and water supplies are currently ample, residents and businesses are encouraged to continue conserving water. As weather conditions are unpredictable, next winter may be another dry season, water storage and infrastructure may not be adequate for current amounts of water, and we may once again face water shortages.

Cash Back on Water-Saving Devices

Put your money in the bank instead of down the drain. Old toilets and clothes washers waste water and money. Residents can save up to $150 on water efficient devices.

To learn how you can start saving today, visit: www.stocktongov.com/mud

Save Water Outdoors

Good for the environment.
Good for our community.
Good for your wallet.

A healthy yard or garden does not require a lot of water. With efficient watering and landscaping techniques, you can have a healthy, beautiful yard, save water, AND save on your water bill.

Landscaping Tips

- Plant warm season grasses
- Use drip irrigation for trees, plants and shrubs
- Install native, drought-tolerant plants, trees, shrubs, and ground covers
- Group plants according to watering needs
- Apply mulch to plants and trees to help keep soil moist
- Aerate lawns to increase moisture absorption

Conserving water outdoors helps to:

- Reduce your water and energy bills
- Be environmentally responsible
- Protect Stockton's water supplies

Water Conservation Program
Saving Water for Stockton's Future
City of Stockton

Get great garden ideas and tour virtual gardens online: www.stockton.watersavingplants.com

Most residents can reduce their outdoor water use by 20 to 40 percent without any adverse effects.

24-hour Emergency Service (209) 937-8341
Call to Report: Sanitary Sewer Overflows, Water Waste, or Illegal Dumping to Storm Drains

May is Water Awareness Month

Stockton Area Water Suppliers (SAWS) is launching "May is Water Awareness Month" by asking Stockton residents, "Water U Doing … to Save Water?" The four water suppliers – the City of Stockton Municipal Utilities Department, California Water Service Company, San Joaquin County and Stockton East Water District – are encouraging efficient water use to protect Stockton's water supplies – now and for the future.

SAWS works to ensure safe, reliable water supplies are available and encourages water conservation efforts throughout Stockton.

SAWS Water Education Program

Stockton Area Water Suppliers (SAWS) is proud of its statewide recognized water education program that offers free water education to local elementary students. The program offers:

- Classroom presentations
- After school and day camp presentations
- An assembly program featuring Zun Zun
- Attendance at various community events

If you are an educator interested in the SAWS Water Education Program, visit: www.stocktonareawater.com

CITY OF STOCKTON
MUNICIPAL UTILITIES
www.stocktongov.com • (209)937-8700

2500 Navy Drive
Stockton, CA 95206

Main Office: 209.937.8700
7:00 a.m.—5:30 p.m., Monday—Thursday
7:00 a.m.—5:00 p.m. on alternate Fridays

24-Hour Emergency Service
209.937.8341

Water/Sewer Billing & Service
209.937.8295

Report Water Waste
866.786.5987

Plant Tours
209.937.8852

Visit the City's redesigned website to learn more about water conservation, wastewater, and stormwater. www.stocktongov.com/mud

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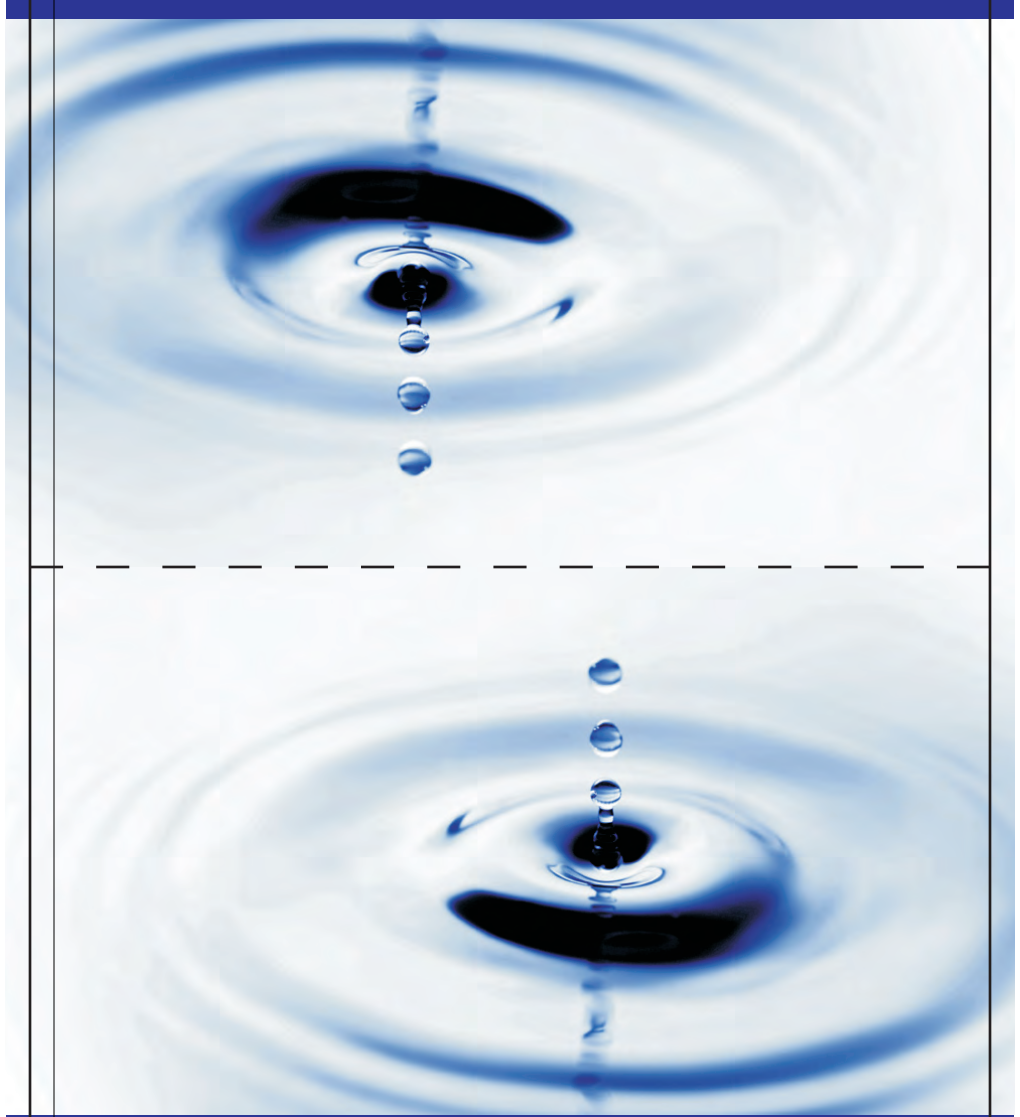

Did you know...

It takes THREE glasses of water to serve just ONE glass of water! To ice, wash and rinse an 8-ounce glass of water, 24 ounces of water are required.

This restaurant supports water conservation by "Saving Water for Stockton's Future"

WATER CONSERVATION PROGRAM
Saving Water for Stockton's Future
CITY OF STOCKTON

Water will be served upon request.

www.stocktongov.com/mud
1.866.STOKWTR (1.866.786.5987)

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NON-IMPRINTABLE

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Saving Water Indoors

- Replace old toilets and clothes washers with new, water efficient models.
- Run dishwashers and clothes washers only when full.
- Install water saving showerheads and faucet aerators.
- Insulate hot water pipes.
- Fix leaky faucets.

Typical Indoor Water Usage

Source: American Water Works Association.

Saving Water Outdoors

- Set sprinklers to run every other day between 6 p.m. and 11 a.m.
- Install a weather-based irrigation controller.
- Adjust sprinklers to prevent water runoff.
- Use drip irrigation for trees, plants and shrubs.
- Equip all hoses with automatic shut-off nozzles.
- Check irrigation systems for leaks and clogs; fix what's necessary.
- Avoid watering on windy days.
- Apply mulch to plants and trees to keep soil moist and reduce water evaporation.
- Install drought tolerant plants and ground cover.

Simple Steps Save by the Minute, Day or Week!

- Turn the water off while brushing your teeth. — Saves 10 gallons each time you brush.
- Take five minutes off your shower time. — Saves 25 gallons per day.
- Fix a leaking toilet. — Saves between 200-500 gallons of water per day.
- Use a broom instead of a hose. — Saves 13 gallons per minute.
- Water your lawn one to two times a week. — Saves 25 gallons per day landscape is not watered.
- Install a pool and spa cover to reduce evaporation. — Saves up to 30 gallons per day.

** Actual water saved is approximate and demonstrates potential gallons saved.*

Your Water is Worth Saving

Water is one of our most valuable, yet limited resources. As part of the City of Stockton's Water Conservation Program, we're working to **Save Water for Stockton's Future**. We encourage you to join our effort.

Why Conserve Water in Your Home?

- **Reduce Costs**
  Water waste equals higher water and energy bills.
- **Be Environmentally Responsible**
  Practicing water conservation behaviors serve as a model to your family, friends and neighbors.
- **Protect Stockton's Water Supplies**
  Conserving water year round helps stretch limited water supplies.

WATER CONSERVATION PROGRAM

Saving Water for Stockton's Future

CITY OF STOCKTON

Save Water... At Home

Good for the environment.
Good for our community.
Good for your wallet.

CITY OF STOCKTON MUNICIPAL UTILITIES

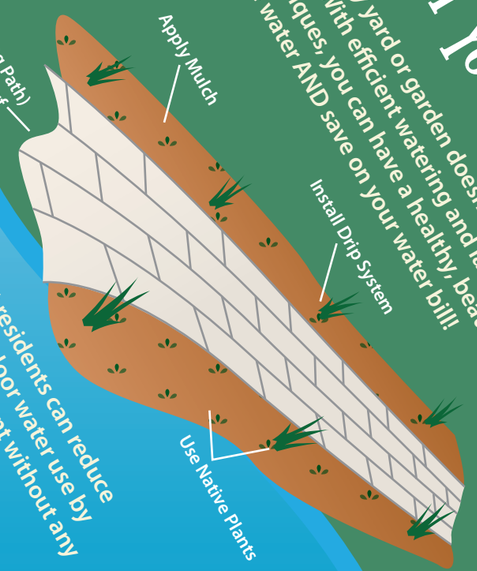
Contact Us

City of Stockton
Municipal Utilities Department
2500 Navy Drive, Stockton, CA 95206
Water Conservation Hotline:
866.STOKWTR (866.786.5987)

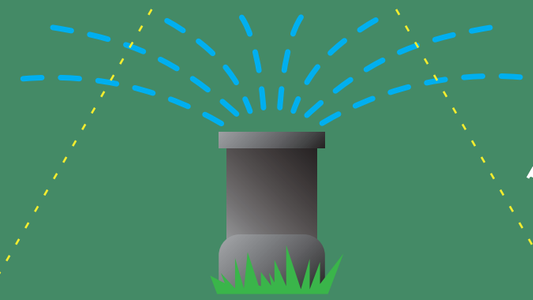
EPA WaterSense PARTNER

Save Water in Your Yard

A healthy yard or garden doesn't require a lot of water. With efficient watering and landscaping techniques, you can have a healthy, beautiful yard, save water AND save on your water bill!



Most residents can reduce their outdoor water use by 20 to 40 percent without any adverse effects.



Watering Tips

Nearly half the water you use is for landscaping. Hundreds or even thousands of gallons a year can be saved by reducing your outdoor water use.

- Adjust irrigation controllers as the weather changes.
- Adjust sprinklers to water grass areas only.
- Check, repair and adjust sprinklers at the beginning of every watering season.
- Set sprinklers to run every other day between 6 p.m. and 11 a.m.
- Install a weather-based irrigation controller.
- Use drip irrigation for trees, plants and shrubs.

To schedule a free water use survey, which includes a review of your irrigation schedule and outdoor water use tips, call 866.786.5987.

Landscaping Tips

- Plant warm season grasses.
- Install native, drought-tolerant plants, trees, shrubs and ground covers.
- Group plants according to their watering needs.
- Reduce lawn area by replacing grass with rock gardens, mulched areas or ground covers.
- Apply mulch to plants and trees to keep soil moist.
- Add compost to enhance soil.
- Aerate lawns to increase moisture absorption.

Try These Native Favorites

Trees and Shrubs
Valley Violet, Winter Jasmine, California White Sage, Grape Myrtle, Valley Oak

Plants and Groundcover
California Fuchsia, Island Pink Yarrow, Cyclamen, Ice Plant

Grasses
Bermuda, St. Augustine, Zoysia

Your Water is Worth Saving

Water is one of our most precious, natural resources. As Stockton continues to grow and our water demands increase, it's important for everyone to use water wisely. The City of Stockton continually works to **Save Water for Stockton's Future**. We encourage you to join our effort.

Why Conserve Water Outdoors?

- **Reduce Costs**
  Water waste equals higher water and energy bills.
- **Be Environmentally Responsible**
  Residents with water efficient landscape contribute to a more sustainable future for Stockton's water supply.
- **Protect Stockton's Water Supplies**
  Conserving water outdoors helps to stretch limited water resources.

WATER CONSERVATION PROGRAM

Saving Water for Stockton's Future

CITY OF STOCKTON

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EPA WaterSense PARTNER

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CITY OF STOCKTON MUNICIPAL UTILITIES

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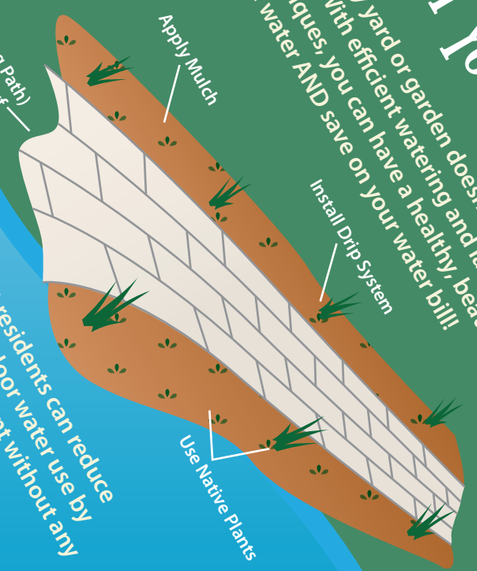

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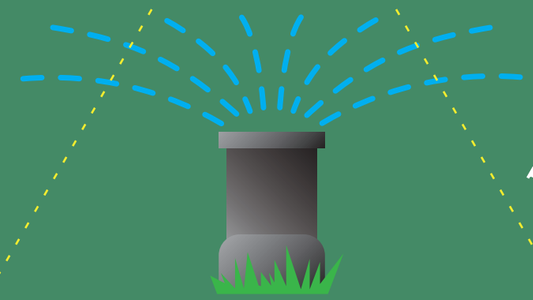

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WATER CONSERVATION PROGRAM

Saving Water for Stockton's Future

CITY OF STOCKTON

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EPA WaterSense PARTNER

Save Water... Outdoors

Good for the environment.
Good for our community.
Good for your wallet.

www.stockton.watersavingplants.com

CITY OF STOCKTON MUNICIPAL UTILITIES

Conservando Agua para el Futuro de Stockton

Consejos rápidos para la conservación de agua:

ADENTRO

- No deje correr el agua mientras se lava los dientes o afeita, o para calentar o enfriar el agua.
- Instale cabezas de ducha, lavadoras, inodoros, y aereadores de llaves eficientes.
- Tome duchas más cortas.
- Examine sus llaves e inodoros para detectar goteras.

AFUERA

- Programe su sistema de riego para cada dos días.
- Ajuste sus regadoras para no dirigir agua al pavimento.
- Programe su sistema de riego para prender solamente durante las 7 p.m. y 10 a.m. para reducir la evaporación.
- No deje prendida la manguera de agua mientras que lava su coche.
- Examine sus regadoras y pipas de irrigación para detectar goteras.

¡Consigue reembolsos de hasta $150! Reemplaza lavadoras e inodoros viejos con modelos nuevos que son eficientes.

PROGRAMA DE CONSERVACIÓN DE AGUA

CONSERVANDO AGUA PARA EL FUTURO DE STOCKTON

CITY OF STOCKTON

Llame al 866-STOKWTR o visite www.stocktongov.com para más consejos sobre como conservar agua.

Saving Water for Stockton's Future

Quick Water-Saving Tips:

INDOOR

- Don't let the faucet run while you shave or brush your teeth or to let water get hot or cold.
- Install water-saving shower heads, washing machines, toilets and faucet aerators.
- Take shorter showers.
- Check for leaks in faucets and toilets.

OUTDOOR

- Set your sprinklers to run every other day.
- Adjust sprinklers so they don't run onto the pavement.
- Set sprinklers to run only between 7 p.m. and 10 a.m. to reduce evaporation.
- Don't let the hose run while you wash your car.
- Check for leaks in sprinklers and irrigation pipes.

Get rebates up to $150! Replace old washing machines and toilets with new water-efficient models.

Water Conservation Program

Saving Water for Stockton's Future

City of Stockton

Call 866-STOKWTR or visit www.stocktongov.com for more water-saving tips.

Wasting Water is a Turn Off!

Be sure to turn off faucets and hoses when not in use.

While reading your water meter, the water field technician noticed the following:

- ☐ Plumbing break or leak needs attention
- ☐ Sprinklers running during peak hours
- ☐ Sprinklers running onto pavement or in excess
- ☐ Hose left running

_____

_____

For questions or service:
7 a.m. to 4 p.m. (209) 937-7031
After-hours message (209) 937-8341

Water Conservation Program
Saving Water for Stockton's Future
City of Stockton

Call 866-STOKWTR or visit www.stocktongov.com for more water-saving tips.

Appendix K

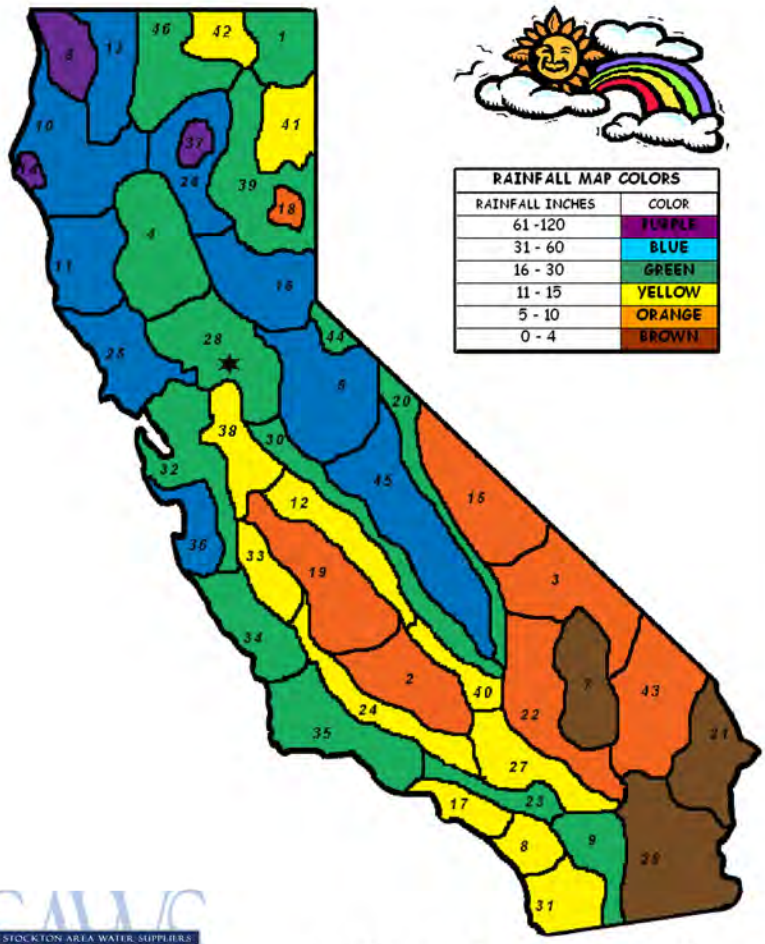
Samples of Public Education Materials

SAWS Water Education Program

ANNUAL REPORT

2009/2010 School Year

ANNUAL RAINFALL		
#	CITY / PLACE	RAINFALL INCHES
1	Alturas	16"
2	Bakersfield	6"
3	Bishop	6"
4	Chico	26"
5	Columbia	15"
6	Crescent City	66"
7	Death Valley	2"
8	Disneyland	14"
9	Escondido	16"
10	Eureka	39"
11	Fort Bragg	40"
12	Fresno	11"
13	Happy Camp	52"
14	Honeydew	100"
15	Independence	5"
16	Lake Tahoe	32"
17	Los Angeles	12"
18	Loyalton	10"
19	Mendota	8"
20	Mono Lake	14"
21	Needles	5"
22	Palm Springs	5"
23	Pasadena	20"
24	Paso Robles	15"
25	Point Arena	32"
26	Redding	40"
27	Riverside	11"
28	Sacramento	18"
29	Salton Sea	3"
30	San Andreas	27"
31	San Diego	11"
32	San Francisco	24"
33	San Jose	14"
34	San Luis Obispo	23"
35	Santa Barbara	18"
36	Santa Cruz	31"
37	Shasta Dam	63"
38	Stockton	15"
39	Susanville	11"
40	Tehachapi	11"
41	Termo	11"
42	Tulelake	11"
43	Twenty Nine Palms	4"
44	Woodfords	21"
45	Yosemite Valley	43"
46	Yreka	21"



RAINFALL MAP COLORS	
RAINFALL INCHES	COLOR
61 -120	PURPLE
31 - 60	BLUE
16 - 30	GREEN
11 - 15	YELLOW
5 - 10	ORANGE
0 - 4	BROWN

SAWS STOCKTON AREA WATER SUPPLIERS
Water Education Program

California Rainfall Puzzle Map

SAWS STOCKTON AREA WATER SUPPLIERS
Water Education Program

SAWS Water Education Program Annual Report

School Year: 2009/2010

August 1, 2009 through July 31, 2010

REPORT SUMMARY

This report presents an update on activities related to implementation of the SAWS Water Education Program in the 2009/2010 school year. This report presents the year's highlights followed by a detailed chart of program statistics.

In the 2009/2010 school year, the SAWS Water Education Program continued to serve Stockton in elementary school classrooms, on the Delta College Campus, at AgVenture, Kid's College, Farm Days and numerous special events. The standard program offers six, grade-level specific in-class presentations, an after school program and water-themed, school-wide assemblies through the Zun Zun environmental education performing troop. As part of a comprehensive outreach effort, the SAWS Water Education Program also participates in a variety of youth oriented events in the Stockton area. In the 2009/2010 school year, the SAWS Water Education Program reached a total of 23,297 students; 18,838 through in-class, event and after school programs and 4,459 through the Zun Zun assembly program.

A summary of 2009/2010 Program highlights:

- The SAWS in-class programs visited 76 Stockton area schools, presenting in 284 classrooms for 7,728 students.
- All 42 SUSD campuses hosted the SAWS After School H20lympics program, reaching 3,609 students.

- SAWS sponsored 15 Zun Zun "Water Beat" assembly performances for 4,459 students in nine Stockton elementary schools.
- The SAWS Water Education Program participated in a variety of local, youth-oriented special events and promotional programs, reaching 7,501 attendees. These events included:
    - San Joaquin County's AgVenture Programs (South County, Stockton & Lodi)
    - Stockton's Earth Day Festival
    - Pixie Woods Children's Day
    - Manteca Unified School District's Farm Days
    - KWIN/KAT Country's Promo at Orchard Supply
    - SJCOE "Dinner with a Scientist"
    - SJCOE Science Fair judging
    - San Joaquin Delta College "Kid's College" Program
    - Stockton's State of the City Event
    - Don Riggio Elementary School's "Delta Experience"
    - Stockton City Council's Water Awareness Month Proclamation
- Special presentations on water awareness, conservation, career path development and implementation of the SAWS Water Education Program were made for a variety of organizations and groups, including:
    - Lincoln High School's "Window on Your Future" career path development event
    - Delta College Reading for Science classes
    - Stagg High School Chemistry classes

- Benjamin Holt University Preparatory School Chemistry classes
- Lincoln USD Parent/Teacher Organization
- Solano County Environmental Educator's Symposium
- APAPA (Asian Pacific Islander American Public Affairs)

- The SAWS Water Education Program conducted water treatment plant tours for the fifth grade classes from Don Riggio and John Muir Elementary Schools and presented a week of water programs for the summer school sessions at both Annunciation and Lakeside Christian Schools.
- SAWS hosted at the Fall 2009 meeting of the DWR Water Education Committee, which included a guided bus and boat tour of the Sacramento/San Joaquin Delta, visits to the Harvey O. Banks Pumping Plant (the California Aqueduct) and the SAWS exhibits at the Children's Museum of Stockton, and a day of presentations and networking for over 30 water educators from around the state at the Robert J. Cabral Agricultural Center in Stockton.

Water Educators from around the state attended the DWR Water Education Committee Meeting hosted by SAWS in October 2009

2009/2010 SAWS WATER EDUCATION PROGRAM

HIGHLIGHTS & UPDATES

The SAWS In-Class Presentation Program:

SAWS in-class presentations and the H20lympics After School Programs continue to increase in popularity in all four Stockton school districts. Most presentation slots for the upcoming school year fill before the current year is over. In the 09/10 school year, invitations were sent to teachers and administrators via email in May 2009, just prior to the end of the school year. The presentation calendar was 90 percent full by mid September, and a waiting list had been established by the end of 2009.

Teachers familiar with the program often coordinate our presentations with their lesson plans. First grade teachers will host our presentation during their weather unit, second grade while studying gravity and motion, and third grade during the study of states of matter. The fourth grade "California Water" presentation features map interpretation and an in-depth look at the history, use and distribution of water in our state, concepts that closely relate to this grade's California history standards, including the California Missions and the Gold Rush.

The "California Water" presentation uses interactive games and hands-on activities, like this topographical map, to help fourth graders understand how water is distributed in our state.

In our fifth grade program, students spend 90 minutes immersed in the water cycle and are invited to tour the plant to observe the water treatment process firsthand. Unfortunately, most schools lack the funding for transportation to our facilities, but with parent chauffeurs we are still able to host a few classrooms at the plant each year. We ask that tours include one parent/adult chaperon for every five students. While the main purpose for this request is crowd control, we have also found that parents touring the plant often learn more than their children do, and invariably leave with a greater appreciation for the community's water resources. **After a tour last year, a parent remarked, "I will never complain about my water bill again!"**

Plant tours help students *and their parents* understand the water treatment and distribution process

There is evidence that as Stockton's educational resources have diminished, our programs have steadily gained favor. Teachers have found value in our ability to connect content standards to water resources, the environment and conservation. We like to remind teachers that, in spite of budget cuts, students can still experience the benefit of community learning because the SAWS in-class programs "bring the field trip to the classroom."

The SAWS H20lympics for After School Programs, AgVenture & Special Events:

The H2Olympics After School Program: In the 2009/2010 school year, SAWS presenters visited 42 SUSD campuses with the H20lympics After School Program, reaching over 3,600 students with our message of water awareness and conservation. The program was presented at every SUSD after school program site, and schools from both the Lincoln and Lodi districts hosted the program as well. SUSD is pleased with the program and has scheduled all sites for repeat visits in 2010/2011.

Benefits of the SAWS H20lympics After School Programs Include:

- Hands-on activities educate and entertain
- Format holds students' attention because it provides an alternative to standard after school activities
- Students likely to take message home
- Parents often show up, may even participate
- Broad outreach to multiple grade levels (K-8): maximum contacts in minimum amount of time
- Use of upper elementary and middle school helpers allows older students to work with/teach younger students: excellent learning environment for all students

Hands-on activities educate and entertain students, while providing program facilitators with free, appropriate curriculum for understaffed and underfunded programs…

…AND the after school program format is an excellent venue for dissemination of SAWS' message of water conservation!

- Provides after school program coordinators and facilitators with free, appropriate educational activities for understaffed and underfunded programs.

San Joaquin County's AgVenture Events: Every third grader in San Joaquin County is eligible to participate in this dynamic program sponsored by San Joaquin Select. AgVenture participants enjoy a day of fun while learning about the vast diversity of agriculture in San Joaquin County. AgVenture exposes students to important concepts during their "day on the farm," including nutritional values, agronomics, marketing, farm and crop production, the value of locally grown products and the role that producers, vendors and the purveyors of our natural resources play in bringing these commodities to the community. AgVenture's unique format offers a meaningful and memorable experience for students and a special opportunity for the agricultural community to reach out to some of our most impressionable citizens. SAWS participation in these events allows us to promote our in-class, after school and assembly programs while sharing our message of water awareness and conservation with thousands of third graders and their teachers. Each AgVenture hosts between 2,500 and 4,000 third graders. **In 2010, SAWS and the SEWD Board of Directors donated $1,000 to AgVenture to help keep this valuable program alive.**

SAWS participates in all three AgVenture events: South County in November, Stockton in January and Lodi in March. At left, Mrs. Webster helps students fashion a "Water Saver" button and guides them through a hands-on "water experiment" at the Stockton AgVenture.

Zun Zun "Water Beat" Assemblies

Because most Stockton schools had hosted the SAWS sponsored Great Water Mystery assembly program by the close of the 2008/2009 school year, SAWS contracted with a new water assembly provider for 2009/2010.

Stephen Snyder and Gwynne Snyder Cropsey are "Zun Zun," a performing arts group that celebrates the environment through water-themed, interactive, musical assemblies. In the 2009/2010 school year, SAWS sponsored 15 Zun Zun assemblies in nine Stockton area schools.

ZunZun's "Water Beat" show highlights the connection of the community to its watershed, focusing on water conservation and resource protection. In this 45 minute program, Zun Zun performs a number of skits using musical instruments, song and dance, audience participation and humor for a truly memorable show. Topics covered include water conservation, watershed protection, water reclamation, and water pollution. Students and teachers are encouraged to participate, playing unique "water instruments" from around the world, joining in the Sprinkler, Swimmer, and Washing Machine dances, and singing the "Save Some Water" song. Audience members are invited on stage to participate in hilarious activities like the "Toilet Game Show," where students learn that a leaking toilet may be the single greatest use of water in a home. Students do the Drought Limbo and participate in a crazy race that explains the purpose of storm drains and the potential threat of storm water pollution. Students leave the assembly singing, dancing and chatting about the many facets of water covered by the show.

In Stockton, Zun Zun received an enthusiastic reception, evidenced by some of the comments we received from teachers about the Zun Zun assembly:

- "What a wonderful program! The children loved it, as did the faculty and staff. They have been singing the songs all week…Thank you so much!! (St. Luke's CES)
- "Awesome assembly with awesome actors! Students and staff loved it and retained the info. Thank you!" (Wilhelmina Henry Elementary)
- "My students are still talking about it! Great job!" (Wilhelmina Henry Elementary)
- "The presentation was engaging and informative…the perfect follow-up to the SAWS water cycle/conservation course in helping us remember basic water conservation ideas. Thank you!" (St. Luke's CES)
- "Great way to teach water conservation!" (Richard Pittman Elementary)
- „The students were very excited when they came back from the assembly. Great show!" (Richard Pittman Elementary)
- "The presentation was fantastic – one of the best assemblies we've ever had. It contained all the elements that make up a great learning experience. Thank you!" (Tully C. Knoles Elementary)
- "Outstanding assembly. The best I've seen in a very long time." (TCK)
- "Very entertaining! Reminded me of Science Camp!" (Annunciation CES)
- "My students had so much to say [after the assembly]…I took notes so you can see how you influenced them! Thank you for the humor, music, dance, creativity and kindness which helped all of us to think and learn!" (Annunciation CES)
- "Awesome – kept the students' interested – very valuable! You taught something that I don't have time to teach!" (Brookside Elementary)

Status Update: The SAWS Conservation Cottage Exhibit and Water Mural at the Children's Museum of Stockton

2010 was not the best year for the SAWS Conservation Cottage. Due to budget cutbacks, the museum's maintenance crew was eliminated and operating hours were reduced. When the power to the exhibit was left on over a long weekend, the pump ran low on water and burned out. It appears that Gizmo, the firm that built the exhibit, is no longer in business, so it was difficult to find someone to repair the exhibit. A local construction firm was contracted to replace the pump and get the exhibit working again, and the same firm was hired to replace the warped floor of the Conservation Cottage. While the exhibit is currently mostly operational, the touch screen computer was hacked by visitors, and the "Pick-Quick" water conservation game is no longer functional. The plan was to repair the computer and enclose it in a child-proof kiosk; however this plan is currently on hold because operation of the museum has been transferred from the City of Stockton to the museum's Board of Directors, and SAWS felt it was wise to allow museum operations to stabilize before spending money to build a new kiosk.

The outside wall of the SAWS Conservation Cottage demonstrates how many bottles of water would be needed to make one slice of bread

The SAWS Conservation Cottage

The SAWS Water Education Program and the Community

The SAWS Water Education Program participates in and supplies hand-outs and materials for a long list of community gatherings and other special activities and events for Stockton residents. In the 2009/2010 school year, SAWS participated in the following events:

- **Rotary Read-In:** On behalf of SAWS, Mrs. Webster visited Elmwood Elementary School to read aloud to a Kindergarten class from a hard-bound, water-themed book. The book was donated to the school library, and SAWS water conservation booklets and materials were provided.
- **San Joaquin Delta College "Kid's College" Program:** The SAWS Water Education Program again participated in this unique program that offers children and teens summer academic and enrichment workshops. In July, SAWS offered a two-day workshop for 9-12 year old students entitled "The Wonders of Water," featuring lectures, games, videos and hands-on activities focusing on water science, conservation, and water treatment and distribution in California. In lieu of a service stipend from SJDC, SAWS sponsored several scholarships for Kid's College students.
- **KWIN/KAT Country's Promo at Orchard Supply:** The SAWS Water Education Program joined the City of Stockton staff in hosting a booth at this promotional event, which featured a washing machine giveaway and handouts of conservation materials.
- **San Joaquin County's "Dinner with a Scientist":** The SAWS Coordinator participated in this event designed to recognize Stockton students' achievements in science.
- **San Joaquin County Science Fair:** The SAWS Coordinator was selected to be a judge at the annual Science Fair, rating science projects for grades 4-6.
- **Children and Youth Day at Pixie Woods:** In July 2010, SAWS staffed a booth at this annual youth-oriented fun day that is designed to increase community awareness of services and opportunities available for children in San Joaquin County.
- **Lincoln USD "Window on Your Future":** Both Mrs. Webster and Mrs. Coon participated in mock job interviews designed to prepare Lincoln High School students for entry into the job market.
- **Manteca Unified School District's Farm Days:** SAWS sponsored an activity booth (H20lympics) at each of the three Weston Ranch elementary schools' annual Farm Day events.
- **State of the City:** Each year, SAWS joins the City of Stockton and Cal Water in hosting a booth at Stockton's annual State of the City event.
- **Stockton's Earth Day Festival:** SAWS sponsors a booth featuring color-your-own water saver buttons and water themed activities for children at Stockton's annual Earth Day event at Victory Park.
- **"May is Water Awareness Month":** The SAWS Coordinator attended a meeting of the Stockton City Council to participate in the acceptance of a "May is Water

Awareness Month" proclamation in recognition of water conservation efforts by SAWS member agencies.

- **Community Based Programs:** SAWS visited and supplied water conservation materials for Special Day classrooms at Stagg High School, First Five, Head Start and regional pre-school programs, SUSD's "Project Live" program for developmentally disabled adults, and other community programs requesting resources.
- **Water Treatment Plant Tours:** SAWS conducted on-site tours of the Joe Waidhofer Drinking Water Treatment Plant for Grade 5 classrooms.
- **Water Educator Training:** The SAWS Coordinator met with and shared ideas and resources and with other Northern California water agencies.
- **DWR Water Education Committee:** The SAWS Coordinator attends bi-annual meetings of the DWR Water Education Committee, joining water educators from all over California to share resources and ideas for water conservation education and outreach. In October 2009, SAWS hosted the fall meeting of the DWR Water Education Committee for a tour of the Delta and a sit-down meeting at the Robert J. Cabral Agricultural Center in Stockton.
- **Children's Museum Benefit Bocce Challenge:** Each year, SAWS donates to and participates in the Children's Museum Annual Bocce Challenge, an event that raises thousands of dollars for the Children's Museum of Stockton.
- **Don Riggio Elementary School's "Delta Experience":** The SAWS Water Education Program participated in this lower-elementary school event that focuses on the Sacramento/San Joaquin Delta.
- **Delta College "Reading for Science" classes:** During both the fall and spring semesters, the SAWS Coordinator made presentations SJDC's Reading for Science classes on the water cycle, water treatment and distribution and the Sacramento San Joaquin Delta. Instructors at SJDC use our presentations to teach incoming community college students how to listen to a guest speaker, take notes and ask meaningful questions.
- **Career Path Development:** The SAWS Coordinator was invited to visit several Stockton high school classes to talk about careers in the water industry.
- **PTO Presentations:** Mrs. Webster made a presentation on water resources and conservation for the Lincoln Unified School District's Parent/Teacher Organization.
- **Solano County Environmental Educator's Symposium:** Mrs. Coon was invited by the organizers of this regional conference to make a presentation on the design, development and implementation of the SAWS Water Education Program.
- **APAPA Presentation:** The SAWS Coordinator was invited to talk to the Stockton branch of the Asian Pacific Islander American Public Affairs group about water resources, conservation and the SAWS outreach programs.

Conclusion

The SAWS Water Education Program is endorsed and approved by the Stockton, Lincoln, Lodi and Manteca school districts, works closely with SUSD as part of the STEP UP After School Program, and is sanctioned by the San Joaquin County Office of Education. The program's success is evidenced by the numbers: in-class participation has increased steadily year after year. The most effective tool for program growth remains teacher-to-teacher recommendations; every year more teachers add our programs to their curriculums and recommend us to their colleagues and acquaintances. This promotes a progressive learning approach, which is a major component of the overall plan: when we see students year after year, we are building a comprehensive knowledge base that will make water conservation and awareness second nature for our future citizens, ultimately helping us achieve our goal of promoting effective, community-wide water conservation in Stockton. Evaluations from both teachers and students have been overwhelmingly positive, and support for the program has increased because it reinforces grade specific content standards, coordinates seamlessly with curriculum, and provides a hands-on, memorable learning experience for students.

As the teacher and students look on, Mrs. Webster demonstrates how a town's growth and well-being might be affected by a water shortage during a round of "Pass the Jug," a role-playing game designed to teach fourth graders the importance of water in our communities.

Looking Ahead:

- **Maintain and enhance current programs:** After six years, the SAWS Water Education Program has become a well-known and respected outreach program in Stockton area schools and with the public. We are reaching significant numbers of students with a variety of programs, and we participate in many high-profile youth oriented local events. Early on, the program focused on building participation and expansion, and that mission has been accomplished. From here on, our priority will be enhancement; since our programs are established, popular and in demand and we are making an impressive number of contacts with minimal staff, our plan for the future is to enhance the value of our programs for those we are able to serve. While our evaluations are always enthusiastic and positive, suggestions for improvement indicate that teachers would like to see us offer more hands-on activities. We will look to programs like Project WET, CREEC, Project WILD, AIMS and other experiential learning curriculums to develop and incorporate more grade level appropriate activities into our presentations.
- **Middle/High School Programs:** The SAWS Coordinator is collaborating with Contra Costa Water District to develop a middle school (grades 6-8) presentation that focuses on storm water awareness, groundwater and water quality.
- **Project WET Workshop:** The SAWS Coordinator is currently working with Project WET to develop and schedule a Project WET workshop for Stockton area teachers and educational facilitators.

Project WET (Water Education for Teachers) offers training workshops and a catalog of grade-appropriate, standards-based experiential learning activities designed to be incorporated into water education curriculums.

Comments from teachers (taken from our Program Evaluation Forms):

I notice that each year this program has added more to help students really understand. I appreciate the additional materials that reinforce learning. *Mrs. Ross, Grade 1, Colonial Heights Elementary*

The best program I have ever had in the classroom, and I have been teaching for 19 years!
Julie Steyer, Grade 3, GW Bush Elementary

Objectives and content were clearly aligned with our current curriculum and California standards…I like the way the program integrates standard-based instruction and explores local issues related to water procurement and distribution. *Mr. Guzman, Grade 5, Pittman Elementary*

Every aspect of the lesson was age-appropriate and the kids were very engaged in the subject matter.
Misa Horita, Grade 1, Mable Barron Elementary

The curriculum is very good – love that local tie-in! *Mrs. Loftin, Grade 3, Wagner-Holt Elementary*

Good balance of listening activities and movement activities…an interesting science lesson that meets state standards. *Ms. Falat, Grade 1, Mable Barron Elementary*

[The presenter] tailored the presentation to my adult students and covered topics at my request, like the Delta and groundwater. Thanks! *Michelle Marta, San Joaquin Delta College "Reading for Science"*

This is our third year [hosting the after school program] and the students love it…the games were very easy, fun and fast paced. Kids didn't have time to be bored – they came back talking about what they learned – awesome! Kristal *Bloch, SUSD After School Program Facilitator, Hoover Elementary*

[The presenter's] tone of voice, gestures and realia help my ELL students to understand the water cycle. The presentation was excellent! *Mr. Ruiz, Grade 1, Grant Elementary*

The presentation was wonderful! The students benefitted in many ways and gained a clear understanding of the water cycle. *Ms. Bregman, Grade 5, Pittman Elementary*

Water cycle clearly explained…hits all content standards…all kids engaged and happy!
Mrs. Ringer, Grade 2, GW Bush Elementary

Hit every second grade Earth Science standard! Very prepared! Very knowledgeable!
Ms. Salgado, Grade 2, Aspire Rosa Parks Academy

Our instructor had a great rapport with the children. Those few who are easily off task were brought back with ease. I love that [the program] is very interactive and engaging; the children get very excited!
Ms. Eggert, Grade 1, Stockton Collegiate International

[The presentation] was a definite learning experience which was well worth the time.
Ms. Stansfield, Grade 2, McKinley Elementary

I like the fact that water treatment and distribution is discussed.
Ms. Maloy, Grade 5, Brookside Elementary

Program met and went beyond grade specific content standards; the presentation was engaging. Students had a lot of fun and were excited about learning and reviewing.
Ms. Malibunas, Grade 5, Brookside Elementary

This program does a good job of integrating both science and social science standards and covering them in an engaging way. Thank you for visiting each year! Our kids love it!
Ms. Gregoire, Grade 1, John Muir Elementary

Everything was grade appropriate; the presenter asked good questions and made the students think. The questions fit perfectly into our curriculum…Thanks so much - keep up the good work!
Ms. Sandoval, Grade 3, Dolores Huerta Elementary

The varied activities are designed perfectly for fourth grade – everything fits well with our standards!
Ms. Huiras, Grade 4, Elkhorn Elementary

Objectives were clear and met; the program made learning about science fun. My kids loved the very cool hands-on game. Students were able to apply information to their lives!
Ms. Go Miller, Grade 5, Elkhorn Elementary

Perfect! [The presenter] does such a good job of tying together, in a fun way, everything that we've been covering. *Mrs. Carido, Grade 4, St. Luke's CES*

All objectives were clear and were met. Materials were very much grade appropriate; excellent charts, pictures, illustrations, visuals…an excellent presentation! Please come back more often!
Mrs. Razo, Grade 1, GW Bush Elementary

[The program] teaches students to be aware of saving water while incorporating fun and science.
Ms. DelPrato, SUSD After School Program Coordinator, Elmwood Elementary

The presenter's personality, questioning, presence, visual aids: all excellent! I cannot think of one thing that could make this program better! *Mrs. Ewart, Grade 3, First Baptist Christian School*

[The presenter] was fluent, articulate, well-prepared and got an immediate, eager student response. They "drank it all up"! *Ms. Zuckerman, Grade 1, Tully Knoles Elementary*

Outstanding! Standards were pointed out along the way. The content was appropriate, informative and just the right amount. The program covered science standards in a fun, interactive and educational manner, providing easy access for all learners. This is the first time having the program in my classroom, and it is absolutely wonderful. I really appreciate and value the SAWS Water Education Program – Thank you! *Ms. Mary Hood, Grade 5, Podesta Ranch Elementary*

This program meets 3rd grade standards well. The water filter was a great hands-on activity. The kids love it and talk about it all year long! *Jan Utterback, Grade 3, Tyler Elementary*

Perfect balance of listening to hands-on. This program honors the students' abilities – leaves them with something they can share. *Leslie Warmke, Grade 3, Brookside Elementary*

The hands-on portion of the program is very helpful in reaching the different learning types. A fine program – thanks! *Mrs. Maring, Grade 3, Tyler Elementary*

I look forward to this presentation every year. I love the visuals – they help students relate the content to their city, and the hands-on activities light up their faces! *Mrs. Blake, Grade 2, Taylor Elementary*

Excellent!! Totally on-target with grade level standards. Lots of hands-on. [The presenter] was terrific! She was able to describe content in 2nd grade lingo, kept the pace moving – the kids were totally engaged. This is the second time we've had the program and we couldn't be more pleased!
Ann Garcia, Grade 2, John Muir Elementary

Students were very engaged. All new content will tie in to our science lessons!
Karin Compise, Grade 5, Pittman Elementary

This program is right on target with our benchmark test. I love the songs and game activities.
Ms. Nguyen, Grade 1, Oakwood Elementary

Objectives were very clear and well planned; [the presenter] checked for understanding and presented in a challenging manner…this program should be on PBS so other children can enjoy it and learn about water!
Mrs. Clover, Grade 1, San Joaquin Elementary

All content is related to third grade standards – it tied in nicely to what I've already taught or as a preview of what is to come. *Thank you! Suzanne Podesto, Grade 3, TCK*

This program is a great lead-in to my next science lesson. [The presenter] is positive and upbeat. She holds the students' attention and has a variety of items that help the students understand the concepts.
Barbara Yamada, Grade 3, Julia Morgan Elementary

What an excellent lesson – perfect for third grade! The students had so much fun they didn't even realize how much they were learning. It was fun, hands-on, full of information…just what kids love!
Isabel Calderon, Grade 3, Hazelton Elementary

The children truly enjoyed this lesson – it was full of energy and information. Hands-on, informative, age-appropriate demonstrations, good use of age-appropriate language. Fantastic! I will pass it on to other grade levels! *Ms. Fortney, Grade 2, Hazelton Elementary*

Very useful and important information delivered in an extremely clear manner – [the presentation is] outstanding. *Patrick Wall, San Joaquin Delta College, "Reading for Geography"*

Everyone who went to the presentation came back with a smile on their face! The students had fun while learning how to save water.
Malinda Otero, SUSD After School Program Facilitator, Hamilton Elementary

Students understand the importance of water and where it comes from. My class remembered [the presenter] from Kindergarten and were excited to see her again. The hands-on activities and visuals are super! *Mrs. Acosta, Grade 1, Brookside Elementary*

Ours is a large and talkative group, but [the presenter] had great control and did a fantastic job! I hope we can schedule a return visit in January to coincide with our weather unit. Thank you so much!
Ms. Vizcarra, Kindergarten, Tully Knoles Elementary

The lesson met all our standards for this unit of study. I like that it covers so many grade level standards and that my students enjoyed it so much. Thank you! *Julie Glennon, Kindergarten, Brookside Elementary*

The presenter was fun and interested in her topic – students were kept on task for over an hour! I really liked the pictures, storyboard, stretching, reenacted rainy day activities and the game.
Ms. Vaughan, Grade 1, TCK

The presentation fit perfectly with our curriculum and touched on so many standards – the hands-on activities made it come alive for the kids. *Ms. Rodriguez, Grade 4, Manlio Silva Elementary*

The hands on activities about the water cycle and three states of matter will stay with students – the whole program is wonderful! *Mrs. Conrad, Grade 2, Mable Barron Elementary*

The presentation contains "spot-on" content standards. I like how smooth and quick it is - the time went by so quickly, we didn't even realize it! Great information presented so well; you truly do a wonderful job! *Sachi Harada-Ponder, Grade 1, TCK*

This program was good to begin with and just keeps improving every year! The information directly correlated with 4th grade standards. Thanks! *Mrs. Strobel, Grade 4, TCK*

I really liked that the program showed how water is connected to the students' lives. They talked about water days after the presentation. *Ms. Johnson, Grade 2, Oakwood Elementary*

The format was great! Discussion…Modeling…Hands-on…Follow-up…Debrief…Excellent!
Ms. West, Grade 2, TCK

I liked the way the activities connected to 4th grade California history standards! It was great!
Ms. Smith, Grade 4, Aspire Rosa Parks Academy

The entire program is extremely worthwhile and meets our standards. Excellent scheduling, communication, materials, presenters! Keep everything as is!
Debbie Rojas, Grade 1, El Dorado Elementary

I love the felt board story and the game…change NOTHING…the program is wonderful the way it is! *Sabrina Rohleder, Grade 1, El Dorado Elementary*

The program is very interactive and hands-on while being standards-based. It is wonderful!
Susie Rainwater, Grade 4, Annunciation CES

The presentation is perfect for first grade, touching on standards very effectively in an engaging way. Students love the activities and game. Both Mrs. Webster and Mrs. Coon have presented to my classes over the years and they are awesome! So good with the kids – they make them feel smart and confident. The only thing that would make this presentation better would be if you created another first grade program so we could see you twice a year instead of once!
Amy Hickenbotham, Grade 1, Ansel Adams Elementary

Dear Mrs. Coon,

Thankyou for coming to teach us about water! I really enjoyed your fun and interesting presentation. I wish you could come again! The activities were just simply wonderful. I don't have any questions, anyway, because you explained everything so clear and very understandable. As soon as I got into my car, I bursted out with information from the presentation, to my parents. Again, I enjoyed everything and thankyou so much for the useful information.

From,

Megan Shanice Kan

2010

Dear Mrs. Coon,

Thank you for doing the water presentation for us. It was fun. Three things I learned are Aqueduct, Columbia was fighting over water, and Columbia is deserted. My favorite was making the puzzle. We couldent have don this without you.

Sicerly,
Dominic Pespicio

3 Things I learned...

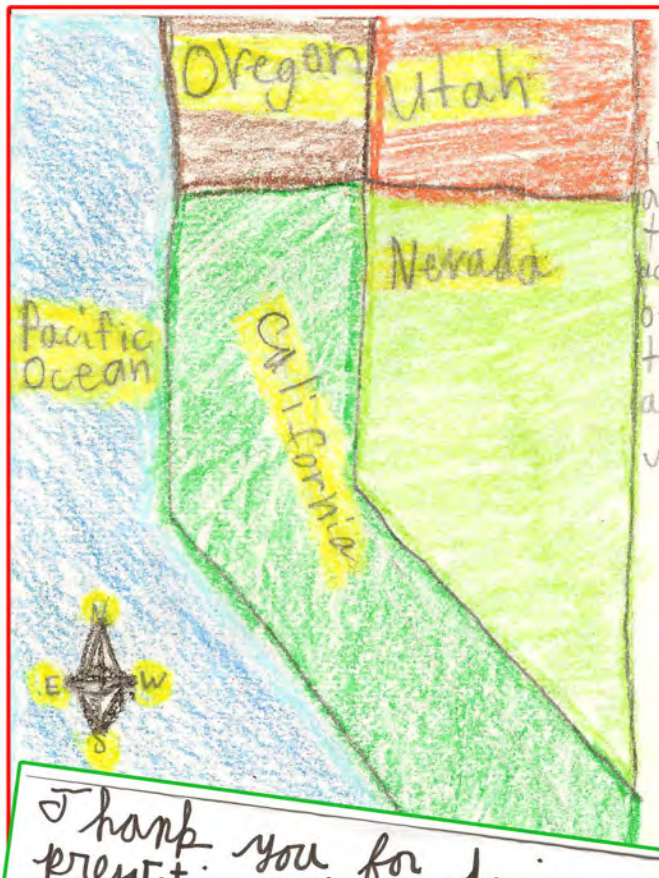
1. The process takes 4 hours to complete

2. You get the water from rivers and lakes

3. New water never comes to Earth.

Connor

Thanks Mrs. Coon!
(For Healty Water)



Thank you, Mrs. Coon, for coming and teaching us about water and how to save it. I had a wonderful time learning and doing fun activities with you. Now I know lots of facts about water and hope to see you next year. Thank you again for teaching us about water and how to save it.

Sincerely,
Khemathan
Chorn

Thank you for doing the water presetation with us. I learned alot. Three things I learned were that we need water everyday, California shares water and Northern California borrows our water. Thank again for doing the water presetation That's nice.

love,
Nick Vargas

April 8, 2010

Dear Mrs, Coon

Thank you for teaching us about water. I learned that you should use water more carefully, and that I should not waist water. I like water and I dont want the water to be gone so I'm going to use water more carefully.

Sincerly,
Shion

Dear Mrs. Coon,

Thank you for coming to Manlio Silva and giving us the wonderful presentation. My favorite part of the presentation was learning about the differen states and how much rain fall came a year. I remember I had Honeydew and it had 100 inches of rain. A really fun game was Pass the Jug. I thinks thats what it's called. I really feel bad for the farimers because the miners flooded their crops.

Sincearly,

Jamie

P.S. You have beautiful handwriting

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August 14, 2009

Dear Mrs. Webster,

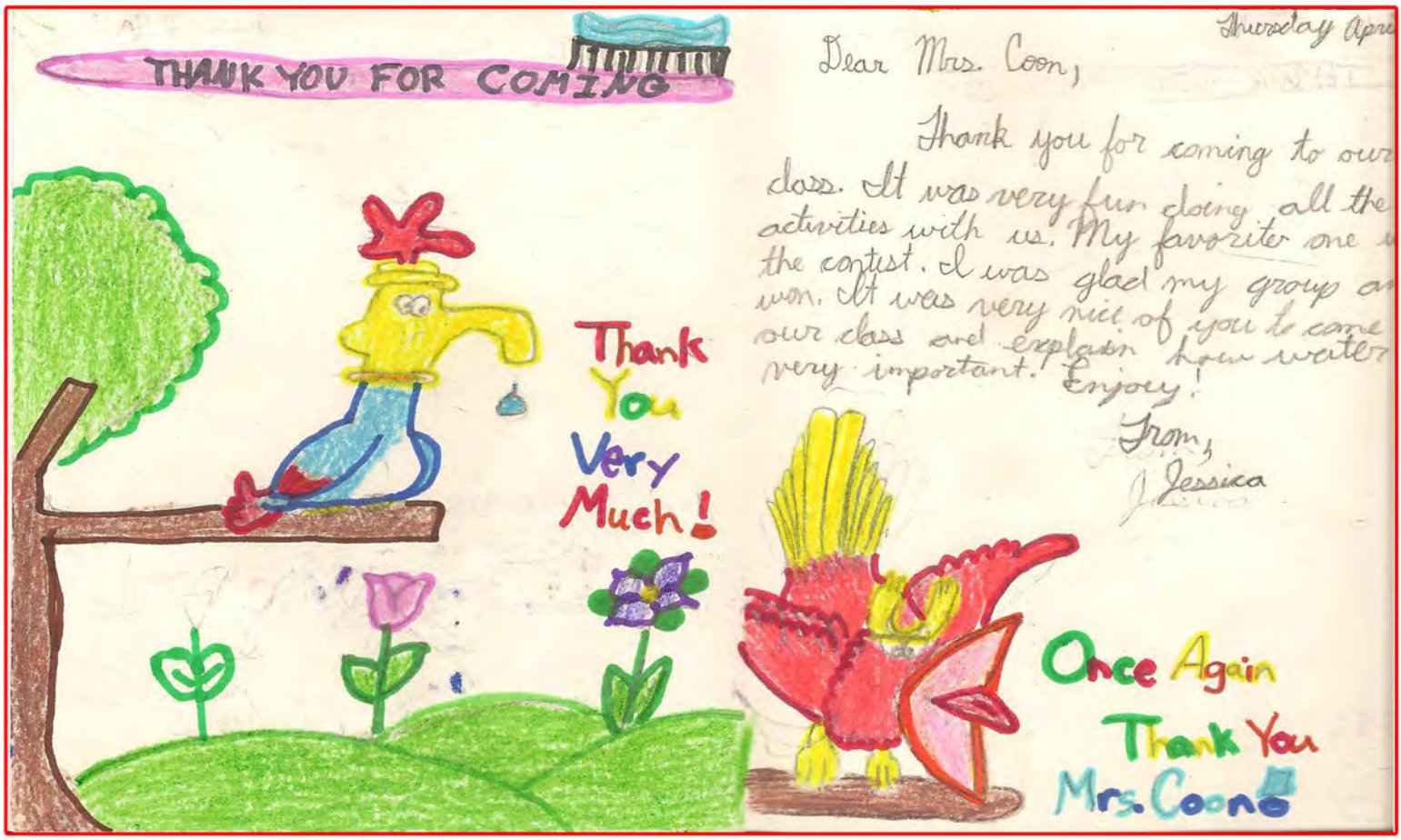
Thank you for Coming to our class yesterday. You taught me so much about water. First, I learnd that our water comes from the moutain. Then I found out that the water tower cleans the water. Finally, I absorbed info about water. That was so nice of you to visit our class.

Sincerely,
Darren Kaseumsouk

Dear Mrs. Coon,

Thankyou for teaching us about water and saving water. Those california aqueduct are cool. I can't believe we had a lot of rains but its just average.

Waterlover,
aaron

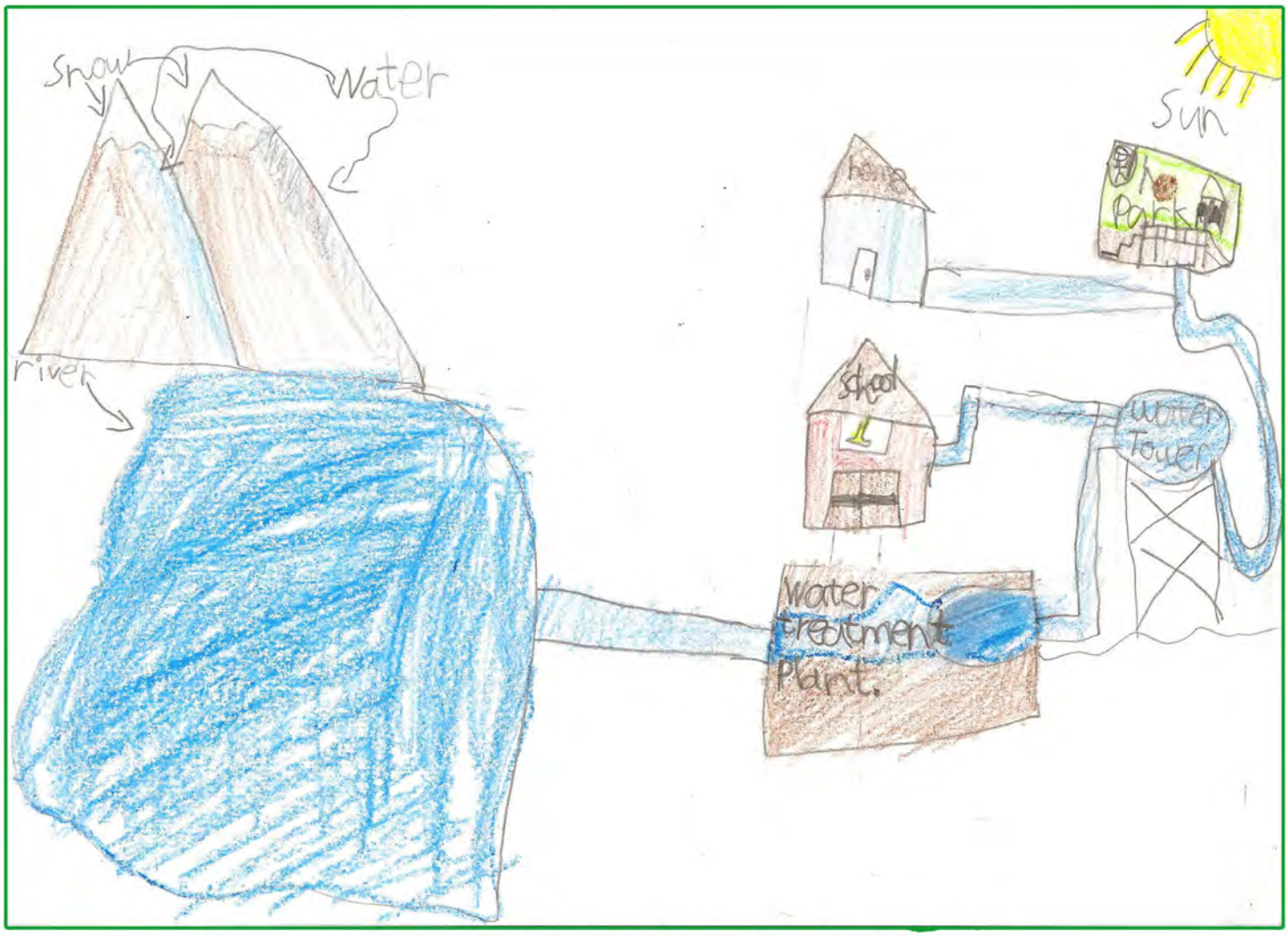


Thursday Apr

Dear Mrs. Coon,

Thank you for coming to our class. It was very fun doing all the activities with us. My favorite one was the contest. I was glad my group won. It was very nice of you to come to our class and explain how water very important. Enjoy!

From,
Jessica



These drawings were done by second graders after seeing our "H20 to Go!" presentation

SAWS Water Education Program
Students Participating: All Outreach Programs
Comparison by School Year (SY)

	# of Students				
Program	**SY 05/06**	**SY 06/07**	**SY 07/08***	**SY 08/09****	**SY 09/10*****
In-Class Program:	8044	12357	15344	18293	18838
Large Audience Assembly Program	3002	11452	9925	13989	4459
Totals:	11046	23809	25269	32282	23297

* 46 GWM assemblies performed in the 2007/2008 school year covered under the 2007/2008 agreement with SYRCL
** 54 GWM assemblies performed in the 2008/2009 school year covered under the 2007/2008 agreement with SYRCL
*** 15 Zun Zun assemblies performed in the 2009/2010 school year covered under the 2009/2010 agreement with Zun Zun

SAWS Water Education Program Presentations and Events
School Year: 2009/2010
Category Breakdown

By Presentation Type

Quantity	Presentation Type	%
269	Classrooms	80%
9	Events	3%
42	After School Programs	13%
15	Other	4%
335		100%

By School District

Students	District	%
5617	SUSD	30%
2188	Lincoln	12%
1763	MUSD	9%
1973	Lodi	10%
574	Private	3%
719	Aspire	4%
6004	All *	32%
18838		100%

Total Schools Visited 08/09	
76	Total Schools

By Grade

Grade	Clsrms	Students	%
K	24	656	3%
Gr 1	60	1484	8%
Gr 2	59	1364	7%
Gr 3	60	1504	8%
Gr 4	29	952	5%
Gr 5	37	1291	7%
Aftersch	42	3609	19%
Other	15	477	3%
Event	9	7501	40%
	335	18838	100%

By Presenter

Presenter	Venues	Students	%
Kristin (KC)	107	3211	17%
Susan (SW)	174	5103	27%
Heather (HD)	41	3654	19%
Combo (KC/SW/HD)	13	6870	36%
	335	18838	100%

By Water Provider

Provider	Students	Title 1 Students	T1%
Cal Water	4220	3816	90%
City of Stockton	5295	3493	66%
SJ County/???	2007	1995	99%
All *	7316	N/A	0%
	18838	9304	49%

* Students or children reached through city or county wide events: unable to determine district, provider or Title 1 status

SAWS Water Education Program Presentations and Events
School Year: 2009/2010 (8/1/09-7/31/10)
Master Presentation List

Date	School	T-1	District	Water Provider	# Clsrms	Grade	Students	Presenter	Remarks
03/02/10	Adams Elementary	Y	SUSD	Cal Water	1	A	60	HD	
12/09/09	Adams Elementary	Y	SUSD	Cal Water	1	O	30	KC	
03/10/10	AgVenture (Lodi)	N	All	All	1	E	1220	KC/SW	
11/04/09	AgVenture (South County)	N	MUSD	All	1	E	1300	KC/SW	
02/17/10	AgVenture (Stockton)	N	All	All	1	E	1200	KC/SW	
01/27/10	Annunciation CES	N	Private	Cal Water	1	4	37	KC	
06/09/10	Annunciation CES	N	Private	Cal Water	1	3	35	KC/HD	
06/16/10	Annunciation CES	N	Private	Cal Water	1	5	35	KC/HD	
01/14/10	Ansel Adams Elementary	Y	Lodi	City of Stockton	1	1	23	KC	
06/10/10	APAPA	N	All	All	1	O	12	KC	comm mtg
09/15/09	APSARA	Y	SUSD	Cal Water	1	A	100	HD	
08/21/09	August Elementary	Y	SUSD	???	1	A	100	HD	
10/16/09	August Elementary	Y	SUSD	???	2	1	45	KC	
09/04/09	August Elementary	Y	SUSD	???	1	2	21	KC	
10/23/09	August Elementary	Y	SUSD	???	2	1	45	SW	
04/28/10	Ben Holt Univ Prep	Y	Aspire	City of Stockton	2	O	80	KC	High School
01/26/10	Brookside Elementary	N	Lincoln	City of Stockton	2	1	57	SW	
01/28/10	Brookside Elementary	N	Lincoln	City of Stockton	1	1	28	SW	
10/05/09	Brookside Elementary	N	Lincoln	City of Stockton	3	2	60	SW	
10/08/09	Brookside Elementary	N	Lincoln	City of Stockton	1	2	21	SW	

Date	School	T-1	District	Water Provider	# Clsrms	Grade	Students	Presenter	Remarks
10/09/09	Brookside Elementary	N	Lincoln	City of Stockton	1	2	21	SW	
09/29/09	Brookside Elementary	N	Lincoln	City of Stockton	1	3	21	SW	
10/06/09	Brookside Elementary	N	Lincoln	City of Stockton	1	3	21	SW	
05/24/10	Brookside Elementary	N	Lincoln	City of Stockton	1	4	35	SW	
05/27/10	Brookside Elementary	N	Lincoln	City of Stockton	1	4	34	SW	
05/28/10	Brookside Elementary	N	Lincoln	City of Stockton	1	4	34	SW	
10/26/09	Brookside Elementary	N	Lincoln	City of Stockton	1	5	40	SW	
12/04/09	Brookside Elementary	N	Lincoln	City of Stockton	1	5	40	SW	
12/05/09	Brookside Elementary	N	Lincoln	City of Stockton	2	5	70	SW	
02/16/10	Brookside Elementary	N	Lincoln	City of Stockton	2	K	58	SW	
02/18/10	Brookside Elementary	N	Lincoln	City of Stockton	1	K	28	SW	
11/06/09	Bush Elementary	Y	SUSD	City of Stockton	1	1	21	KC	
08/14/09	Bush Elementary	Y	SUSD	City of Stockton	1	3	25	KC	
08/18/09	Bush Elementary	Y	SUSD	City of Stockton	1	3	25	KC	
09/11/09	Bush Elementary	Y	SUSD	City of Stockton	1	3	25	KC	
03/01/10	Bush Elementary	Y	SUSD	City of Stockton	1	5	40	KC	
03/12/10	Bush Elementary	Y	SUSD	City of Stockton	1	A	100	KC	
11/10/09	Bush Elementary	Y	SUSD	City of Stockton	1	1	26	SW	
08/21/09	Bush Elementary	Y	SUSD	City of Stockton	1	2	25	SW	
09/10/09	Bush Elementary	Y	SUSD	City of Stockton	1	2	21	SW	
10/16/09	Bush Elementary	Y	SUSD	City of Stockton	1	2	23	SW	
11/19/09	Bush Elementary	Y	SUSD	City of Stockton	1	3	30	SW	
11/20/09	Bush Elementary	Y	SUSD	City of Stockton	1	3	25	SW	
10/29/09	Bush Elementary	Y	SUSD	City of Stockton	1	5	35	SW	

Date	School	T-1	District	Water Provider	# Clsrms	Grade	Students	Presenter	Remarks
01/19/10	Clairmont Elementary	Y	Lodi	City of Stockton	1	1	25	KC	
01/22/10	Clairmont Elementary	Y	Lodi	City of Stockton	2	1	49	SW	
03/17/10	Claudia Landeen Elementary	Y	Lincoln	City of Stockton	1	1	30	KC	
03/24/10	Claudia Landeen Elementary	Y	Lincoln	City of Stockton	1	1	28	KC	
11/09/09	Claudia Landeen Elementary	Y	Lincoln	City of Stockton	1	3	35	KC	
01/25/10	Claudia Landeen Elementary	Y	Lincoln	City of Stockton	1	5	35	KC	
04/06/10	Claudia Landeen Elementary	Y	Lincoln	City of Stockton	1	1	30	SW	
11/06/09	Claudia Landeen Elementary	Y	Lincoln	City of Stockton	1	3	21	SW	
11/10/09	Claudia Landeen Elementary	Y	Lincoln	City of Stockton	1	3	27	SW	
01/15/10	Claudia Landeen Elementary	Y	Lincoln	City of Stockton	1	5	35	SW	
01/29/10	Claudia Landeen Elementary	Y	Lincoln	City of Stockton	1	5	29	SW	
09/01/09	Cleveland Elementary	Y	SUSD	Cal Water	1	A	81	HD	
10/16/09	Commodore Stockton Skills	Y	SUSD	???	1	A	80	HD	
12/08/09	Commodore Stockton Skills	Y	SUSD	???	2	3	50	KC	
02/25/10	Commodore Stockton Skills	Y	SUSD	???	1	4	35	KC	
10/13/09	Commodore Stockton Skills	Y	SUSD	???	1	5	35	KC	
12/07/09	Commodore Stockton Skills	Y	SUSD	???	2	3	50	SW	
12/10/09	Commodore Stockton Skills	Y	SUSD	???	1	3	25	SW	
12/11/09	Commodore Stockton Skills	Y	SUSD	???	2	3	50	SW	
09/21/09	Davis Elementary	Y	Lodi	???	1	2	24	KC	
04/29/10	Davis Elementary	Y	Lodi	???	1	3	25	KC	
09/25/10	Davis Elementary	Y	Lodi	???	2	3	50	SW	
03/10/10	Dinner w/ Scientist	N	All	All	1	E	6	KC	
02/22/10	Don Riggio	Y	Lincoln	City of Stockton	2	5	70	KC	

Date	School	T-1	District	Water Provider	# Clsrms	Grade	Students	Presenter	Remarks
03/05/10	Don Riggio	Y	Lincoln	City of Stockton	2	5	64	KC	
03/26/10	Don Riggio	Y	Lincoln	City of Stockton	4	K	94	KC	"Delta Exp"
09/08/09	El Dorado Elementary	Y	SUSD	Cal Water	1	A	58	HD	
01/04/10	El Dorado Elementary	Y	SUSD	Cal Water	1	1	25	SW	
01/05/10	El Dorado Elementary	Y	SUSD	Cal Water	1	1	25	SW	
01/06/10	El Dorado Elementary	Y	SUSD	Cal Water	1	1	25	SW	
02/11/10	El Dorado Elementary	Y	SUSD	Cal Water	1	1	23	SW	
02/12/10	El Dorado Elementary	Y	SUSD	Cal Water	1	1	24	SW	
03/31/10	Elkhorn Elementary	N	Lodi	City of Stockton	1	4	40	KC	
04/07/10	Elkhorn Elementary	N	Lodi	City of Stockton	1	5	40	KC	
09/11/09	Elmwood Elementary	Y	SUSD	???	1	A	60	HD	
03/16/10	Fillmore Elementary	Y	SUSD	Cal Water	1	A	100	HD	
04/09/10	First Baptist	N	Private	Cal Water	1	2	30	SW	
08/10/09	First Baptist	N	Private	Cal Water	1	3	23	SW	
09/18/09	Fremont Elementary	Y	SUSD	Cal Water	1	A	100	HD	
03/19/10	Great Valley Elementary	Y	MUSD	City of Stockton	5	2	130	KC/SW	farm day
05/07/10	Grunsky Elementary	Y	SUSD	Cal Water	1	A	80	HD	
10/23/09	Hamilton Elementary	Y	SUSD	???	1	A	80	HD	
05/14/10	Hamilton Elementary	Y	SUSD	???	1	2	22	SW	
10/27/09	Harrison Elementary	Y	SUSD	Cal Water	1	A	100	HD	
05/25/10	Harrison Elementary	Y	SUSD	Cal Water	2	K	60	KC	
11/06/09	Hazelton Elementary	Y	SUSD	Cal Water	1	A	100	HD	
05/12/10	Hazelton Elementary	Y	SUSD	Cal Water	3	3	60	KC	
11/10/09	Henry Elementary	Y	SUSD	???	1	A	80	HD	

Date	School	T-1	District	Water Provider	# Clsrms	Grade	Students	Presenter	Remarks
05/18/10	Hong Kingston Elementary	Y	SUSD	City of Stockton	1	A	80	HD	
11/17/09	Hoover Elementary	Y	SUSD	???	1	A	80	HD	
10/20/09	Hoover Elementary	Y	SUSD	???	2	4	65	KC	
10/22/09	Hoover Elementary	Y	SUSD	???	1	4	30	SW	
04/27/10	Huerta Elementary	Y	SUSD	Cal Water	1	A	80	HD	
02/23/10	Huerta Elementary	Y	SUSD	Cal Water	2	K	46	SW	
01/14/10	John Muir Elementary	N	Lodi	City of Stockton	1	5	35	KC	
01/18/10	John Muir Elementary	N	Lodi	City of Stockton	1	5	45	KC	
02/16/10	John Muir Elementary	N	Lodi	City of Stockton	1	5	36	KC	
11/03/09	John Muir Elementary	N	Lodi	City of Stockton	2	1	45	SW	
11/05/09	John Muir Elementary	N	Lodi	City of Stockton	2	1	45	SW	
08/24/09	John Muir Elementary	N	Lodi	City of Stockton	1	2	25	SW	
09/22/09	John Muir Elementary	N	Lodi	City of Stockton	1	2	25	SW	
10/26/09	John Muir Elementary	N	Lodi	City of Stockton	1	2	25	SW	
10/27/09	John Muir Elementary	N	Lodi	City of Stockton	1	2	25	SW	
11/02/09	John Muir Elementary	N	Lodi	City of Stockton	1	5	35	SW	
02/22/10	John Muir Elementary	N	Lodi	City of Stockton	1	5	25	SW	
02/26/10	John Muir Elementary	N	Lodi	City of Stockton	2	K	88	SW	
06/29/10	JR Williams Elementary	Y	Lincoln	City of Stockton	1	2	14	SW	
01/29/10	Julia Morgan Elementary	Y	Lodi	City of Stockton	1	3	27	KC	
02/10/10	Julia Morgan Elementary	Y	Lodi	City of Stockton	1	3	25	KC	
04/12/10	Julia Morgan Elementary	Y	Lodi	City of Stockton	2	4	41	KC	
04/19/10	Julia Morgan Elementary	Y	Lodi	City of Stockton	1	4	40	KC	
03/08/10	Julia Morgan Elementary	Y	Lodi	City of Stockton	2	1	46	SW	

Date	School	T-1	District	Water Provider	# Clsrms	Grade	Students	Presenter	Remarks
03/09/10	Julia Morgan Elementary	Y	Lodi	City of Stockton	2	1	47	SW	
04/26/10	Julia Morgan Elementary	Y	Lodi	City of Stockton	2	2	47	SW	
04/27/10	Julia Morgan Elementary	Y	Lodi	City of Stockton	2	2	47	SW	
04/29/10	Julia Morgan Elementary	Y	Lodi	City of Stockton	1	2	23	SW	
01/28/10	Julia Morgan Elementary	Y	Lodi	City of Stockton	1	3	27	SW	
02/01/10	Julia Morgan Elementary	Y	Lodi	City of Stockton	1	3	24	SW	
02/02/10	Julia Morgan Elementary	Y	Lodi	City of Stockton	1	3	23	SW	
04/13/10	Julia Morgan Elementary	Y	Lodi	City of Stockton	1	4	32	SW	
12/01/09	Kennedy Elementary	Y	SUSD	City of Stockton	1	A	100	HD	
07/13/10	Kid's College (SJ Delta)	N	Private	All	1	O	12	KC	
12/08/09	King Elementary	Y	SUSD	City of Stockton	1	A	100	HD	
09/22/09	King Elementary	Y	SUSD	City of Stockton	1	2	24	KC	
10/23/09	King Elementary	Y	SUSD	City of Stockton	1	2	23	KC	
10/15/09	King Elementary	Y	SUSD	City of Stockton	2	2	45	SW	
10/19/09	King Elementary	Y	SUSD	City of Stockton	2	2	45	SW	
12/05/09	Kohl Open School	Y	SUSD	Cal Water	1	A	100	HD	
05/05/10	Komure Elementary	Y	MUSD	City of Stockton	1	E	225	HD	Farm Day
04/08/10	Komure Elementary	Y	MUSD	City of Stockton	1	4	40	KC	
09/01/09	Komure Elementary	Y	MUSD	City of Stockton	1	1	35	SW	
01/19/10	Komure Elementary	Y	MUSD	City of Stockton	1	1	33	SW	
05/27/10	KWIN/KAT Country Promo	N	All	All	1	E	600	SW	
06/21/10	Lakeside Christian	N	Private	City of Stockton	1	1	16	KC	
06/23/10	Lakeside Christian	N	Private	City of Stockton	1	3	22	KC	
06/24/10	Lakeside Christian	N	Private	City of Stockton	1	4	40	KC	

Date	School	T-1	District	Water Provider	# Clsrms	Grade	Students	Presenter	Remarks
06/22/10	Lakeside Christian	N	Private	City of Stockton	1	2	15	SW	
06/25/10	Lakeside Christian	N	Private	City of Stockton	1	5	35	SW	
04/14/10	Lincoln Elementary	Y	Lincoln	???	2	K	50	KC	
04/20/10	Lincoln Elementary	Y	Lincoln	???	2	K	45	SW	
02/24/10	Lincoln HS	N	SUSD	???	1	O	12	KC	"Window"
04/13/10	Lincoln USD	Y	Lincoln	???	1	O	40	SW	PTO
04/23/10	Mabel Barron Elementary	N	Lincoln	City of Stockton	1	2	25	KC	
06/17/10	Mabel Barron Elementary	N	Lincoln	City of Stockton	1	4	35	KC	
05/07/10	Mabel Barron Elementary	N	Lincoln	City of Stockton	1	E	150	KC/SW	
03/25/10	Mabel Barron Elementary	N	Lincoln	City of Stockton	1	1	28	SW	
05/11/10	Mabel Barron Elementary	N	Lincoln	City of Stockton	2	1	56	SW	
05/13/10	Mabel Barron Elementary	N	Lincoln	City of Stockton	1	1	32	SW	
04/30/10	Mabel Barron Elementary	N	Lincoln	City of Stockton	2	2	50	SW	
03/23/10	Mabel Barron Elementary	N	Lincoln	City of Stockton	2	3	56	SW	
12/15/09	Madison Elementary	Y	SUSD	Cal Water	1	A	100	HD	
05/03/10	Manlio Silva Elementary	Y	Lodi	City of Stockton	1	4	35	KC	
05/04/10	Manlio Silva Elementary	Y	Lodi	City of Stockton	1	4	35	KC	
04/02/10	Manlio Silva Elementary	Y	Lodi	City of Stockton	1	5	40	KC	
04/16/10	Manlio Silva Elementary	Y	Lodi	City of Stockton	1	5	40	KC	
04/08/10	Manlio Silva Elementary	Y	Lodi	City of Stockton	1	5	40	SW	
04/15/10	Manlio Silva Elementary	Y	Lodi	City of Stockton	1	5	32	SW	
08/28/09	Marshall Elementary	Y	SUSD	Cal Water	1	A	100	HD	
05/17/10	Marshall Elementary	Y	SUSD	Cal Water	2	1	42	SW	
11/20/09	McKinley Elementary	Y	SUSD	Cal Water	1	A	80	HD	

Date	School	T-1	District	Water Provider	# Clsrms	Grade	Students	Presenter	Remarks
10/27/09	Merryhill Brookside	N	Private	City of Stockton	1	3	30	SW	
12/11/09	Monroe Elementary	Y	SUSD	???	1	A	100	HD	
03/23/10	Montezuma Elementary	Y	SUSD	Cal Water	1	A	80	HD	
10/20/09	Nightingale Elementary	Y	SUSD	Cal Water	1	A	80	HD	
11/09/09	Oakwood Elementary	Y	Lodi	City of Stockton	2	1	44	SW	
11/12/09	Oakwood Elementary	Y	Lodi	City of Stockton	2	1	47	SW	
04/12/10	Oakwood Elementary	Y	Lodi	City of Stockton	1	2	22	SW	
04/19/10	Oakwood Elementary	Y	Lodi	City of Stockton	1	2	22	SW	
05/06/10	Oakwood Elementary	Y	Lodi	City of Stockton	2	2	46	SW	
05/06/10	Pittman Elementary	Y	SUSD	Cal Water	1	2	25	KC	
08/12/09	Pittman Elementary	Y	SUSD	Cal Water	2	3	40	KC	
11/20/09	Pittman Elementary	Y	SUSD	Cal Water	1	5	30	KC	
04/06/10	Pittman Elementary	Y	SUSD	Cal Water	1	A	80	KC	
11/17/09	Pittman Elementary	Y	SUSD	Cal Water	1	1	23	SW	
08/13/09	Pittman Elementary	Y	SUSD	Cal Water	2	3	40	SW	
08/14/09	Pittman Elementary	Y	SUSD	Cal Water	1	3	20	SW	
11/19/09	Pittman Elementary	Y	SUSD	Cal Water	1	5	34	SW	
04/28/10	Pittman Elementary	Y	SUSD	Cal Water	1	K	24	SW	
05/15/10	Pixie Woods Children's Day	N	All	All	1	E	1600	SW/HD	
09/14/09	Podesta Ranch Elementary	Y	Lodi	City of Stockton	1	2	23	KC	
04/01/10	Podesta Ranch Elementary	Y	Lodi	City of Stockton	1	4	40	KC	
09/28/09	Podesta Ranch Elementary	Y	Lodi	City of Stockton	2	1	44	SW	
09/11/09	Podesta Ranch Elementary	Y	Lodi	City of Stockton	1	2	25	SW	
09/18/09	Podesta Ranch Elementary	Y	Lodi	City of Stockton	1	3	25	SW	

Date	School	T-1	District	Water Provider	# Clsrms	Grade	Students	Presenter	Remarks
01/21/10	Podesta Ranch Elementary	Y	Lodi	City of Stockton	2	4	55	SW	
11/16/09	Podesta Ranch Elementary	Y	Lodi	City of Stockton	1	5	32	SW	
05/10/10	Port City Academy	Y	Aspire	Cal Water	2	1	44	KC	
05/10/10	Port City Academy	Y	Aspire	Cal Water	2	K	44	KC	
09/24/09	Port City Academy	Y	Aspire	Cal Water	2	2	50	SW	
11/30/09	Port City Academy	Y	Aspire	Cal Water	2	3	60	SW	
04/23/10	Pulliam Elementary	Y	SUSD	City of Stockton	1	A	80	HD	
05/11/10	Rio Calaveras Elementary	Y	SUSD	City of Stockton	1	A	80	HD	
09/22/09	Roosevelt Elementary	Y	SUSD	Cal Water	1	A	100	HD	
04/26/10	Roosevelt Elementary	Y	SUSD	Cal Water	1	3	25	KC	
03/02/10	Roosevelt Elementary	Y	SUSD	Cal Water	1	3	28	SW	
04/09/10	Roosevelt Elementary	Y	SUSD	Cal Water	1	3	30	SW	
04/23/10	Roosevelt Elementary	Y	SUSD	Cal Water	1	3	23	SW	
02/10/10	Rosa Parks Elementary	Y	Aspire	Cal Water	1	1	22	KC	
06/07/10	Rosa Parks Elementary	Y	Aspire	Cal Water	1	4	35	KC	
05/24/10	Rosa Parks Elementary	Y	Aspire	Cal Water	2	5	80	KC	
02/09/10	Rosa Parks Elementary	Y	Aspire	Cal Water	1	1	22	SW	
02/11/10	Rosa Parks Elementary	Y	Aspire	Cal Water	1	1	22	SW	
08/18/09	Rosa Parks Elementary	Y	Aspire	Cal Water	1	2	25	SW	
09/03/09	Rosa Parks Elementary	Y	Aspire	Cal Water	2	2	50	SW	
09/04/09	Rosa Parks Elementary	Y	Aspire	Cal Water	1	2	25	SW	
08/20/09	Rosa Parks Elementary	Y	Aspire	Cal Water	2	3	50	SW	
12/18/09	San Joaquin Elementary	Y	SUSD	Cal Water	1	A	100	HD	
09/14/09	San Joaquin Elementary	Y	SUSD	Cal Water	1	1	21	KC	

Date	School	T-1	District	Water Provider	# Clsrms	Grade	Students	Presenter	Remarks
09/18/09	San Joaquin Elementary	Y	SUSD	Cal Water	1	1	21	KC	
08/24/09	San Joaquin Elementary	Y	SUSD	Cal Water	1	1	25	SW	
09/21/09	San Joaquin Elementary	Y	SUSD	Cal Water	1	1	23	SW	
11/16/09	San Joaquin Elementary	Y	SUSD	Cal Water	1	1	26	SW	
03/15/10	Sierra Christian Elementary	N	Private	Cal Water	1	1	29	SW	
03/15/10	Sierra Christian Elementary	N	Private	Cal Water	1	3	21	SW	
03/16/10	Sierra Christian Elementary	N	Private	Cal Water	1	4	21	SW	
03/16/10	Sierra Christian Elementary	N	Private	Cal Water	1	5	19	SW	
09/01/09	SJ Delta College	N	All	All	1	O	45	KC	
10/06/09	SJ Delta College	N	All	All	1	O	41	KC	
01/26/10	SJ Delta College	N	All	All	1	O	40	KC	
04/06/10	SJ Delta College	N	All	All	1	O	40	KC	
04/13/10	Spanos Elementary	Y	SUSD	Cal Water	1	A	80	HD	
05/14/10	St. George Elementary	Y	SUSD	Cal Water	1	A	30	HD	
03/22/10	St. Luke's CES	N	Private	Cal Water	1	4	25	KC	
03/04/10	St. Luke's CES	N	Private	Cal Water	1	1	29	SW	
04/22/10	St. Luke's CES	N	Private	Cal Water	1	2	23	SW	
02/12/10	St. Luke's CES	N	Private	Cal Water	1	3	27	SW	
03/04/10	St. Luke's CES	N	Private	Cal Water	1	5	20	SW	
03/05/10	St. Luke's CES	N	Private	Cal Water	1	K	30	SW	
03/03/10	Stagg HS	Y	SUSD	Cal Water	3	O	90	KC	
04/18/10	Stockton Earth Day	N	All	All	1	E	1200	KC/SW	
08/18/09	Taft Elementary	Y	SUSD	Cal Water	1	A	100	HD	
05/04/10	Taylor Elementary	Y	SUSD	Cal Water	1	A	80	HD	

Date	School	T-1	District	Water Provider	# Clsrms	Grade	Students	Presenter	Remarks
09/15/09	Taylor Elementary	Y	SUSD	Cal Water	2	2	45	SW	
09/17/09	Taylor Elementary	Y	SUSD	Cal Water	2	2	45	SW	
03/11/10	Tully Knoles Elementary	Y	Lincoln	???	1	1	28	KC	
03/18/10	Tully Knoles Elementary	Y	Lincoln	???	2	1	60	KC	
05/21/10	Tully Knoles Elementary	Y	Lincoln	???	2	2	41	KC	
02/03/10	Tully Knoles Elementary	Y	Lincoln	???	1	3	27	KC	
05/20/10	Tully Knoles Elementary	Y	Lincoln	???	1	4	35	KC	
05/20/10	Tully Knoles Elementary	Y	Lincoln	???	2	2	41	SW	
02/04/10	Tully Knoles Elementary	Y	Lincoln	???	1	3	26	SW	
02/05/10	Tully Knoles Elementary	Y	Lincoln	???	1	3	26	SW	
05/18/10	Tully Knoles Elementary	Y	Lincoln	???	2	4	63	SW	
12/14/09	Tully Knoles Elementary	Y	Lincoln	???	1	5	35	SW	
12/15/09	Tully Knoles Elementary	Y	Lincoln	???	1	5	35	SW	
12/18/09	Tully Knoles Elementary	Y	Lincoln	???	1	5	35	SW	
02/19/10	Tully Knoles Elementary	Y	Lincoln	???	3	K	89	SW	
08/25/09	Tyler Elementary	Y	SUSD	???	1	A	100	HD	
08/31/09	Tyler Elementary	Y	SUSD	???	1	3	21	KC	
08/25/09	Tyler Elementary	Y	SUSD	???	1	3	25	SW	
09/08/09	Tyler Elementary	Y	SUSD	???	1	3	21	SW	
09/25/10	Valenzuela Elementary	Y	SUSD	City of Stockton	1	A	100	HD	
03/09/10	Van Buren Elementary	Y	SUSD	Cal Water	1	A	60	HD	
12/17/09	Venture Academy	N	Aspire	City of Stockton	1	4	35	KC	
12/04/09	Venture Academy	N	Aspire	City of Stockton	1	5	40	KC	
10/08/09	Venture Academy	N	Aspire	City of Stockton	1	O	35	KC	

Date	School	T-1	District	Water Provider	# Clsrms	Grade	Students	Presenter	Remarks
11/13/09	Victory Elementary	Y	SUSD	Cal Water	1	A	80	HD	
04/16/10	Wagner-Holt Elementary	Y	Lodi	City of Stockton	1	3	40	KC	
12/10/09	Wagner-Holt Elementary	Y	Lodi	City of Stockton	1	4	35	KC	
03/11/10	Wagner-Holt Elementary	Y	Lodi	City of Stockton	1	3	25	SW	
03/12/10	Wagner-Holt Elementary	Y	Lodi	City of Stockton	1	3	25	SW	
04/15/10	Wagner-Holt Elementary	Y	Lodi	City of Stockton	1	3	22	SW	
11/03/10	Washington Elementary	Y	SUSD	Cal Water	1	A	100	HD	
10/13/09	Wilson Elementary	Y	SUSD	Cal Water	1	A	80	HD	
Totals:					**335**		**18838**		

KEY

Grade	Description
K	Kindergarten
1 - 5	Grade Level
A	After School Program
E	Event
O	Other

Appendix L

City of Stockton Rate Structure

Municipal Utilities Department

Water

(209) 937-8750

2010/2011 FEE SCHEDULE

Account #	Pay Code	Effective Date	DESCRIPTION	Amount
Hydrant Meter Rental				
421-0000-379.99-00		7/1/2010	Installation - Field Charge	$50.00
421-0000-379.99-00		7/1/2010	Consumption Charge	$2.42
421-0000-379.99-00		7/1/2010	Monthly Rental	$81.40
Single Family Residential Monthly Service Charge				
421-0000-343.31-00		7/1/2010	5/8" Meter	$16.00
421-0000-343.31-00		7/1/2010	3/4" Meter	$18.80
421-0000-343.31-00		7/1/2010	1" Meter	$24.70
421-0000-343.31-00		7/1/2010	1.5" Meter	$35.65
421-0000-343.31-00		7/1/2010	2" Meter	$46.05
421-0000-343.31-00		7/1/2010	3" Meter	$81.40
421-0000-343.31-00		7/1/2010	4" Meter	$117.05
421-0000-343.31-00		7/1/2010	6" Meter	$192.85
421-0000-343.31-00		7/1/2010	8" Meter	$279.60
421-0000-343.31-00		7/1/2010	10" Meter	$348.90
421-0000-343.31-00		7/1/2010	12" Meter	$491.25
421-0000-343.31-00		7/1/2010	Consumption per CCF (1 unit = 1CCF)	$1.21
Multi-Family Residential Monthly Service Charge				
421-0000-343.32-00		7/1/2010	5/8" Meter	$16.00
421-0000-343.32-00		7/1/2010	3/4" Meter	$18.80
421-0000-343.32-00		7/1/2010	1" Meter	$24.70
421-0000-343.32-00		7/1/2010	1.5" Meter	$35.65
421-0000-343.32-00		7/1/2010	2" Meter	$46.05
421-0000-343.32-00		7/1/2010	3" Meter	$81.40
421-0000-343.32-00		7/1/2010	4" Meter	$117.05
421-0000-343.32-00		7/1/2010	6" Meter	$192.85
421-0000-343.32-00		7/1/2010	8" Meter	$279.60
421-0000-343.32-00		7/1/2010	10" Meter	$348.90
421-0000-343.32-00		7/1/2010	12" Meter	$491.25
421-0000-343.32-00		7/1/2010	Consumption per CCF (1 unit = 1 CCF)	$1.21
Commerical Monthly Service Charge				
421-0000-343.33-00		7/1/2010	5/8" Meter	$16.00
421-0000-343.33-00		7/1/2010	3/4" Meter	$18.80
421-0000-343.33-00		7/1/2010	1" Meter	$24.70
421-0000-343.33-00		7/1/2010	1.5" Meter	$35.65
421-0000-343.33-00		7/1/2010	2" Meter	$46.05
421-0000-343.33-00		7/1/2010	3" Meter	$81.40
421-0000-343.33-00		7/1/2010	4" Meter	$117.05
421-0000-343.33-00		7/1/2010	6" Meter	$192.85
421-0000-343.33-00		7/1/2010	8" Meter	$279.60
421-0000-343.33-00		7/1/2010	10" Meter	$348.90
421-0000-343.33-00		7/1/2010	12" Meter	$491.25
421-0000-343.33-00		7/1/2010	Consumption per CCF (1 unit = 1 CCF)	$1.21

Municipal Utilities Department

Water

(209) 937-8750

2010/2011 FEE SCHEDULE

Account #	Pay Code	Effective Date	DESCRIPTION	Amount
Industrial Monthly Service Charge				
		7/1/2010	5/8" Meter	$16.00
		7/1/2010	3/4" Meter	$18.80
		7/1/2010	1" Meter	$24.70
		7/1/2010	1.5" Meter	$35.65
		7/1/2010	2" Meter	$46.05
		7/1/2010	3" Meter	$81.40
		7/1/2010	4" Meter	$117.05
		7/1/2010	6" Meter	$192.85
		7/1/2010	8" Meter	$279.60
		7/1/2010	10" Meter	$348.90
		7/1/2010	12" Meter	$491.25
		7/1/2010	Consumption per CCF (1 unit = 1 CCF)	$1.21
Institutional Monthly Service Charge				
421-0000-343.36-00		7/1/2010	5/8" Meter	$16.00
421-0000-343.36-00		7/1/2010	3/4" Meter	$18.80
421-0000-343.36-00		7/1/2010	1" Meter	$24.70
421-0000-343.36-00		7/1/2010	1.5" Meter	$35.65
421-0000-343.36-00		7/1/2010	2" Meter	$46.05
421-0000-343.36-00		7/1/2010	3" Meter	$81.40
421-0000-343.36-00		7/1/2010	4" Meter	$117.05
421-0000-343.36-00		7/1/2010	6" Meter	$192.85
421-0000-343.36-00		7/1/2010	8" Meter	$279.60
421-0000-343.36-00		7/1/2010	10" Meter	$348.90
421-0000-343.36-00		7/1/2010	12" Meter	$491.25
421-0000-343.36-00		7/1/2010	Consumption per CCF (1 unit = 1 CCF)	$1.21
Landscape Irrigation Monthly Service Charge				
		7/1/2010	5/8" Meter	$16.00
		7/1/2010	3/4" Meter	$18.80
		7/1/2010	1" Meter	$24.70
		1/1/2011	1.5" Meter	$35.65
		7/1/2010	2" Meter	$46.05
		7/1/2010	3" Meter	$81.40
		7/1/2010	4" Meter	$117.05
		7/1/2010	6" Meter	$192.85
		7/1/2010	8" Meter	$279.60
		7/1/2010	10" Meter	$348.90
		7/1/2010	12" Meter	$491.25
		7/1/2010	Consumption per CCF (1 unit = 1 CCF)	$1.21
Temporary Service				
Varies by user		7/1/2010	Charges for Water Furnished through a Temporary Service connection (shall be at double the established rates for like permanent customers. For unmetered temporary service of three days or less duration, a minimum rate per day will apply).	$16.50

Municipal Utilities Department

Water

(209) 937-8750

2010/2011 FEE SCHEDULE

Account #	Pay Code	Effective Date	DESCRIPTION	Amount
Backflow Device Testing Charges				
Varies by user		7/1/2010	Double-check Valves (plus parts)	$69.50
Varies by user		7/1/2010	Double-check Valves 2" and Larger and Reduce Pressure Devices RPD (plus parts)	$69.50
Private Fire Hydrant Service				
Varies by user		7/1/2010	Hydrant	$5.75
Charges for Private Fire Protection Service				
Varies by user		7/1/2010	1.5" Connection	$8.00
Varies by user		7/1/2010	2" Connection	$10.75
Varies by user		7/1/2010	3" Connection	$16.00
Varies by user		7/1/2010	4" Connection	$21.25
Varies by user		7/1/2010	6" Connection	$32.00
Varies by user		7/1/2010	8" Connection	$40.50
Varies by user		7/1/2010	10" Connection	$53.00
Varies by user		7/1/2010	12" Connection	$63.50
Connection Charges				
424-0000-344.20-00		8/22/2010	Single Family	$1,906.00
424-0000-344.20-00		8/22/2010	First Meter	$1,954.00
424-0000-344.20-00		8/22/2010	Each Additional Unit(s)	$1,577.00
Non-Residential Connections				
424-0000-344.20-00		7/1/2010	5/8" and 3/4" Meter	$1,954.00
424-0000-344.20-00		7/1/2010	1" Meter	$3,681.00
424-0000-344.20-00		7/1/2010	1.5" Meter	$8,322.00
424-0000-344.20-00		7/1/2010	2" Meter	$11,765.00
424-0000-344.20-00		7/1/2010	3" Meter	$24,986.00
424-0000-344.20-00		7/1/2010	4" Meter	$41,605.00
424-0000-344.20-00		7/1/2010	6" Meter	$90,453.00
424-0000-344.20-00		7/1/2010	10" Meter (1)	See Formula
424-0000-344.20-00		7/1/2010	12" Meter (2)	See Formula
Delta Water Supply Project Surface Water Supply Fee				
		7/1/2010	3/4" Meter	$4,442.00
		7/1/2010	1" Meter	$7,418.00
		7/1/2010	1.5" Meter	$17,768.00
		7/1/2010	2" Meter	$23,676.00
		7/1/2010	3" Meter	$47,396.00
		7/1/2010	4" Meter	$74,048.00
		7/1/2010	6" Meter	$148,052.00
		7/1/2010	8" Meter	$236,892.00
		7/1/2010	10" Meter (5)	See Formula - DWSP Surface Water Fee
		7/1/2010	12" Meter (6)	See Formula - DWSP Surface Water Fee
Engineering Studies required under Senate Bill 221 and 610				
Varies by user		7/1/2010	Deposit	$12,500.00

Municipal Utilities Department

Water

(209) 937-8750

2010/2011 FEE SCHEDULE

Account #	Pay Code	Effective Date	DESCRIPTION	Amount

Division General Comments (Applicable to all fees)

An Administrative Fee of 3.5% will be added to the Sewer and Water Connection fee Amount

Division Endnotes

(1) Formula for 10" connection = [(Flowrate/30gpm x $1,954) + 61,907.00]

(2) Formula for 12" connection = [(Flowrate/30gpm x $1,954) + 86,049.00]

(5) DWSP Surface Water Fee Formula for 10" connection = [(Flow rate/30gpm x $4,442) + 61,907.00]

(6) DWSP Surface Water Fee Formula for 12" connection = [(Flow rate/30gpm x 4,442) + 86,049.00]

Municipal Utilities Department

Water Fees & Regulations

(209) 937-8460

2010/2011 FEE SCHEDULE

Account #	Pay Code	Effective Date	DESCRIPTION	Amount
421-0000-239.10		7/1/2010	Deposit (amount equal to 2.5 times the estimated average monthly bill, but not less than $125)	$125.00
421-0000-343.41		7/1/2010	Field Charge - Regular Dispatch	$50.00
421-0000-343.41		7/1/2010	Field Charge - Special Dispatch	$75.00
421-0000-343.41		7/1/2010	Damaged Lock or Device (each)	$25.00
421-0000-343.41		7/1/2010	Damage to City Property (full cost of repairs, but not less than $50)	$50.00
421-0000-343.41		7/1/2010	Meter Removal	$100.00
421-0000-343.41		7/1/2010	Removal of Unauthorized Connection	$75.00
421-0000-343.41		7/1/2010	Extension / Cancellation of Closing	$30.00
421-0000-343.41		7/1/2010	Same Day Service Fee	$50.00

Municipal Utilities Department

Water Fees & Regulations

2010/2011 PROPOSED FEE SCHEDULE

A. DEFINITIONS

APPLICANT A person applying for water service

CITY The City of Stockton, California, a municipal corporation

CITY COUNCIL The City Council of the City of Stockton, California

CROSS CONNECTION Any unprotected connection between any part of a water system used or intended to supply potable water and any source or system containing non-potable water or other substances not safe for human consumption

CUSTOMER A person receiving water or other utility service(s) from the City of Stockton

CUSTOMER LINE The pipe, valves and fittings leading from the meter outlet into the property served, which is installed, maintained and owned by the customer

FIRE SERVICE A connection used solely for the extinguishing of fires except as may be specifically authorized for public or other purposes by the water division

METER The water meter and its enclosure, valves and related appurtenances, which are and shall remain the exclusive property of the City of Stockton

PERSON Any natural person, firm, partnership, association or corporation acting either for themselves or as the clerk, employee or agent of another

SERVICE LINE OR SERVICE CONNECTION Pipe, valves and fittings laid from the main up to and including the water meter

TEMPORARY SERVICE Service of non-permanent nature or of limited duration

UNIFIED BILL A utility bill which contains charges for various utility services, such as water, storm water, solid waste and wastewater, provided to a specific service address

WATER DIVISION The Water Division of the Municipal Utilities Department of the City of Stockton

WATER MAIN The pipe owned and maintained by the City, usually four (4) inches in diameter or larger, laid in a street, road, right-of-way or easement capable of serving two or more customers

WATER MAIN EXTENSION A water main connected to an existing water main

WATER SUPERINTENDENT The superintendent of the Water Division of the Municipal Utilities Department of the City of Stockton

B. APPLICATION FOR SERVICE

APPLICATION AND DEPOSIT Each person desiring a water supply from the City Water System must make application on a form provided by the City or its authorized agent and provide such information or documents as may be required by the City to approve the application. A deposit, as established in the City's annual fee schedule, may be required of an applicant for water service based on the creditworthiness of the applicant. Water service is provided on the next regular business day.

CUSTOMER AGREES TO BE BOUND Every customer shall be deemed to have expressed consent to be bound to the terms and provisions of the regulations then in effect and as may be amended at a later date. Whenever any regulation is violated, the City reserves the right to terminate the water service without notice. The customer whose water is thus terminated shall forfeit all payments made and the water shall not be restored until all unpaid delinquent charges billed on the unified bill and any fees, charges and/or deposits associated with the violation and service termination are paid in full and all other requirements of these regulations are met.

UNPAID BILL Water service shall not be granted to an applicant or customer if that person has unpaid delinquent bills (or charges) for City utility services.

FAILURE TO APPLY OR TO COMPLETE APPLICATION PROCESS Water service shall not be granted to any person who fails to apply for service or who does not complete the application process. The City reserves the right to terminate the water service without notice when it is determined that an application for service has not been approved for the customer(s) at that service address.

FRAUD - REFUSAL OF SERVICE The City shall have the right to refuse water service to any person(s) or premises at any time or to discontinue service without notice if found necessary to do so in order to protect itself against fraud or abuse.

SERVICE TERMINATION FOR NON-PAYMENT, DAMAGE TO CITY PROPERTY OR UNAUTHORIZED WATER SERVICE If water service is terminated because of unpaid delinquent charges billed on a unified bill, dishonored payments, acquisition (or provision) of unauthorized water service or damage to City property, water service shall not be restored to the service address or to the customer(s) at another address until all unpaid delinquent charges billed on the unified bill and any fees, charges and/or deposits associated with the violation and service termination are paid in full and all other requirements of these regulations are met. Water restoral will be made on the next business day following receipt of payment in full and confirmation that all other requirements have been met.

FIELD CHARGE A fee, as established in the annual fee schedule, shall be charged when City personnel are dispatched to terminate water service because of non-payment of delinquent utility charges billed on a unified bill or when City personnel are dispatched to the service location due to dishonored payments, acquisition (or provision) of unauthorized water service or damage to City equipment or property. This fee will be added to the water service customer's account. Failure to pay this fee shall be considered the same as failure to pay for water or water service. In addition to the field charge, the City may require a customer to pay a deposit, as established in the annual fee schedule, before service is restored.

Municipal Utilities Department

Water Fees & Regulations

2010/2011 PROPOSED FEE SCHEDULE

C. METER READING, BILLING AND COLLECTION

COMBINING OF METER READINGS Each meter on a customer's premise will be considered and billed separately. The readings of two or more meters will not be combined.

METER READING FREQUENCY Meters will normally be read at monthly intervals for the preparation of regular bills, and as may be required for the preparation of opening bills, closing bills and special bills.

NON-REGISTERING AND UNREADABLE METERS Bills for service will be based on an estimate if a meter fails to register the volume of water consumed or cannot be read. In estimating consumption due consideration will be given to fluctuations in usage caused by seasonal changes or known service interruptions.

FAILURE TO RECEIVE BILL It shall be the water service customer's responsibility to provide the City or its authorized agent the correct address to which bills are to be mailed. Failure to receive a bill shall not relieve the water service customer of responsibility for on-time payment.

DEPOSIT ON ACTIVE ACCOUNTS A deposit as established in the annual fee schedule may be required if all charges billed on a unified bill are not paid by the due date. This deposit will be added to the water service customer's account. Failure to pay the deposit shall be considered the same as failure to pay for water or water service.

DAMAGE TO CITY PROPERTY A fee, as established in the annual fee schedule, shall be charged to the water service customer's account for each lock or device attached to the City's water meter that is removed or broken by anyone other than authorized City personnel. Other damages to the City water meter or associated equipment will result in additional charges being levied to recover the full cost of repairs with a minimum charge for damages as established in the annual fee schedule. These fees are in addition to field charges and deposits and will be added to the water service customer's account. Failure to pay this fee shall be considered the same as failure to pay for water or water service.

METER REMOVAL A fee, as established in the annual fee schedule, shall be charged if a water meter is removed because of: (1) non-payment of delinquent utility charges billed on a unified bill, (2) damage to or tampering with the City water meter or associated equipment, or (3) acquisition or provision of unauthorized water service. This fee will be added to the water service customer's account. Failure to pay this fee shall be considered the same as failure to pay for water or water service.

EXTENSION OF ACCOUNT CLOSING DATE/SAME-DAY SERVICE FEE A fee, as established in the annual fee schedule, shall be charged if a customer does not cancel their request to close an account (terminate service) at least one business day prior to the scheduled account closing date or if the customer does not meet all requirements for approval of their application for service at least one business day before water service is requested. Same day service fee shall be charged when service is provided sooner than the next business day after approval of customer's application. This fee will be added to the water service customer's account. Failure to pay this fee shall be considered the same as failure to pay for water or water service.

Refer to Resolution No. 02-0331 Sections E, F, G, H, and I for guidelines to water rates and regulations.
Fees adjusted annually in accordance with Resolution No. 03-0362

Appendix M

AB 1420 Documentation

STATE OF CALIFORNIA – CALIFORNIA NATURAL RESOURCES AGENCY

ARNOLD SCHWARZENEGGER, *Governor*

DEPARTMENT OF WATER RESOURCES
1416 NINTH STREET, P.O. BOX 942836
SACRAMENTO, CA 94236-0001
(916) 653-5791

August, 5th 2010

Melissa Price
Program Manager III
City of Stockton
11373 N. Lower Sacramento Road
Lodi, CA 95242

Dear Ms. Price,

The Department of Water Resources (DWR) has reviewed the City of Stockton's Self-Certification Statement Table 1 submitted on August 4, 2010 regarding implementation of the Urban Best Management Practices (BMPs).

The purpose of DWR's review is to determine eligibility of the City of Stockton to receive water management grant or loan funds. DWR has followed the *Compliance with AB 1420 Requirements* dated June 1, 2009. For detailed information, please visit http://www.water.ca.gov/wateruseefficiency/finance/.

Based on DWR's review of the information in Table 1, the City of Stockton has and is currently implementing the BMPs consistent with AB 1420 through GPCD and, therefore, is eligible to receive water management grant or loan funds.

DWR reserves the right to request additional information and documentation, including reports from the City of Stockton to substantiate the accuracy of the information provided in Table 1. DWR may reverse or modify its eligibility determination and notify you and the funding agency if inaccuracies are found in the supporting documentation or in Table 1.

If you have any questions, please contact me at (916) 651-7025 or Jodi Evans at (916) 651-7026.

Sincerely,

Fethi BenJemaa
Ag Water Use Efficiency Section Chief

CITY OF STOCKTON

DEPARTMENT OF MUNICIPAL UTILITIES
2500 Navy Drive • Stockton, CA 95206-1191 • 209/937-8750 • Fax 209/937-8708
www.stocktongov.com

August 4, 2010

Jodi Evans
California Department of Water Resources
Office of Water Use Efficiency
901 P Street, Room 313A
Sacramento, CA 95814

CITY OF STOCKTON AB 1420 SELF-CERTIFICATION

Attached for your review please find the City of Stockton's AB 1420 Self-Certification Statement and supporting documentation.

Based on your e-mail of August 3, 2010, it is our understanding your office will expedite the processing of our compliance letter to ensure it is received for inclusion in our Proposition 84 Grant Application due August 13, 2010.

Once available, please forward the requested compliance letter to:

Melissa Price, Program Manager III
City of Stockton – Municipal Utilities Department
11373 N. Lower Sacramento Road
Lodi, CA 95242

Should you have any questions or require additional information, please contact Ms. Price at (209) 937-8782.

MARK J. MADISON
DIRECTOR OF MUNICIPAL UTILITIES

Attachments

MJM:MP:mp

Stockton
All-America City
2004
1999

AB 1420 Self- Certification Statement Table 1

Note: Table 1 documents Status of Past and Current BMP implementation.

Self-Certification Statement: The Urban Water Supplier and its authorized representative certifies, under penalty of perjury, that all information and claims, stated in this table, regarding compliance and implementation of the BMPs, including alternative conservation approaches, are true and accurate. This signed AB 1420 Self-Certification Statement Table 1, and Table 2 are the basis for granting funds by the Funding Agency. Falsification and/or inaccuracies in AB 1420 Self Certification Statement Table 1, and Table 2 and in any supporting documents substantiating such claims may, at the discretion of the funding agency, result in loss of all State funds to the applicant. Additionally, the Funding Agency, in its sole discretion, may halt disbursement of grant or loan funds, not pay pending invoices, and/or pursue any other applicable legal remedy and refer the matter to the Attorney General's Office.

Name of Signatory: City of Stockton Municipal Utilities Department **Title of Signatory:** Director of Municipal Utilities **Signature of Signatory** [signature] **Date** 8-4-10

Application Date: August 12, 2010

Proposal Identification Number: N/A **CUWCC Member? Yes/No** Yes

Has Urban Water Supplier submitted a 2005 Urban Water Management Plan? Yes/No Yes **Is the UWM Plan Deemed Complete by DWR? Yes/No** Yes

Applicant Name: CITY OF STOCKTON - MUNICIPAL UTILITIES DEPARTMENT

Project Title: Proposition 84 Group 1 - Delta Region Projects Grant Application for the Delta Water Supply Project Intake and Pump Station Facility

Applicant's Contact Information: **Name:** Melissa Price, Program Manager III **Phone:** (209) 937-8782 **E-mail:** Melissa.Price@ci.stockton.ca.us

Participants:

Retailer (List Below)	*Wholesaler (List Below)*
City of Stockton	

C1	C2	C3	C4	C5	*C6	C7	**C8	**C9	**C10	C11	C12	C13	C14	C15	C16	C17	C18
				BMP Implemented by Retailers and/or Wholesalers / *BMP*			Compliance Options/Alternative Conservation Approaches (1)			BMP Is Exempt (2)			BMP Implementation Requirements Met				
BMPs required for Wholesale Supplier	BMPs required for Retail Supplier	BMPs	Retailer *Yes/No*	Wholesaler *Yes/No*	Regional *Yes/No*	BMP Checklist	Flex Track	Gallons Per Capita Per Day GPCD	Not Cost Effective	Lack of Funding	Lack of Legal Authority	CUWCC MOU Requirement Met: Retailer *Yes/No*	CUWCC MOU Requirement Met: Wholesaler *Yes/No*	Date of BMP Report Submitted to CUWCC for (2007-2008) (MOU Signatories)	Date BMP Implementation Data Submitted to DWR in CUWCC Format (Non MOU Signatories) (3)	All Supporting Documents have been Submitted Yes/No***
	✓	BMP 1 Water Survey for Single/Multi-Family Residential Customers	Yes	N/A	N/A	N/A	N/A	✓	N/A	N/A	N/A	N/A	N/A	N/A	N/A	Yes - See Attached
	✓	BMP 2 Residential Plumbing Retrofit	Yes	N/A	N/A	N/A	N/A	✓	N/A	N/A	N/A	N/A	N/A	N/A	N/A	Yes - See Attached
✓	✓	BMP 3 System Water Audits, Leak Detection	Yes	N/A	N/A	N/A	N/A	✓	N/A	N/A	N/A	N/A	N/A	N/A	N/A	Yes - See Attached
✓	✓	BMP 3 Leak Repairs	Yes	N/A	N/A	N/A	N/A	✓	N/A	N/A	N/A	N/A	N/A	N/A	N/A	Attached
	✓	BMP 4 Metering with Commodity Rates for All New connections	Yes	N/A	N/A	N/A	N/A	✓	N/A	N/A	N/A	N/A	N/A	N/A	N/A	Yes - See Attached
	✓	BMP 4 Retrofit of Existing Connections	Yes	N/A	N/A	N/A	N/A	✓	N/A	N/A	N/A	N/A	N/A	N/A	N/A	Yes - See Attached

C1	C2	C3	C4	C5	*C6	C7	**C8	**C9	**C10	C11	C12	C13	C14	C15	C16	C17	C18
				BMP Implemented by Retailers and/or Wholesalers / *BMP*			Compliance Options/Alternative Conservation Approaches (1)			BMP Is Exempt (2)			BMP Implementation Requirements Met				
BMPs required for Wholesale Supplier	BMPs required for Retail Supplier	BMPs	Retailer *Yes/No*	Wholesaler *Yes/No*	Regional *Yes/No*	BMP Checklist	Flex Track	Gallons Per Capita Per Day GPCD	Not Cost Effective	Lack of Funding	Lack of Legal Authority	CUWCC MOU Requirement Met: Retailer *Yes/No*	CUWCC MOU Requirement Met: Wholesaler *Yes/No*	Date of BMP Report Submitted to CUWCC for (2007-2008) (MOU Signatories)	Date BMP Implementation Data Submitted to DWR in CUWCC Format (Non MOU Signatories) (3)	All Supporting Documents have been Submitted Yes/No***
	✓	BMP 5 Large Landscape Conservation Programs and Incentives	Yes	N/A	N/A	N/A	N/A	✓	N/A	N/A	N/A	N/A	N/A	N/A	N/A	Yes - See Attached
	✓	BMP 6 High-Efficiency Washing Machine Rebate Programs	Yes	N/A	N/A	N/A	N/A	✓	N/A	N/A	N/A	N/A	N/A	N/A	N/A	Yes - See Attached
✓	✓	BMP 7 Public Information	Yes	N/A	N/A	N/A	N/A	✓	N/A	N/A	N/A	N/A	N/A	N/A	N/A	Yes - See Attached
✓	✓	BMP 8 School Education	Yes	N/A	N/A	N/A	N/A	✓	N/A	N/A	N/A	N/A	N/A	N/A	N/A	Yes - See Attached
	✓	BMP 9 Conservation programs for Commercial, Industrial, and Institutional (CII) Accounts	Yes	N/A	N/A	N/A	N/A	✓	N/A	N/A	N/A	N/A	N/A	N/A	N/A	Yes - See Attached
✓		BMP 10 Wholesale Agency Assistance Programs	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	Yes - See Attached
	✓	BMP 11 Conservation Pricing	Yes	N/A	N/A	N/A	N/A	✓	N/A	N/A	N/A	N/A	N/A	N/A	N/A	Yes - See Attached
✓	✓	BMP 12 Conservation Coordinator	Yes	N/A	N/A	N/A	N/A	✓	N/A	N/A	N/A	N/A	N/A	N/A	N/A	Yes - See Attached
	✓	BMP 13 Water Waste Prohibitions	Yes	N/A	N/A	N/A	N/A	✓	N/A	N/A	N/A	N/A	N/A	N/A	N/A	Yes - See Attached
	✓	BMP 14 Residential ULFT Replacement Programs	Yes	N/A	N/A	N/A	N/A	✓	N/A	N/A	N/A	N/A	N/A	N/A	N/A	Yes - See Attached

***C6:** Wholesaler may also be a retailer (supplying water to end water users)

****C8, **C9, **, and C10:** Agencies choosing an alternative conservation approach are responsible for achieving water savings equal or greater than that which they would have achieved using only BMP list.

(1) For details, please see: http://www.cuwcc.org/mou/exhibit-1-bmp-definitions-schedules-requirements.aspx.

(2) BMP is exempt based on cost-effectiveness, lack of funding, and lack of legal authority criteria as detailed in the CUWCC MOU

(3) Non MOU signatories must submit to DWR reports and supporting documents in the same format as CUWCC.

*****See Attached Labeled: City of Stockton Municipal Utilities Department AB 1420 Certification GPCD Compliance Option**

City of Stockton
Municipal Utilities Department
AB 1420 Certification
GPCD Compliance Option

Calculation of GPCD:

Year	Total COS MUD Service Area Population [1]	Gross Water Use (AF) [2]	GPCD = Gallons Per Capita Daily	Baseline GPCD = Avg GPCD (1997 - 2006)
1997	108,079	25,516	211	
1998	112,093	22,690	181	
1999	116,674	25,284	193	
2000	121,969	26,516	194	
2001	128,347	28,712	200	
2002	134,342	30,024	200	
2003	144,236	32,336	200	
2004	155,564	34,559	198	
2005	165,690	34,149	184	
2006	168,078	34,039	181	**194**
2007	167,013	38,139	204	
2008	167,051	37,398	200	
2009	168,344	34,645	184	

[1] City of Stockton MUD Service Area overlay with 2000 Census Blocks with prior and subsequent years adjusted based on percentage change in single and multi-family connections (2000 Census assumes 3.8 people per household)
[2] Total volume of water entering distribution system per DWR Public Water System Statistics Report less recycled water, water placed into long-term storage, water conveyed by use to another urban water supplier and water delivered for agriculture use

Compliance Table:
Current GPCD (2009): 184

Year	Compliance Report	Target (% Baseline)	Target (GPCD) for Compliance
2010	1	96.4%	187
2012	2	92.8%	180
2014	3	89.2%	173
2016	4	85.6%	166
2018	**5**	**82.0%**	**159**

Appendix N

Mandatory Water Use Reduction Ordinance

Chapter 13.28 WATER CONSERVATION

13.28.010 Definitions.

Unless the context requires otherwise, the following definitions shall be used in the interpretation and construction of this chapter. Words used in the present tense include the future; the singular number includes the plural and the plural the singular.

"Alternate water source" means water from sloughs, canals, streams, rivers or nonpotable wells which is acquired with permission from the responsible owner or agency with jurisdiction.

"Director" means the Director of Municipal Utilities of the City.

"Person" means any individual, firm, organization, partnership, association, trust, company, business, corporation, public entity, political entity, or any agent thereof.

"Reclaimed" and "reclaimed water" refer to the process of reusing the soap/water solution and to that portion of the soap/water solution which is recaptured, processed, and reused at a non-self service commercial car wash facility.

"Recycled water" means water from the City of Stockton Regional Wastewater Control Facility supplied from designated hydrants under permit from the State Regional Water Quality Control Board.

"Waste" means any inefficient or unreasonable use of or unreasonable method of use of water.

"Water" means any water used in the City. (Prior code § 9-710)

13.28.020 Application of regulations.

The provisions of this chapter shall apply to all persons using water in the City regardless of whether any person using water shall have a contract for water service with the City. Notwithstanding other provisions of this code inconsistent with the chapter, the provisions of this chapter shall supersede and prevail until termination of this chapter, except during a declared water shortage emergency, Stage 2, 3, 4 or 5, in which event the provisions of Chapter 13.32 shall prevail. (Prior code § 9-711)

13.28.030 Regulations.

It is unlawful during the period May 1st to November 1st of each year for any person to use, permit or allow the use of water in any of the following manners:

A. Any use of potable water from any fire hydrant is prohibited except by regularly constituted fire protection agencies for fire suppression purposes or by the responsible water agency, when alternate water sources or reclaimed water sources are available. In the absence of alternate water sources or recycled water sources, potable water from any fire hydrant may be used provided a permit for such use is approved by the Fire Department and the responsible water agency.

B. For exterior irrigation except as follows:

1. These provisions shall apply to all exterior irrigation including but not limited to public, private and commercial locations.

2. Irrigation shall be prohibited between the hours of 11:00 a.m. to 6:00 p.m.

3. To conduct exterior irrigation in such a manner or extent that allows water to run off or escape from the premises or to be wasted.

4. Exceptions to the above regulations:

a. Drip and/or mist irrigation systems.

b. During the initial 21-day period of establishment for new plantings the above regulations shall not apply.

c. Other uses which cannot reasonably comply with the above regulations due to the large size, normal hours of use or type of use of the area to be irrigated may be excepted upon approval by the Director of a water conservation plan which meets the goals of reduction and conservation.

C. To allow the escape of water through leaks, breaks, or malfunction within the water user's plumbing or distribution system for any period of time within which such break or leak should reasonably have been discovered and corrected. It shall be presumed that a period of 24 hours after the water user discovers such break, leak, or malfunction, or receives notice from the City, any water provider or enforcement authority of such condition, whichever occurs first, is a reasonable time within which to correct such condition or to make arrangements for correction.

D. The use of water for washing cars or boats is permitted only with the use of a quick-acting positive shut-off nozzle on the hose.

E. The operation of any non-self service commercial car wash unless the soap/water solution for such use is reclaimed. If a reclaimed water system cannot be installed, the car wash operator shall submit a plan satisfactory to the Director to modify operation of the facility to reduce its usage of water by at least 20 percent of its usage during the same month of the prior year for comparable business volume. If there is no history of prior use, the operator shall provide to the Director data comparable to such history to establish its base monthly usage.

F. Restaurants shall serve water to customers only upon request.

G. Use of water for cleaning building or mobile home exteriors shall be prohibited except as follows:

1. With the use of a bucket and sponge; or

2. For the preparation of such exterior surfaces for the purpose of repair or repainting with the use of a pressurized washing device equipped with a quick acting positive shut off.

H. Use of water in publicly displayed ornamental fountains in public and commercial establishments shall be prohibited unless the water is recirculated.

I. Use of water to wash driveways, sidewalks, patios, parking lots, aprons and other similar exterior surfaces is prohibited except with the use of pressurized sidewalk cleaning equipment or for sanitation, public health and safety and fire protection purposes.

J. The draining and/or refilling of all existing swimming pools, whether public, private or commercial, shall be prohibited between June 1st and October 1st except for protection of public health and safety.

K. Use of potable water for dust control purposes except for public health or safety purposes. Reclaimed, recycled or other nonpotable water may be used for such purposes so long as such water is not wasted.

L. The indiscriminate running of water or washing with water not otherwise prohibited above which is wasteful and without reasonable purpose.

M. Exception. The above regulations shall not apply to users or uses when the source of water is other than:

1. A public water system as defined in California Code of Regulations, Section 64555(a) (23); or
2. A groundwater aquifer used by a public water system. (Prior code § 9-712)

13.28.040 Regulations.

During the period of November 1st through April 30th, it is unlawful for any person to use, permit to allow the use of water as set out in Section 13.28.030 except that no restriction as to the hours of irrigation shall be imposed. (Prior code § 9-712.1)

13.28.050 Water rates and surcharges.

A. Whenever the City becomes aware of a person violating, causing or permitting a violation of the provisions of this chapter, a written notice stating the nature of the violation shall be delivered to the person at the premises by personal service or by first class mail and by posting in a conspicuous location at said premises. A copy of the notice shall be mailed to the person who is regularly billed for use of water at said premises.

B. All notices provided for by this section may be served as an addendum to the regular water service bill. All such notices may be given to any other person known to the City who is responsible for the violation or the correction thereof.

C. The notice shall describe the nature of the violation and order that said violation be corrected, cured or abated immediately or within such specified period as the City believes is reasonable under the circumstances.

D. Upon occurrence of a second violation or failure to immediately correct, cure or abate a violation, a second notice shall be served, as provided above, ordering the immediate correction, cure or abatement of the violation and imposing a surcharge of $100.00 per day for each day the violation continues. The surcharge may be added to the next regular billing for water service. (Prior code § 9-713)

13.28.060 Discontinuance of service.

Upon a determination by the Director that a person has consumed water in violation of any of the provisions of this chapter, the Director may issue an order to cease and desist from such violation, and further order such person to comply forthwith with such provisions or otherwise to take appropriate remedial or preventive action. If, after the issuance of a cease and desist order, such person continues to consume or use, or again consumes or uses water in violation of any such provisions, the Director may, subject to the provisions for notification and hearing hereafter set forth, discontinue water service to the premises of such person. (Prior code § 9-714)

13.28.070 Procedure for discontinuance of service.

Prior to the discontinuance of water service to any premises, the Director shall give written notice of intention to discontinue such service, and of hearing to be held by the Director upon the question of termination, not less than 10 days prior to such hearing. A person determined to be in violation of the provisions of this chapter, the owner of the premises (if not such person), and such other persons as the Director may deem appropriate, shall be heard at the hearing on the question of termination. If, upon completion of the hearing, the Director finds that no violation has occurred, the Director shall order that the service shall not be terminated. If, upon completion of the hearing, the Director determines that such violation has occurred, or is occurring, the Director may order the water service to be terminated, or may order that service be terminated within a specified period of time unless such violation or the conditions or activities causing such violations cease forthwith or

within a specified period of time, or the Director may make such other order as deemed appropriate under the circumstances and in furtherance of the purposes and intent of this chapter. (Prior code § 9-714.1)

13.28.080 Appeal.

Any person aggrieved by a determination, order, or directive of the Director made pursuant to the provisions of Sections 13.28.060 and 13.28.070 may appeal such determination, order, or directive to the City Manager. Written notification of such appeal shall be filed with the City Clerk within 10 days after notification of the determination, order, or directive of the Director, and shall set forth in detail the facts and reasons supporting the appeal. Hearing on the appeal shall be held by the City Manager or the designee within 10 days from the date of filing the notice of appeal. The appellant, the Director, and such other persons as the City Manager or the City Manager's designee may deem appropriate, shall be heard at the hearing on appeal. Upon conclusion of hearing the appeal, the City Manager or the designee may affirm, reverse or modify the determination, order or directive of the Director as deemed just and equitable, and in furtherance of the provisions, purposes, and intent of this chapter. During the pendency of any such appeal, the determination, order or directive of the Director shall remain in full force and effect. The City Manager's or the designee's action on the appeal shall be final. (Prior code § 9-715)

13.28.090 Violation an infraction.

Any person violating any of the provisions of this chapter shall be deemed guilty of an infraction. Each day such violation is committed or permitted to continue shall constitute a separate offense and shall be punishable as such. Said violation shall be in addition to the surcharges and disconnection procedure established hereinabove. (Prior code § 9-716)

13.28.100 Powers and duties of the Director.

The Director of Municipal Utilities is hereby authorized to and may enforce all the provisions of this chapter. For such purposes, the Director shall have the powers and discretion of a law enforcement officer. The Director, and duly delegated representatives, pursuant to the provisions of Section 836.5 of the Penal Code of the State of California, are hereby authorized to arrest a person without a warrant whenever there exists reasonable cause to believe the person has in his or her presence violated any provision of this chapter which is an infraction. Upon making such arrest, the Director or the delegated representative shall prepare a citation and release the person arrested pursuant to Section 853.6 of the Penal Code of the State of California. The provisions of Sections 836.5 and 853.6 of the Penal Code are hereby adopted by reference as part of this section. (Prior code § 9-717)

13.28.110 Remedies cumulative.

The remedies and penalties provided for in this chapter shall be cumulative and shall be in addition to any or all other remedies available to the City. (Prior code § 9-719)

Chapter 13.32 WATER SHORTAGE EMERGENCIES

13.32.010 Purpose and scope.

This chapter adopts regulations to deal with water shortage emergency conditions which exist within the City and the City's water service areas, as declared by resolution of this City Council. These regulations shall become effective with the effective date of the ordinance codified in this chapter. A water shortage emergency declaration shall be in effect upon proper findings made by the City Council after a public hearing and shall remain in effect until the City Council finds and declares by resolution that the water shortage emergency condition has abated, has changed in degree or no longer exists. (Prior code § 9-730)

13.32.020 Findings.

The City Council finds, determines, and declares that the following shall occur prior to enforcement of the provisions of this chapter:

A. The City Council shall conduct duly noticed public hearings for the purpose of determining whether a water shortage emergency condition exists and, if so, the degree of the emergency and what regulations and restrictions should be enforced in response to the shortage.

B. The City Council shall adopt a resolution which declares that a water shortage emergency condition exists, the facts and conclusions which support such a declaration and that the ordinary water demands and requirements of water consumers within the City cannot be satisfied.

C. The regulations set forth herein are necessary and proper to protect and conserve the water supply for human consumption, sanitation, and fire protection during the duration of the water shortage emergency condition.

D. The regulations set forth herein shall remain enforceable to the extent declared by the City Council and until such time as the City Council finds that the water shortage emergency no longer exists.

E. During the existence of a declared water shortage emergency, the provisions of this chapter shall take precedence over the provisions of the City's Water Conservation Ordinance, Stockton Municipal Code Chapter 13.28, as now enacted or hereafter amended. The provisions of the Water Conservation Ordinance shall continue in effect except where provisions of this chapter are different. Within areas of the City where water service is provided by any other water provider, the provisions of this chapter as to prohibited uses and waste shall be applicable. The Water Conservation Ordinance shall remain in effect except where more stringent requirements are set out herein. (Prior code § 9-731)

13.32.030 Definitions.

The following terms are defined for the purposes of this chapter:

"Allocation" means the calculated percentage of the amount of water delivered to each customer's property during the corresponding monthly billing period of the base year for which no penalty or surplus use charge shall be imposed.

"Applicant" means a person, firm, partnership, business, corporation, district or governmental agency that requests or receives water service from the City.

"Base year" means the calendar year of 1987 or any other period established by resolution of the City Council.

"Customer" means any person, firm, partnership, business, corporation, district, or governmental agency that receives water from the City ("City") Water Utility.

"Director" means the Director of the Municipal Utilities Department of the City.

"Process water" means water used to manufacture, alter, convert, clean, grow, heat or cool a product, including water used in laundries and car wash facilities.

"Water" means water used in or supplied by the City. (Prior code § 9-732)

13.32.040 Additional limits on water use available to all water users.

During Stage 2, 3, 4 and 5 emergencies, the following wasteful uses shall be prohibited in addition to the prohibitions and limitations stated in the Water Conservation Ordinance, Stockton Municipal Code Chapter 13.28. During said stages Section 13.28.040 and Sections 13.28.030(A) and (B)(3) and (4) shall not be applicable. In the event the provisions of the section are inconsistent with the Water Conservation Ordinance, this section shall prevail.

A. Any use of potable water from any fire hydrant is prohibited, except by regularly constituted fire protection agencies for fire suppression purposes or by the responsible water agency, when alternate water sources or recycled water sources are available. In the absence of alternate water sources or reclaimed water sources, use of potable water from a hydrant may be used provided a permit for such use is approved by the Fire Department and the responsible water agency.

B. Use of potable water for dust control purposes except for public health or safety purposes. Reclaimed, recycled or other nonpotable water may be used for such purposes so long as such water is not wasted.

C. Irrigation of exterior landscaping, turf areas, open ground, crops, trees, grass, lawn, groundcover, shrubbery, or decorative plantings between the hours of 11:00 a.m. and 6:00 p.m. except irrigation by drip or mist irrigation systems shall not be restricted as to hours.

D. Irrigation of exterior landscaping, turf areas, open ground, crops, trees, grass, lawn, groundcover, shrubbery, or decorative plantings in such a manner or extent that allows water to run off or escape from the premises or to be wasted.

E. Violation of the above stated provisions shall be unlawful and an infraction. (Prior code § 9-733)

13.32.050 Water allocations—City water utility.

A. The following classes of water use are established:

1. "Residential" which shall consist of water service to land improved with structures designed to serve as a residence for human habitation.

2. "Multiple-family residential" which shall consist of water service to land improved with structures designed to serve as a residence for more than a single family, including apartments, condominiums, townhouses, mobilehome parks, and the like where more than one unit is served by a single meter.

3. "Nonresidential" which shall consist of water service to land improved with structures designed to serve for uses other than residential uses and land without structures but used for agricultural purposes. The following kinds of water use are, without limitation, designated as nonresidential: commercial, industrial, agricultural, municipal, schools, and churches.

4. "Process water users" which shall consist of nonresidential users which utilize water primarily to manufacture, alter, convert, clean, grow, heat, or cool a product, including laundries and vehicle wash facilities.

B. No customer shall use City water for permitted uses in excess of the respective allocation for each class of service within each stage of water shortage emergency. (Prior code § 9-734)

13.32.060 Stages of water shortage emergency.

The following stages of water shortage emergency are established. Upon declaration of the City Council that an emergency condition exists, as provided in Sections 13.32.010 and 13.32.020, the City Council shall declare the degree of emergency and identify the applicable stage and the regulations which shall be enforceable for each respective stage. During Stages 2, 3, 4 and 5 additional restrictions on water use shall be enforceable as stated in Section 13.32.040.

A. Stage 1—Mandatory Water Conservation. Upon a finding made by the City Council that a Stage 1 water shortage emergency exists, the regulations set out in the Water Conservation Ordinance, Stockton Municipal Code Chapter 13.28, as presently enacted or amended shall be enforceable as to all water users.

B. Stage 2—Water Shortage Emergency. Upon declaration of the City Council that a Stage 2 water shortage emergency exists, the following regulations shall be applicable to all customers of the City's water system:

1. Residential Accounts. Residential accounts shall use no more than 90 percent of the quantity of water delivered to the customer's property as recorded by meter during the corresponding billing period of the base year. Notwithstanding this provision, no residential account shall receive an allocation of less than 600 cubic feet (6 CCF) of water per billing period.

2. Multiple-Family Residential Accounts. Multiple family residences which are served by a single meter shall use no more than 90 percent of the total quantity of water delivered to the customer's property as recorded by meter during the corresponding billing period during the base year. Notwithstanding this provision, no multiple-family residential account shall receive a monthly allocation of less than 400 cubic feet (4 CCF) of water per unit served on a single meter.

3. Nonresidential Accounts. Nonresidential accounts shall use no more than 90 percent of the quantity of water delivered to the customer's property as recorded by meter during the corresponding billing period of the base year.

4. Process-Water User Accounts. Process-water users shall use no more than 100 percent of the quantity of water as recorded by meter during the corresponding billing period during the base year.

C. Stage 3—Water Shortage Emergency. The following regulations shall be applicable to all customers of the City's water system:

1. Residential Accounts. Residential accounts shall use no more than 80 percent of the quantity of water delivered to the customer's property as recorded by meter during the corresponding billing period of the base year. Notwithstanding this provision, no residential account shall receive an allocation of less than 600 cubic feet (6 CCF) of water per billing period.

2. Multiple-Family Residential Accounts. Multiple family residences which are served by a single meter shall use no more than 80 percent of the total quantity of water delivered to the customer's property as recorded by the meter during the corresponding billing period during the base year. Notwithstanding this provision, no multiple-family residential account shall receive a monthly allocation of less than 400 cubic feet (4 CCF) of water per unit served on a single meter.

3. Nonresidential Accounts. Nonresidential accounts shall use no more than 80 percent of the quantity of water delivered to the customer's property as recorded by meter during the corresponding billing period of the

base year.

4. Process-Water User Accounts. Process-water users shall use no more than 90 percent of the quantity of water as recorded by meter during the corresponding billing period during the base year.

D. Stage 4—Water Shortage Emergency. The following regulations shall be applicable to all customers of the City's water system.

1. Residential Accounts. Residential accounts shall use no more than 70 percent of the quantity of water delivered to the customer's property as recorded by meter during the corresponding billing period of the base year. Notwithstanding this provision, no residential account shall receive an allocation of less than 600 cubic feet (6 CCF) of water per billing period.

2. Multiple-Family Residential Accounts. Multiple-family residences which are served by a single meter shall use no more than 70 percent of the total quantity of water delivered to the customer's property as recorded by meter during the corresponding billing period during the base year. Notwithstanding this provision, no multiple-family residential account shall receive a monthly allocation of less than 400 cubic feet (4 CCF) of water per unit served on a single meter.

3. Nonresidential Accounts. Nonresidential accounts shall use no more than 70 percent of the quantity of water delivered to the customer's property as recorded by meter during the corresponding billing period of the base year.

4. Process-Water User Accounts. Process-water users shall use no more than 90 percent of the quantity of water as recorded by meter during the corresponding billing period during the base year.

E. Stage 5—Water Shortage Emergency. The following regulations shall be applicable to all customers of the City's water system.

1. Residential Accounts. Residential accounts shall use no more than 60 percent of the quantity of water delivered to the customer's property as recorded by meter during the corresponding billing period of the base year. Notwithstanding this provision, no residential account shall receive an allocation of less than 600 cubic feet (6 CCF) of water per billing period.

2. Multiple-Family Residential Accounts. Multiple family residences which are served by a single meter shall use no more than 60 percent of the total quantity of water delivered to the customer's property as recorded by meter during the corresponding billing period during the base year. Notwithstanding this provision, no multiple-family residential account shall receive a monthly allocation of less than 400 cubic feet (4 CCF) of water per unit served on a single meter.

3. Nonresidential Accounts. Nonresidential accounts shall use no more than 60 percent of the quantity of water delivered to the customer's property as recorded by meter during the corresponding billing period of the base year.

4. Process-Water User Accounts. Process-water users shall use no more than 80 percent of the quantity of water as recorded by meter during the corresponding billing period during the base year. (Prior code § 9-735)

13.32.070 Establishment of customer allocation.

A. The Director shall classify each customer and calculate each customer's allocation. Each customer shall be notified of the Director's determination by mail deposited in the United States Postal Service.

B. Establishment of Allocations With No Customer Use History.

1. Residential. All residential customers with no water use history at the current property address shall be assigned an allocation for single- or multiple-family residential accounts, as determined by the Director, on

the basis of usage by similarly situated customers or on such other basis as may be fair and equitable under all the circumstances.

2. Other Use Classifications. In order to determine water use allocations for a new nonresidential use customer, for a change in property use, or for a customer with no water use history at the current property address, an application by the customer shall be submitted to the Director designating the intended use of the property, the square footage, and number of employees. An allocation will be determined by the Director after reviewing the above factors as well as comparing water use for similar types of construction and property uses, averaging the water use and applying the appropriate percentage reduction to this amount. (Prior code § 9-736)

13.32.080 Request for increase in allocation.

A. All applicants for an increase in allocation must submit an application in writing to the City Department of Municipal Utilities on an application form provided by the City.

B. Requests for increased allocations will be reviewed by the Water Conservation Officer for recommendation to the Director for approval, modified approval, or denial. Requests for increased allocations in excess of the historical use may be recommended for approval for reasons outlined in subsection D of this section.

C. All residential applicants for an additional allocation based on additional persons residing at a residence shall show proof of residency for all residents at that property.

D. Water allocations may be adjusted by the Director upon written application where the requested adjustment is found to be reasonably necessary. Factors for consideration shall include without limitation:

1. Additional people residing full time at that residence.

2. Unusual medical needs.

3. Change of property use.

4. Where a City audit of nonresidential customer's water-using appliances and usage shows that all reasonable conservation measures are being employed and the applicant provides a conservation plan demonstrating the measures employed and compliance with the plan.

5. Where a nonresidential customer has demonstrated growth in business volume over the base year in providing a water-related service to the public, the allocation may be based upon 1990 annual water use.

6. Hospitals, health care facilities, nursing care facilities, health clinics, and similar users may be excepted from the percentage reductions providing that a water conservation plan demonstrating reductions in consumption to the maximum extent feasible without jeopardizing patient care is prepared and approved by the Director.

E. A decision in writing shall be mailed to the applicant within 15 days of receipt of the application. (Prior code § 9-737)

13.32.090 Appeals.

A. Procedure. Any customer may appeal for reconsideration of the Director's classification of use, allocation or determination of a request for an increase in allocation on the basis of hardship or incorrect calculation. Appeals for reconsideration shall be processed as set forth below.

1. Any customer appealing for reconsideration of the classification or allocation shall do so in writing to the Director by either using forms provided by the City or by letter setting forth in detail the reasons for the appeal.

2. The appeal for reconsideration shall be reviewed by the City Department of Municipal Utilities and a site visit scheduled if required.

3. If an appeal for reconsideration is sustained, a condition of approval may include a requirement for the installation of water efficient plumbing fixtures and/or irrigation systems.

4. A staff committee or designee of the Director and the Director shall review all appeals for reconsideration and make decisions on the appeal.

5. If an applicant disagrees with the Director's decision, the decision may be appealed in the same procedural manner as specified in subsection A of this section to the City Manager or a designee, whose decision shall be final. If an appeal to the City Manager is requested, the customer shall be notified of a hearing date by mail. Such hearing shall be scheduled within 10 days of filing the appeal. A decision shall be forwarded to the applicant within 15 days of the date of the hearing.

B. Each appeal to the City Manager shall be accompanied by an appeal fee in an amount to be set by resolution of the City Council from time to time to defray the additional costs to the City. (Prior code § 9-738)

13.32.100 Enforcement and penalties.

A. The first billing period after the effective date of the Council's declaration of a water shortage emergency or the effective date stated in said resolution shall be considered an adjustment period during which no penalties will be imposed for water usage in excess of the allocation.

B. Beginning with the second billing period after the effective date and except as provided in subsection C of this section, any customer who exceeds the established allocation in any monthly billing cycle shall pay an excess use charge in addition to all other charges. The excess use charge shall be based on a rate schedule as specified from time to time by resolution of the City Council.

C. No excess use charge shall be imposed in the following circumstances:

1. Multiple-family residential customers whose consumption is 400 cubic feet (4 CCF) per unit or less during any billing period;

2. All other customers whose consumption is 600 cubic feet (6 CCF) or less during any billing period.

D. Installation of Flow Restrictor.

1. After the issuance of one (1) written warning for violation of the provisions of this chapter, or for any use of water which is prohibited, the City may install a flow restricting device on the customer's water service which shall remain in place for a period of not less than 48 hours and until the customer has paid the removal charges set forth below. The device shall not be removed except by the City.

2. If the customer, after removal of a flow restricting device by the City, shall again violate the provisions of this ordinance or the Water Conservation Ordinance, the City may install a flow restricting device which shall remain for a period of at least two (2) weeks and until payment for removal by the City.

3. Further violations, removal of or by-passing the flow restricting device may result in termination of water service. Upon a determination by the Director that service shall be terminated, written notice of intent to disconnect shall be mailed to the customer. Said notice shall be mailed to the resident and any other person or entity known to the City who is responsible for the violation or correction of the violation, including the property owner in the case of rentals. A request for hearing on the discontinuance of service shall be requested within five (5) days of mailing the notice. A hearing before the Director shall be held within three (3) days of expiration of the period for requesting a hearing. The Director's final decision shall be mailed to the responsible parties within three (3) days of the hearing. If the final decision is to discontinue service, the discontinuance shall not occur less than three (3) days after mailing of the Director's final decision.

4. Removal Charges. The charge for removal of a flow restricting device shall be based on a rate schedule as established from time to time by resolution of the City Council. In the case of rentals, the person or entity occupying the premises and the owner shall be jointly and severally responsible for payment of said costs. (Prior code § 9-739)