California Water Service Company

2010 Urban Water Management Plan

Bakersfield District

ADOPTED

June 2011

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California Water Service Company
2010 Urban Water Management Plan
Contact Sheet

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1 Plan Preparation

California Water Service Company (Cal Water) is an investor-owned public utility supplying water service to 1.7 million Californians through over 435,000 connections. Its 24 separate water systems serve 63 communities from Chico in the North to the Palos Verdes Peninsula in Southern California. California Water Service Group, Cal Water's parent company, is also serving communities in Washington, New Mexico and Hawaii. Rates and operations for districts located in California are regulated by the California Public Utilities Commission (CPUC). Rates are set separately for each of the systems. Cal Water incorporated in 1926 and has provided water service to the Bakersfield community since 1927.

1.1 Purpose

California Water Code §10644(a) requires urban water suppliers to file with the Department of Water Resources, the California State Library, and any city or county within which the supplier provides water supplies, a copy of its Urban Water Management Plan (UWMP), no later than 30 days after adoption. All urban water suppliers as defined in Section 10617 (including wholesalers), either publicly or privately owned, providing water for municipal purposes either directly or indirectly to more than 3,000 customers or supplying more than 3,000 acre-feet annually are required to prepare an UWMP.

This UWMP is a foundation document and source of information for a SB 610 (Senate Bill 610 Chapter 643, Statutes of 2001) Water Supply Assessment and a SB221 (Chapter 642, Statutes of 2001) Written Verification of Water Supply. An UWMP also serves as:

- A long-range planning document for water supply.
- Source data for development of a regional water plan.
- A source document for cities and counties as they prepare their General Plans.
- A key component to Integrated Regional Water Management Plans.

1.2 Coordination

Cal Water completed a draft of the UWMP for the District on April 1, 2011. The draft was sent to the agencies listed in Table 1.2-1 for review and comment. Copies of the draft plan were available at Cal Water's corporate office in San Jose, and District office for public review and comment.

Table 1.2-1: Coordination with Appropriate Agencies (Table 1)

Agency	Participated in developing the plan	Commented on the draft	Attended public meetings	Was contacted for assistance	Was sent a copy of the draft plan	Was sent a notice of intention to adopt	Not involved/ No information
City of Bakersfield				✓	✓	✓	
Kern County				✓	✓	✓	
Kern County Water Agency		✓		✓	✓	✓	
Kern Delta Water District		✓		✓	✓	✓	

Cal Water conducted a formal public meeting to present UWMP on May 25, 2011 from 5:30-7:30 p.m. at the following location:

California Water Service Company Operation Center Conference Room
3725 "H" Street
Bakersfield, CA 93301

Proof of the public meeting is presented in Appendix A.

1.3 Plan Adoption

The deadline for comments was June 15, 2011. The final plan was adopted by the Vice President of Engineering & Water Quality on June 24, 2011 and was submitted to California Department of Water Resources within 30 days of approval. Appendix A presents a copy of the signed Resolution of Plan Adoption. In addition to the resolution, Appendix A also contains the following:

- Any comments received during the public review of this plan.
- Minutes from the public meeting.
- Correspondence between Cal Water and participating agencies.

A copy of the final version of this report will be sent to the agencies listed in Table1.2-1 and to the California State Library.

1.4 Water Management Tools

Cal Water uses the following water management tools to optimize management of water resources for the District:

- Computerized Hydraulic Model for analysis of various operating conditions within the water distribution network and for planning operational and facility improvements. For smaller systems, a simple model is maintained that only models trunk lines, key sources, and major delivery points.
- Supervisory Control and Data Acquisition (SCADA) system that provides information as to how the water system is operating, provides operational control functions, and maintains a historical record of selected data.
- Revenue Management Solutions (RMS) is an information system that Cal Water uses to maintain detailed historical records including the water sales and customer service connections.
- District Report on Production (DROP) is a database that maintains water production data for wells and purchased amounts from wholesale service connections.
- Geographical Information Systems (GIS) that combines multiple sources of information and allows data to be electronically mapped for analysis and understanding of growth and constraints on land development and water use.
- Laboratory Information Management System (LIMS) provides water quality data for detailed constituent analysis of raw and finished water, determination of compliance with state and federal drinking water standards, and trends in water quality changes.
- Water Supply and Facilities Master Plan for identification of near and long term capital improvement projects for water system facilities and equipment using all of the above tools and Cal Water experience in design and construction.
- Computerized Maintenance Management System (CMMS) is a computerized database system that tracks asset data, assigns and schedules maintenance work orders, and reports on maintenance related activities. A CMMS allows a business to manage maintenance work more effectively and is a stepping stone towards Asset Management (AM).
- Groundwater Level Monitoring Program tracks groundwater fluctuations over time and is used to inform resource management and well maintenance decisions.

1.5 Plan Organization

This plan is organized as described in the following outline. The corresponding provisions of the California Urban Water Management Planning Act are included as references. Tables in this plan have cross-references to the tables as listed in the "Guidebook to Assist Water Suppliers to Prepare a 2010 Urban Water Management Plan" prepared by the California Department of Water Resources.

Section	Table 1.5-1: Plan Organization	Act Provision
Contact Sheet	List of Contact Persons	-
Section 1	Plan Preparation This section describes the requirement and the purpose of the Urban Water Management Planning Act, coordination, plan adoption, schedule, and management tools.	§10620 (d)(2) §10621(a -b) §10635(b) §10642 §10643 §10644 (a) §10645
Section 2	System Description This section describes the District service area and includes area information, population estimate, and climate description.	§10631 (a)
Section 3	System Demands This section describes the water supply projection methodology used to estimate water demands and supply requirements to 2040. It also includes a discussion of SBx7-7 baselines and targets.	§10631 §10608.20(e)
Section 4	System Supplies This section includes a detailed discussion of the water supply sources.	§10631 §10633 §10634
Section 5	Water Supply Reliability and Water Shortage Contingency Planning This section includes a discussion of the water supply reliability and describes the District's planning for water shortages during drought and emergency situations.	§10620 §10631 (d) §10632 §10634 §10635 (a)
Section 6	Demand Management Measures This section describes Cal Water's conservation programs.	§10631
Section 7	Climate Change This section contains a discussion of climate change.	
Section 8	DWR Checklist This section includes the completed DWR UWMP Checklist.	
Appendix A	Resolution To Adopt The Urban Water Management Plan This section includes the following: 1) Resolution 2) Letters to and comments from various agencies 3) Minutes from the public hearing 4) Correspondence between Cal Water and participating agencies.	§10621 (b) §10642 §10644 (a)
Appendix B	Service Area Map This appendix includes the service area map of the District as filed with the Public Utilities Commission.	-
Appendix C	Water Supply, Demand, And Projection Worksheets This section includes the spreadsheets used to estimate the water demand for the District.	-
Appendix D	DWR Groundwater Bulletin 118 Sections from the Department of Water Resources Bulletin 118 are included as reference and provide details of the basin for the District.	§10631 (b)(1-4)
Appendix E	Tariff Rule 14.1 Water Conservation And Rationing Plan This section contains the tariff rule and local ordinances.	-
Appendix F	Water Efficient Landscape Guidelines This section contains the Guideline for Water Efficient Landscape that Cal Water uses at its properties, including renovations.	-
Appendix G	Conservation Master Plan	§10631 (j)

Section	Table 1.5-1: Plan Organization	Act Provision
	This section contains the District's Conservation Master Plan.	
Appendix H	Northeast Bakersfield Water Supply Agreement No. 01-08 W.B.	-
Appendix I	ID-4 KCWA Agreement	
Appendix J	City of Bakersfield Agreement	
Appendix K	ID-4 Report of Water Conditions	

1.6 Implementation of Previous UWMP

Cal Water will follow the California Water Code and file an UWMP at least once every five years on or before December 31, in years ending in five and zero. Since Cal Water operates 24 separate service districts the UWMP for each district has historically been submitted every third year to coincide with its California Public Utilities Commission (CPUC) general rate case (GRC) schedule. This method divided the districts into three sets that followed an established three-year schedule. The Plan for Bakersfield was last submitted as part of the 2006 grouping. Cal Water has since eliminated these groupings and will now file a GRC for all districts every third year and an UWMP every fifth year.

2 System Description

2.1 Service Area Description

The Bakersfield District is located in Kern County, situated in the Tulare Lake hydrologic region, within the Kern Valley Floor Rivers sub-area. The service area is built upon the alluvium of the Kern River flood plain and covers approximately 51 square miles. The District is approximately 115 miles north of the City of Los Angeles and 290 miles south of the City of Sacramento. Figure 2.1-1 shows a general location map of the District.

The system serves portions of the City of Bakersfield and segments of unincorporated Kern County lands adjacent to the City of Bakersfield (see Figure 2.1-2). The Cities of Oildale and Shafter are to the north of Bakersfield. The towns of Rosedale and Green Acres are to the west, Pumpkin Center, Panama, and Greenfield are to the south, and Mayfield is to the east.

The water system to the west of the District is owned by the City of Bakersfield but operated under contract by Cal Water. The Oildale Mutual Water Company and North of the River Municipal Water District serve Oildale and unincorporated lands to the north of the District. East Niles Community Services District provides service to the region east of the District. In 1999 Cal Water acquired the Olcese Water District, which includes the community of Rio Bravo.

Major transportation links in the District include the Golden State Highway (State Route 99), and Stockdale Highway (State Route 58); the Westside Freeway (Interstate 5) is approximately 15 miles to the west south west of the District at its closest point. The Southern Pacific Railroad and the Burlington Northern Santa Fe Railroad provide rail service to the region.

Figure 2.1-1: General Location of Bakersfield District

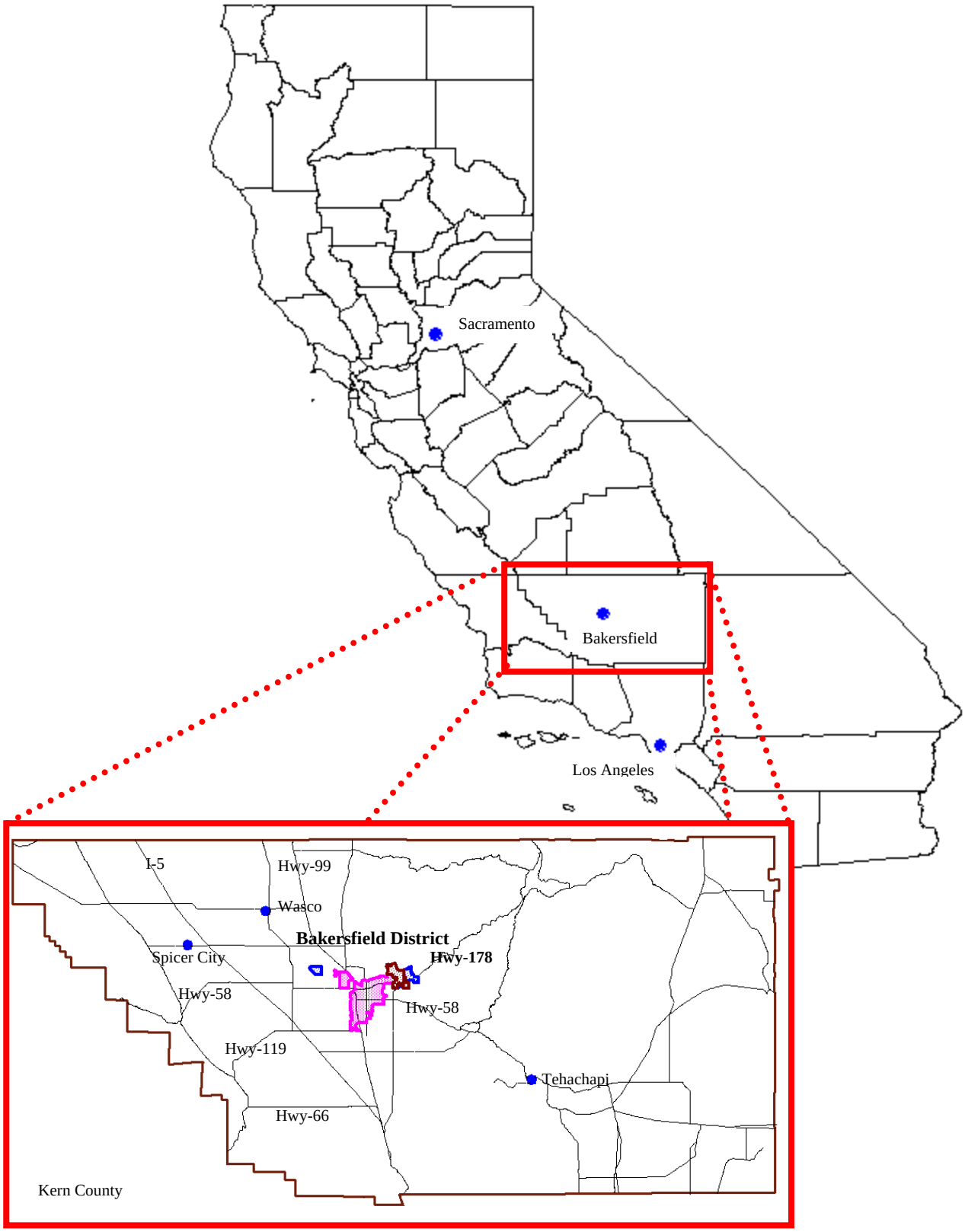


Figure 2.1-2: General Service Area

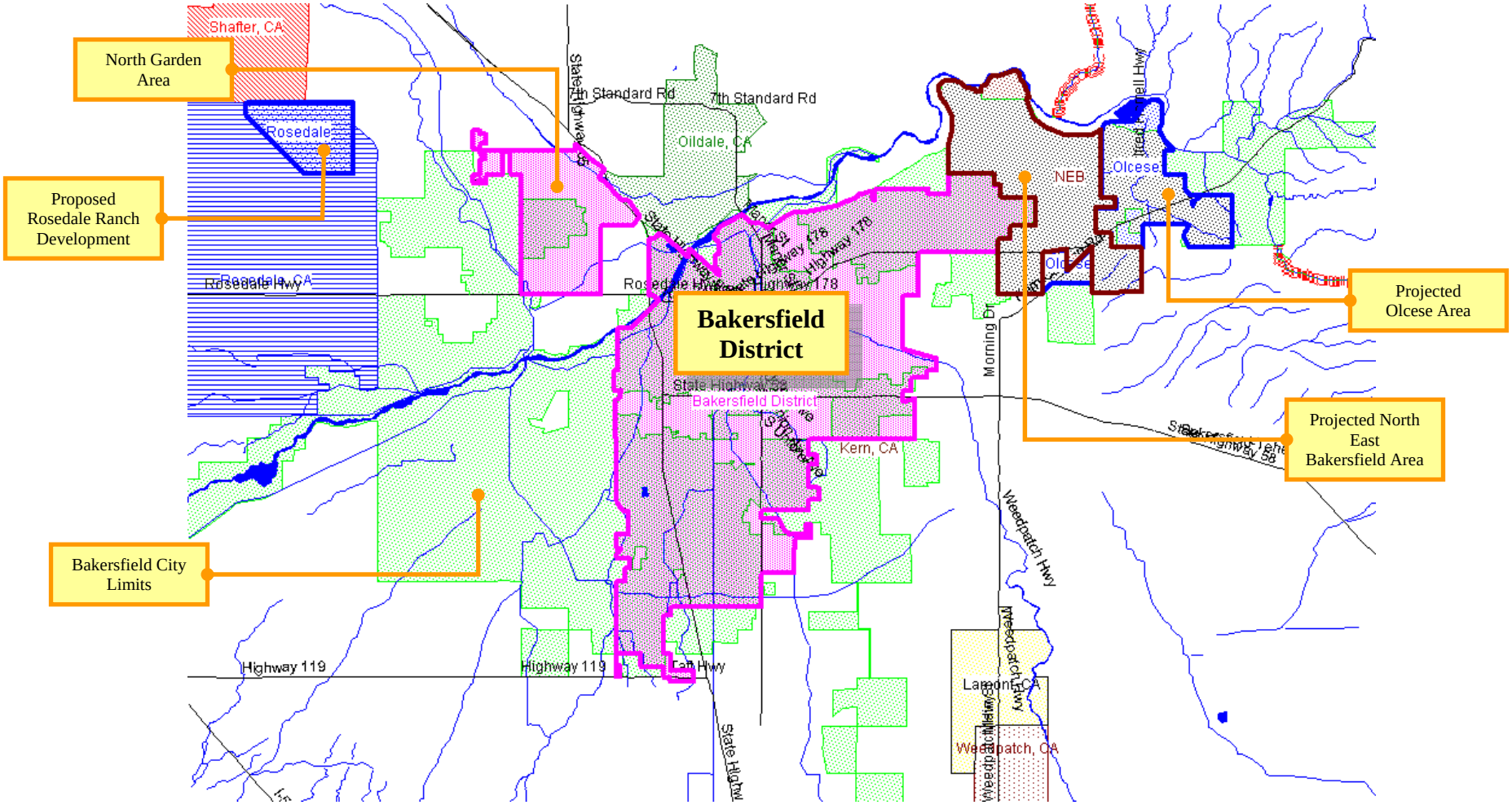
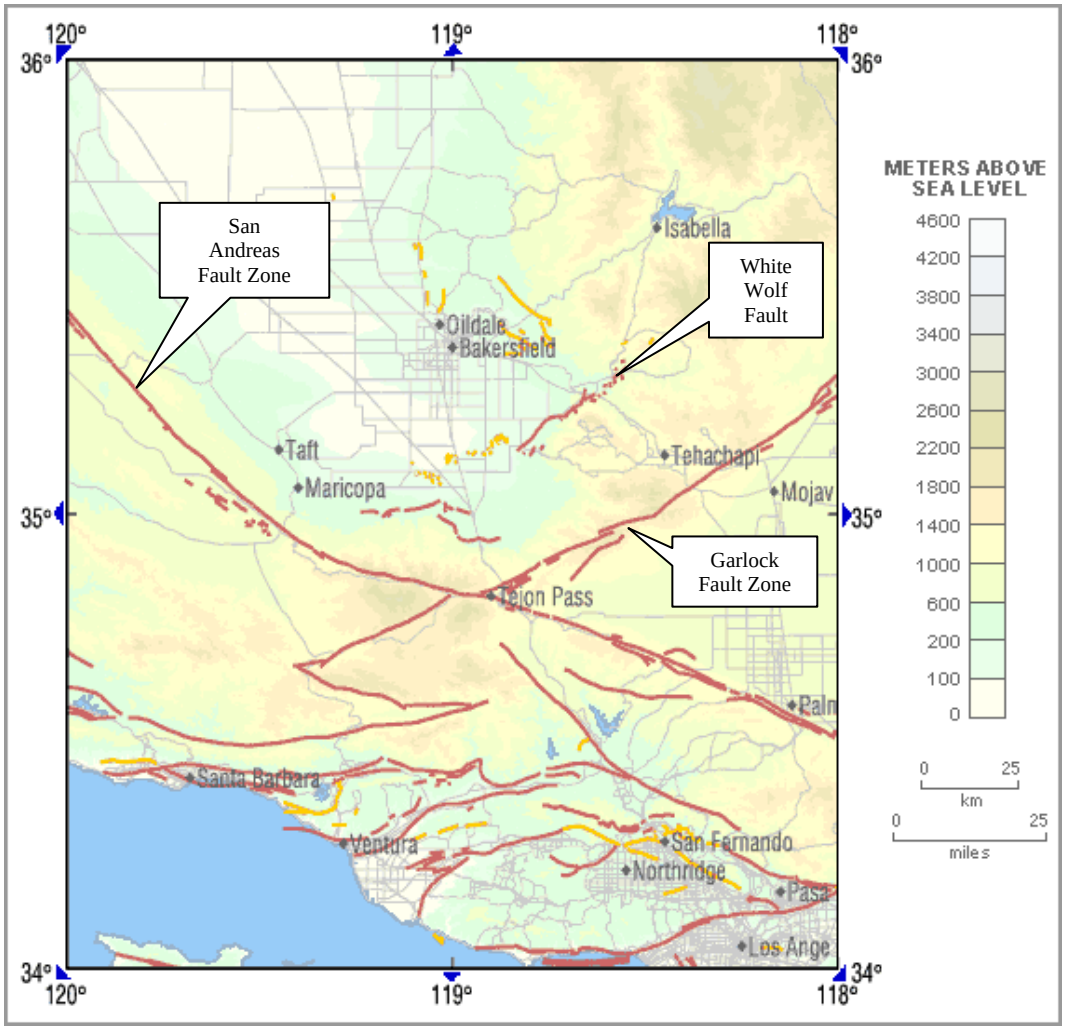


Figure 2.1-3: Major Fault Lines near Bakersfield District[1]



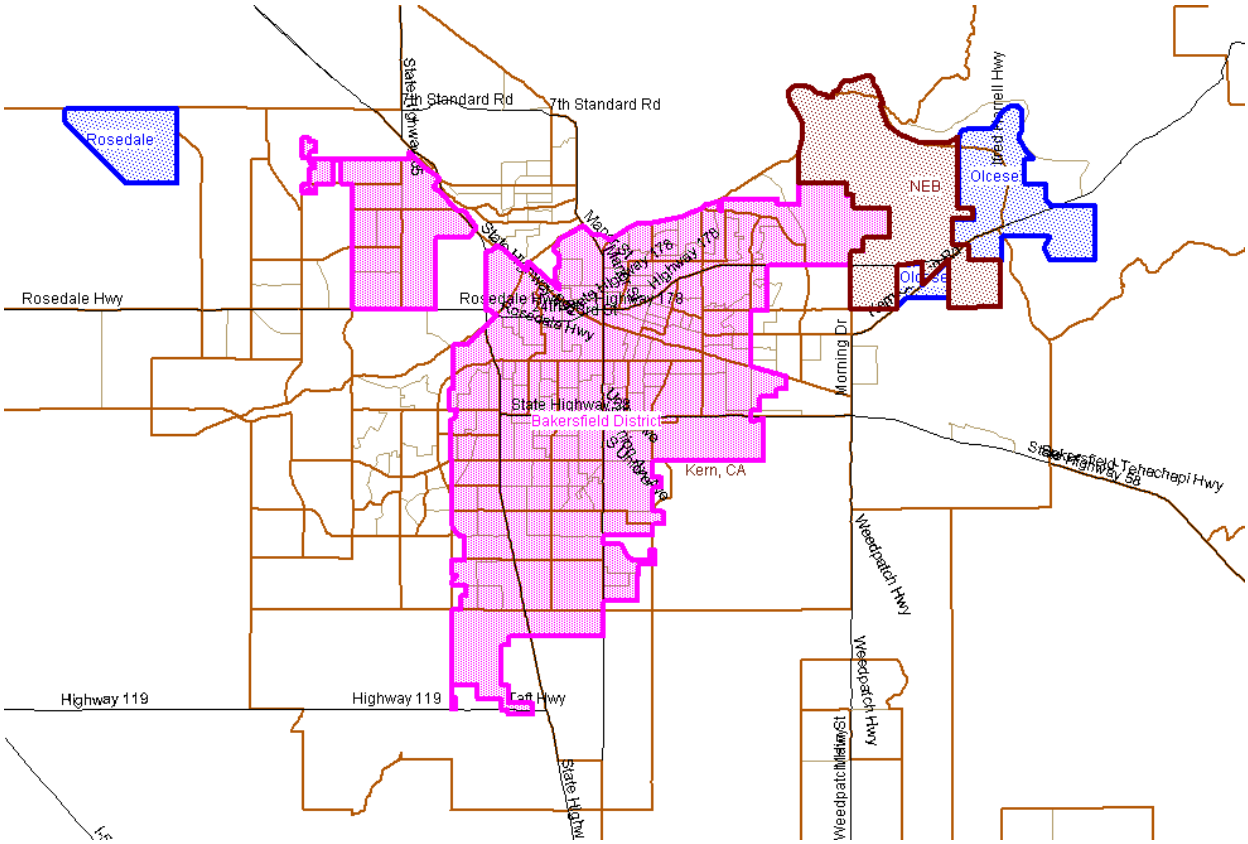
1 http://earthquake.usgs.gov/earthquakes/recenteqscanv/FaultMaps/119-35.html

2.2 Service Area Population

The Bakersfield District has historically been a rapidly growing District. It is increasing service connections through ongoing development within existing service areas and by delivering new services to developing areas in the northeast, northwest and southwest areas of the City Bakersfield. The Bakersfield District is surrounded by land used for agriculture (Northwest and Southwest) or that is fallow (Northeast). The new City Sphere of Influence provides for urban development in all these areas. In addition to agricultural uses, large tracts in the Bakersfield area are used for oil production, refining, and storage.

The process for estimating population in the Bakersfield District began by overlaying the U.S. Census 2000 Block data with the Cal Water service area map (SAM), as shown in Figure 2.2-1.

Figure 2.2-1: Approximated SAM with US Census 2000 Tract Map



A summary of the census data for the year 2000 is shown in Table 2.2-1. LandView 5 and MARPLOT ® software were used to generate the data[2].

Table 2.2-1: Summary of Census 2000 Data			
	Census Blocks	**Population**	**Housing Units**
Bakersfield Service Area	2,665	218,582	75,070
Olcese Area	23	1,043	406
Northeast Bakersfield (NEB)	11	1,226	546
Total	**2,699**	**220,851**	**76,022**

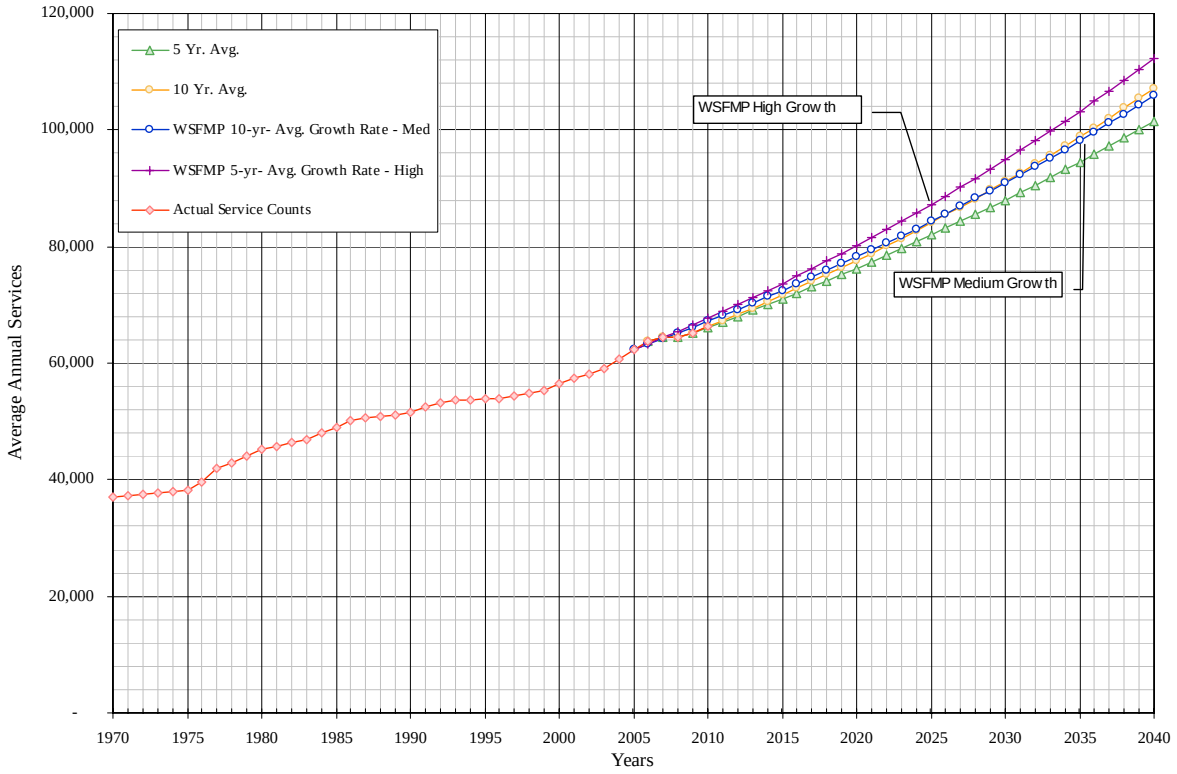
This data was used as a baseline for estimating population starting in 2000. To calculate estimated population after 2000, the Census 2000 population was then divided by the total number of dwelling units served by Cal Water in 2000 to produce a population density value. This density was then multiplied by the number of Cal Water dwelling units in each future year.

To establish a range of future service counts the five-year, ten year, and Master Plan projected growth rates for each service type were continued through 2040. A comparison of service connection growth rates is shown in Figure 2.2-1.

Projected service connections based on past service counts are labeled five-year average and ten-year average. The five-year average is the short-term growth rate, calculated from 2005 to 2009, which has an overall annual average growth rate of 1.42 percent. The ten-year average is long-term growth rate calculated from 2000 to 2009, which exhibits an overall annual average growth rate of 1.66 percent.

[2] LandView 5 and MARPLOT ® software, US Census Bureau/Environmental Protection Agency, downloaded from: http://www.census.gov/geo/landview/lv5/lv5.html, http://www.epa.gov/ceppo/cameo/marplot.htm

Figure 2.2-2: Historical & Projected Services



The service projection made in the WS&FMP was made at a time when the District and the City was experiencing an especially high growth rate. Since then there has been an abrupt downturn in the housing market and growth has come to a halt. Because of this the high growth rate for projected services shown in the WS&FMP was not used to project future services and demand. Instead, Cal Water's 5-year average is more likely to occur until conditions change. Any growth seen in the developments listed above will be accounted for within this lower rate of growth. As a result, the 5-year growth rate was used to forecast future water demand.

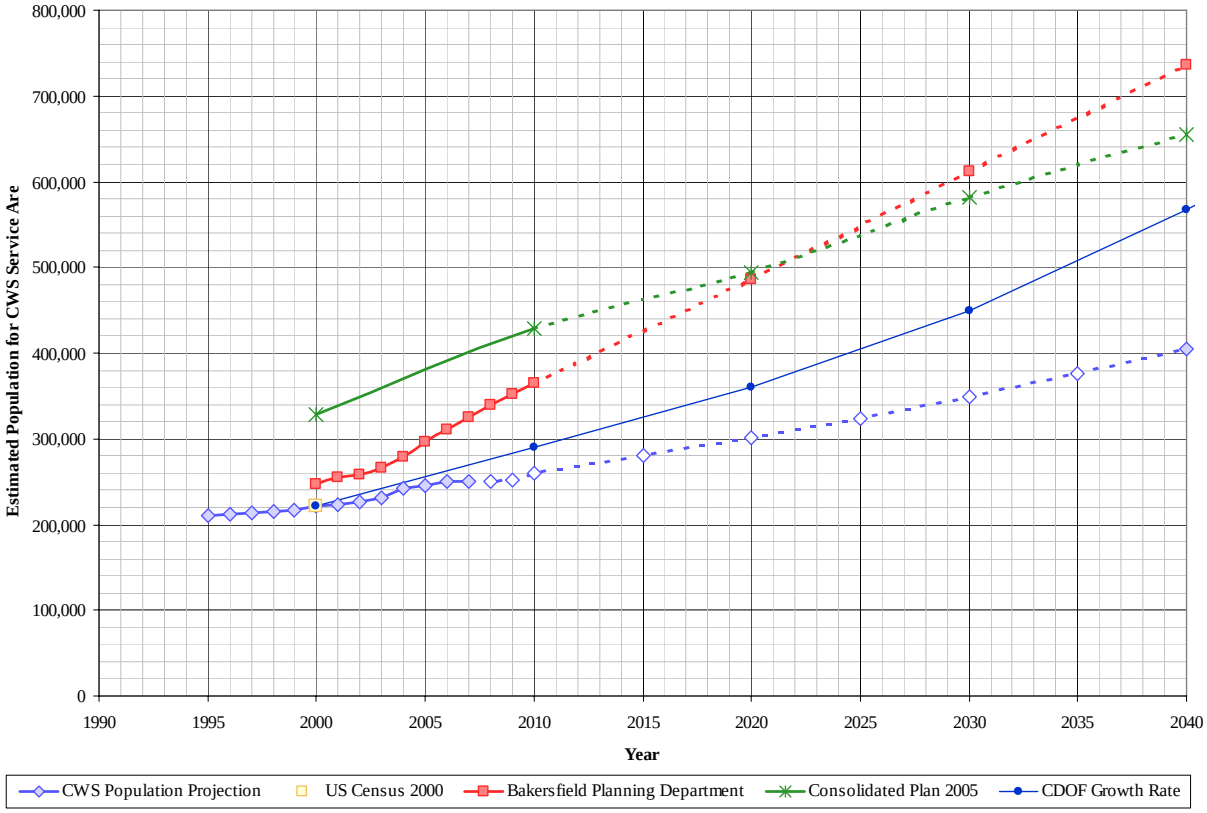
Cal Water estimates that the population for 2009 in the Bakersfield District including the Northeast Olcese areas has increased to approximately 252,010. The Cal Water population projection is based on projected services over the planning horizon. The estimated population was calculated by multiplying the total projected dwelling units by the number of people per dwelling unit for each year. This estimate is based on the average number of service connections in 2009 and the assumption that density has remained unchanged since the 2000 Census. Cal Water estimates the service area's population could reach 404,060 by 2040. Table 2.2-2 lists the population growth in 5-year increments.

Table 2.2-2: Population - Current and Projected (Table 2)								
	2005	2010	2015	2020	2025	2030	2035	2040
Service Area Population	245,900	260,100	279,910	301,230	324,180	348,880	375,450	404,060

The population estimates for the District are compared to projections made by other governmental agencies, as shown in Figure 2.2-3. A description of the other data sources is as follows:

- Bakersfield Planning Department – This data is dated May 12, 2005 was prepared by the City of Bakersfield – Planning Department. The population projection is for the city area and has only been projected to 2010. A linear equation of the existing data has been used to project to the year 2040.
- Consolidated Plan 2005 – This data is dated May 2000 and prepared by the City of Bakersfield - Department of Economic and Community Development. The population projection is for the city urban area and is only projected to 2020. A linear equation of the existing data has been used to project to the year 2040.
- California Department of Finance – Estimated from 2009 revised CDOF county-wide data.

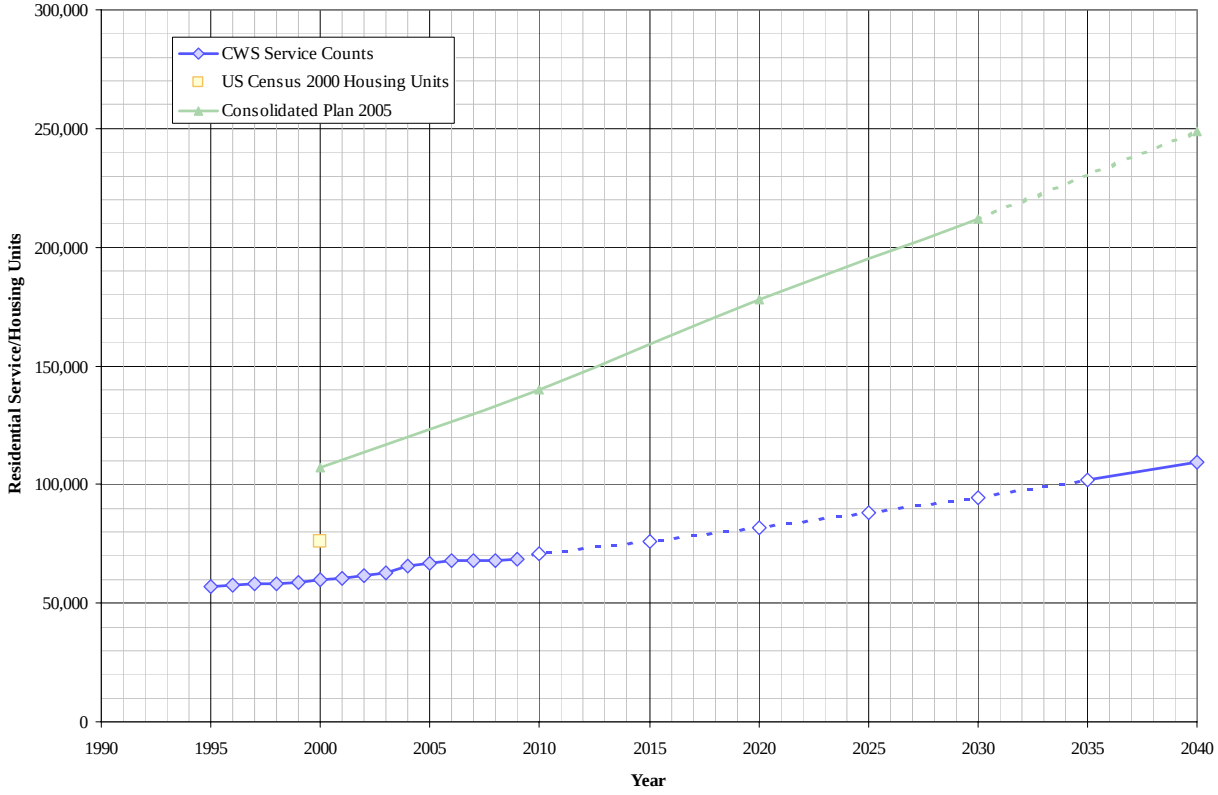
Figure 2.2-3: Estimated Population Comparison



From the graph above, it is shown that the growth rate projected by Cal Water is similar to the projected rate of increase for the two data sources from the City of Bakersfield. The City's population estimate is larger because it includes areas of the City not served by Cal Water.

Similarly, the housing count was estimated by comparing the US Census 2000 data, the housing projections from the Consolidated Plan 2005, and the service counts for the Bakersfield District, as shown in Figure 2.2-4. The service count for the year 2000 is lower than US Census 2000 housing units estimate. This is likely due to District service connections being based on one meter that serves multiple housing units, such as duplexes, multi-unit apartments and condominiums, whereas the US Census counts each housing unit (single and multifamily residences) separately. The US Census 2000 housing units count was obtained by summarizing the individual census blocks enclosed within the service area of the District. As with the population estimate discussed previously, the projected dwelling unit growth rates for the City of Bakersfield are the same as the Cal Water projection. Total housing units are much greater for the City since there are large areas of the City not served by Cal Water.

Figure 2.2-4: Estimated Housing Comparison



2.3 Service Area Climate

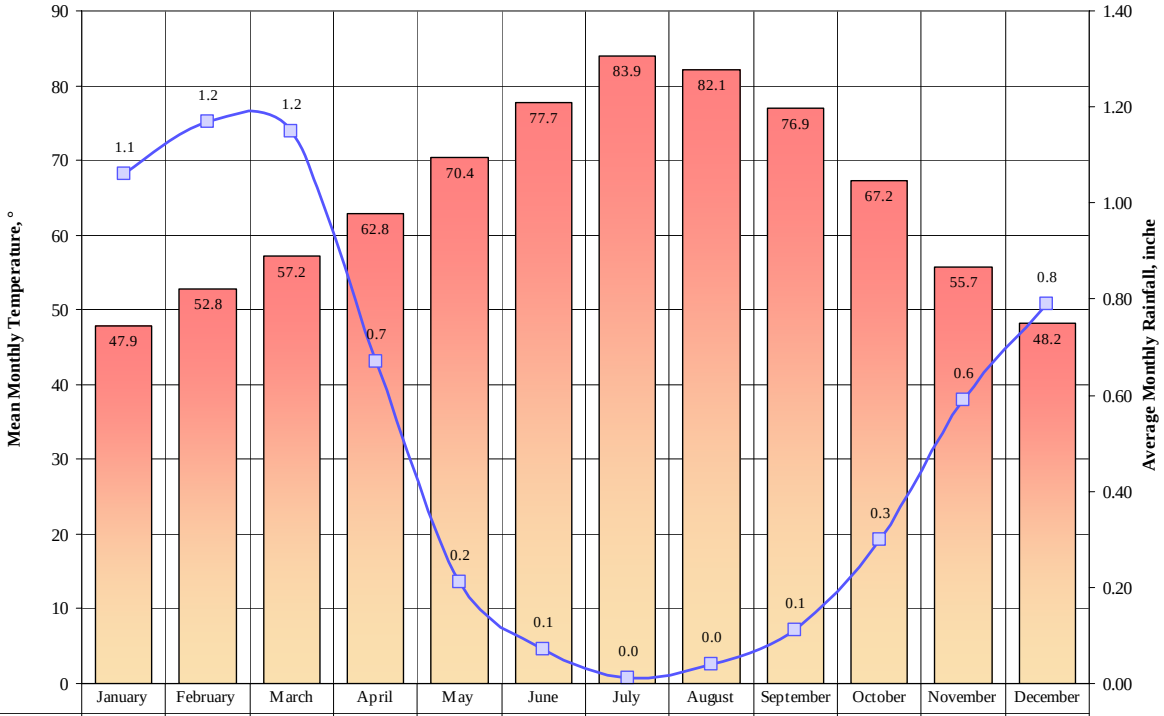
The climate for the Bakersfield District is moderate with hot dry summers and cool winters. The majority of precipitation falls during late autumn, winter, and spring. Table 2.3-1 lists the average annual conditions at the Bakersfield Airport, which is the closest weather station to Bakersfield District.

Table 2.3-1: Average Annual Climate (Table 3)

Average Temperature	Average Rainfall	Annual Total Evapotranspiration
65.3°F	6.1 inches	57.9 inches

Figure 2.3-1 displays the average monthly temperature and rainfall[2]. Additional climate data is provided in the Appendix C, worksheet 18.

Figure 2.3-1: Average Monthly Temperature and Rainfall

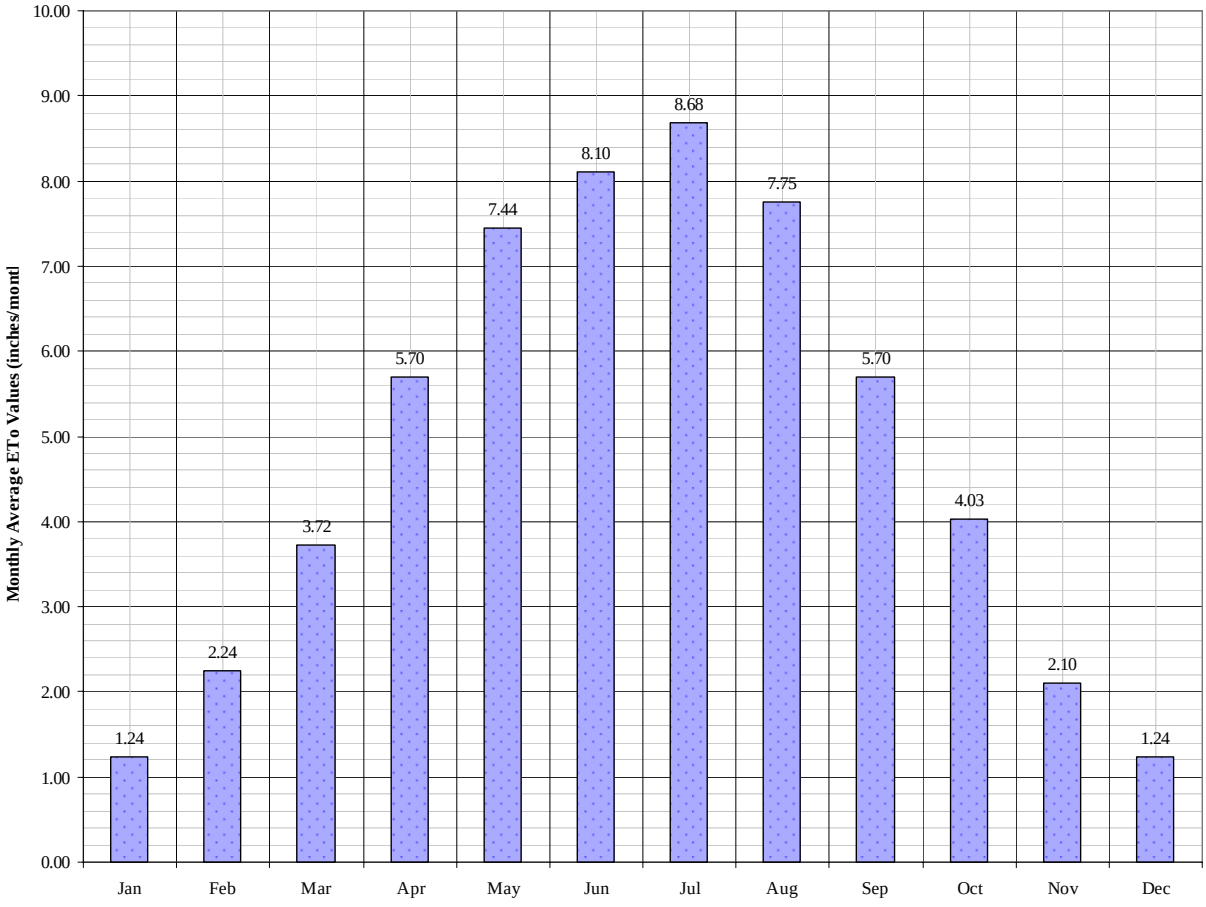


	January	February	March	April	May	June	July	August	September	October	November	December
Temperature	47.9	52.8	57.2	62.8	70.4	77.7	83.9	82.1	76.9	67.2	55.7	48.2
Rainfall	1.06	1.17	1.15	0.67	0.21	0.07	0.01	0.04	0.11	0.3	0.59	0.79

2 Western Regional Climate Center, Bakersfield WSO Airport Weather Station, http://www.wrcc.dri.edu/cgi-bin/cliMAIN.pl?cabake+sca

Figure 2.3-2 displays the monthly average evapotranspiration values for the area of the district[3]. Evapotranspiration is the sum of water loss from a watershed because of the processes of evaporation from the earth's surface and transpiration from plant leaves. The annual estimated transpiration for Bakersfield is 57.9 inches. The average annual rainfall of 6.1 inches is only 11 percent of the annual total evapotranspiration value. This indicates that the Bakersfield District is located in a water-deficient environment. The desert landscape with poorly developed soils and scrubby vegetation are evidence of this low amount of naturally available water. The average monthly evapotranspiration rates are shown in Figure 2.3-2.

Figure 2.3-2: Monthly Average ETo Values



3 California Irrigation Management Information System (CIMIS), EvapoTranspiration (Eto) Zones Map - Zone 15, http://wwwcimis.water.ca.gov/cimis/welcome.jsp

3 System Demands

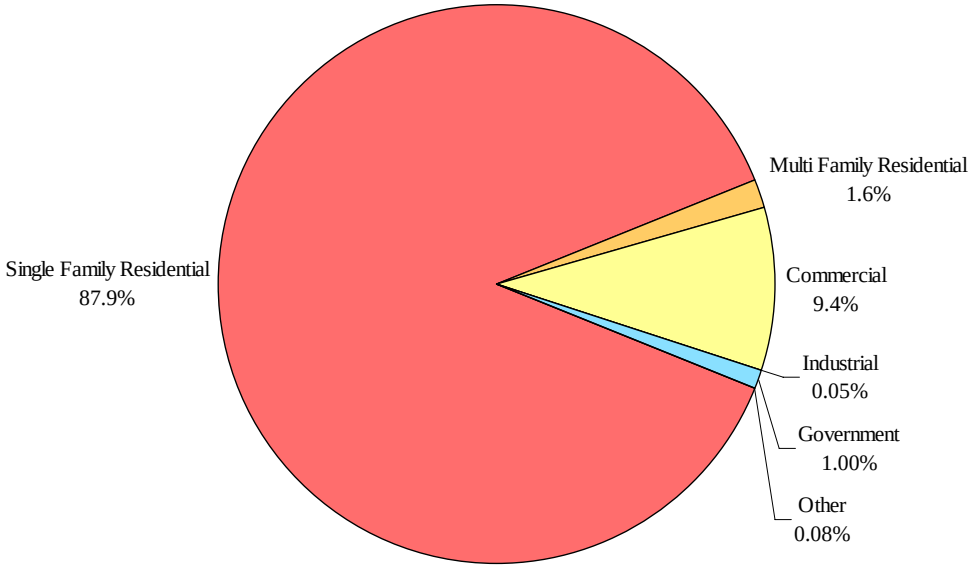
3.1 Distribution of Services

Cal Water designates the different customer connections as follows:

- Single Family Residential
- Multi Family Residential
- Commercial
- Industrial
- Government
- Other

The dominant land uses in the Bakersfield District are for residential and commercial purposes. This can be seen in the service count of the District. Single family residential services account for 87.9 percent of all services; multifamily residential services represent 1.6 percent, and commercial services 9.4 percent. Thus, 98.9 percent of all services are for residential and commercial facilities. The remaining 1.1 percent includes industrial, governmental uses, and other functions such as temporary construction meters.

Figure 3.1-1: Distribution of Services (2010)



3.2 Historical and Current Water Demand

Historical sales values are illustrated in Figure 3.2-1. Historical service counts values are illustrated in Figure 3.2-2.

Figure 3.2-1: Historical Sales

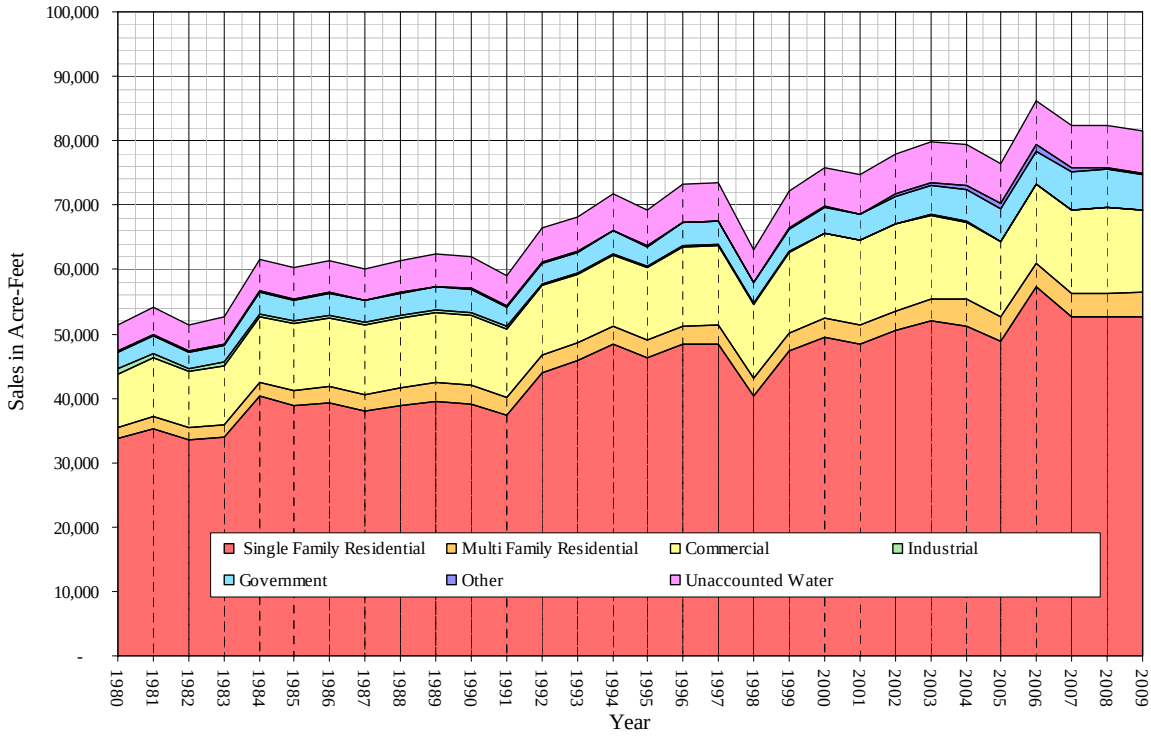
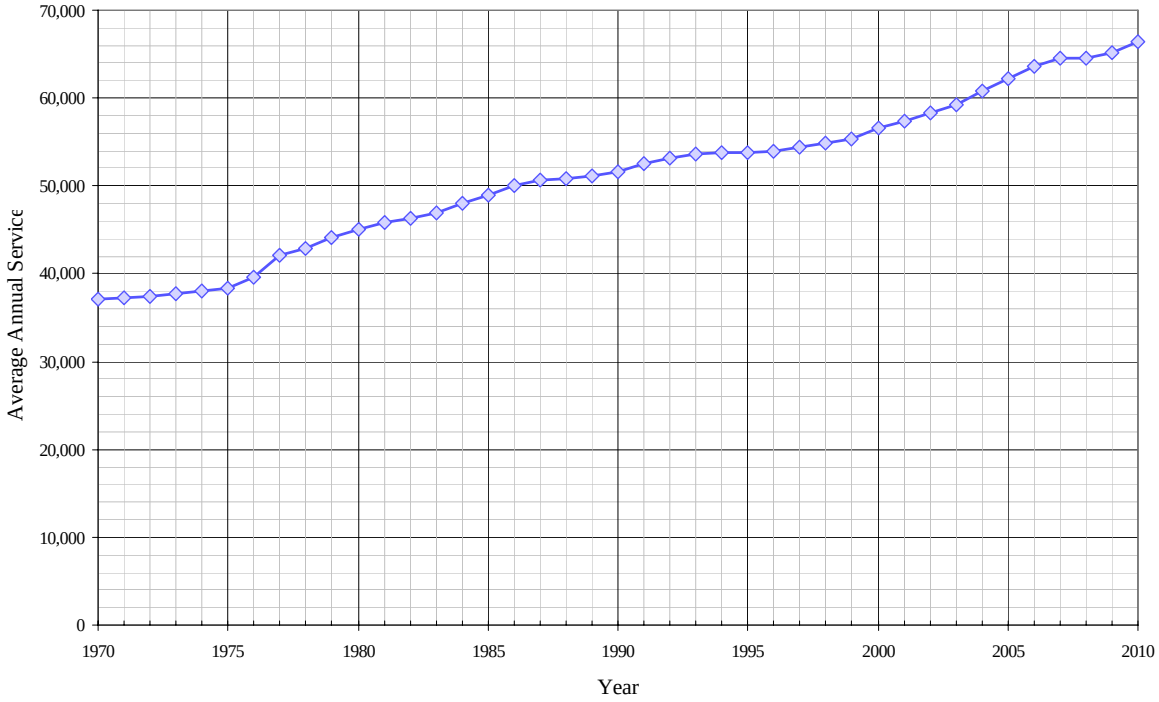
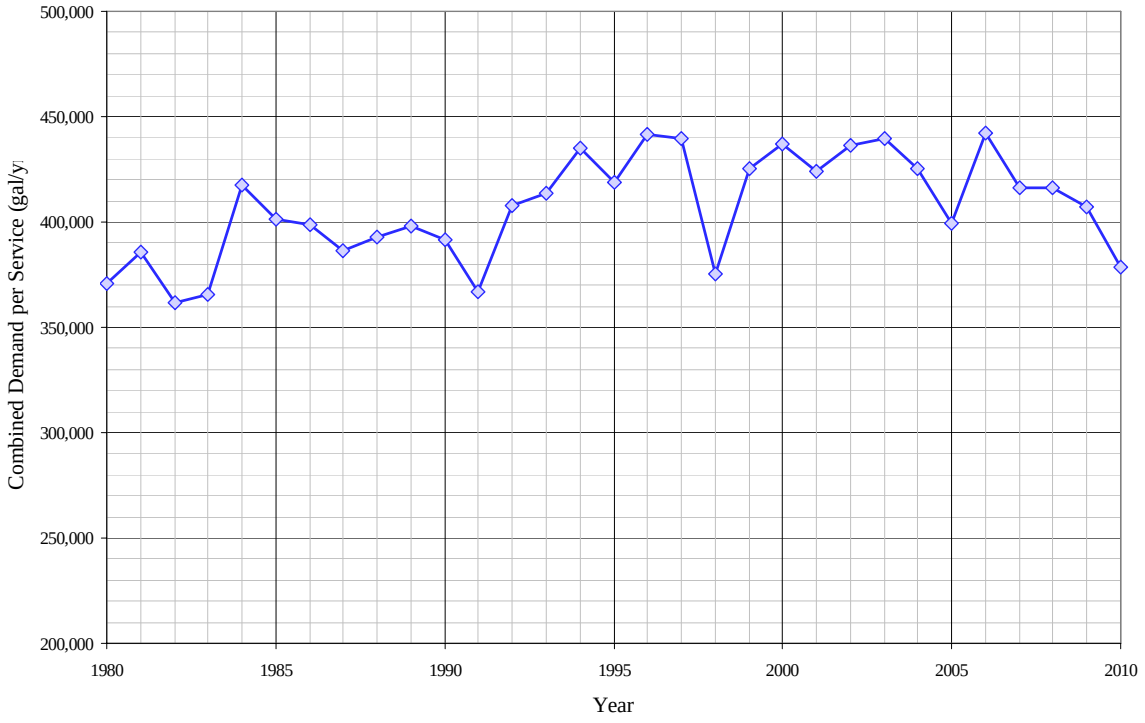


Figure 3.2-2: Historical Service Counts



Demand per service was established as a function of historical sales and service data. 54 percent of the single family residential services in the Bakersfield District are un-metered. In order to estimate demand by the residential sector, unaccounted for water was fixed at 8 percent of total production. This amount along with all metered sales was subtracted from total production to estimate deliveries to flat rate residential customers. The resulting combined demand per service for all services fluctuated between 360,000 and 440,000 gallons per service per year, Figure 3.2-3.

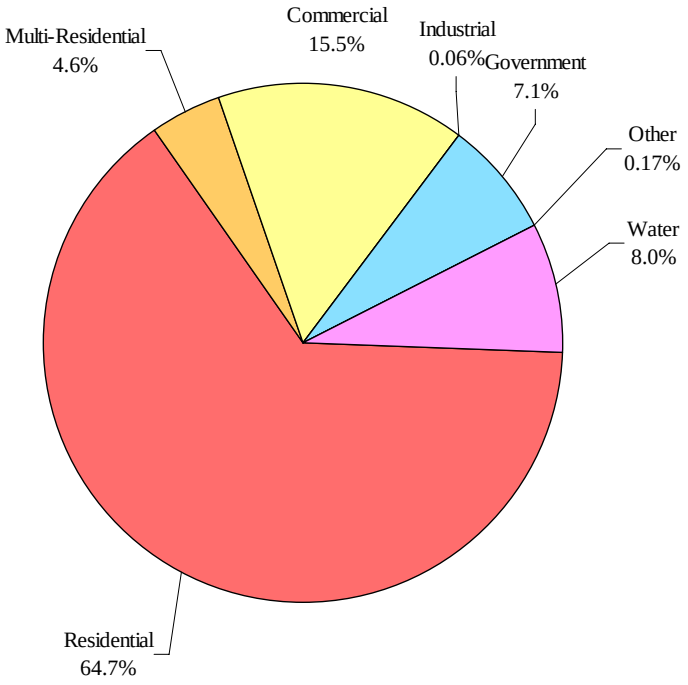
Figure 3.2-3: Historical Demand per Service



A response to the statewide drought conditions resulted in a reduction in the demand per service values for 1991. This response, however, was short-lived with demand per service rebounding in the following years to above previous levels. Curbing the rising demand per service will require the implementation of conservation activities.

Because the Bakersfield District still has some unmetered services it is difficult to estimate unaccounted for water. For the purposes of this UWMP unaccounted for water was fixed at 8 percent of total demand, which is below industry standard practices but above similar Cal Water districts. Once all the unmetered services have been retrofitted with meters over the next few years it will be possible to determine a better estimate of this value. The distribution of demand from each service category is shown in Figure 3.2-4.

Figure 3.2-4: Percent of Total Demand by Type of Use (2010)



Single family residential water use represents the smallest demand per service segment in the District with approximately 310,000 gallons per service per year, yet this category uses 64.7 percent of the total demand. The multifamily residential use was 4.6 percent of the total demand with a demand per service that is greater than 1,200,000 gallons per service per year. The combined residential sector component of demand is equal to 69.3 percent of total demand.

3.3 Water Demand Projections

Cal Water has historically made its water demand projections by first calculating individual growth rates for each of its service connection types. These growth rates were based on five or ten year averages of service count data, and were extended over the planning horizon resulting in projected service counts. A set of three demand per service values (low, average, high), which were based on past customer usage records, were then applied to the projected service counts to calculate projected water demands for each service type. Due to the passage of Senate Bill 7 (SBx7-7) this method is no longer used as the primary method for calculating projected demands. However, these calculations are still used as the basis for calculating projected services, population, and the distribution of demand amongst service connection types.

The method used in this UWMP to determine future water demands is a response to SBx7-7 requirements. It results in two demand projections; the unadjusted baseline

demand, and the target demand. The unadjusted baseline water demand projection is the total demand expected without any achieved conservation. It is equal to forecasted population multiplied by the 2005-09 average, or 293 gpcd.

The target water demand projection includes conservations savings due to both passive and active demand management, which are described in Section 6. The target demand is calculated by multiplying SBx7-7 target gpcd values and projected population. These conservation savings are illustrated in the comparison of projected demands shown in Figure 3.3-1.

Figure 3.3-1: Historical & Projected Demand

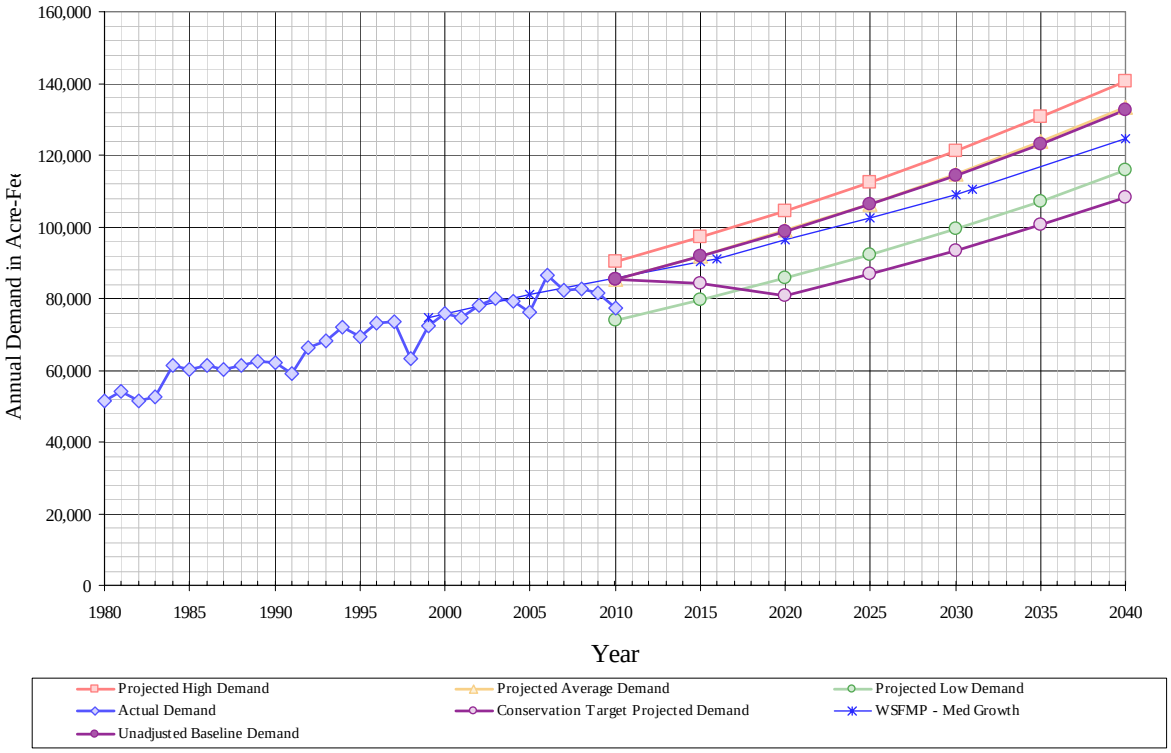


Figure 3.3-1 also shows the median demand projection developed in Cal Water's Water Supply and Facilities Master Plan for the Bakersfield District. In this case water demands were projected through full buildout of the Bakersfield District using a unit demand methodology based on land uses in the City's General Plan. This projection calculates demands based on past water use levels. It is included here to provide a comparison to demands calculated for the purposes of SBx7-7 compliance.

The water demand projection calculation used for SBx7-7 compliance relies only on future population and gpcd target values. Projected water deliveries separated by customer type can not be determined by this method alone. To get a breakdown of future deliveries Cal Water used the ratio of individual deliveries for each class to the total amount that was developed for the previously used water demand projection. This ratio was applied to the total adjusted baseline demand, which resulted in the projected

deliveries listed in Tables 3.3-1 through 3.3-6. These demands include the conservation savings associated with the demand management measures described in Section 6.

Table 3.3-1: Actual 2005 Water Deliveries – AF (Table 3)

	2005				
	Metered		Not Metered		Total
Water Use Sectors	# of accounts	Volume	# of accounts	Volume	Volume
Single family	21,168	14,571	33,395	34,266	48,837
Multi-family	960	3,726	-	-	3,726
Commercial	6,047	11,765	-	-	11,765
Industrial	36	77	-	-	77
Institutional/government	573	5,007	-	-	5,007
Landscape	-	-	-	-	-
Recycled	-	-	-	-	-
Other	93	818	-	-	818
Total	28,877	35,964	33,395	34,266	70,231

Table 3.3-2: Actual 2010 Water Deliveries – AF (Table 4)

	2010				
	Metered		Not Metered		Total
Water Use Sectors	# of accounts	Volume	# of accounts	Volume	Volume
Single family	28,480	17,334	29,877	32,597	49,931
Multi-family	1,089	3,520	-	-	3,520
Commercial	6,229	11,932	-	-	11,932
Industrial	32	45	-	-	45
Institutional/government	661	5,444	-	-	5,444
Landscape	-	-	-	-	-
Recycled	-	-	-	-	-
Other	56	131	-	-	131
Total	36,547	38,406	29,877	32,597	71,003

Table 3.3-3: Projected 2015 Water Deliveries – AF (Table 5)

	2015				
	Metered		Not Metered		Total
Water Use Sectors	# of accounts	Volume	# of accounts	Volume	Volume
Single family	62,514	54,777	-	-	54,777
Multi-family	1,125	5,824	-	-	5,824
Commercial	6,523	10,078	-	-	10,078
Industrial	32	166	-	-	166
Institutional/government	768	6,401	-	-	6,401
Landscape	-	-	-	-	-
Recycled	-	-	-	-	-
Other	75	276	-	-	276
Total	71,038	77,522	-	-	77,522

Table 3.3-4: Projected 2020 Water Deliveries - AF (Table 6)

	2020				
	Metered		Not Metered		Total
Water Use Sectors	# of accounts	Volume	# of accounts	Volume	Volume
Single family	67,319	52,589	-	-	52,589
Multi-family	1,205	5,562	-	-	5,562
Commercial	6,764	9,317	-	-	9,317
Industrial	32	148	-	-	148
Institutional/government	880	6,535	-	-	6,535
Landscape	-	-	-	-	-
Recycled	-	-	-	-	-
Other	81	264	-	-	264
Total	76,280	74,415	-	-	74,415

Table 3.3-5: Projected 2025 and 2030 Water Deliveries - AF (Table 7)				
	2025		2030	
	Metered		Metered	
Water Use Sectors	# of accounts	Volume	# of accounts	Volume
Single family	72,493	56,588	78,065	60,860
Multi-family	1,291	5,954	1,383	6,370
Commercial	7,014	9,654	7,273	9,998
Industrial	32	148	32	147
Institutional/government	1,007	7,477	1,153	8,551
Landscape	-	-	-	-
Recycled	-	-	-	-
Other	86	283	93	303
Total	81,924	80,103	87,999	86,229

Table 3.3-6: Projected 2035 and 2040 Water Deliveries - AF (Table 7)				
	2035		2040	
	Metered		Metered	
Water Use Sectors	# of accounts	Volume	# of accounts	Volume
Single family	84,065	65,419	90,526	70,284
Multi-family	1,482	6,812	1,587	7,280
Commercial	7,541	10,348	7,820	10,706
Industrial	32	147	32	147
Institutional/government	1,321	9,773	1,512	11,165
Landscape	-	-	-	-
Recycled	-	-	-	-
Other	100	324	107	347
Total	94,540	92,823	101,584	99,928

3.3.1 Senate Bill No. 7 Baselines and Targets

Cal Water is in the process of expanding current conservation programs and developing new programs for its 24 service districts. Over the next five years, Cal Water conservation program expenditures are likely to increase significantly due in large measure to recently adopted state policies requiring significant future reductions in per capita urban water use. These include the passage of Senate Bill No. 7 (SBx7-7) in November 2009, which mandated a statewide 20 percent reduction in per capita urban water use by 2020, as well as recent decisions by the California Public Utilities Commission (CPUC) directing Class A and B water utilities to adopt conservation programs and rate structures designed to achieve reductions in per capita water use, and the *Memorandum of Understanding Regarding Urban Water Conservation in California* (MOU), of which Cal Water has been a signatory since 1991. In preparing for this program expansion, Cal Water has spent the past year developing five-year conservation program plans for each of its service districts. The complete Bakersfield District Conservation Master Plan is included as Appendix G.

SBx7-7, which was signed into law in November 2009, amended the State Water Code to require a 20 percent reduction in urban per capita water use by December 31, 2020. Commonly known as the 20x2020 policy, the new requirements apply to every retail urban water supplier subject to the Urban Water Management Planning Act (UWMPA).

The state is required to make incremental progress toward this goal by reducing per capita water use by at least 10 percent on or before December 31, 2015. SBx7-7 requires each urban retail water supplier to develop interim and 2020 urban water use targets in accordance with specific requirements. They will not be eligible for state water grants or loans unless they comply with those requirements.

The law provides each water utility several ways to calculate its interim 2015 and ultimate 2020 water reduction targets. In addition, water suppliers are permitted to form regional alliances and set regional targets for purposes of compliance. Under the regional compliance approach, water suppliers within the same hydrologic region can comply with SBx7-7 by either meeting their individual target or being part of a regional alliance that meets its regional target. For all Cal Water districts falling within the same hydrologic region, Cal Water intends to enter regional alliances as listed in Table 3.3-7. The Bakersfield District lies within the Tulare Lake hydrologic region, along with Kern River Valley, Selma, and Visalia Districts.

Table 3.3-7: Cal Water Districts Sorted by Hydrologic Region	
Hydrologic Region	**Cal Water Districts in Region**
North Coast	Redwood Valley
San Francisco Bay Area	Bear Gulch, Livermore, Los Altos, Mid- Peninsula, South San Francisco
Central Coast	King City, Salinas
South Coast	Dominguez, East LA, Hermosa-Redondo, Palos Verdes, Westlake
Sacramento River	Chico, Dixon, Marysville, Oroville, Willows
San Joaquin	Stockton
Tulare Lake	**Bakersfield**, Kern River Valley, Selma, Visalia
North Lahontan	None
South Lahontan	Antelope Valley
Colorado River	None

District-specific and regional targets for Cal Water districts within the Tulare Lake hydrologic region are shown in Table 3.3-8. The 2015 and 2020 district-specific targets for Bakersfield District are 268 and 239 gpcd, respectively. Over the last five years District demand has averaged about 293 gpcd. Thus, per capita demand needs to fall by about 8 percent by 2015 and by about 18 percent by 2020 in order for Bakersfield District to meet its district-specific targets. Alternatively, demand for the four Cal Water districts within the Tulare Lake hydrologic region can average no more than 250 gpcd in 2015 and 222 gpcd in 2020.

Table 3.3-8: Regional SBx7-7 Targets for Cal Water Districts in Tulare Lake Hydrologic Region			
District	**Population**	**2015 Target**	**2020 Target**
Bakersfield	252,010	268	239
Kern River Valley	6,359	190	179
Selma	24,260	242	215
Visalia	132,930	219	194
Regional Targets[1]		**250**	**222**
[1] Regional targets are the population-weighted average of the district targets.			

The following analysis presents the individual SBx7-7 compliance targets for the Bakersfield District.

Under SBx7-7, an urban retail water supplier may adopt one of four different methods for determining the 2020 gpcd target:

1. Set the 2020 target to 80 percent of average GPCD for any continuous 10-year period ending no earlier than December 31, 2004, and no later than December 31, 2010.

2. Set the 2020 target as the sum of the following:

   a. 55 GPCD for indoor residential water use.

   b. 90 percent of baseline CII water uses, where baseline CII GPCD equals the average for any contiguous 10-year period ending no earlier than December 31, 2004, and no later than December 31, 2010.

   c. Estimated per capita landscape water use for landscape irrigated through residential and dedicated irrigation meters assuming water use efficiency equivalent to the standards of the Model Water Efficient Landscape Ordinance set forth in Section 2.7 of Division 2 of Title 23 of the California Code of Regulations.

3. Set the 2020 target to 95 percent of the applicable state hydrologic region target, as set forth in the state's draft 20x2020 Water Conservation Plan (dated April 30, 2009).

4. A method determined by DWR through the urban stakeholder process.

For district-specific SBx7-7 compliance, targets were set to either 80 percent of baseline gpcd (Method 1) or 95 percent of the District's hydrologic region target (Method 3), whichever was greater. An analysis for Method 2 was not performed due to a lack of data necessary for this method. Method 4 was also not considered because it was not available when the Conservation Master Plan process began.

Under Method 1, the 2015 and 2020 targets are set to 90 percent and 80 percent of baseline water use, respectively. Baseline water use is the average water use for any continuous 10-year period ending between 2004 and 2010. For the Bakersfield District, the 10-year base period 1995-2004 yielded the maximum target under this method. The 2015 target is 268 gpcd and a 2020 target is 239 gpcd. Table 3.3-9 summarizes the base period ranges and Table 3.3-10 lists the per capita demand over the ten-year base period.

Table 3.3-9: Base Period Ranges (Table 13)			
Base	**Parameter**	**Value**	**Units**
10-15-year base period	2008 total water deliveries	75,881	AF
	2008 total volume of delivered recycled water	0	AF
	2008 recycled water use as a percent of total deliveries	0	%
	Number of years in base period	10	years
	Year beginning base period range	1995	
	Year ending base period range	2004	
5-year base period	Number of years in base period	5	years
	Year beginning base period range	2003	
	Year ending base period range	2007	

Table 3.3-10: Daily Base Per Capita Water Use-10-Year Range (Table 14)				
Base Period Year		**Distribution System Population**	**Daily System Gross Water Use (mgd)**	**Annual Daily Per Capita Water Use (gpcd)**
Sequence Year	**Calendar Year**			
Year 1	1995	210,710	61.7	293
Year 2	1996	211,810	65.4	309
Year 3	1997	213,820	65.6	307
Year 4	1998	214,910	56.3	262
Year 5	1999	216,780	64.5	297
Year 6	2000	220,851	67.7	306
Year 7	2001	223,690	66.6	298
Year 8	2002	226,660	69.6	307
Year 9	2003	231,060	71.3	309
Year 10	2004	241,440	70.8	293
			Base Daily Per Capita Water Use	298

Under Method 3, the 2015 and 2020 targets are set to 95 percent of the 2015 and 2020 targets for the hydrologic region in which the district is located. Because the Bakersfield District is located in the Tulare Lake hydrologic region the Bakersfield District's 2015 target is 250 gpcd and the 2020 target is 222 gpcd.

The SBx7-7 target for 2020 cannot exceed 95 percent of the District's five-year baseline water use, where the baseline period ends no earlier than December 31, 2007 and no later than December 31, 2010. The District's 2020 target cannot exceed this level, regardless of which method is used to calculate it. The maximum allowable target in the Bakersfield District is 281 gpcd, as shown in Table 3.3-11. In this case, neither target calculation method results in a target exceeding the maximum allowable target, so no adjustment is necessary.

Table 3.3-11: Daily Base Per Capita Water Use-5-Year Range (Table 15)

Base Period Year		Distribution System Population	Daily System Gross Water Use (mgd)	Annual Daily Per Capita Water Use (gpcd)
Sequence Year	Calendar Year			
Year 1	2003	231,060	71.3	309
Year 2	2004	241,440	70.8	293
Year 3	2005	245,900	68.2	277
Year 4	2006	250,400	77.0	308
Year 5	2007	249,850	73.5	294
			Base Daily Per Capita Water Use	295

Based on the results of this analysis as shown in Table 3.3-12, the Method 1 targets were chosen for the Bakersfield District.

Table 3.3-12. Bakersfield District SBx7-7 Targets

Maximum Allowable Target	
Base Period:	2003-2007
Per Capita Water Use:	295
Maximum Allowable 2020 Target:	281
Method 1: 80% of Baseline Per Capita Daily Water Use	
Base Period:	1995-2004
Per Capita Water Use:	298
2015 Target:	268
2020 Target:	239
Method 3: 95% of Hydrologic Region Target	
Hydrologic Region:	Tulare Lake
2015 Target:	225
2020 Target:	179
Selected District Target	
2015 Target:	268
2020 Target:	239

3.3.2 Low Income Housing Projected Demands

California Senate Bill No. 1087 (SB 1087), Chapter 727, was passed in 2005 and amended Government Code Section 65589.7 and Water Code Section 10631.1. SB 1087 requires local governments to provide a copy of their adopted housing element to water and sewer providers. In addition, it requires water providers to grant priority for service allocations to proposed developments that include housing units for lower income families and workers. Subsequent revisions to the Urban Water Management Planning Act require water providers to develop water demand projections for lower income single and multi-family households.

Cal Water does not maintain records of the income level of its customers and does not discriminate in terms of supplying water to any development. Cal Water is required to serve any development that occurs within its service area, regardless of the targeted income level of the future residents. It is ultimately the City's or County's responsibility to approve or not approve developments within the service area.

The City of Bakersfield Housing Element utilizes data from the 2000 Census, the American Community Survey, and the U.S. Department of Housing and Urban Development (HUD) to estimate the percent of city's households in the lowest income group. The Housing Element estimates that 23.3 percent of the households to be in the very low-income group[4]. For the purposes of estimating projected demand for low income households, Cal Water has applied this percentage to its total residential projected demand, as shown in Table 3.3-13.

Table 3.3-13: Low-income Projected Water Demands (Table 8)

Low Income Water Demands	2015	2020	2025	2030	2035	2040
Single-family residential	1,276	1,225	1,319	1,418	1,524	1,638
Multi-family residential	136	130	139	148	159	170
Total	1,412	1,355	1,457	1,566	1,683	1,807

As a benefit to our customers, Cal Water offers its Low Income Rate Assistance Program (LIRA) in all of its service districts. Under the LIRA Program qualified customers are able to receive a discount on their monthly bills.

[4] "City of Bakersfield, General Plan - Final Housing Element, 2008-2013", Northcutt & Associates/Pacific Housing Consulting, February 25, 2009, Page 2-13

3.4 Total Water Use

Cal Water does not currently sell water to other agencies, nor does it provide water for saline barriers, groundwater recharge, conjunctive use, or recycling. The potential additional water uses within Cal Water's service area are discussed and quantified in Section 4. For the purposes of this UWMP it is assumed that the only water sales to customers and distribution system losses are included in the total demand. The system losses are summarized in Table 3.4-1.

Table 3.4-1: Additional Water Uses and Losses - AFY (Table 9 and 10)

Water Use	2010	2015	2020	2025	2030	2035	2040
Sales to Other Agencies	-	-	-	-	-	-	-
Saline barriers	-	-	-	-	-	-	-
Groundwater recharge	-	-	-	-	-	-	-
Conjunctive use	-	-	-	-	-	-	-
Raw water	-	-	-	-	-	-	-
Recycled	-	-	-	-	-	-	-
Unaccounted-for system losses	6,174	6,506	6,229	6,685	7,171	7,690	8,244
Total	6,174	6,506	6,229	6,685	7,171	7,690	8,244

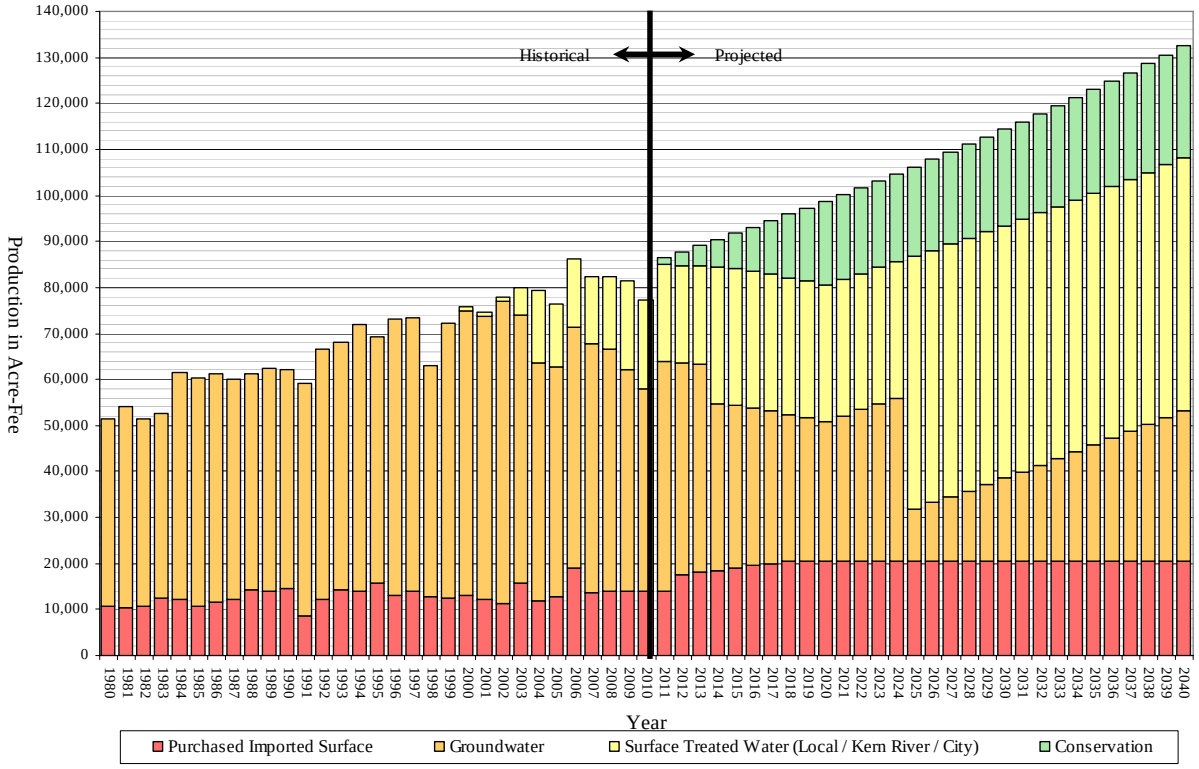
Actual and projected water use through 2040 is shown in Table 3.4-2. The values represent the total target demand projection based on SBx7-7 gpcd targets, including unaccounted for water.

Table 3.4-2: Total Water Use – Actual and Projected AFY (Table 11)

	2005 (Actual)	2010 (Actual)	2015	2020	2025	2030	2035	2040
Water Use	76,338	77,177	84,029	80,644	86,788	93,400	100,513	108,173

Figure 3.4-1 shows the planned sources of supply based on these demands through 2040. Cal Water's efforts to secure alternative supplies are discussed in the following section.

Figure 3.4-1: Historical & Projected Sources



The projected demand to be supplied by Kern County Water Agency is shown in Table 3.4-3. The values shown in the table represent the full entitlement from Kern County Water Agency.

Table 3.4-3: Agency Demand Projections To ID-4 – AFY (Table 19)

Wholesaler	Source	2010	2015	2020	2025	2030	2035	2040
Kern County Water Agency (ID-4)	Henry C. Garnett Water Treatment Plant (expanded)	20,500	20,500	20,500	20,500	20,500	20,500	20,500

4 System Supplies

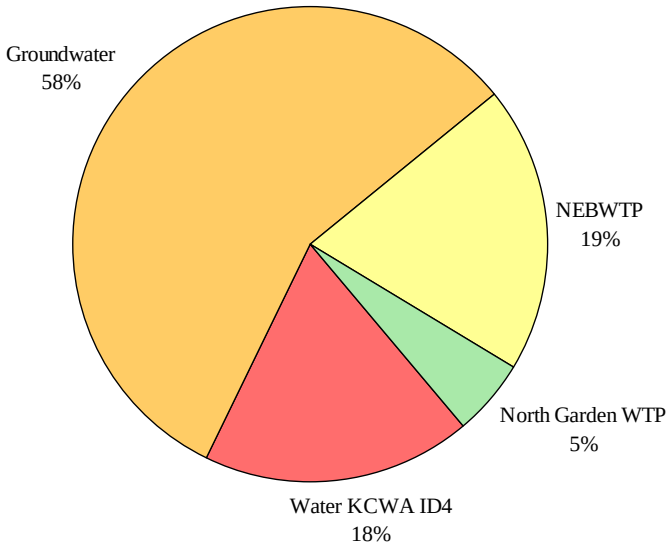
4.1 Water Sources

The water supply for the customers of the Bakersfield District comes from a combination of the following sources:

- Groundwater
- Treated surface water
- Purchased supplemental water

The water supply is divided into various sources as shown in Figure 4.1-1. In 2010 groundwater supplied 58 percent of the annual demand. Kern River water purchased from the City of Bakersfield and treated by Cal Water's North East Bakersfield Water Treatment Plant (NEBWTP) equaled 19 percent of the total. The North Garden Water Treatment Plant uses this same source and supplied 5 percent of the total supply in 2010. Purchased treated Kern River or State Water Project (SWP) water from Improvement District No. 4 (ID-4) of the Kern County Water Resources Agency (KCWRA) provided remaining 18 percent.

Figure 4.1-1: Water Sources (2010)



The District participates in several groundwater banking or in-lieu programs intended to maintain groundwater basin storage and levels. These programs include:

- Annual purchase by the Cal Water of 20,000 AF of seepage losses from Kern Delta Water District (KDWD).
- Cal Water currently has banked approximately 42,000 AF in the City of Bakersfield's dedicated 2,800 acre recharge preserve.
- Cal Water, in conjunction with ID-4, has approximately 22,000 AF of recharged State Project Water in the basin.

These groundwater banking programs are intended to provide needed water to the District during times of drought or emergencies. Extraction of these stored quantities by Cal Water would be coordinated through the City and ID-4.

To continue with these programs and for the District to reduce its dependence on groundwater during normal water years, additional sources of supplies are currently being developed. These projects are outlined below and further described in detail in the following sections.

- Cal Water participated with ID-4 in the expansion of the Henry C. Garnett treatment plant along with construction of the North West Feeder Line.
- Cal Water's NEBWTP will add additional capacity during Phase 2 and 3 expansions.
- Cal Water has completed the North Garden WTP in Northwest Bakersfield
- A proposed South West Bakersfield WTP (SWBWTP) will provide a water source in two increments, initial and second phase.
- A proposed Rosedale Ranch and Seventh Standard Corridor WTP (RRSSWTP) will provide a water source in two increments, initial and second phase.

Determining the actual supply of groundwater available to Cal Water in any given year is complicated by several factors. The first of which is that there has not been a legal adjudication of groundwater rights for basin pumpers. Because of the difficulty in defining an exact supply quantity, the theoretical supply could be considered the amount that Cal Water has the ability to pump. The design capacity of all the active wells is currently 127 mgd, or if run continuously, 142,000 AFY. However, this value greatly exceeds the projected water demand throughout the planning horizon of this UWMP, and may be unrealistic to characterize supply in this way. Cal Water recognizes the need for responsible management of groundwater resources and will remain committed to implementing conservation programs to minimize its pumping in the basin, and will remain supportive of the management efforts of the Kern County Water Agency. Cal Water will only pump enough water to meet the needs of its customers, after first maximizing its surface water treatment plants and ID-4 purchases.

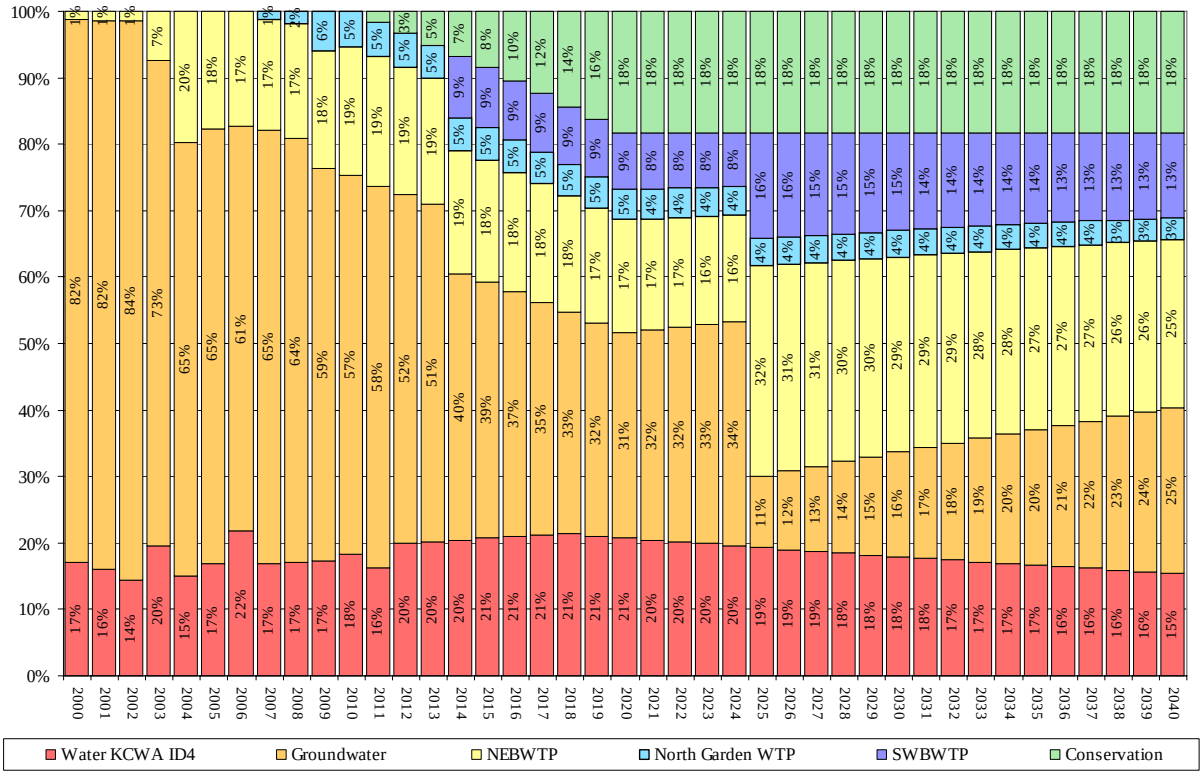
Table 4.1-1 shows the mix of expected supplies in five year increments. The total groundwater supply in any given year is assumed to equal the difference between the total projected demand and the amount provided from the treatment plants and from ID-4. Cal Water is in the process of utilizing more surface water as its primary water source, while still maintaining the groundwater supply and sufficient production facilities that can be used during periods when surface water is curtailed, and to provide for peak demands.

Table 4.1-1: Actual and Planned Water Supplies (Table 16) (AFY)

Water Supply Sources	2005 Actual	2010 Actual	2015	2020	2025	2030	2035	2040
ID-4 Kern County Water Agency (KCWA)	12,908	14,103	19,000	20,500	20,500	20,500	20,500	20,500
Northeast Bakersfield Treatment Plant	13,574	14,922	16,802	16,802	33,604	33,604	33,604	33,604
North Garden Treatment Plant	0	4,157	4,481	4,481	4,481	4,481	4,481	4,481
South Bakersfield Treatment Plant	0	0	8,401	8,401	16,802	16,802	16,802	16,802
Supplier produced groundwater	49,856	43,995	35,345	30,460	11,401	18,013	25,126	32,786
Transfers in or out	-	-	-	-	-	-	-	-
Exchanges In or out	-	-	-	-	-	-	-	-
Recycled Water (projected use)	-	-	-	-	-	-	-	-
Desalination	-	-	-	-	-	-	-	-
Total	76,338	77,177	84,029	80,644	86,788	93,400	100,513	108,173

While groundwater and purchased ID-4 treated water will continue to be a significant percentage of the District's future water supply, their overall percentage will diminish in the future as Cal Water proceeds with a number of additional surface water treatment plant expansions and new projects. This is shown below in Figure 4.1-2, which assumes groundwater is used to supply the peaking demand.

Figure 4.1-2: Planned Use of Supply



4.2 Purchased Water

The purchased water used in the Bakersfield District is imported into the city by the Kern County Water Agency (KCWA) - Improvement District No. 4 (ID-4). KCWA is a contractor of the State Water Project (SWP) and imports water for Municipal and Industrial use in the urbanized area through the California Aqueduct, a facility of the SWP, which is owned and operated by the California Department of Water Resources.

Cal Water purchases imported water from ID-4, which serves as a regional water management agency. ID-4 built and operates a surface water treatment plant (Henry C. Garnett Water Treatment Plant, HGWTP) that serves Cal Water, East Niles Community Services District, and North of the River Water District. ID-4 obtains its water supply from KCWA entitlements to SWP supplies and from Kern River flows. ID-4 uses these waters to recharge groundwater aquifers and to supply its conventional multi-media high rate filtration plant. Cal Water has a contract with ID-4 to purchase 20,500 acre-feet/year (10.26 MGD average annual) of treated water from the treatment plant. Depending on the

needs of other water suppliers and the production capabilities of the plant Cal Water can purchase up to 15 percent more than this amount or has a contracted peaking capacity of 15.5 MGD. Cal Water annually prepares a monthly demand schedule for this water and submits it to ID-4. The schedule is weighted so that the greatest amount of water delivered is during the peak summer demand period. Deliveries are reduced to less than the average annual value during the winter months. Total treatment plant capacity of the ID-4 plant is about 50,400 AFY (45 MGD). Each of the entities that are served by ID-4 has a fixed contractual allocation of ID-4 treatment plant capacity. The water acquired from ID4 is obtained through five service connections.

Rapid growth is also occurring in the northwest Bakersfield area. To provide a reliable supply for this area, Cal Water entered into an agreement with KCWA for expansion of the ID-4 treatment plant and for construction of the Northwest feeder pipeline to convey water to the area from the expanded ID-4 treatment plant. Cal Water has contracted for an additional 9,000 AF/YR (8.0 MGD average annual flow) and a peaking capacity of 15.0 MGD.

The ID-4 treatment plant water is used throughout the year by the Cal Water Bakersfield District and in particular to meet peak summer demands and thereby reduce pumping of groundwater aquifers during that period. Groundwater elevations in the District have stabilized since use of this supply began in 1977. To insure use of water from the ID-4 plant, KCWA uses financial incentives (pump tax) so as to minimize the extraction of groundwater. This approach permits recharge to the groundwater to maintain or increase the amount in storage.

The reliability of KCWA's imported water supply from the SWP has been impacted by the recent Wanger Decision that limits pumping in the Delta. Pumping restrictions have been implemented, at least temporarily, because of the negative impact of pumping on Delta Smelt populations, which are protected under the California Endangered Species Act. The restrictions will be in place from late December through June and could reduce available supply from this source by up to 30 percent. This level of reduction could limit KCWA's ability to deliver normal allocation amounts to each of its retail customers, especially in dry or consecutive dry years. Delta pumping restrictions due to Delta Smelt and other emerging species of concern are expected to last for at least several years.

Purchased water agreements are provided in Appendix H, I, and J.

4.3 Surface Water

Cal Water utilizes surface water treatment plants to supply a portion of the total supply to the City of Bakersfield and is proposing three additional plants. The water treatment plants will be utilized to address several water quality issues in addition to supply the present and future demand of the District.

Northeast Bakersfield Water Treatment Plant

In June 2003, Cal Water commenced operation of the Northeast Bakersfield Water Treatment Plant (NEBWTP). The first phase treats a base load of 22,403 AFY (20 MGD) of pumped Kern River water. The plant has peak capacity of 23 MGD. Cal Water has a signed long-term supply agreement for 67,200 AFY with the City of Bakersfield for water supplied to the plant. The City of Bakersfield holds pre-1914 appropriative rights to Kern River water.

Two additional expansions of the NEBWTP will provide addition water to the District. Phase 2 will add another 20 MGD (22,400 AFY) of base load capacity to bring the total to 40 MGD (44,800 AFY) with a peaking capacity 46 MGD. It is projected to be online by 2030. Phase 3 of the expansion of the NE Bakersfield WTP will add another 20 MGD (22,400 AFY) of base load capacity to bring the total to 60 MGD (67,200 AFY) with a peaking capacity of 69 MGD. It is not projected to be online during the planning horizon of this UWMP.

North Garden Water Treatment Plant

Cal Water has constructed a micro-filtration plant in the North Garden WTP in North West Bakersfield area that treats Kern River water and serves the area. The plant has a capacity of 8,960 AFY (8.0 MGD) base load (10.4 MGD peaking) capacity. Half of the total base load (4,480 AFY, 4.0 MGD) is supplied to the City of Bakersfield under contract.

Southwest Bakersfield Water Treatment Plant

Phase 1 of the proposed Southwest Bakersfield WTP will provide 22,400 AFY (20 MGD) of base load capacity (peaking capacity will be 23 MGD); however, half of the capacity will be contracted to the City so Cal Water's share will be 11,200 AFY (10 MGD) base load (11.5 MGD peaking capacity). It is expected to be online in 2014.

Phase 2 of the proposed Southwest Bakersfield WTP will provide another 22,400 AFY (20 MGD) of base load capacity to bring the total to 44,806 AFY (40 MGD) (peaking capacity will be 46 MGD). Since half of the capacity will be contracted to the City, Cal Water's share will be 22,403 AFY (20 MGD) base load (23 MGD peaking). The source of raw water is Kern River based on a long-term supply contract with the City. Implementation of Phase 2 will depend on the rate of growth in the Southwest area, but is assumed occur in 2025.

Rosedale Ranch and Seventh Standard Corridor Water Treatment Plant

Phase 1 of the proposed Rosedale Ranch and Seventh Standard Corridor (RRSS) WTP will provide 7,840 AFY (7.0 MGD) of base load capacity (peaking capacity will be 8.0 MGD). It is expected to be online in 2010. The source of raw water is Kern River based on a long-term supply contract with the City. Phase 2 will add another 5,040 AFY (4.5 MGD) of base load capacity. Implementation of Phase 2 will depend on the rate of growth in the Rosedale Ranch and the Seventh Standard Corridor, but is assumed to be 2045.

4.4 Groundwater

Historically, groundwater, on the average, has satisfied up to 80 percent of the District's water demand. The groundwater used by the Bakersfield District is extracted from the unconfined aquifers of the Kern River Fan that underlie the District. Groundwater extraction is accomplished using 136 wells, of which 115 are currently operational.

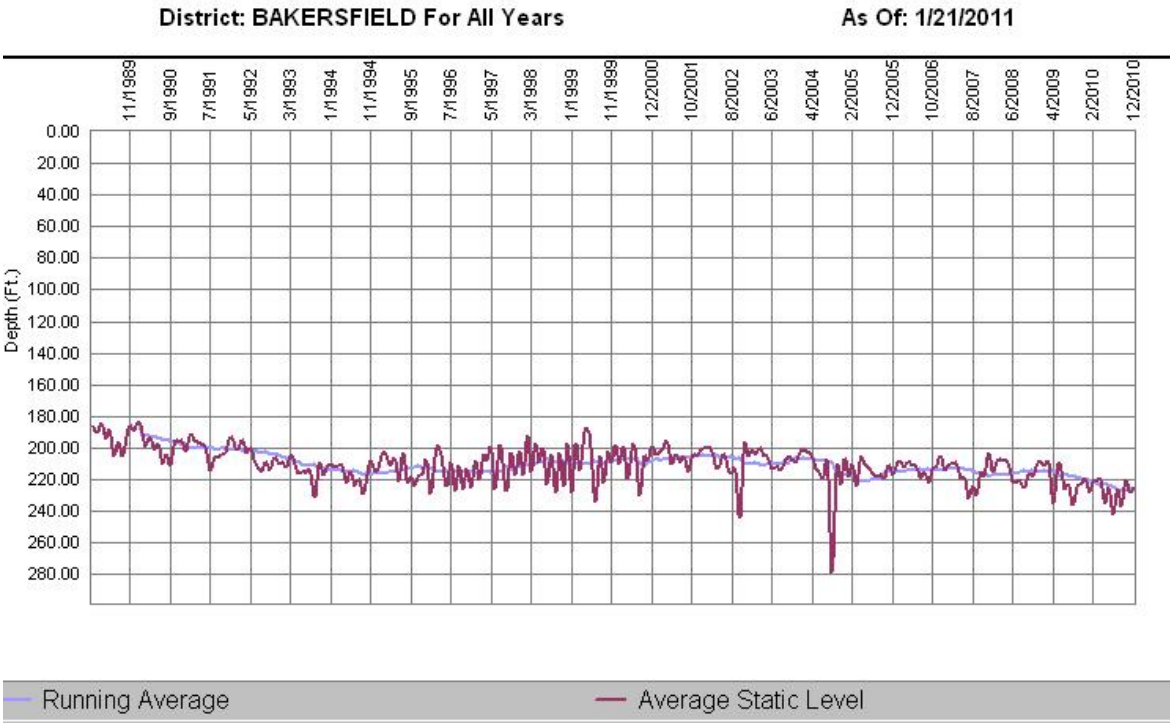
Current design capacity for the operational wells is 127 MGD, equivalent to approximately 142,000 AFY. The District has sufficient groundwater production capacity to supply all of the current annual average day demand using this source. All portions of the distribution system can be served by groundwater; however, not all areas can be served with sufficient groundwater to meet maximum day demand. Because of the storage capacity limitations and distribution system restrictions, operation of these groundwater production facilities at design parameters is not always feasible.

Average groundwater elevations in the District had declined steadily through the 1960s and 1970s, with only a slight upward response to the availability of SWP supplies to Kern County in 1968. In 1977 KCWA began a conjunctive use program with both urban and agricultural pumpers that enable surplus imported supplies to be used in-lieu of groundwater. This program resulted in a 10-foot rise in the average static groundwater elevations in the Bakersfield District.

In the mid-1990s Cal Water changed the method for storing and presenting the groundwater level data they collect. The new computerized system houses manually collected and entered data. Data back to 1989 was included in the computer database. Individual, as well as average data and graphs can be displayed.

The District well level average (static) indicates that a 25 foot decline in groundwater levels occurred as a result of the 1987-1992 drought. Recovery began in 1995 resulting in an average increase of 12 feet. During the more recent drought groundwater previously banked in the basin by other agencies was pumped to make up the shortfall in surface supplies. This resulted in a further decline in groundwater levels. Figure 4.4-1 shows average well level for the Bakersfield District.

Figure 4.4-1: District Well Level Average



In response to changing water quality regulations and conditions, Cal Water plans to reduce the amount of groundwater it produces from this basin and will replace this supply with treated surface water from the Kern River. In 2009 groundwater extraction totaled 48,154 AF. By 2040 Cal Water anticipates reducing the use of groundwater to about 32,786 AF annually. This, along with the groundwater recharge activities Cal Water is participating in, will reduce overdraft, allow water levels to rebound, and increase basin storage. Additional water sources will need to be investigated after this time to limit groundwater withdrawals as Bakersfield grows. Managing the quantity of water stored in the groundwater aquifers in the region will help perpetuate the availability of this resource.

The historical volume of the groundwater pumped is shown in Table 4.4-1.

Table 4.4-1: Amount of Groundwater Pumped – AFY (Table 18)

Basin Name	2006	2007	2008	2009	2010
San Joaquin Valley Basin	52,499	53,889	52,661	48,154	43,995
% of Total Water Supply	61%	65%	64%	59%	57%

Projected groundwater withdrawals through 2040 are listed in Table 4.4-2.

Table 4.4-2: Amount of Groundwater projected to be pumped – AFY (Table 19)						
Basin Name	**2015**	**2020**	**2025**	**2030**	**2035**	**2040**
San Joaquin Valley Basin	35,345	30,460	11,401	18,013	25,126	32,786
% of Total Water Supply	39%	31%	11%	16%	20%	25%

Cal Water plans to continue to use groundwater as a source of supply into the future. Imported supplies and treated surface water will make up the bulk of the average day demand in the District while groundwater will be used to supplement maximum day and peak demands. Groundwater wells will also provide reliability of supply for times when treated surface water is in short supply due to treatment plant maintenance or drought.

4.4.1 Basin Boundaries and Hydrology

The Kern County Groundwater sub-basin is bounded on the north by the Kern County line and the Tule Groundwater sub-basin, on the east and southeast by granite bedrock of the Sierra Nevada foothills and Tehachapi Mountains, and on the southwest and west by the marine sediments of the San Emigdio Mountains and Coast Ranges. Principal rivers and streams include Kern River and Poso Creek.

The current DWR Groundwater Bulletin 118 published in 2003 does not state that the basin is in overdraft, which is inconsistent the Bulletin published in 1980 which lists the basin as critical condition of overdraft. The current Bulletin and the District operating records show that the water levels have remained unchanged since 1970; however, prior years have shown water level higher then current levels. Regardless of the basin status, Cal Water is taking steps in reducing its dependence on groundwater by increasing surface water production. By doing so, the water banked by limiting the groundwater supply can be used during periods of droughts.

Additional details of the basin[5] are given in the DWR's Groundwater Bulletin 118, see Appendix D.

4.4.2 Groundwater Management Plan

The groundwater basin that Cal Water pumps from is an un-adjudicated basin. Recharge and in-lieu programs are managed by the City of Bakersfield and Kern County Water Agency ID-4. A GWMP has not been developed; however ID-4 has an annual Report on Water Conditions within ID-4, which contains the same information as a GWMP. The Agency's management plan in attached in Appendix K.

4.5 Recycled Water

The recycling of wastewater offers several potential benefits to Cal Water and its customers. Perhaps the greatest of these benefits is to help maintain a sustainable

5 California's Ground Water Bulletin 118, 2003; Tulare Hydrologic Region; San Joaquin Valley Groundwater Basin; Kern County Subbasin; Groundwater Basin Number: 5-22.14

groundwater supply either through direct recharge, or by reducing potable supply needs by utilizing recycled water for appropriate uses (e.g., landscape, irrigation) now being served by potable water. Currently, no wastewater is recycled for direct reuse from the domestic or industrial wastewater streams in the District. Indirect recycling occurs through the recharge of groundwater. The potential amount of recycled water that can be produced is proportional to the amount of wastewater that is generated by the District, and is discussed in the following sections.

4.5.1 Wastewater Collection

Four wastewater treatment plants serve the City of Bakersfield. The City of Bakersfield owns, operates and maintains the collection sewer system for Treatment Plant 2 and Treatment Plant 3. The Kern Sanitation Authority and North of River Sanitary District Number 1 also own and maintain the sewer systems for their respective treatment plants. The collection systems consist of gravity sewers less than 24 inches in diameter, raw sewage pumping stations and force mains. The North of River Sanitary District Number 1 wastewater treatment plant only receives wastewater from residential customers.

All four wastewater treatment plants servicing Bakersfield utilize secondary treatment with trickling filters. The wastewater flow rate capacities and current wastewater flow rates for each treatment plant are given in Table 4.5-1.

Table 4.5-1: Wastewater Flow Rates in the City of Bakersfield

Plant	Capacity		Average flow rate	
	MGD	AFY	MGD	AFY
Treatment Plant 2	25	28,004	17	19,042
Treatment Plant 3	16	17,922	11	12,322
Kern Sanitation Authority	6-7	6,721	4.3	4,817
North of River Sanitary District #1	6	6,721 - 7,841	4.5	5,041
Total	53-54	59,368 - 60,488	36.8	41,221

All treated effluent is currently used for agricultural irrigation for a variety of crops on farmland surrounding the treatment plants. During the winter months, the recycled water not used for irrigation is discharged to storage reservoirs and used for irrigation during the following growing season.

Additional water recycling is provided by the petroleum industry. There are several oil companies in the area that produce deep groundwater while pumping oil wells. Most of this water is used for steam cooling operations and subsequently treated. The treated water is then released into agricultural lands[6].

[6] Kern County Water Agency - Improvement District No. 4, Urban Water Management Plan, No. 4. December 1995

4.5.2 Estimated Wastewater Generated

Estimates for the District's wastewater production quantity since 1980 are shown in Figure 4.5-1 and were calculated by annualizing 90 percent of January water use in Cal Water's service area. The future quantity of waste generation is based on a linear projection of the historical estimates. The estimated volume of wastewater generated for the District in five-year increments to the year 2040 is presented in Table 4.5-2.

Figure 4.5-1: Estimated District Annual Wastewater Generated

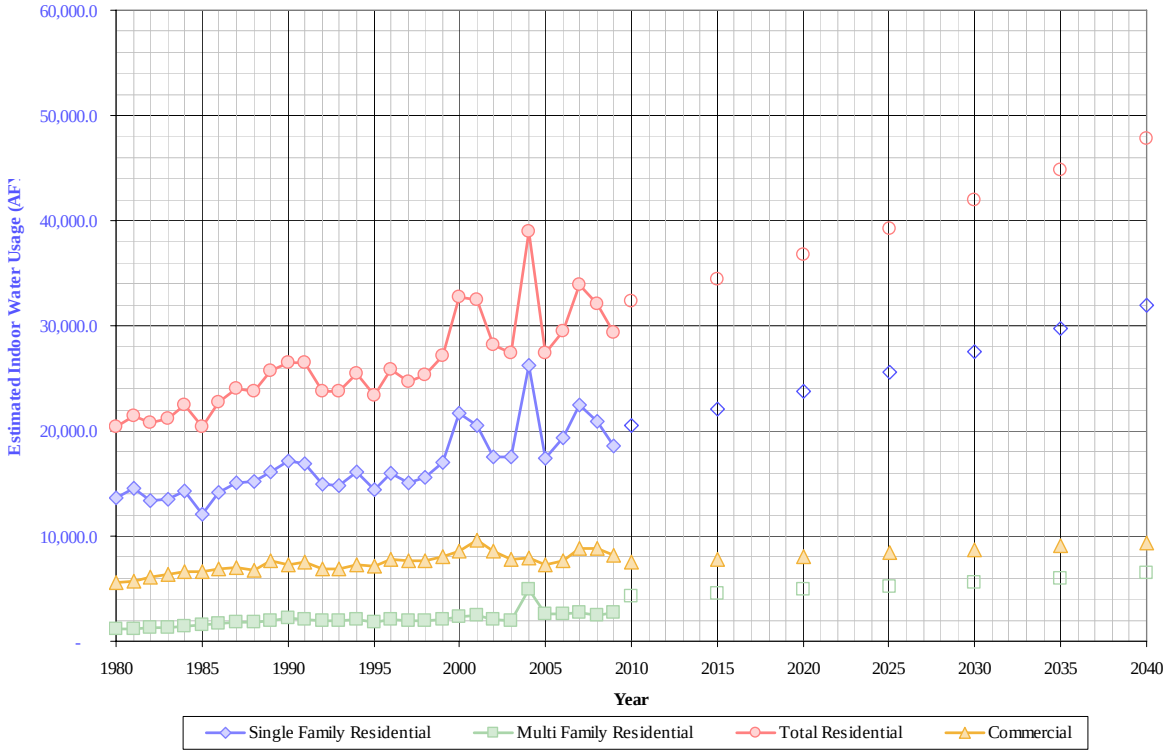


Table 4.5-2: Disposal of wastewater (non-recycled) AFY (Table 22)									
Method of Disposal	**Treatment Level**	**2005**	**2010**	**2015**	**2020**	**2025**	**2030**	**2035**	**2040**
Agricultural Irrigation	Secondary treatment with trickling filters	27,383	32,303	34,461	36,772	39,248	41,900	44,741	47,785
	Total	27,383	32,303	34,461	36,772	39,248	41,900	44,741	47,785

4.5.3 Potential Water Recycling

It is anticipated that treated wastewater will continue to be used for agricultural irrigation. Agricultural reuse of the wastewater saves on groundwater withdrawal and in turn helps preserve Cal Water's groundwater supply. The additional source of treated water for agriculture from the petroleum industry also offsets part of the demand for water. Because agricultural application utilizes all of the treated wastewater supply and is the only anticipated use of recycled water in the future, the projected recycled water supply

for Cal Water's Bakersfield service area through the year 2040 is 0 acre-feet per year. Cal Water has not implemented any incentive programs to encourage recycled water use because they do not own and operate the wastewater system.

Table 4.5-3: Recycled Water - Potential Future Use-AFY (Table 23)								
User Type	**Description**	**Feasibility**	**2015**	**2020**	**2025**	**2030**	**2035**	**2040**
Agricultural irrigation	Farming	Yes	34,461	36,772	39,248	41,900	44,741	47,785
Landscape irrigation	Parks, Schools, etc.	No	0	0	0	0	0	0
Groundwater recharge	Indirect potable reuse	No	0	0	0	0	0	0
Wetlands/Wildlife	Environmental	No	0	0	0	0	0	0
	Total		34,461	36,772	39,248	41,900	44,741	47,785

4.6 Desalinated Water

There are no opportunities for the development of desalinated water in the District. Bakersfield is located inland at a great distance from any source of saline water.

4.7 Transfer or Exchange Opportunities

With exception of the City of Bakersfield agreements mentioned earlier Cal Water does not have any transfer agreements in place. Increased future demand will be supplied by treated surface water provided through ID-4 and the City of Bakersfield. Long term agreements with these agencies will be developed as needed. Excess groundwater supplies will be stored for aquifer recovery and drought management.

For the purposes of augmenting groundwater recharge in Cal Water's Visalia District, The Bakersfield District has participated in a transfer of banked groundwater. There is 10,000 acre-feet of water banked in the City of Bakersfield's groundwater bank, which is owned by Cal Water and can be made available over 5 to 7 years for extraction and ultimate delivery to the Visalia area via the Kaweah River and its distributaries for groundwater recharge.

In order to make the cost acceptable as recharge water, the water will be first delivered to citrus growers in Hills Valley Irrigation District (that can use and are willing to pay for the firm nature of this water) and they in turn will provide the City of Visalia and the Visalia District water in a future year at a cost of somewhere between $25 and $50 per acre-foot at a time when the City of Visalia otherwise does not have access to water at equivalent costs. Thus, the City of Visalia will be able to access 10,000 acre-feet of water it otherwise would not be able to purchase elsewhere at a net cost of somewhere between $25 and $50 per acre-foot. In 2010 1,623 AF were recharged under this agreement, 1,300 of which were purchased by the City at a price of $50/AF and 324 of which were prepaid by Hills Valley at no cost to the City.

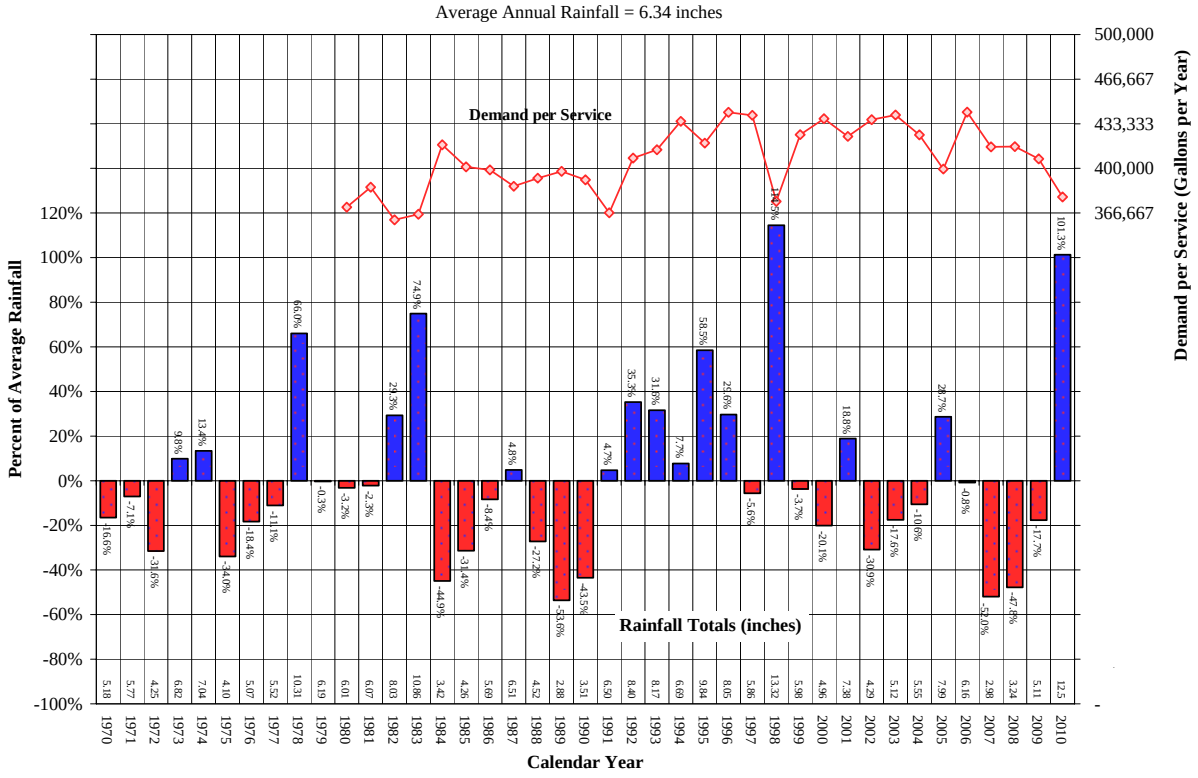
5 Water Supply Reliability and Water Shortage Contingency Planning

5.1 Water Supply Reliability

A chart comparing annual rainfall since 1970 to the historic average is shown in Figure 5.1-1. It also displays the demand per service values for each year. You can see that water use usually increases in the first years of a drought. Afterwards, conservation efforts are increased and the demand per service decreases accordingly. The statewide drought of 1987-1992 is a good example of these trends. The data shows that the drought began as far back as 1984, with a corresponding increase in demand per service in the early years and a drop as the drought persisted. Water use later rebounded to above pre-drought levels.

Other below average rainfall periods have also occurred in the District's history. These periods coincide with the drought conditions that California experienced from 1977-1978 and 2007-2009.

Figure 5.1-1: Comparison of Annual Rainfall to Historical Average



5.2 Drought Planning

Because the Bakersfield District relies on groundwater during droughts it is difficult to define an exact supply available in any given type of hydrologic year. Storage in the groundwater basin will provide a buffer against years with decreased precipitation while wetter years will recharge natural supplies and provide adequate surface supplies. As a result Cal Water can not compare total supply volumes as it would in areas that are supplied either by local reservoirs or solely by imported surface water. In addition, the surface water supplies are relatively new and were not present in the years normally used to analyze reliability.

The most recent driest year occurred in 2007 when the rainfall was 51 percent below average (2.98 inches). This is taken as the single dry year shown in Table 5.2-1. The normal year chosen was 1999 when annual precipitation was just 2 percent below average. As discussed in the following section, surface supplies are expected to be reliable in all hydrologic years.

Table 5.2-1: Basis of Water Year Data (Table 27)

Water Year Type	Base Year (s)
Average Water Year	1999
Single-Dry Water Year	2007
Multiple-Dry Water Years	2006-2009

Because we have made the assumption that the total supply will equal demand, it may be more appropriate to discuss the annual hydrologic variation in terms of overall demand per service. In general, water use tends to increase during drier years as potable water is used for purposes that would normally be supplied by natural precipitation, such as outdoor landscape irrigation.

Table 5.2-2: Supply Reliability – gal/service/yr (Table 28)

Average / Normal Water Year	Single Dry Water Year	Multiple Dry Water Years			
		Year 1	Year 2	Year 3	Year 4
425,221	416,034	441,895	416,034	416,235	407,085
% of Normal	98%	104%	98%	98%	96%

For the reasons described above, groundwater supplies are not limited during dry hydrologic years. In addition, imported and surface supplies are expected to be available in normal quantities in all years. Therefore, an adequate supply to meet customer

demands is expected to be available during multiple-dry year events. Table 5.2-3 shows the minimum supplies that would be available in a multiple dry year event from 2011-2013, beginning in 2010 with a normal hydrologic year. The total supply amounts were calculated by applying the percentages from years 1-3 in Table 5.2-2 to the target demand projection for those years. The imported and surface supplies shown are the normal projected amounts for these sources. Groundwater will provide the remaining supply and will vary depending on customer demand. During future dry periods customer water use patterns are expected to be similar to past events.

Table 5.2-3: Supply Reliability – Current Water Sources - AFY (Table 31)

Water Supply Source	Average / Normal Water Year Water Supply	Multiple Dry Water Year Water Supply		
		2011	2012	2013
Purchased	14,103	14,000	17,500	18,000
Groundwater	52,075	53,112	44,226	43,526
NEBWTP	14,922	16,802	16,802	16,802
North Garden WTP	4,157	4,481	4,481	4,481
Total	85,257	88,395	83,008	82,808
% of Normal Year	100%	104%	97%	97%

5.2.1 Normal-Year Comparison

Water supply and demand patterns change during normal, single dry, and multi dry years. To analyze these changes, Cal Water relies on historical usage to document expected changes in future usage in water demand; such as, assuming increasing demand due to increased irrigation needs or a decrease in demand due to awareness of drought conditions.

KCWA can expect a 60 percent allocation of SWP Table A supplies during normal years, which is sufficient to meet normal treated water demands. As a result, Cal Water can expect to receive sufficient supplies from KCWA in normal years.

In normal years surface water in the Kern River is sufficient to operate the treatment plants at the desired capacity and the City of Bakersfield maintains water rights in excess of current demands.

Groundwater will continue to be an important source of supply throughout the planning horizon. It will be needed to meet peak demands and to supply portions of the distribution system that are more isolated from the surface treatment plants.

For this analysis the normal supply is considered equal to the SBx7-7 target water demand projection. Conservation savings are already incorporated into this projection.

Table 5.2-4 indicates that current and planned supplies will be reliable throughout the planning horizon of this UWMP and that no supply deficiencies are expected.

Table 5.2-4: Supply and Demand Comparison - Normal Year - AF (Table 32)						
	2015	2020	2025	2030	2035	2040
Purchased	19,000	20,500	20,500	20,500	20,500	20,500
Groundwater	35,345	30,460	11,401	18,013	25,126	32,786
NEBWTP	16,802	16,802	33,604	33,604	33,604	33,604
North Garden WTP	4,481	4,481	4,481	4,481	4,481	4,481
SBTP	8,401	8,401	16,802	16,802	16,802	16,802
Supply totals	84,029	80,644	86,788	93,400	100,513	108,173
Demand totals	84,029	80,644	86,788	93,400	100,513	108,173
Difference	0	0	0	0	0	0
Difference as % of Supply	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Difference as % of Demand	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%

5.2.2 Single Dry-Year Comparison

In single dry years the quantity of Kern River water supplied by the City of Bakersfield to Cal Water's Northeast and Northwest water treatment plants is expected to be the same as for a normal year. (Note: On November 7, 2001, the City and Cal Water executed a supplemental agreement (Water Board Agreement No. 10-26) that provides for the City to use various means to maintain the normal supply during critically dry years. A copy of this agreement is attached in Appendix I.)

According to KCWA's Draft 2010 UWMP, treated water deliveries will be 100 percent reliable during single dry years. This will be accomplished by pumping groundwater to offset any reduction in Table A deliveries. KCWA manages the groundwater basin through conjunctive use of surface water while excess supplies are available. Therefore, groundwater will make up any supply deficiency caused by a reduction in purchased water or surface water, and the total supply will equal the projected demand in any given single dry year. Cal Water will also operate its own wells to insure adequate supplies in single dry years.

In general, and from operational records, the District's demand has shown to increase during a single-dry year as compared to normal years. The water demand increases due to maintenance of landscape and other high water uses that would normally be supplied by precipitation. The supply and demand values shown in Table 5.2-5 were calculated by increasing the target demand projection in each year by the percentage listed for the single dry year in Table 5.2-2. The imported and surface supplies shown are the normal projected amounts for these sources. Groundwater will provide the remaining supply and

will vary depending on customer demand. Therefore, the supply is 100 percent reliable in single dry years.

Table 5.2-5: Supply and Demand Comparison – Single Dry Year - AF (Table 33)						
	2015	2020	2025	2030	2035	2040
Purchased	19,000	20,500	20,500	20,500	20,500	20,500
Groundwater	33,529	28,718	9,526	15,995	22,955	30,449
NEBWTP	16,802	16,802	33,604	33,604	33,604	33,604
North Garden WTP	4,481	4,481	4,481	4,481	4,481	4,481
SBTP	8,401	8,401	16,802	16,802	16,802	16,802
Supply totals	82,213	78,901	84,913	91,382	98,342	105,836
Demand totals	82,213	78,901	84,913	91,382	98,342	105,836
Difference	0	0	0	0	0	0
Difference as % of Supply	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Difference as % of Demand	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%

5.2.3 Multiple Dry-Year Comparison

According to KCWA's Draft 2010 UWMP, treated water deliveries will also be 100 percent reliable in multiple dry years. Any deficiency in SWP Table A water will be supplemented by pumping banked groundwater for the duration of the drought. Also, based on the previously mentioned agreement, the City of Bakersfield surface water supply is expected to be available in multiple dry year periods.

If surface or imported supplies are not adequate to meet multiple dry year demands, Cal Water will draw from its groundwater banks. By maintaining excess well capacity Cal Water can insure that all customer demands will be met.

As noted earlier, water demand generally increases early in a multiple dry year period then gradually decreases as the drought persists and customers respond to conservation messaging. This pattern is evident in Table 5.2-6 where demands at the beginning of each five year period are higher than in the normal year, and demands decrease each year thereafter. The supplies and demands shown here are calculated by multiplying the target demand projection for that year by the percentages listed in Table 5.2-2 for the multiple dry year sequence. The imported and surface supplies shown are the normal projected amounts for these sources. Groundwater will provide the remaining supply and will vary depending on customer demand. Again, no supply deficiency is expected.

Table 5.2-6: Supply And Demand Comparison - Multiple Dry Year Events – AFY (Table 34)						
		2015	2020	2025	2030	2035
Multi-dry year first year supply	Purchased	19,000	20,500	20,500	20,500	20,500
	Groundwater	38,640	33,622	14,804	21,676	29,068
	NEBWTP	16,802	16,802	33,604	33,604	33,604
	North Garden WTP	4,481	4,481	4,481	4,481	4,481
	SBTP	8,401	8,401	16,802	16,802	16,802
	Supply Totals	87,324	83,806	90,191	97,063	104,455
	Demand Totals	87,324	83,806	90,191	97,063	104,455
	Difference	0	0	0	0	0
	Difference as % of Supply	0.0%	0.0%	0.0%	0.0%	0.0%
	Difference as % of Demand	0.0%	0.0%	0.0%	0.0%	0.0%
Multi-dry year second year supply	Purchased	19,500	20,500	20,500	20,500	20,500
	Groundwater	32,440	29,886	10,780	17,347	24,411
	NEBWTP	16,802	16,802	33,604	33,604	33,604
	North Garden WTP	4,481	4,481	4,481	4,481	4,481
	SBTP	8,401	8,401	16,802	16,802	16,802
	Supply Totals	81,624	80,070	86,167	92,734	99,798
	Demand Totals	81,624	80,070	86,167	92,734	99,798
	Difference	0	0	0	0	0
	Difference as % of Supply	0.0%	0.0%	0.0%	0.0%	0.0%
	Difference as % of Demand	0.0%	0.0%	0.0%	0.0%	0.0%
Multi-dry year third year supply	Purchased	20,000	20,500	20,500	20,500	20,500
	Groundwater	31,353	31,109	12,098	18,762	25,935
	NEBWTP	16,802	16,802	33,604	33,604	33,604
	North Garden WTP	4,481	4,481	4,481	4,481	4,481
	SBTP	8,401	8,401	16,802	16,802	16,802
	Supply Totals	81,037	81,293	87,485	94,149	101,322
	Demand Totals	81,037	81,293	87,485	94,149	101,322
	Difference	0	0	0	0	0
	Difference as % of Supply	0.0%	0.0%	0.0%	0.0%	0.0%
	Difference as % of Demand	0.0%	0.0%	0.0%	0.0%	0.0%

5.3 Factors Affecting Reliability of Supply

Although the historical record shows that the demand can be met by the supply, several factors may reduce the reliability of these sources, which are listed in Table 5.3-1.

Table 5.3-1: Factors Resulting In Inconsistency of Supply (Table 10)

Name of supply	Legal	Environmental	Water Quality	Climatic
Groundwater	✓		✓	✓
Surface Water		✓		✓
Imported Water	✓	✓	✓	✓

The factors listed in the above table are described as follows:

- Legal issues may occur due to water right issues or limits on pumping due to adjudication.
- Environmental factors may result from endangered species legislation.
- Water quality concerns may occur through contamination of supplies or more stringent water quality standards, or water quality impacts associated with its transportation through the California Aqueduct.
- Climatic factors may limit water supplies due to drought conditions from lack of rainfall or snow pack.

Climatic conditions can always pose a threat to water supplies, especially in low rainfall areas such as California. The main concern for the District is water quality, which will be discussed in the next section.

Before the Wanger Decision restrictions went into effect, short-term drought events were not thought to pose a serious threat to the reliability of supply in the Bakersfield District. The buffer of excess imported supplies will not exist as long as Delta pumping is reduced. This decreases the reliability of supply from KCWA. During drought events Cal Water may have to implement voluntary or mandatory rationing depending on the severity of the drought and availability of imported supplies. During extended droughts, as the primary source of supply shifts from deliveries to groundwater withdrawals, and the reliability of supply would decrease as the drought event continued.

5.4 Water Quality

The drinking water delivered to customers in the Bakersfield District, whether its source was groundwater or imported water, meets or surpasses all federal and state regulations. The U.S. Environmental Protection Agency as authorized by the Federal Safe Drinking Water Act of 1974 sets drinking water standards. A state can either adopt the USEPA

standard or set state standards that are more stringent than those set by the federal government.

There are two types of drinking water standards: Primary and Secondary. Primary Standards are designed to protect public health by establishing Maximum Contamination Levels (MCL) for substances in water that may be harmful to humans. MCLs are established very conservatively for each contaminant and are generally based on health effects which may occur if a person were to drink three liters of the water per day for 70 years. Secondary Standards are based on the aesthetic qualities of the water such as taste, odor, color, and certain mineral content. These standards, established by the State of California, specify limits for substances that may affect consumer acceptance of the water.

Depending on location, the quality of groundwater produced by the District's active wells can be highly mineralized. This is evident in the concentration range from water quality report data, for Total Dissolved Solids (TDS) at 9 to 611 mg/Liter (secondary standard of 1000 mg/liter). Several wells have been tested and produce water that exceeds the Secondary Standard for manganese; however, these wells have either been taken out of service or treated to reduce the contaminant level in the water delivered.

Additionally, some wells have been tested showing concentrations of volatile organic compounds (VOCs), particularly trichloroethylene (TCE) and tetrachloroethylene (PCE), which have, on occasion, exceeded the MCL for these substances. A number of wells contain detectable concentrations of the inorganic compound nitrate. If the concentration of nitrates exceeds the MCL, wells are either taken out of service or treatment (ion exchange) is provided. Three wells have been taken out of service due to contamination from the chemical MTBE. Eighteen wells are within ¼ mile of known MTBE plumes. Should MTBE contamination occur at these wells, Cal Water would either provide treatment facilities or inactivate the wells if that is not feasible.

The presence of arsenic (As) in some of the District’s wells has resulted in a loss of groundwater supplies. In January 2006, the new USEPA As standard of 10 parts per billion (ppb) replaced the previous standard of 50 ppb. Cal Water has inactivated seven wells with arsenic levels in excess of 10 ppb for a loss of production capacity of 6,500 GPM (9.36 MGD). These wells are in the southern portion of the system, an area mainly served by groundwater, but also by ID-4 plant water during the late fall, winter and early spring. Cal Water has increased ID-4 flows to this area in the late spring, summer and early fall by reducing flows to the northeast from the ID-4 plant. The NE Bakersfield plant will make up for the redirected ID-4 water.

The State has the authority to set water quality standards that are more stringent than the adopted Federal standards. California's Department of Health Services has been considering an arsenic standard of 5 ppb. If DHS adopts the 5 ppb standard, this would impact 25 wells with a total capacity of 21,710 GPM (39.9 MGD). Cal Water is

developing an arsenic treatment plan should DHS adopt a more stringent standard than the US EPA.

The rapidly growing northwest area of the District including a sub-area called North Gardens was previously supplied completely by groundwater. In general, the Northwest area has experienced high chlorides, dibromochloropropane (DBCP), nitrates, hydrogen sulfide, and high levels of microbial activity in some wells, such as sulfate reducing and iron bacteria. Cal Water is treating some wells for removal of hydrogen sulfide, DBCP, and TCE. Cal Water drilled a new well in 2005 but could not complete it due to severe quality problems encountered that included the presence of some of the above constituents. The area where some of wells are experiencing quality problems was used for a large scale dairy and farming operation for many years prior to conversion to residential use. Homes in this area primarily utilize septic systems to leach wastewaters back into the ground. Groundwater levels in the Northwest area are declining and drinking water quality standards are getting more stringent, thus markedly increasing the difficulty in developing and using new well sites that meet all DHS requirements as well as keeping existing wells in service.

Cal Water currently has one site with an aeration system for hydrogen sulfide, six sites with activated carbon filters to remove VOCs, and one well site where the water must be blended to reduce nitrates to an acceptable level.

A hydro-geologist familiar with the area indicates that groundwater contamination has been and is an increasing problem, and that polluted or contaminated groundwater in the Northwest area presents a major challenge for water utilities attempting to develop wells to meet existing and future residential water demand. Because of past land use practices, ongoing use of septic tanks, and high levels of pumping from the area's groundwater system, the prognosis is that water quality problems will likely become more severe.

With respect to state drinking water standards, Cal Water believes that while groundwater can be treated to be in compliance for many parameters, it is not cost effective for others and a combination of contaminants such as VOCs, nitrates and vulnerability to fecal coliforms can substantially drive up the capital and O&M costs at a well site if ion exchange, GAC, and increased chlorination and site storage are all required. Groundwater quality is inferior to treated Kern River water from the standpoint of having more undesirable constituents and poorer taste and odor properties.

In addition, there is the concern that if groundwater were the only supply source for the northwest area, there would be a substantial increase in the groundwater pumping rate, which would likely result in overdrafting of groundwater, thereby reducing groundwater storage levels and inducing spread of contaminant plumes. Therefore, reliance on wells in this area to provide all required supply is not considered an acceptable option.

5.5 Water Shortage Contingency Planning

This section contains an updated version of Cal Water's Water Shortage Contingency Plan. The Water Shortage Contingency Plan was last revised in response to the drought that California experienced between 1987 and 1992. The first version of the Plan was included in each subsequent UWMP update.

California's most recent drought event that began in the spring of 2006, coupled with the Delta pumping restrictions, brought increased awareness to the importance of drought preparedness. By the spring of 2008 it became apparent that several of Cal Water's service districts had the potential for water supply shortages and potential wholesaler allocations in the following year. In response, a Conservation/Supply Team was formed to develop a plan for addressing these potential issues. Through this process Cal Water learned valuable lessons and is better prepared for extended droughts or other long term water shortages. The results of this planning process are summarized in this Water Shortage Contingency Plan.

5.5.1 Water Shortage Contingency Plan Scope

The Water Shortage Contingency Plan is a unique document designed to address specific conditions that may occur from time to time in Cal Water's service areas. It can be triggered by several types of events but is primarily used as a response to longer term drought conditions. The Water Shortage Contingency Plan provides a comprehensive company-wide strategy for approaching water supply shortages that may last from several months to several years in duration.

Other triggers may include a partial loss of supply due to a mechanical failure of either Cal Water or wholesale supplier facilities resulting from natural disasters, chemical contamination, or other water quality issues. These two types of triggers are unlikely in larger districts where operational changes can more easily be made in one part of the system to overcome supply shortages in other parts of the system. However, in smaller isolated systems that rely heavily on one source of supply, a partial loss of this supply could necessitate the implementation of the Water Shortage Contingency Plan. Generally, this type of water supply shortage would not last as long as those caused by drought.

There are some important distinctions that should be made between the Water Shortage Contingency Plan and other programs and plans that Cal Water has for each district. Cal Water also maintains an Emergency Response Plan (ERP) for each service area. The ERP is similar to the Water Shortage Contingency Plan in that it may include a loss of supply and inability to serve our customers with normal quantities of water. However, the ERP is designed to manage crises that occur more suddenly and are caused by events such as natural disasters, technological failures, chemical contamination, or national security emergencies.

The ERP provides a guide for district and general office personnel to follow in response to one of these emergencies. It includes the policies, responsibilities, and procedures to be used to protect public safety and includes the setup of an Emergency Operations Center and implementation of the Standardized Emergency Management System. The ERP also describes the necessary inter-jurisdictional coordination and provides the communications and notification plan to insure an efficient response to the emergency.

The ERP for each district was completed in 2004 in response to the Public Health and Safety and Bioterrorism and Response Preparedness Act (H.R. 3448) of 2002. They were then updated in May of 2008. Cal Water is planning to rewrite the ERPs in the next few years. These new Plans will include more detailed district-specific information and will be designed to be used as a manual for Cal Water personnel during emergency situations.

Cal Water is also in the process of developing Water Conservation Master Plans for each district. These Water Conservation Master Plans are different from the Water Shortage Contingency Plans in that they are designed to permanently reduce per capita water use by Cal Water's customers. The Water Conservation Master Plans are not associated with any short or long term loss of supply but will have the effect of making existing supplies last further into the future. In the short term, this will also provide increased supply reliability.

The water use targets selected by Cal Water for each service area are consistent with current regulations. In general, this will mean a reduction in per capita demand. Specific reductions will vary by service area and are contained in the service-area specific Water Conservation Master Plans. The annual level of funding for these programs will be determined through each General Rate Case filed with the California Public Utilities Commission (CPUC). The Water Conservation Master Plan will be discussed in more detail in Section 5 of this UWMP.

5.5.2 Water Conservation/Water Supply Team

As mentioned earlier, Cal Water formed a Conservation/Supply Team in response to the water shortage conditions that were forecasted for 2009. This Team consisted of an interdepartmental group of personnel that guided the planning process for the company-wide response to the drought. Members of the Conservation/Supply Team include:

- Vice President of Regulatory and Corporate Communications
- Vice President of Customer Service, Human Resources, and Information Technology
- Director of Corporate Communications
- Director of Customer Service
- Conservation Manager
- Chief Engineer
- Water Resources Planning Supervisor
- Manager of Rates

- Manager of Operations
- Maintenance Manager
- Billing Manager
- Regulatory Accounting Manager
- Meter Operations Supervisor
- Support Staff

The Conservation/Supply Team held regular meetings to discuss strategies for all aspects of drought preparation such as water supply monitoring, public communications, wholesale and customer allocations, information technology improvements, and financial impacts. Additional staff participated as needed as the planning process progressed.

5.5.3 Water Supply Allocation Plan

During the most recent drought several of Cal Water's districts were faced with the possibility of reduced wholesale allocations of imported water. If implemented, Cal Water would need to reduce its use of this supply proportionally in order to meet regional conservation targets and avoid wholesaler imposed penalties for overuse. Cal Water would have to request customers to reduce water use, usually to the same level as required by the wholesaler.

These reductions could either be voluntary or mandatory depending on the severity of the cutback required. If mandatory rationing is deemed necessary, retail customer allocations would need to be implemented. To determine the methodology used for customer allocations a cross-functional Water Allocation Team was formed. The Water Allocation Team consisted of a subset of the Conservation/Supply Team and was tasked with developing the details of how the allocation process would be handled internally by Cal Water. The Water Allocation Team reported back to the Conservation/Supply Team at the regular meetings.

The Water Allocation Team meetings resulted in a comprehensive strategy that is summarized in Cal Water's Water Supply Allocation Plan. The Water Supply Allocation Plan details the methodology used for determining customer allocations, conducting public communications, tracking water use, assessing penalties, and processing appeals.

The Water Supply Allocation Plan also outlines regulatory actions that must be taken in order to implement mandatory allocations. If it is determined that mandatory allocations are likely to be necessary in a particular district Cal Water will file a Tier 2 advice letter with the CPUC that describes the need for mandatory allocations as well as our methodology and plan for implementation. A public hearing is required during the 30 days following this filing and all customers in the affected district will be notified of the hearing. If, after the 30 day period, it is determined that mandatory allocations are necessary, Cal Water will file a Tier 1 advice letter with the CPUC, which would make mandatory allocations effective 5 days following the filing.

Cal Water has the legal authority to implement mandatory allocations only after requesting from the CPUC that Tariff Rule 14.1, Mandatory Conservation Plan, be added to existing tariffs. *Section A. Conservation – Nonessential or Unauthorized Water Use* of Tariff Rule 14.1 identifies specific water use prohibitions. Prior to implementing mandatory allocations Cal Water will communicate details of the Plan to all customers.

5.5.4 Allocation Methodology and Customer Information

The Water Allocation Team's methodology for determining customer allocations was decided through careful consideration of all available information. Throughout this process the Team tried to maintain fairness to all customers and develop a plan that was easy to understand and communicate. Secondary concerns included impacts to Cal Water such as the ease of implementation and revenue shortfalls.

Customer allocations will be calculated on a monthly basis for each "premise", or customer location. The required cutback will be a percent reduction from prior use compared to baseline time period. The percentage reduction and baseline that Cal Water uses will be consistent with those used by the regional wholesaler. This will be done to ensure regional coordination between agencies and to offer a clear message to the public. In districts that do not have an imported supply and therefore no wholesaler, Cal Water will choose the percent reduction depending on the severity of the water shortage.

In most cases the percent reduction will be kept constant on an annual basis. It will be reviewed and adjusted as necessary in the spring of each year after the water supply picture becomes clear for the following dry season. In most districts Cal Water does not have direct control over long term storage of imported water and will rely on the California Department of Water Resources, U.S. Bureau of Reclamation, and regional water wholesalers to manage carryover storage between years. In some cases it may be necessary to adjust these percentages mid-year, if, for example, a district is not meeting its reduction target. The allocation period will end when Cal Water determines that the water shortage no longer exists and ample supplies are available on an ongoing basis.

A minimum allocation will be given to single-family residential customers whose monthly allocation would fall below a level that is considered necessary for health and safety. These minimum allocations will be calculated for each district and will include water for indoor consumption on a per capita basis and also a percentage of normal water for outdoor use such as landscape irrigation. Multi-family, commercial, industrial, government, and other service connection categories will not be subject to minimum allocations.

Cal Water will provide customers the opportunity to bank unused water that has been allocated in a billing period. A customer will bank their unused allocation in a given billing period which can then be used to offset a future month where the customer exceeds their allocation. There is no limit to the amount of water that can be banked by a

customer. All banked water will expire once allocations are determined to no longer be needed.

As a deterrent to exceeding monthly allocations and to offset penalties that Cal Water may incur from wholesale agencies, a penalty rate will be applied to a customer's water use that is in excess of their allocation. This penalty rate will be charged in addition to the normal tiered rate for every unit (Ccf) above the allocation during a billing period.

If a customer feels that their allocation does not represent their current need, or to dispute penalties assessed to their account, customers can file an appeal with their local district. The appropriate personnel will review the appeal and issue a judgment in writing. The appeals will be reviewed according to rules outlined in the Water Supply Allocation Plan.

During a water shortage priority will be given to uses that promote public health and safety. These uses include residential indoor use and other sanitary purposes. On a case by case basis Cal Water will decide that certain services are seen as essential, such as hospitals, and may exempt the customer from allocations. The second priority will be given to commercial and industrial water use in an effort to minimize financial impacts to local businesses. And finally, outdoor irrigation has the lowest priority.

If Cal Water requests voluntary reductions, all customer categories will be asked to make the same percent reduction. If mandatory reductions are required, which in general means a reduction of greater than 15 percent, Cal Water may develop different demand reduction targets for each connection category. This will be done to enforce the priorities listed above and to ensure that the correct mix of targets are chosen so that the overall district demand reduction goal is reached.

5.5.5 Drought Stages

Cal Water has developed a four stage approach to drought response that corresponds to specific levels of water supply shortage. At each higher stage Cal Water will become more aggressive in requiring water use reductions from its customers. The decision to enter a new stage will be made by careful consideration of a variety of factors including wholesale supply, availability of alternative supplies, time of year, and regional coordinated activities. These stages are designed to guide Cal Water personnel in making informed decisions during water shortages. A certain amount of flexibility is built in to the stages to allow for the unique characteristics of each water shortage event and the unique characteristics within each of Cal Water's districts. In each progressive stage the actions taken in earlier stages will be carried through to the next stage either at the same or at an increased intensity level, thereby becoming more restrictive.

When the water conditions in a district appear to warrant the activation of the Shortage Contingency Plan's Demand Reduction Stages, whether that be via implementing Stage 1, the movement from one Stage to a higher stage, the movement from a higher stage back down to a lower stage, or deactivating the use of Demand Reduction Stages

altogether; the Water Conservation /Water Supply Team will consider those conditions at hand and prepare a recommendation on the appropriate action to be taken by the Company. The Team's recommendation will be presented by the Chief Engineer to the Vice President of Engineering and Water Quality. If the Vice President of Engineering and Water Quality concurs with the WC/WS Team recommendation, then he or she will take that recommendation to the President and Chief Executive Officer. The President & CEO will make the final determination as to whether or not the recommended action is to be taken by the Company.

If it is determined that the Company will implement or change the active Demand Reduction Stage for a given District, then a press release will be made in a manner that advises the customers served by that district of this determination. This press release will explain the desired outcome of the action to implement the appropriate stage. Upon making that determination Cal Water will immediately begin implementing the specific actions identified for the determined stage as outlined in the reminder of this section of the Shortage Contingency plan.

Stage 1 covers water shortages of up to 10 percent and can be used to address annual variations in precipitation and mild drought events that may last only a year or two. All reductions in Stage 1 are voluntary and impacts to customers are minimal. The actions to be taken by Cal Water in Stage 1 are listed in Table 5.5-1.

Table 5.5-1: Demand Reduction Stage 1 (Table 36)

Stage	Water Supplier Actions
1. Minimal 5 to 10 percent Shortage Up to 10 percent Reduction Goal Voluntary Reductions	**Cal Water will:** Request voluntary customer conservation as described in CPUC Rule 14.1. Maintain an ongoing public information campaign. Maintain conservation kit distribution programs. Maintain school education programs. Maintain incentive programs for high efficiency devices. Coordinate drought response with wholesale suppliers and cities. Lobby cities for passage of drought ordinances. Discontinue system flushing except for water quality purposes. Request that restaurants serve water only on request.

Stage 2 includes water shortages of between 10 and 20 percent. Stage 2 will be entered during prolonged water shortages of moderate severity such as those caused by a multi-year drought. Reduction methods can either be voluntary or mandatory depending on the severity of the water shortage. Allocations would likely be implemented when the shortage exceeds 15 percent. Customers will begin to notice moderate impacts to normal water use and companies may begin to have financial impacts. In Stage 2 Cal Water will intensify its conservation efforts by implementing the actions listed in Table 5.5-2. All actions from Stage 1 will be carried through or intensified in Stage 2.

Table 5.5-2: Demand Reduction Stage 2 (Table 36)

Stage	Water Supplier Actions
2. Moderate 10 to 20 Percent Shortage Up to 20 Percent Reduction Goal Voluntary or Mandatory Reductions	**Cal Water will:** Increase or continue all actions from Stage 1. Implement communication plan with customers, cities, and wholesale suppliers. Request voluntary or mandatory customer reductions. File Schedule 14.1 with CPUC approval if necessary. Request memorandum account to track penalty rate proceeds and other drought related expenses. Lobby for implementation of drought ordinances. Monitor water use for compliance with reduction targets.

Stage 3 represents a severe water shortage emergency with a reduction in supply of between 20 and 35 percent. This stage can be triggered by the most severe multi-year droughts, major failures in water production and distribution facilities, or by water quality concerns, especially in smaller isolated systems. A shortage of this magnitude may begin to seriously impact public health and safety, and cause significant financial hardships on local businesses. All reductions will be mandatory and customer allocations would be necessary. During Stage 3 Cal Water will take the following actions listed in Table 5.5-3, which includes all the actions from Stage 2.

Table 5.5-3: Demand Reduction Stage 3 (Table 36)

Stage	Water Supplier Actions
3. Severe	**Cal Water will:**
20 to 35 Percent Shortage	Increase or continue all actions from previous stages.
	Implement mandatory conservation with CPUC approval.
Up to 35 Percent Reduction Goal	Install flow restrictors on repeat offenders.
	Require customers to have high efficiency devices before granting increased allocations.
Mandatory Reductions	Require participation in survey before granting an increased allocation.

Stage 4 is a critical water shortage emergency with a reduction of supply of at least 35 and potentially above 50 percent. This represents an exceptional crisis that could be caused only by the most severe multi-year drought, natural disaster, or catastrophic failure of major water supply infrastructure. Impacts to public health and safety would be significant. In Stage 4 Cal Water will take the additional actions listed in Table 5.5-4 while also continuing or increasing actions from Stage 3.

Table 5.5-4: Demand Reduction Stage 4 (Table 36)

Stage	Water Supplier Actions
4. Critical 35 to 50+ Percent Shortage Up to and above a 50 percent Reduction Goal Mandatory Reductions	**Cal Water will:** Increase or continue all actions from previous stages. Discontinue service for repeat offenders. Monitor water use weekly for compliance with reduction targets. Prohibit potable water use for landscape irrigation.

5.5.6 Water Supply Conditions and Trigger Levels

All the District's wells extract water from a non adjudicated groundwater basin. Since a safe yield for the basin has not been established, Cal Water does not have an extraction limitation and can therefore use groundwater during drought periods to meet full demands should there be some reductions in the surface supplies from Cal Water's or ID-4's treatment plants. In preparation for such an event, the City of Bakersfield has had for a number of years a program and facilities for groundwater replenishment where it increases groundwater recharge by infiltrating surplus surface water into a 2,800 acre spreading area.

In addition, the City has the capability of transferring surface supplies currently contracted to agricultural irrigation districts to Cal Water for treatment in its plants and in turn pumping groundwater into conveyance systems that deliver water to the agricultural irrigation districts. (This is covered in the supply agreements between Cal Water and the City.)

ID-4 has had a groundwater replenishment program in place since 1971. It reports that it has recharged 1.49 million AF during this period of which 0.72 million AF were SWP

supplied water and 0.77 million AF were from Kern River, Friant-Kern Canal Exchanges and banked water imports since the program began. Groundwater recharge by ID-4 was 105,375 AF for 2005 – the largest single recharge since the program commenced. ID-4 continually recharges groundwater to the basin underlying the Cal Water District.

Therefore, it is not likely that for moderate droughts there will be much reduction in overall supply. In the case of severe sustained drought, there would be the need for implementation of conservation measures to reduce demand.

Cal Water generally will declare drought stages uniformly across all its service districts. If statewide or local conditions warrant, Cal Water will initiate the response according to the thresholds shown in Table 5.5-5.

Table 5.5-5: Water Supply Triggering Levels (Table 35)

Stage	Percent Shortage
Stage 1	5 to 10% supply reduction
Stage 2	10 to 20% supply reduction
Stage 3	20 to 35% supply reduction
Stage 4	35 to 50% supply reduction

5.5.7 Water Use Restriction Enforcement

Because of its investor owned status Cal Water has limited authority to enforce water use restrictions unless Rule 14.1 is enacted through CPUC approval. Restrictions on water use prior to enacting Rule 14.1 must be regulated by ordinances passed by the local governments in each community served. Cal Water has worked with municipalities to pass ordinances and will continue this effort on an ongoing basis. Rule 14.1 contains a detailed list of the water use restrictions common to many of these ordinances, and is included as Appendix E of this UWMP.

Cal Water maintains extensive water use records on individual metered customer accounts. These records are reviewed in the districts to identify potential water loss problems. In order to protect itself against serious and unnecessary waste or misuse of water, Cal Water may meter any flat rate service and apply the regularly established meter rates where the customer continues to misuse or waste water beyond five days after Cal Water has given the customer written notice to remedy such practices.

During all stages of water shortages, production figures are reported to and monitored by the district manager. Consumption will be monitored through these daily production figures in the district for compliance with necessary reductions.

Cal Water, after one written warning, shall install a flow-restricting device on the service line of any customer observed by Cal Water personnel to be using water for any non-essential or unauthorized use defined in Section A. of Tariff Rule 14.1. Repeated violations of unauthorized water use will result in discontinuance of water service.

5.5.8 Analysis of Revenue and Expenditure Impacts

Cal Water is an investor-owned water utility and, as such, is regulated by the CPUC. On March 8, 1989, the Commission instituted an investigation to determine what actions should be taken to mitigate the effects of water shortages on the State's regulated utilities and their customers. In decision D. 90-07-067, effective July 18, 1990, the Commission authorized all utilities to establish memorandum accounts to track expenses and revenue shortfalls caused both by mandatory rationing and by voluntary conservation efforts. Subsequently, D. 90-08-55 required each class A utility (more than 10,000 connections) seeking to recover revenues from a drought memorandum account to submit; for Commission approval, a water management program that addresses long-term strategies for reducing water consumption. Utilities with approved water management programs were authorized to implement a surcharge to recover revenue shortfalls recorded in their drought memorandum accounts.

However, the Commission's Decision 94-02-043 dated February 16, 1994, states:

> *10. Now that the drought is over, there is no need to track losses in sales due to residual conservation.*
> *11. The procedures governing voluntary conservation memorandum accounts (see D.92-09-084) developed in this Drought Investigation will no longer be available to water companies as of the date of this order.*
> *12. Procedures and remedies developed in the Drought Investigation that are not specifically authorized for use in the event of future drought in these Ordering Paragraphs will no longer be available to water companies as of the date of this order except upon filing and approval of a formal application.*
> *(CPUC Decision 94-02-043, Findings of Fact, paragraphs 10-12)*

In 2008 the CPUC allowed for the creation of a Water Revenue Adjustment Mechanism (WRAM) and Modified Cost Balancing Accounts (MCBA). The goals of the WRAM and MCBA are to sever the relationship between sales and revenue to remove the disincentive to implement conservation rates and conservation programs especially in times of drought. WRAM and MCBA are designed to ensure that the utilities and ratepayers are proportionally affected when conservation rates are implemented, so that neither party is harmed nor benefits. Because of these regulatory developments Cal Water expects to increase the implementation of conservation rates and conservation programs on a permanent basis.

During water supply shortages Cal Water would expect to see a reduction in revenue. The amount of this reduction would depend on the total amount of water being conserved and the price (tier rate) at which the cutbacks were made for each customer. In other words, the reduction would be roughly equivalent to the quantity charge for the amount of water saved. Cal Water would still receive its monthly service charge fees.

Cal Water has adequate reserves to overcome this short term reduction. These reductions in revenue would also be recovered through the WRAM and MCBA. Through the WRAM and MCBA Cal Water will be able to track its revenue impacts and expenditures during water shortages and recover these losses through the CPUC rate case process in future years. Because of these new mechanisms Cal Water is assured that it will have adequate reserves available to operate normally under water shortage conditions.

Expenditures will not increase due to a mild water shortage condition. Any expenditure made during this time will come out of the normal conservation budget that has been approved by the CPUC. Actions that may be taken include public information campaigns that draw attention to the shortage and steer customers towards our other conservation programs (toilet rebates, washing machine rebates, home audits, etc) that are available. These programs will be paid for by money that is already budgeted. Therefore no additional expenditures will take place. If the water shortage warrants mandatory allocations, Cal Water would need to file an advice letter with the CPUC to seek approval to implement mandatory allocations. This process would include securing any additional funding necessary for the administration of this program. Again, these costs would be recovered through the MCBA and WRAM.

5.5.9 Catastrophic Water Supply Interruption

As mentioned earlier, Cal Water has an ERP in place that coordinates the overall company response to a disaster in any or all of its districts. In addition, the ERP requires each District to have a local disaster plan that coordinates emergency responses with other agencies in the area.

Cal Water also inspects its facilities annually for earthquake safety. To prevent loss of these facilities during an earthquake, auxiliary generators and improvements to the water storage facilities have been installed as part of Cal Water's annual budgeting and improvement process.

During an emergency, the District can transfer water from a neighboring water system owned by the City of Bakersfield using three emergency connections. These interconnections can be used to help offset the impact of the interruption in service to District customers resulting from the failure of water supply facilities. Because these are two-way connections, these facilities can also be used to supply either imported water or pumped groundwater from the Bakersfield District to the City of Bakersfield water system. Cal Water operates this system under contract for the City.

6 Demand Management Measures

6.1 Statewide Urban Water Demand Reduction Policies

As mentioned earlier, Cal Water is in the process of significantly expanding its conservation programs. Inter-related state-level policies and agreements aimed at reducing urban water use have provided much of the impetus for this change. The policies include: (1) recent decisions by the California Public Utilities Commission (CPUC) directing Class A and B water utilities to reduce per capita urban water demand; (2) state legislation mandating urban water suppliers to reduce per capita demand 20 percent by 2020; and (3) the Memorandum of Understanding Regarding Urban Water Conservation in California (MOU). This section discusses these requirements, their relationship to one another, and their relationship to Cal Water's overall conservation strategy.

The CPUC's Decision 07-05-062 directed Class A and B water utilities to submit a plan to achieve a 5 percent reduction in average customer water use over each three-year rate cycle. This policy was refined under Decision 08-02-036, which established a water use reduction goal of 3 to 6 percent in per customer or service connection consumption every three years once a full conservation program, with price and non-price components, is in place. These decisions anticipated enactment of policies by the State legislature to reduce urban water use in California 20 percent by 2020.

SBx7-7 requires the state to achieve a 20 percent reduction in urban per capita water use by December 31, 2020. The state is required to make incremental progress toward this goal by reducing per capita water use by at least 10 percent on or before December 31, 2015. SBx7-7 requires each urban retail water supplier to develop interim and 2020 urban water use targets. Urban retail water suppliers will not be eligible for state water grants or loans unless they comply with SBx7-7's requirements.

There are three ways in which a water supplier can comply with the MOU. The first way is to implement a set of water conservation best management practices (BMPs) according to the requirements and schedules set forth in Exhibit 1 of the MOU. The second way, called Flex Track compliance, is to implement conservation programs expected to save an equivalent or greater volume of water than the BMPs. The third way, similar to SBx7-7, is to reduce per capita water use. Each of these compliance options is briefly described below.

Originally, the MOU established a set of BMPs that signatories agreed to implement in good faith. For each BMP, the MOU established the actions required by the water supplier (e.g. site surveys, fixture and appliance rebates, water use budgets, volumetric pricing and conservation rate designs), the implementation schedule, and the required level of effort (in the MOU this is referred to as the coverage requirement). Additionally, the MOU established the terms by which a water supplier could opt out of implementing a BMP.

BMPs are grouped into five categories. Two categories, Utility Operations and Education, are "Foundational BMPs" because they are considered to be essential water conservation activities by any utility and are adopted for implementation by all signatories to the MOU as ongoing practices with no time limits. The remaining BMPs are "Programmatic BMPs" and are organized into Residential, Commercial, Industrial, and Institutional (CII), and Landscape categories. Table 6.1-1 shows the BMPs by category. The requirements and coverage levels of each BMP are set forth in Exhibit 1 of the MOU. As of the date of this UWMP, Cal Water is in process of completing and submitting BMP reports to the CUWCC for the period 2009-2010. Submission was delayed due to delays in the CUWCC reporting forms being made available.

Table 6.1-1: MOU Best Management Practices

BMP Group	BMP Name
1. Utility Operations Programs (F)	Conservation Coordinator
	Water Waste Prevention
	Wholesale Agency Assistance Programs
	Water Loss Control
	Metering & Volumetric Rates
	Retail Conservation Pricing
2. Education Programs (F)	Public Information Programs
	School Education Programs
3. Residential (P)	Residential Assistance Program
	Landscape Water Surveys
	High Efficiency Clothes Washer Program
	Watersense Toilet Program
	Watersense Specifications for Residential Development
4. Commercial, Industrial, Institutional (P)	Reduce baseline CII water use by 10% in 10 years
5. Landscape (P)	Large Landscape Water Budget Programs
	Large Landscape Water Surveys
F = Foundational BMP, P = Programmatic BMP	

Under Flex Track, a water supplier can estimate the expected water savings over the 10-year period 2009-2018 if it were to implement the programmatic BMPs in accordance with the MOU's schedule, coverage, and exemption requirements, and then achieve these water savings through any combination of programs it desires. Thus, through the Flex Track compliance option, a water supplier agrees to save a certain volume of water using whatever it determines to be the best combination of programs. Because the savings target depends on the programmatic BMP coverage requirements, which in turn are functions of service area size and composition of demand, the volume of water to be saved under this compliance option must be calculated separately for each supplier. The methodologies and tools for water suppliers to implement these calculations are still being developed by the CUWCC.

Under the gpcd option, a water supplier can comply with the MOU by reducing its baseline gpcd by 18 percent by 2018. The baseline is the ten-year period 1997-2006. The MOU also establishes interim gpcd targets and the highest acceptable levels of water use deemed to be in compliance with this option. The MOU's gpcd option is similar to using Method 1 to set the SBx7-7 target, except that it uses a fixed baseline period and only runs through 2018. This compliance option may be difficult to achieve for Cal Water districts that are part of a regional alliance for purposes of SBx7-7 compliance because savings as a percent of demand will vary considerably among the districts in the alliance. It may also conflict with district-specific SBx7-7 targets set using method 3 (hydrologic region-based target). Because of these potential conflicts, this is not considered a viable MOU compliance option for Cal Water districts.

Cal Water plans to use Flex Track to comply with the MOU. This compliance option affords the most flexibility in selecting conservation programs suited to each Cal Water district and allows for more streamlined reporting. Because CUWCC tools for calculating a district's Flex Track savings target are not yet available, Cal Water developed its own target estimates for planning purposes. Cal Water will update these estimates as necessary following the release of the CUWCC Flex Track target calculator.

6.2 Conservation Master Plans

In an effort to address the statewide policies for urban water use reduction Cal Water developed Conservation Master Plans for each of its service districts. These Conservation Master Plans are designed to provide a framework for meeting these statewide policies and to chart a course for Cal Water's conservation programs over the next five years. The major tasks of the Conservation Master Plans include:

1. A complete review of State policies and development of a compliance strategy
2. Calculating all appropriate per capita targets
3. Determining water savings required from new programs
4. Performing an analysis of conservation programs
5. Developing a portfolio of conservation programs
6. Creating a plan for monitoring and update of Conservation Master Plans

Cal Water's Conservation Master Plans have a five year planning horizon and are designed to be updated in coordination with the UWMP for each district. The Conservation Master Plan for the Bakersfield District is included in its entirety as Appendix G. A discussion of baseline and target water use can be found in Section 3 of this UWMP. A summary of the water savings requirements and program portfolio is summarized in the following section.

6.3 Water Savings Requirements

The gross water savings required under SBx7-7 can be determined with a simple calculation by subtracting the target water demand from the unadjusted baseline demand. According to this calculation the Bakersfield District has a gross savings requirement of 7,282 AF from 2011-2015, as shown in Table 6.3-1.

Table 6.3-1: SBx7-7 and MOU Gross Water Savings Requirements

Gross Water Savings Required by 2015	SBx7-7	MOU Flex Track
2015 Unadjusted Baseline Demand	91,422 AF	91,422 AF
2015 Target Demand	84,139 AF	91,178 AF
Gross Savings Requirement	**7,282 AF[6]**	**244 AF**

As discussed earlier, because CUWCC tools for calculating a district's Flex Track savings target are not yet available, Cal Water developed its own target estimates for planning purposes. The targets are based on the expected water savings from cost-effective programmatic BMPs over the ten-year period 2009-2018. The coverage requirements for the programmatic BMPs were used to calculate the Flex Track targets. Expected water savings and cost-effectiveness were based on the conservation program specifications and avoided water supply costs. The supporting data and calculations are provided in Appendix G.

The differences between the unadjusted baseline demand, district-specific SBx7-7 target, and MOU Flex Track target are shown in Table 6.3-1. This shows the maximum amount of water savings needed for SBx7-7 compliance, as well as the savings required for MOU compliance. Because Bakersfield District is part of a regional alliance, the amount of water savings needed for SBx7-7 compliance may turn out to be less than the amount shown in the table. Also, some of the reduction in baseline demand needed to achieve SBx7-7 and MOU compliance will come from efficiency codes, response to adjustments in rates, and savings from past program implementation. The remainder will need to come from new conservation program activity.

The unadjusted baseline demand described in Section 3 does not account for future changes in water demand due to the effects of plumbing fixture efficiency codes, changes in water rates, metering, and existing conservation programs. A portion of the gross savings requirements shown above are expected to come from these sources. The Conservation Master Plan includes an estimate of the volume of water saved as a result of

[6] The savings requirement calculated in the Conservation Master Plan was based on draft UWMP data. An update to the water production data from 2006-2009 results in a difference in gross savings requirements between the Conservation Master Plan and the UWMP worksheet data in Appendix C.

these things. The results are used to adjust baseline demand so that the volume of water savings that will need to come from new conservation programs can be determined.

Two recent California laws are expected to accelerate the replacement of low efficiency plumbing fixtures – primarily toilets and showerheads – with higher efficiency alternatives.

- AB 715, passed in 2007, amended the California Building and Safety Code to require by January 1, 2014, that toilets sold or installed in California use no more than 1.28 gallons per flush. It also requires that urinals sold or installed use no more than 0.5 gallons per flush.

- SB 407, passed in 2009, amended the California Civil Code to require replacement of low efficiency plumbing fixtures with higher efficiency alternatives when a property undergoes alterations, improvements, or transfer. In the case of single-family residential properties, issuance of a certificate of final completion and occupancy or final permit approval by the local building department for building alterations or improvements will be conditional on the replacement of low efficiency plumbing fixtures beginning in 2014. Single-family property owners are required by law to replace any remaining non-compliant plumbing fixtures by no later than January 1, 2017. After this date, a seller or transferor of single-family residential real property must disclose in writing to the prospective purchaser or transferee whether the property includes any noncompliant plumbing fixtures. For multi-family and commercial properties non-compliant fixtures must be replaced by January 1, 2019. As with single-family properties, final permits or approvals for alterations or improvements are conditional on the replacement of low efficiency fixtures beginning in 2014.

The phase-in dates for AB 715 and SB 407 mean they will not greatly contribute to meeting the 2015 interim gpcd target under SBx7-7. But they will support meeting the 2020 target. Moreover, since the early 1990's, the sale and installation of toilets manufactured to flush more than 1.6 gallons, showerheads manufactured to have a flow capacity more than 2.5 gallons per minute, and interior faucets manufactured to emit more than 2.2 gallons per minute has been prohibited. These requirements will continue to improve the efficiency of plumbing fixtures in older residential and commercial buildings.

Water savings from expected rate adjustments in Bakersfield District were also calculated. The estimates are based on inflation-adjusted changes in rates for 2011, 2012, and 2013, as contained in CPUC's proposed GRC decision. Short-run price elasticity estimates used to calculate potential changes in demand were drawn from the CUWCC's conservation rate guidebook.

In addition to savings from codes and rates, expected on-going water savings from conversion of flat rate customers to metered billing plus conservation activity occurring in 2009 and 2010 were also taken into account. The adjusted baseline demand and savings associated with code changes, rate changes, meter conversions, and existing conservation programs are shown in Table 6.3-2.

Table 6.3-2: Adjusted Baseline Demand Projection

Adjusted Baseline (AF)	2011	2012	2013	2014	2015
Unadjusted Baseline	86,206	87,483	88,776	90,089	91,422
Less Savings from					
Codes	103	201	297	389	512
Schedule Rate Increases	-56	-123	-210	-241	-323
Existing Programs & Meter Conversion	1,865	2,437	3,010	3,554	4,099
Adjusted Baseline Demand	**84,295**	**84,967**	**85,680**	**86,386**	**87,134**
Per Capita (GPCD)	285	283	281	280	278

The amount of water savings required from new conservation programs is not the same for SBx7-7 and MOU Flex Track compliance. In the case of SBx7-7, the objective is to reduce 2015 per capita water use at least to the target of 268 gpcd, and any expected savings from codes, rates, and existing conservation programs can be credited toward meeting this goal. This is not the case for MOU Flex Track compliance, where the objective is to implement conservation programs that would save at least as much as the Flex Track target. Unlike SBx7-7, water savings from codes and rates cannot be credited against the Flex Track target. Only savings from existing conservation programs can be deducted.

Savings required from new conservation programs to meet SBx7-7 and MOU Flex Track compliance requirements are summarized in Table 6.3-3. In the case of SBx7-7, expected savings from codes, rates, and existing programs fall short of the 2015 gross savings requirement by almost 3,000 AF and new program savings would need to reach this level to achieve district-specific SBx7-7 compliance in 2015. Approximately 169 AF of additional water savings are required by 2015 in order for the district to meet its MOU Flex Track target.

Table 6.3-3: New Program Savings Required for SBx7-7 and MOU Compliance

2015 Net Savings Requirement (AF)	SBx7-7	MOU Flex Track
Gross Savings Requirement	**7,282**	**244**
Less		
Savings from codes	-512	NA
Savings from rates	323	NA
Savings from existing programs	-4,099	-75
Subtotal Expected Savings	*-4,288*	*-75*
Savings Required from New Programs[1]	**2,995**	**169**

[1]*Negative net savings indicates that no new program savings required for compliance*

6.4 Conservation Program Analysis

Cal Water engaged in a detailed, multi-step process to identify the best mix of programs to achieve the required savings. The process began with an inclusive range of potential program concepts. These concepts were qualitatively analyzed to eliminate those that were clearly inappropriate for each district and thereby narrow the analytical focus to those remaining programs that were potentially appropriate. Those programs were then subjected to detailed quantitative analysis. This Section describes the steps of the analytical process for Bakersfield District, and the programs that emerged as potential components of a portfolio of programs for the district.

As a result of an exhaustive search of the literature, consultation with experts in the field, knowledge of conservation programming by other water suppliers, and the experience of the project team, a total of more than 75 conservation program concepts were defined. At this point in the process, the goal was to be as inclusive as possible. The list was therefore intentionally large to ensure that all possible program concepts were considered. Cal Water did not want to risk inadvertently excluding a program from consideration.

Once the range of program concepts was defined, the next step was to subject each program concept to a careful district-specific qualitative screen, the objective of which was to eliminate those program concepts that were clearly inappropriate.

A preliminary quantitative analysis was conducted on the programs that passed the qualitative screen. To do that, estimates were made of key savings and cost parameters for each of the programs. Where applicable, these estimates were based on prior Cal Water experience with similar programs. In the absence of such experience, the experience of other water suppliers, the expertise of the project team, consultation with national experts, and published figures, where available, were relied upon. In particular, estimates developed by the California Urban Water Conservation Council and the Alliance for Water Efficiency were utilized where such estimates were available. While in most cases, the savings assumptions for a program do not vary across districts, for several programs, they do due to district-specific characteristics of household size, climate, etc. Other than meter installation, program cost assumptions are uniform across districts, although in some cases, cost sharing with other water utilities reduce Cal Water's share.

Using the results of the qualitative screening and preliminary quantitative analysis, Cal Water identified five core programs that it would run in every district over the next five years. In addition to the core programs, an additional set of non-core programs was selected. Unlike core programs, Cal Water may not offer non-core programs in every district or in every year. Implementation of non-core programs will depend on whether additional water savings are required for SBx7-7 compliance, MOU compliance, or to help address local supply constraints. Table 6.4-1 lists all Cal Water core and non-core conservation programs.

Table 6.4-1: Cal Water Conservation Programs

Program Name	Description	Target Market
CORE PROGRAMS		
Rebate/Vouchers for toilets, urinals, and clothes washers	Provide customer rebates for high-efficiency toilets, urinals, and clothes washers	All customer segments
Residential Surveys	Provide residential surveys to low-income customers, high-bill customers, and upon customer request or as pre-screen for participation in direct install programs	All residential market segments
Residential Showerhead/Water Conservation Kit Distribution	Provide residential showerhead/water conservation kits to customers upon request, as part of residential surveys, and as part of school education curriculum	All residential market segments
Pop-Up Nozzle Irrigation System Distribution	Offer high-efficiency pop-up irrigation nozzles through customer vouchers or direct install.	All customer segments
Public Information/Education	Provide conservation messaging via radio, bill inserts, direct mail, and other appropriate methods. Provide schools with age appropriate educational materials and activities. Continue sponsorship of Disney Planet Challenge program.	All customer segments

NON-CORE PROGRAMS		
Toilet/Urinal Direct Install Program	Offer direct installation programs for replacement of non-HE toilets and urinals	All customer segments
Smart Irrigation Controller Contractor Incentives	Offer contractor incentives for installation of smart irrigation controllers	All customer segments
Large Landscape Water Use Reports	Expand existing Cal Water Large Landscape Water Use Report Program providing large landscape customers with monthly water use reports and budgets	Non residential customers with significant landscape water use and potential savings
Large Landscape Surveys & Irrigation System Incentives	Provide surveys and irrigation system upgrade financial incentives to large landscape customers participating in the Large Landscape Water Use Reports programs and other targeted customers	Non residential customers with significant landscape water use and potential savings
Food Industry Rebates/Vouchers	Offer customer/dealer/distributor rebates/vouchers for high-efficiency dishwashers, food steamers, ice machines, and pre-rinse spray valves	Food and drink establishments, institutional food service providers
Cooling Tower Retrofits	Offer customer/dealer/distributor rebates/vouchers of cooling tower retrofits	Non-residential market segments with significant HVAC water use
Industrial Process Audits and Retrofit Incentives	Offer engineering audits/surveys and financial incentives for process water efficiency improvement	Non-residential market segments with significant industrial process water uses

Core and non-core programs were then subjected to a detailed benefit cost analysis, the results of which were used to inform program portfolio development discussed in the next section. The first step in this process was to refine and finalize the savings and cost specifications of each program. The program savings and cost assumptions enable the calculation of program benefits and costs to the utility and its ratepayers, and comparisons of these costs in the form of benefit-cost ratios. The tool used to do this comparison was a simplified version of the Alliance for Water Efficiency Tracking Tool. Following are descriptions of how the model calculates and compares conservation program benefits and costs.

6.5 Conservation Program Portfolio

This section presents the recommended conservation program portfolio for the Bakersfield District. The program analysis results described in the previous section provided the starting point for portfolio development. The next step was to determine the annual levels of program activity needed to, at minimum, meet Bakersfield District's water savings targets and local demand management goals. Several considerations informed these decisions, including budgetary constraints included in the current GRC decision, Cal Water conservation program administrative capacity, program market and water savings potential, and the program benefit-cost results.

The water savings requirement analysis showed that, after accounting for water savings from existing water efficiency codes and ordinances, scheduled adjustments to water rates, and past investment in conservation programs, Bakersfield District still needs approximately 3,000 AF of demand reduction to meet its 2015 SBx7-7 per capita water use target. It also showed that an additional 169 AF of water savings from new programs would be required to satisfy MOU compliance requirements in 2015. Moreover, in order to reach its 2020 SBx7-7 per capita water use target, 2020 demand will need to fall an additional 11 percent from the 2015 target. The program recommendations presented in this section are designed to both move the district towards its 2015 targets and position it to achieve the 2020 targets by establishing a set of programs that can be scaled up over time. For the Bakersfield District, the programs selected and the activity level of each are shown in Table 6.5-1.

Table 6.5-1: Recommended Program Levels

Program	Recommended Annual Activity Levels				
	2011	2012	2013	2014	2015
CORE PROGRAMS					
Rebates/Vouchers					
Toilets	600	600	600	1,940	1,940
Clothes Washers	320	320	320	980	980
Urinals	0	0	0	0	0
Customer Surveys/Audits	150	150	150	1,550	1,550
Conservation Kit Distribution	1,100	1,100	1,100	1,660	1,660
Pop-Up Nozzle Distribution	34,800	34,800	34,800	34,800	34,800
NON-CORE PROGRAMS					
Direct Install Toilets/Urinals	180	180	180	4,190	4,190
Smart Irr. Controller Vendor Incentives	10	10	10	730	730
Large Landscape Water Use Reports	250	250	250	250	250
Large Landscape Surveys/Incentives	100	100	100	110	110
Commercial Kitchen Rebates/Vouchers	0	0	0	80	80
Cooling Tower/Process Water Retrofit Incentives	0	0	0	0	0

The program levels for 2011-2013 reflect the funding level approved in Cal Water's most recent General Rate Case (GRC) settlement with the CPUC. Program levels for 2014 and 2015 will be dependent on the outcome of Cal Water's 2014-2016 GRC filing.

Table 6.5-2 shows projected water savings associated with the programs listed above.

Table 6.5-2: Projected Water Savings by Program					
Program	**Annual Water Savings (AF)**				
	2011	**2012**	**2013**	**2014**	**2015**
CORE PROGRAMS					
Rebates/Vouchers					
Toilets	17.7	34.6	50.9	105.9	158.6
Clothes Washers	5.8	11.4	16.7	34.4	51.3
Urinals	0.0	0.0	0.0	0.0	0.0
Customer Surveys/Audits	8.7	16.6	23.6	111.2	189.9
Conservation Kit Distribution	17.1	32.1	45.3	65.8	83.8
Pop-Up Nozzle Distribution	139.2	278.3	417.5	556.6	695.8
Subtotal Core Programs	***188.5***	***373.0***	***554.0***	***873.8***	***1,179.5***
NON-CORE PROGRAMS					
Direct Install Toilets/Urinals	5.5	10.7	15.8	150.4	279.8
Smart Irr. Controller Vendor Incentives	0.1	0.2	0.3	28.0	55.8
Large Landscape Water Use Reports	31.9	31.9	31.9	31.9	31.9
Large Landscape Surveys/Incentives	23.3	46.5	69.8	96.1	122.5
Commercial Kitchen Rebates/Vouchers	0.0	0.0	0.0	25.4	50.7
Cooling Tower/Process Water Retrofit Incentives	0.0	0.0	0.0	0.0	0.0
Subtotal Non-Core Programs	***60.8***	***89.4***	***117.8***	***331.9***	***540.7***
Total Core and Non-Core Program Savings	**249.3**	**462.4**	**671.8**	**1,205.7**	**1,720.1**

Based on the above analysis the district is not projected to achieve its district-specific 2015 SBx7-7 compliance target through the combination of passive savings and the proposed 2011-2015 conservation program portfolio. However, it will achieve compliance with its 2015 SBx7-7 compliance target through the regional alliance. The district may ultimately elect to achieve 2020 SBx7-7 compliance through a regional alliance also. Appendix C, Worksheet 24, includes a comparison of conservation savings required to meet SBx7-7 compliance targets to the savings expected as a result of existing and planned programs, including passive savings due to code changes.

For the purpose of this analysis it is assumed that there will be a linear reduction in GPCD from 2015-2020 to achieve the district-specific 2020 SBx7-7 compliance target. Programs required to achieve 2020 SBx7-7 compliance will be outlined in the next Conservation Master Plan for the district, which will be included in the 2015 UWMP. The activity level of each future program will depend on Cal Water's success in obtaining the necessary funding through the CPUC rate case process.

As part of the Conservation Master Plan development, one page program summaries, or fact sheets were developed for each recommended program. These fact sheets provide a quick reference summarizing program design and marketing, expected level of customer participation, projected water savings, and proposed program expenditure for the period 2011 – 2015. The fact sheets for the Bakersfield District are included in Appendix G.

7 Climate Change

7.1 Introduction

Investigating climate change brings the prospect of examining both model-predicted outcomes and unforeseen changes to the environment. These changes may physically affect the water districts that Cal Water serves. Climate change does not just mean a change in average temperature within any particular region, but a change in the climatic conditions that creates or results in an increase in extreme weather events. These potential changes include a more variable climate with risks of extreme climate events that are more severe than those in the recent hydrologic record, in addition to sea level rise, a hotter and drier climate, and the likelihood that more of the uplands precipitation will fall as rain and not as snow.

7.2 Cal Water Strategy

Cal Water intends to prepare a Climate Assessment Report in 2013 that will examine the regional impacts on water supply for each of its 24 service areas. This report will review any supply changes that may occur due to climate change and will outline mitigation and adaption methods to meet the needs of the District's service area. The following section, adapted from DWR's *Guidebook to Assist Water Suppliers to Prepare a 2010 Urban Water Management Plan,* provides a range of topics to be examined in Cal Water's Climate Assessment Report.

Responding to climate change generally takes two forms: mitigation and adaptation. Mitigation is taking steps to reduce our contribution to the causes of climate change by reducing greenhouse gas (GHG) emissions. Adaptation is the process of responding to the effects of climate change by modifying our systems and behaviors to function in a warmer climate. Regardless if climate change is manmade or a result of natural climate cycles, investigating mitigation and adaptive methods to better manage possible uncertainties in climatic changes will have more immediate benefits such as: cutting carbon emissions, reducing energy usage, possible economic development at the local level, and financial savings for Cal Water and the ratepayers.

<u>Mitigation</u>

In the water sector, climate change mitigation is generally achieved by reducing energy use, becoming more efficient with energy use, and/or substituting fossil fuel based energy sources for renewable energy sources. Water requires energy to move, treat, use, and discharge, thus water conservation is energy conservation. One possible mitigation method is to calculate conserved energy and GHGs not-emitted as water conservation targets are being met.

<u>Adaptation</u>

Climate change means more than just hotter days. Continued warming of the climate system may have considerable impact on the operation of Cal Water Districts, even if indirectly. For example, snow in the Sierra Nevada provides 65 percent of California's

water supply. Predictions indicate that by 2050 the Sierra snowpack will be significantly reduced. Much of the lost snow will fall as rain, which flows quickly down the mountains during winter and cannot be stored in the current water system for use during the summer. This change in water runoff may severely impact groundwater recharge and other water supply networks. The climate is also expected to become more variable, bringing more droughts and floods. Cal Water districts will have to adapt to these new and more variable conditions.

7.3 Potential Climate Change Effects

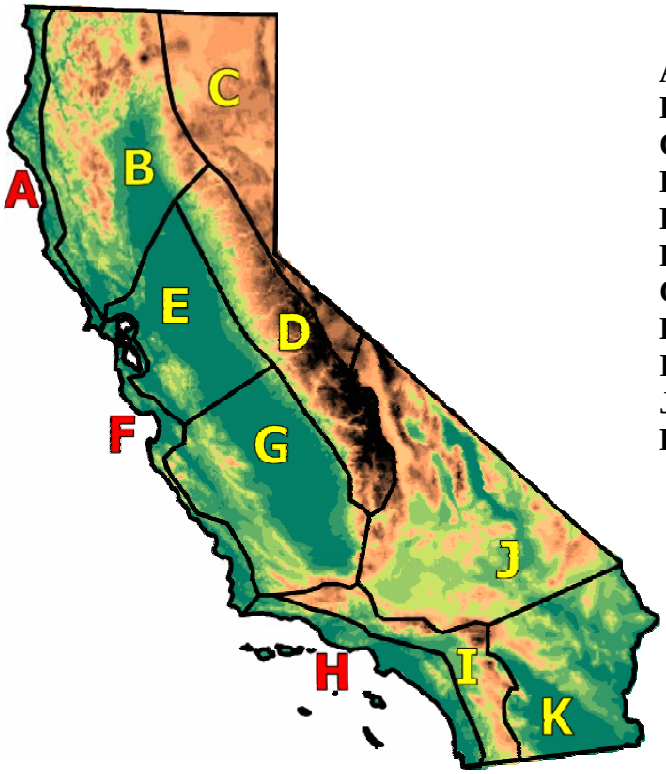
Even in the near term of the next 20 years, DWR has outlined potential climate change effects to water supplies, water demand, sea level, and the occurrence and severity of natural disasters. Some of these potential changes are presented below. Cal Water will investigate the following climate change and the effects on Cal Water's Districts:

- Water Demand — Hotter days and nights, as well as a longer irrigation season, will increase landscaping water needs, and power plants and industrial processes will have increased cooling water needs.
- Water Supply and Quality — Reduced snowpack, shifting spring runoff to earlier in the year, increased potential for algal bloom, and increased potential for seawater intrusion—each has the potential to impact water supply and water quality.
- Sea Level Rise — It is expected that sea level will continue to rise, resulting in near shore ocean changes such as stronger storm surges, more forceful wave energy, and more extreme tides. This will also affect levee stability in low-lying areas and increase flooding.
- Disaster — Disasters are expected to become more frequent as climate change brings increased climate variability, resulting in more extreme droughts and floods. This will challenge water supplier operations in several ways as wildfires are expected to become larger and hotter, droughts will become deeper and longer, and floods can become larger and more frequent.

7.4 Historical Climate Data Summary

The National Climatic Data Center (NCDC) has established 11 climate regions within California. Each region is defined be unique characteristics, and is shown in Figure 7.4-1.

Figure 7.4-1: The Climate Regions of California[7]



A. North Coast Region
B. North Central Region
C. Northeast Region
D. Sierra Region
E. Sacramento-Delta Region
F. Central Coast Region
G. San Joaquin Valley Region
H. South Coast Region
I. South Interior Region
J. Mohave Desert Region
K. Sonoran Desert Region

Cal Water has water service districts in 7 out of 11 of the climate regions. The Bakersfield District is located in the San Joaquin Valley Region, as listed in Table 7.4-1.

Table 7.4-1: Cal Water Districts Sorted by Climate Region

Climate Region	Cal Water Districts in Each Climate Region
North Coast Region	None
North Central Region	Chico-Hamilton City, Redwood Valley
Northeast Region	None
Sierra Region	Kern River Valley
Sacramento-Delta Region	Dixon, Livermore, Marysville, Oroville, Stockton, Willows
Central Coast Region	Bear Gulch, Los Altos, Mid- Peninsula, Salinas , South San Francisco
San Joaquin Valley Region	**Bakersfield**, King City, Selma, Visalia
South Coast Region	Dominguez, East LA, Hermosa-Redondo, Palos Verdes, Westlake
South Interior Region	None
Mojave Desert Region	Antelope Valley
Sonoran Desert Region	None

[7] http://www.wrcc.dri.edu/monitor/cal-mon/frames_versionSTATIONS.html

The region has experience a general warming trend as indicated by the maximum, minimum, and mean temperature departure from average. Since 1895 these values have increased by 0.33°F, 2.42°F, and 1.37°F, respectively. More recently, since 1975, the maximum, minimum, and mean temperature departures have increased 2.70°F, 5.36°F, and 4.03°F, respectively. The historical data for these parameters are shown in Figures 7.4-2, 7.4-3, and 7.4-4.

Figure 7.4-2: Maximum Temperature Departure for San Joaquin Valley

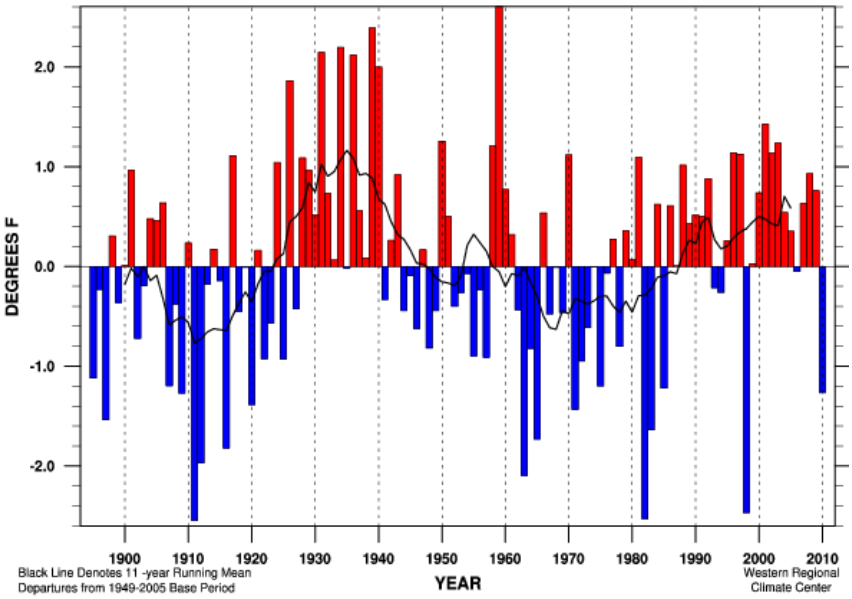


Figure 7.4-3: Mean Temperature Departure for San Joaquin Valley

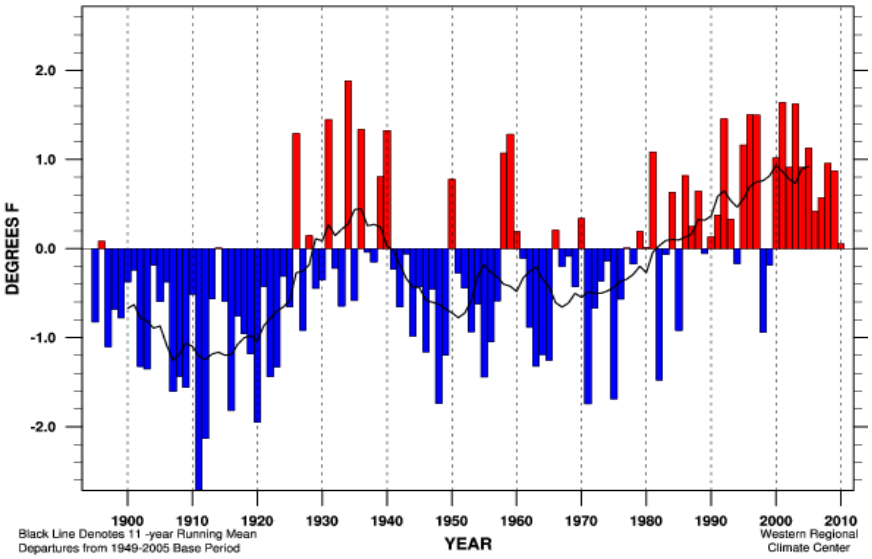
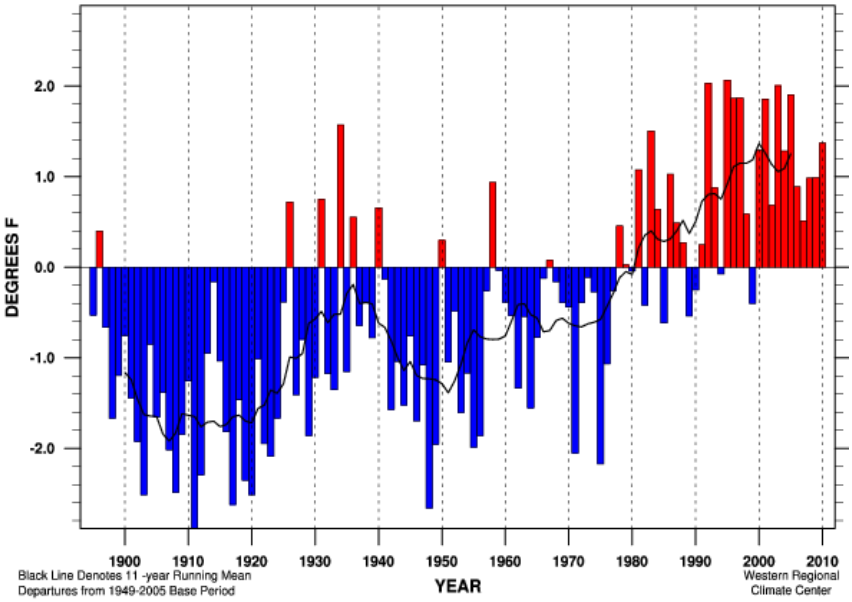
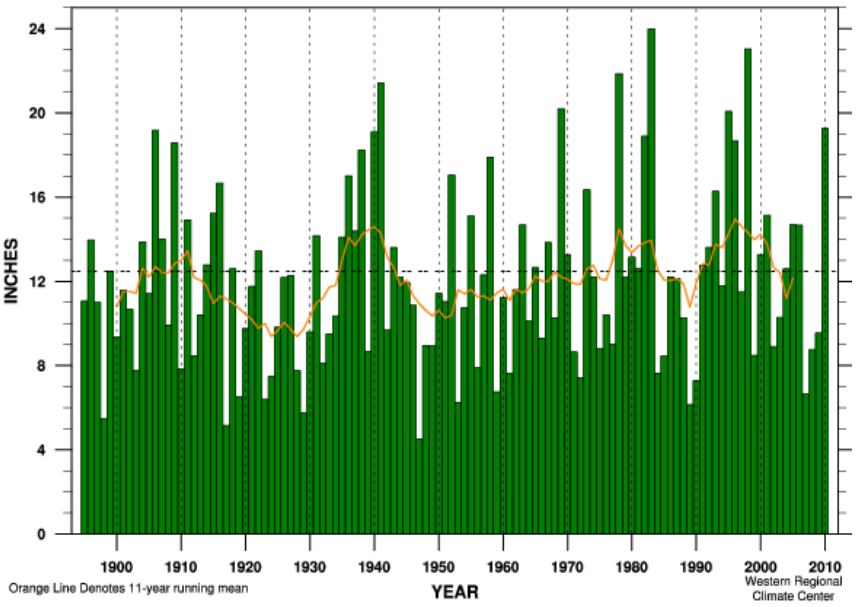


Figure 7.4-4: Minimum Temperature Departure for San Joaquin Valley



Variation in annual rainfall totals has also shown an increasing trend since 1900 with more deviation from average occurring in recent decades as compared to earlier part of the century.

Figure 7.4-5: Annual Precipitation in San Joaquin Valley



Historical data is showing a general correlation as to the general consensus for the different climate change scenarios. As stated above, a more comprehensive investigation will be prepared by Cal Water in 2013. The outcome of this report will outline mitigation and adaptation methods that will provide water supply reliability for Cal Water's service areas.

7.5 Climate Change Guidance

The California Department of Water Resources is currently in the process of compiling the potential actions and responses to climate change in the Integrated Regional Water Management (IRWM) climate change handbook. This handbook will provide guidance to water utilities for planning for the potential impacts of climate change and will offer a framework for responding to these impacts. Cal Water will review this handbook and other available literature when developing localized strategies for each of its water service districts.

8 Completed UWMP Checklist

8.1 Review Checklist

Table 8.1-1, adapted from DWR's *Guidebook to Assist Water Suppliers to Prepare a 2010 Urban Water Management Plan*, is included as a reference to assist DWR staff in review of this UWMP.

Table 8.1-1: Urban Water Management Plan Checklist (organized by legislation number)

No.	UWMP requirement [a]	Calif. Water Code reference	Subject [b]	Additional clarification	UWMP location
1	Provide 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.	10608.20(e)	Water Conservation		3.3.1
2	Include an assessment of present and proposed future measures, programs, and policies to help achieve the water use reductions.	10608.36	Water Conservation		6.4
3	Report progress in meeting urban water use targets using the standardized form.	10608.4	Water Conservation		Appendix G
4	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.	10620(d)(2)	External Coordination and Outreach		1.2
5	An urban water supplier shall describe in the plan water management tools and options used by that entity that will maximize resources and minimize the need to import water from other regions.	10620(f)	Water Supply (Water Management)		1.4
6	Every urban water supplier required to prepare a plan pursuant to this part shall, at least 60 days prior to the public hearing on the plan required by Section 10642, notify any city or county within which the supplier provides water supplies that the urban water supplier will be reviewing the plan and considering amendments or changes to the plan. The urban water supplier may consult with, and obtain comments from, any city or county that receives notice pursuant to this subdivision.	10621(b)	External Coordination and Outreach		1.2
7	The amendments to, or changes in, the plan shall be adopted and filed in the manner set forth in Article 3 (commencing with Section 10640).	10621(c)	External Coordination and Outreach		1.2
8	Describe the service area of the supplier	10631(a)	Service Area		2.1
9	(Describe the service area) climate	10631(a)	Service Area		2.3
10	(Describe the service area) current and projected population. . . The projected population estimates shall be based upon data from the state, regional, or local service agency population projections within the service area of the urban water supplier . . .	10631(a)	Service Area	Provide the most recent population data possible. Use the method described in "Baseline Daily Per Capita Water Use." See Section M.	2.2

11	. . . (population projections) shall be in five-year increments to 20 years or as far as data is available.	10631(a)	Service Area	2035 and 2040 can also be provided to support consistency with Water Supply Assessments and Written Verification of Water Supply documents.	2.2
12	Describe . . . other demographic factors affecting the supplier's water management planning	10631(a)	Service Area		2.2
13	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).	10631(b)	Water Supply	The 'existing' water sources should be for the same year as the "current population" in line 10. 2035 and 2040 can also be provided to support consistency with Water Supply Assessments and Written Verification of Water Supply documents.	4.1
14	(Is) groundwater . . . identified as an existing or planned source of water available to the supplier . . .?	10631(b)	Water Supply	Source classifications are: surface water, groundwater, recycled water, storm water, desalinated sea water, desalinated brackish groundwater, and other.	4.4
15	(Provide 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. Indicate whether a groundwater management plan been adopted by the water supplier or if there is any other specific authorization for groundwater management. Include a copy of the plan or authorization.	10631(b)(1)	Water Supply		4.4.2
16	(Provide a) description of any groundwater basin or basins from which the urban water supplier pumps groundwater.	10631(b)(2)	Water Supply		4.4.1
17	For those basins for which a court or the board has adjudicated the rights to pump groundwater, (provide) a copy of the order or decree adopted by the court or the board	10631(b)(2)	Water Supply		N/A

18	(Provide) a description of the amount of groundwater the urban water supplier has the legal right to pump under the order or decree.	10631(b)(2)	Water Supply		N/A
19	For basins that have not been adjudicated, (provide) 10631(b)(2) Water Supply 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.	10631(b)(2)	Water Supply		4.4.1
20	(Provide 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.	10631(b)(3)	Water Supply		4.4
21	(Provide 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.	10631(b)(4)	Water Supply	Provide projections for 2015, 2020, 2025, and	4.4
22	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.	10631(c)(1)	Reliability		5.3
23	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.	10631(c)(2)	Reliability		5.1
24	Describe the opportunities for exchanges or transfers of water on a short-term or long-term basis.	10631(d)	Water Supply (Transfers)		4.7
25	Quantify, to the extent records are available, past and current water use, and projected water use (over the same five-year increments described in subdivision (a)), 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;(I) Agricultural.	10631(e)(1)	Water Demands	Consider “past” to be 2005, present to be 2010, and projected to be 2015, 2020, 2025, and 2030. Provide numbers for each category for each of these years.	3.3

26	(Describe and provide a schedule of implementation for) 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 toilet replacement programs.	10631(f)(1)	DMMs	Discuss each DMM, even if it is not currently or planned for implementation. Provide any appropriate schedules.	6.5
27	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.	10631(f)(3)	DMMs		6.2
28	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.	10631(f)(4)	DMMs		6.3
29	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; (4) Include a description of the water supplier's legal authority to implement the measure and efforts to work with other relevant agencies to ensure the implementation of the measure and to share the cost of implementation.	10631(g)	DMMs	See 10631(g) for additional wording.	6.4

30	(Describe) 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.	10631(h)	Water Supply		4.9
31	Describe the opportunities for development of desalinated water, including, but not limited to, ocean water, brackish water, and groundwater, as a long-term supply.	10631(i)	Water Supply		4.6
32	Include the annual reports submitted to meet the Section 6.2 requirement (of the MOU), if a member of the CUWCC and signer of the December 10, 2008 MOU.	10631(j)	DMMs	Signers of the MOU that submit the biannual reports are deemed	6.5
33	Urban water suppliers that rely upon a wholesale agency for a source of water shall provide the wholesale agency with water use projections from that agency for that source of water in five-year increments to 20 years or as far as data is available. The wholesale agency shall provide information to the urban water supplier for inclusion in the urban water supplier's plan that identifies and quantifies, to the extent practicable, the existing and planned sources of water as required by subdivision (b), available from the wholesale agency to the urban water supplier over the same five-year increments, and during various water-year types in accordance with subdivision (c). An urban water supplier may rely upon water supply information provided by the wholesale agency in fulfilling the plan informational requirements of subdivisions (b) and (c).	10631(k)	Water Supply	Average year, single dry year, multiple dry years for 2015, 2020, 2025, and 2030.	N/A
34	The water use projections required by Section 10631 shall include projected water use for single-family and multifamily residential housing needed for lower income households, as defined in Section 50079.5 of the Health and Safety Code, as identified in the housing element of any city, county, or city and county in the service area of the supplier.	10631.1(a)	Water Demands		3.3.2
35	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.	10632(a)	Contingency		5.3.5
36	Provide 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.	10632(b)	Contingency		5.2

37	(Identify) 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.	10632(c)	Contingency		5.3.9
38	(Identify) 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.	10632(d)	Contingency		5.3.7
39	(Specify) 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.	10632(e)	Contingency		5.3.5
40	(Indicated) penalties or charges for excessive use, where applicable.	10632(f)	Contingency		5.3.7
41	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.	10632(g)	Contingency		5.3.8
42	(Provide) a draft water shortage contingency resolution or ordinance.	10632(h)	Contingency		5.3
43	(Indicate) a mechanism for determining actual reductions in water use pursuant to the urban water shortage contingency analysis.	10632(i)	Contingency		5.3.7
44	Provide, to the extent available, information on recycled water and its potential for use as a water source in the service area of the urban water supplier. The preparation of the plan shall be coordinated with local water, wastewater, groundwater, and planning agencies that operate within the supplier's service area	10633	Recycled Water		4.5
45	(Describe) the wastewater collection and treatment systems in the supplier's service area, including a quantification of the amount of wastewater collected and treated and the methods of wastewater disposal.	10633(a)	Recycled Water		4.5.1
46	(Describe) the quantity of treated wastewater that meets recycled water standards, is being discharged, and is otherwise available for use in a recycled water project.	10633(b)	Recycled Water		4.5.2
47	(Describe) the recycled water currently being used in the supplier's service area, including, but not limited to, the type, place, and quantity of use.	10633(c)	Recycled Water		4.5.3
48	(Describe and quantify) the potential uses of recycled water, including, but not limited to, agricultural irrigation, landscape irrigation, wildlife habitat enhancement, wetlands, industrial reuse, groundwater recharge, indirect potable reuse, and other appropriate uses, and a determination with regard to the technical and economic feasibility of serving those uses.	10633(d)	Recycled Water		4.5.3
49	(Describe) The projected use of recycled water within the supplier's service area at the end of 5, 10, 15, and 20 years, and a description of the actual use of recycled water in comparison to uses previously projected pursuant to this subdivision.	10633(e)	Recycled Water		4.5.3
50	(Describe the) actions, including financial incentives, which may be taken to encourage the use of recycled water, and the projected results of these actions in terms of acre-feet of recycled water used per year.	10633(f)	Recycled Water		4.5

51	(Provide a) plan for optimizing the use of recycled water in the supplier's service area, including actions to facilitate the installation of dual distribution systems, to promote recirculating uses, to facilitate the increased use of treated wastewater that meets recycled water standards, and to overcome any obstacles to achieving that increased use.	10633(g)	Recycled Water		4.5
52	The plan shall include information, to the extent practicable, relating to the quality of existing sources of water available to the supplier over the same five-year increments as described in subdivision (a) of Section 10631, and the manner in which water quality affects water management strategies and supply reliability.	10634	Water Supply (Water Quality)	For years 2010, 2015, 2020, 2025, and 2030	5.2.4
53	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.	10635(a)	Reliability		5.2
54	The urban water supplier shall provide that portion of its urban water management plan prepared pursuant to this article to any city or county within which it provides water supplies no later than 60 days after the submission of its urban water management plan.	10635(b)	External Coordination and Outreach		1.2
55	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.	10642	External Coordination and Outreach		1.2
56	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 within the jurisdiction of the publicly owned water supplier pursuant to Section 6066 of the Government Code. The urban water supplier shall provide notice of the time and place of hearing to any city or county within which the supplier provides water supplies. A privately owned water supplier shall provide an equivalent notice within its service area.	10642	External Coordination and Outreach		1.2
57	After the hearing, the plan shall be adopted as prepared or as modified after the hearing.	10642	External Coordination and Outreach		1.3
58	An urban water supplier shall implement its plan adopted pursuant to this chapter in accordance with the schedule set forth in its plan.	10643	External Coordination and Outreach		1.6
59	An urban water supplier shall submit to the department, the California State Library, and any city or county within which the supplier provides water supplies a copy of its plan no later than 30 days after adoption. Copies of amendments or changes to the plans shall be submitted to the department, the California State Library, and any city or county within which the supplier provides water supplies within 30 days after adoption.	10644(a)	External Coordination and Outreach		1.3

60	Not later than 30 days after filing a copy of its plan with the department, the urban water supplier and the department shall make the plan available for public review during normal business hours.	10645	External Coordination and Outreach		1.3

[a] The UWMP Requirement descriptions are general summaries of what is provided in the legislation. Urban water suppliers should review the exact legislative wording prior to submitting its UWMP.

[b] The Subject classification is provided for clarification only. A water supplier is free to address the UWMP Requirement anywhere with its UWMP, but is urged to provide clarification to DWR to facilitate review for completeness.

APPENDIX A-1: RESOLUTION TO ADOPT UWMP

APPENDIX A-2: CORRESPONDENCES

APPENDIX A-3: PUBLIC MEETING NOTICE

APPENDIX B: SERVICE AREA MAP

APPENDIX C: WATER SUPPLY, DEMAND, AND PROJECTION WORKSHEETS

APPENDIX D: DWR'S GROUNDWATER BULLETIN 118

APPENDIX E: TARIFF RULE 14.1 WATER CONSERVATION AND RATIONING PLAN, AND LOCAL ORDINANCE

APPENDIX F: WATER EFFICIENT LANDSCAPE GUIDELINES

APPENDIX G: CONSERVATION MASTER PLAN

APPENDIX H: NEB WATER AGREEMENT

APPENDIX I1: ID-4 AMENDMENT

APPENDIX I2: ID-4 AGREEMENT

APPENDIX J: CITY AGREEMENT

APPENDIX K: ID-4 REPORT ON WATER CONDITIONS