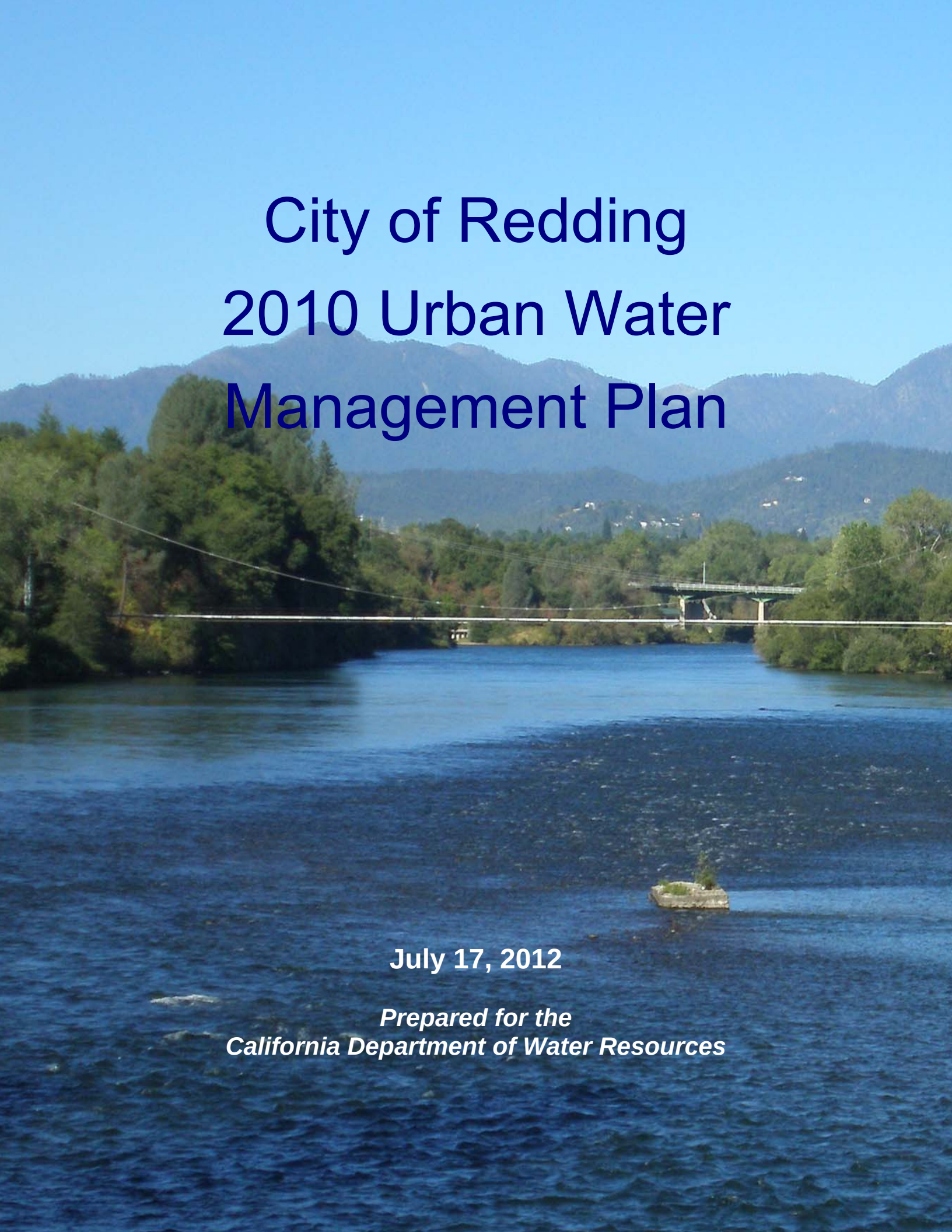


City of Redding 2010 Urban Water Management Plan

July 17, 2012

Prepared for the California Department of Water Resources

This page intentionally left blank.

Table of Contents

		Page
LIST OF APPENDICES		vi
LIST OF ABBREVIATIONS AND ACRONYMS		vii
EXECUTIVE SUMMARY		viii
	Table ES-1: Per Capita Baseline use and Targets	
	Figure ES-1: Historic Demand and 2015/2020 Targets	
	Figure ES-2: Monthly Demand and Production by Source	
	Figure ES-3: Projected Dry Year Supplies and Demands	
INTRODUCTION		xii
SECTION 1	**PLAN PREPARATION**	
1.1	Coordination within the City	1
1.2	Planning Documents	1
1.3	Interagency Coordination	1
	Table 1: Coordination and Public Involvement	
1.4	Public Participation	4
1.5	Plan Adoption and Implementation	5
SECTION 2	**SYSTEM DESCRIPTION**	
2.1	City Service Area	7
	Figure 1: Physical Location of Shasta County, Northern California	
2.2	Climate	9
	Table 2: Climate Data	
	Table 3: Monthly Water Consumption by Customer Type (2010)	
	Figure 3: City of Redding 2010 Monthly Water Use by Sector	
2.3	Service Area Population	10
	Table 4: Population Projections	
2.4	Water Use by Customer Type—Past, Current, Future	11
	Figure 4: City of Redding Percentage Water Use by Sector, 2006-2010	
	Residential Sector	
	Commercial Sector	
	Industrial Sector	
	Institutional/Governmental Sector	
	Landscape/Residential Sector	

SECTION 3 SYSTEM DEMANDS

3.1 Actual Water Deliveries 15
Table 5: Water Deliveries, Actual—2005
Table 6: Water Deliveries, Actual—2010
3.2 Calculation of Base Period Average Daily Use 16
Table 7: Base Period Ranges
Table 8: Base Daily Per Capita Water Use—10-year Range
Table 9: Base Daily Per Capita Water Use—5-year Range
Table 10: 2020 Urban Water Use Target Calculation
Figure 5: California Hydrologic Regions and 2020 Conservation Goals
Table 11: 2020 Urban Water Use Target and Interim Target Check
Figure 6: City of Redding Historic Yearly Demand & 2015, 2020 Water Use Targets
3.3 Water Demand Projections 21
Table 12: Water Deliveries—Projected, 2015
Table 13: Water Deliveries—Projected, 2020
Table 14: Water Deliveries—Projected, 2025 & 2030
3.4 Projected Water Demand from Future Lower Income Housing Units 23
Table 15: Low-income Projected Water Demands
3.5 Sales/Connections to Other Agencies 24
Table 16: Sales/Connections to Other Agencies
3.6 Total Annual and Projected Water Use 25
Table 17: Additional Water Uses and Losses
Table 18:Total Water Use
Figure 7: City of Redding GPCD Water Use Targets and Per Capita Monthly Use by Sector, 2010
3.7 Water Use Reduction Plan 26

SECTION 4 SYSTEM SUPPLIES

4.1 Water Sources—General 27
Figure 8: Areal Extent of Redding Groundwater Basin
Figure 9: City of Redding Monthly Water Production by Source, 2010
Table 19: Water Supplies, Current & Projected
4.2 Water Sources—Groundwater 29
Table 20: Groundwater—Volume Pumped 2006-2010
Table 21: Groundwater—Volume Projected to be Pumped
4.3 Transfer and Exchange Opportunities 31
Table 22: Transfer and Exchange Opportunities
4.4 Desalinated Water Opportunities 32
4.5 Recycled Water Opportunities
4.5.1 Wastewater Quantity, Quality, and Current Uses 32
Collection System
Wastewater Treatment Processes
Estimated Wastewater Disposal Quantities

Table 23: Recycled water—Wastewater Collection and Treatment
Table 24: Recycled water—Non-recycled Wastewater Disposal
4.5.2 Recycled Water Potential and Projected Use 35
Table 25: Recycled water—Potential Future Use
Table 26: Recycled water—2005 UWMP Use Projection Compared to 2010 Actual
4.6 Future Water Projects 36
Table 27: Future Water Supply Projects

SECTION 5 WATER SUPPLY RELIABILITY AND WATER SHORTAGE CONTINGENCY PLANNING

5.1 Water Supply Reliability 37
Water Supply: Historical Context
Water Supply Reliability and Future Growth
5.2 Historic and Current Supply Reliability 38
Table 28: Basis of Water Year Data
Table 29: Supply Reliability—Historic Conditions
Table 30: Factors Resulting in Inconsistency of Supply
Table 31: Supply Reliability—Current Water Sources
Table 32: Supply and Demand Comparison—Normal Year
Figure 10: City of Redding Projected Demand and Source Supplies, Normal Water Year
Table 33: Supply and Demand Comparison—Single Dry Year
Table 34: Supply and Demand Comparison—Multiple Dry-year Events
Figure 11: City of Redding Projected Demands and Supplies, Dry Years
5.3 Water Quality 44
Source Water Assessment and Sanitary Survey
Table 35: Water Quality—Current and Projected Water Supply Impacts
5.4 Water Shortage Contingency Plan 46
Disaster Response and Water Shortage Response Plans
Table 36: Water Supply Shortage Stages and Conditions
Table 37: Mandatory Prohibitions
Table 38: Consumption Reduction Methods
Table 39: Water Shortage Contingency—Penalties and Charges
5.5 Analysis of Revenue Impacts of Reduced Sales during Shortages 48

SECTION 6 DEMAND MEASUREMENT MEASURES (DMM's) 49

Table 40: Best Management Practices (BMPs)

SECTION 7 MISCELLANEOUS PROVISIONS 57

LIST OF APPENDICES

APPENDIX A	Contact Information for Agencies listed in *Table 1*	A-1
APPENDIX B	Coordinated AB 3030 Groundwater Management Plan	A-6
APPENDIX C	Redding General Plan Public Facilities Element	A-54
APPENDIX D	Redding General Plan Natural Resource Element (updated 2009)	A-56
APPENDIX E	2010 California Urban Water Conservation Council Report	A-58
APPENDIX F	City of Redding Water Utility Disaster Response Plan	A-149
APPENDIX G	City of Redding Drought Management Plan	A-172
APPENDIX H	2010 City of Redding Consumer Confidence Report	A-176
APPENDIX I	Notices of Public Hearing - Redding Record Searchlight; Screen Shot—Draft Plan available for review on City of Redding website	A-186
APPENDIX J	City Council Agenda and Resolution to Adopt the 2010 Urban Water Management Plan	A-193
APPENDIX K	Notification to Shasta County of Pre-submittal Urban Water Management Plan Review/Revision Process	A-195
APPENDIX L	Documentation of Submittal of Reviewed Plan to Shasta County and the California State Library	A-198
APPENDIX M	Timeline of Urban Water Management Plan Review and Approval Process	A-200
APPENDIX N	FIGURE 2: City of Redding Existing Water System	A-203
APPENDIX O	City of Redding Water Efficient Landscape Ordinance	A-206
APPENDIX P	Notice that Approved Plan is Available for Public Review	A-231
APPENDIX Q	California Urban Water Conservation Council GPCD Worksheets	A-233
APPENDIX R	United States Bureau of Reclamation Redding and Buckeye Contract Supplies by Year & Redding Contract Supply by Month	A-237
APPENDIX S	Completed Urban Water Management Plan Checklist	A-243

LIST OF ABBREVIATIONS AND ACRONYMS

ACID	Anderson-Cottonwood Irrigation District
AADF	Average Annual Daily Flow
ADWF	Average Dry Weather Flow
AF	Acre-feet (volume equaling one acre of water one foot deep)
AFY	Acre-feet per year
Baseline use	Base Daily Per Capita Use
BMP	Best Management Practice
Bureau	United States Bureau of Reclamation
CCF	One hundred cubic feet
CCWWTP	Clear Creek Wastewater Treatment Plant
CGWMP	Coordinated Groundwater Management Plan
CSD	Community Services District
CUWCC	California Urban Water Conservation Council
CII	Commercial/Industrial/Institutional (water users)
CVP	Central Valley Project
CVPIA	Central Valley Project Improvement Act
DMM	Demand Management Measure
DWR	(California) Department of Water Resources
EDC	Economic Development Corporation
FDA	Food and Drug Administration
ft^2	Square feet
FWMP	Federal Water Management Plan
GPCD	Gallons Per Capita per Day
GPM	Gallons Per Minute
HE	Household Equivalent
MCL	Maximum Contaminant Level
MGD	Million Gallons per Day
M & I	Municipal & Industrial
pph	persons per household
PPM	Parts Per Million
RAWC	Redding Area Water Council
RGWB	Redding Groundwater Basin
RMC	(City of) Redding Municipal Code
SCWA	Shasta County Water Agency
SWWTP	Stillwater Wastewater Treatment Plant
USEPA	United States Environmental Protection Agency
USGS	United States Geological Survey
UWMP	Urban Water Management Plan
target	Water Use Target
WRMS	Water Resource Managers of Shasta (County)
WTP	Water Treatment Plant
WWTP	Wastewater Treatment Plant

EXECUTIVE SUMMARY

In 1983 the California Legislature approved Assembly Bill 797, Division 6, Part 2.6, Sections 10610 – 10656 of the California Water Code. This legislation, the Urban Water Management Planning Act, requires urban water suppliers providing water for municipal purposes to more than 3,000 service connections or supplying more than 3,000 acre-feet (AF) of water annually to prepare and adopt an Urban Water Management Plan (UWMP) every five years.

An UWMP supports long-term water resource planning in order to ensure that adequate water supplies are available to meet existing and future water demands. The UWMP describes the City of Redding (City) water system and includes information about water supply sources, historical and projected water use, water quality, and water shortage contingency measures. The 2010 UWMP plan builds on the 2005 version by taking into account Senate Bill x7-7, which established a statewide goal of 20 percent water use reduction by the year 2020. Accordingly, this UWMP includes calculation of the City's 10-year base (average) use, current and projected water use per capita, and specific water use targets for 2015 through 2030. Effective 2016, urban retail water suppliers who do not meet the water conservation requirements established by Senate Bill x7-7 are not eligible for state water grants or loans. Therefore, this UWMP proposes continuation and implementation of conservation policies and programs toward the goal of meeting interim (2015) and compliance (2020) per capita water use targets.

Service Area and System Description

The City of Redding, located at the northern end of California's Central Valley, experiences hot, dry summers and cool, rainy winters. Summer temperatures regularly top 100 ºF and 75-90% of the annual 34 inches falls during the months of November through April. Accordingly, five-fold increases in water demand during summer months are not uncommon. In 2010, the City supplied almost 23,000 acre-feet (AF) of retail water to approximately 91,000 people by means of about 28,000 residential and commercial accounts. The customer base is primarily urban and residential and includes no agricultural accounts. The City's two largest water demand sectors for the years 2006-2010 were Single-Family Residential (56%) and Commercial/ Institutional (23%).

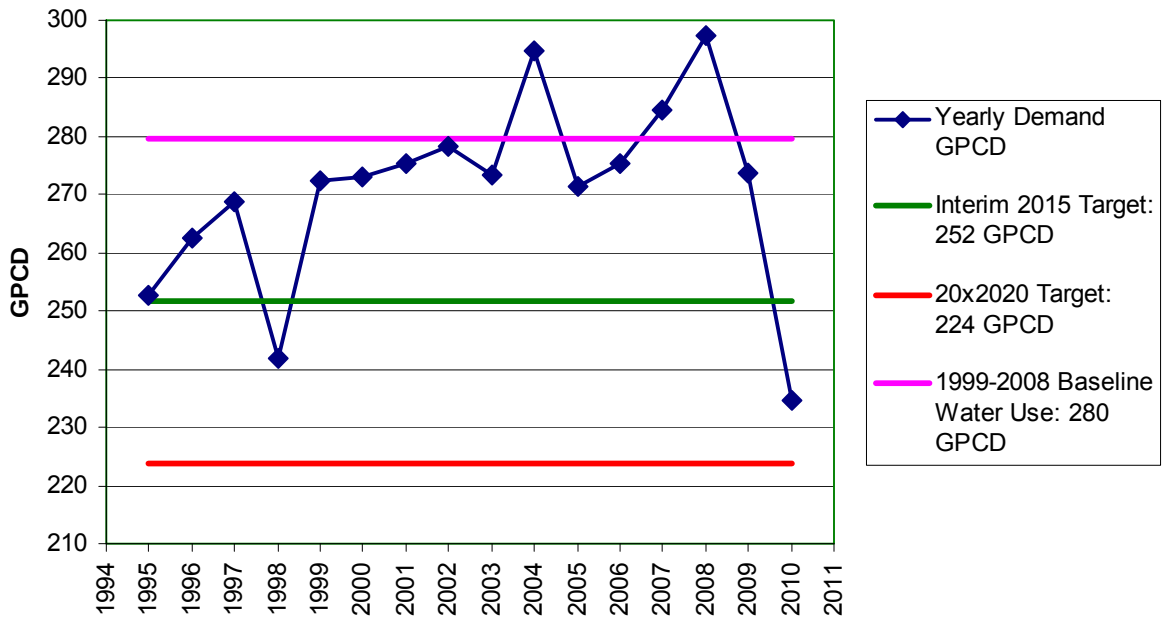
Water Demand and Water Use Targets

The Water Conservation Act of 2009 stipulates explicit methods for calculating gross and per capita water use. The City's base historical per capita use rate (baseline use) is a 10-year per capita average for the years 1999-2008. Targets for 2015 and 2020 are 90% and 80% of the baseline use, respectively (see *Table ES-1*). Various factors, but particularly the recent economic downturn, contributed to significantly reduced water use rates during 2009 and 2010—from a high of 297 gallons per capita per day (GPCD) in calendar year 2008 to a low of 235 GPCD in 2010 (*Figure ES-1*). Water use can be expected to rebound somewhat as the economic situation improves—and indeed did climb slightly to 242 GPCD in 2011. However, if 2009-2010 water use trends continue to some degree and implementation of Best Management Practices (BMPs) outlined in Section 6 of this UWMP occur, the City is likely to meet its interim and compliance water use targets. Meeting the calculated targets would allow the City to remain eligible for State water grants and loans result in both greater water supply reliability and increased flexibility in planning for development.

Table ES-1
Per Capita Baseline use and Targets

Parameter	Calculation Method	Target
Baseline use	1999-2008 calendar year average	280
Interim (2015) Water Use Target	90% of Baseline use	252
Compliance (2020) Water Use Target	80% of Baseline use	224
		Units: Gallons Per Capita per Day (GPCD)

Figure ES-1 City of Redding Historic Yearly Water Demand & 2015, 2020 Water Use Targets



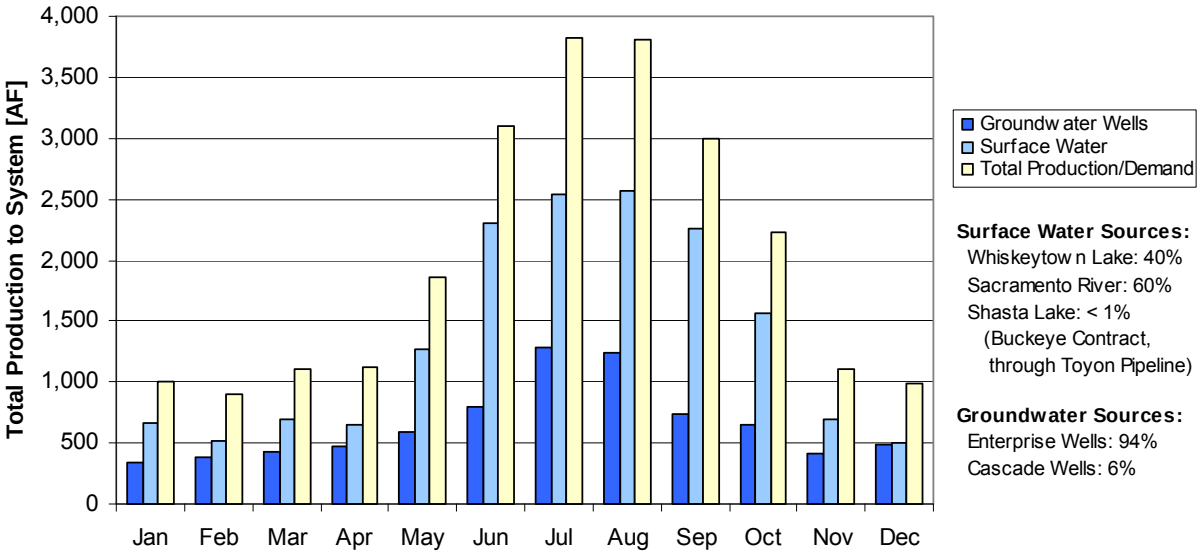
Water Supplies

The City of Redding supplies its municipal water system from three primary sources:

1. Surface water drawn from the Sacramento River one mile upstream of Diestelhorst Bridge and treated at the Foothill Water Treatment Plant just south of Eureka Way. The Redding Contract with United States Bureau of Reclamation (Bureau) combines pre-1914 water rights with Central Valley Project (CVP) water to equal a supply of 21,000 acre-feet per year (AFY).
2. Surface water drawn from Whiskeytown Lake through the Spring Creek Conduit to the Buckeye Water Treatment Plant in Old Shasta. Up to 6,140 AFY are available from this source through the City's Buckeye Contract with the Bureau.
3. Groundwater pumped from the Redding Groundwater Basin by sixteen wells which are located primarily in the Enterprise zone. Operating at 50% of yearly capacity, these wells could supply the City with11,000 AFY—with an additional 2,400 AFY of capacity from two new wells planned by the year 2020. Groundwater wells typically supply about 30% of total annual water production.

Monthly demand and relative contributions to supply (2010) are illustrated in *Figure ES-2*—note increased overall demand during the summer months. In addition, the City has recently negotiated yearly transfers of up to 4,000 AF from Anderson-Cottonwood Irrigation District (ACID) as an insurance water supply. Due to geographic, contractual, and economic factors, the City has no plan to pursue water desalination or water recycling as future water supply sources.

Figure ES-2: City of Redding Monthly Water Production by Source, 2010

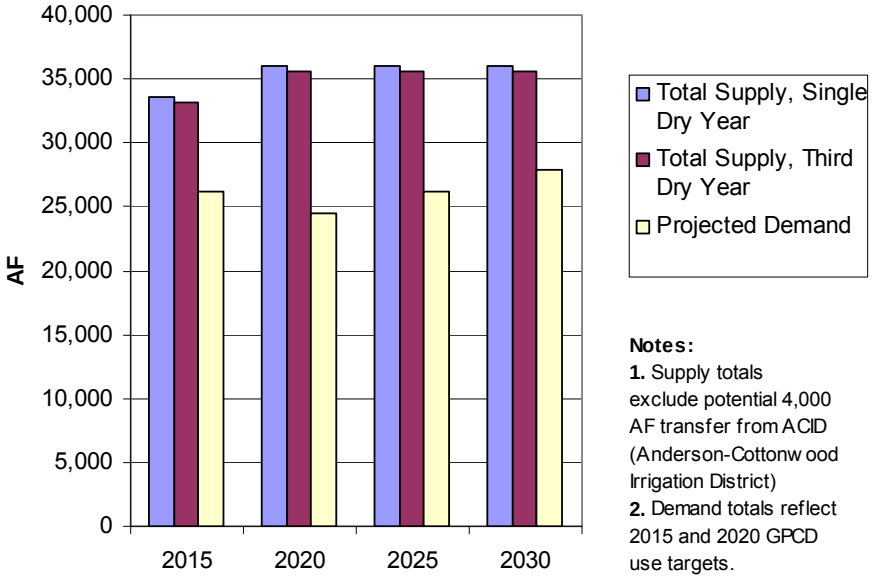


Source City of Redding DWR Water System Statistics, 2010

Supply Reliability and Shortage Contingency

Both of the City's surface water contracts with the Bureau—the Redding and Buckeye Contracts—contain provisions for reduced water allotments during dry water years for Lake Shasta. Estimates of dry year water supply sufficiency were determined using population projections through 2030 and assumptions that 2015 and 2020 per capita targets will be met and sustained during the subsequent decade. Results indicate that the City's diversity of supply sources will be more than sufficient to meet projected demand, even during multiple dry year events (see *Figure ES-3*), through the 2030 planning horizon.

Figure ES-3: City of Redding Projected Water Demands and Supplies, Dry Years



Proposed Water Conservation Measures

California water purveyors are required in their UWMPs to submit descriptions of specific actions—Demand Management Measures (DMMs)—that will be taken in order to reduce overall water demand. As a Bureau contractor, the City also must prepare and submit a Federal Water Management Plan (FWMP) every five years. The FWMP requires contractors to identify and implement Best Management Practices (BMPs)—policies and programs that result in conservation of water resources. DWR allows substitution of Bureau BMPs for DMMs, and to that end Section 6 of this UWMP provides detailed descriptions of the City's proposed and existing BMPs.

The City's proposed/existing BMPs in are divided into two categories (see Section 6 for a complete list and descriptions):

1. Foundational—expected as common practice for all water purveyors, examples of foundational BMPs include:
    - Conservation pricing—water is metered and billed the amount of water delivered.
    - A designated Water Conservation Specialist
    - Community and school educational outreach
2. Programmatic—unique, targeted efforts by agencies that might seek water use reduction for a certain demographic, season, end use, time of day, etc.—examples of the City's existing/proposed programmatic BMPs include:
    - Onsite leak detection assistance for customers
    - Water-use audits to investigate higher-than-ordinary meter reads
    - Technical landscape resources and training
    - Water-saving devices available to customers
    - Water audits for commercial and institutional customers in order to identify potential water-saving policies, practices, and technologies.

INTRODUCTION

In 1983 the California Legislature approved Assembly Bill 797, Division 6, Part 2.6, Sections 10610 – 10656 of the California Water Code. This legislation, the Urban Water Management Planning Act, requires urban water suppliers providing water for municipal purposes to more than 3,000 service connections or supplying more than 3,000 acre-feet of water annually to prepare and adopt an Urban Water Management Plan (UWMP) which is filed with the State Department of Water Resources (DWR) in years ending in five and zero. The UWMP supports long-term water resource planning to ensure that adequate water supplies are available to meet existing and future water demands.

The City of Redding is a retail water supplier and served approximately 28,000 residential and commercial accounts with almost 23,000 acre-feet of water in 2010. The UWMP addresses the City's water system and includes information about water supply sources, historical and projected water use and water shortage contingency measures.

In addition, the 2010 UMWP has been developed to comply with Senate Bill x7-7, the Water Conservation Act of 2009, which requires all water suppliers to increase water use efficiency. The legislation set a goal of reducing urban water use by 20% by December 31, 2020, and of making incremental progress towards this goal by reducing per capita water use by at least 10% by December 31, 2015. Urban water suppliers must include in their 2010 water management plans the baseline daily per capita water use, the 2020 water use target, the interim water use target, and compliance per capita water use—calculated according to methodologies developed by the DWR. Effective 2016, urban retail water suppliers who do not meet the water conservation requirements established by Senate Bill x7-7 are not eligible for state water grants or loans. It is the City's intent that implementation of the UWMP will enhance the efficiency of water use while achieving the City's 2015 and 2020 targets.

SECTION 1 – PLAN PREPARATION

(Water Code Section 10620 - 10621)

1.1 Coordination within the City

The City of Redding is a full-service City that provides Electric, Solid Waste, Storm Drain, Wastewater, and Water services in addition to Engineering, Planning and other municipal services. The Urban Water Management Plan (UWMP) contains elements that may affect other departments or require input from them; therefore, other City departments were contacted for assistance in the completion of this plan or asked to comment on the draft (see *Table 1*). Preparation of this UWMP was coordinated by Water Utility Staff—see ***Appendix A*** for contact information.

1.2 Planning Documents

In addition to consulting with other City Departments, the following sources were utilized in the preparation of this document:

City of Redding 2005 Urban Water Management Plan
City of Redding 1982, 2000 and 2010 Water Master Plans
Redding Area 2011 Watershed Sanitary Survey
City of Redding Water Utility 2002 Source Water Assessment, Groundwater Sources
City of Redding Water Utility 2001 Source Water Assessment, Surface Water Sources
City of Redding General Plan Document (2000)
City of Redding General Plan Natural Resources Element 2009 Update
City of Redding Municipal Code
City of Redding Water Utility Proforma
City of Redding Water Utility 2010 Consumer Confidence Report
The Redding Metro Report
City of Redding 2004 Federal Water Management (Conservation) Plan
California Urban Water Conservation Council 2010 Annual Report
Department of Water Resources Public Water Systems Statistics Reports
Coordinated AB 3030 Groundwater Management Plan for the Redding Groundwater Basin (1998)
Miscellaneous Water Utility Documents
Guidebook to Assist Urban Water Suppliers to Prepare a 2010 Urban Water Management Plan
Methodologies for Calculating Baseline and Compliance Urban Per Capita Water Use
Water Conservation Act of 2009 (Senate Bill X7-7)
Stillwater Wastewater Treatment Plant Facilities Plan (2007)
DWR Bulletin 118—2003 Update (Groundwater Basin Update)
Redding Basin Water Resources Management Plan Environmental Impact Report (2007)

1.3 Interagency Coordination

In developing a UWMP, the City of Redding Water Utility has asked for assistance and solicited comments from local water suppliers, public agencies and non-profits, citizens' groups, and other interested stakeholders. All water sources are shared in common with other urban and agricultural interests in the area and as such, their participation in the process is a valuable element in addressing the water needs of the Redding area. The City of Redding Water Utility maintains working relationships with other local water providers through membership and participation in the Redding Area Water Council (RAWC) and the Water Resource Managers of

Shasta County (WRMS). *Table 1* identifies neighboring local water agencies and indicates their level of involvement in the City of Redding's urban water management planning process. ***Appendix A*** lists contact information for agencies listed in *Table 1*. Of the 55 recipients at the departments, organizations, businesses and government agencies listed in Table 1 who were sent a draft version of the 2010 UWMP in March 2012, six responded with comments.

Table 1
Coordination and Public Involvement

Agency Department	Participated in UWMP Development	Contacted for Assistance	Sent Copy of Draft	Commented on Draft	Attended Public Meeting	Sent Notice of Intent to Adopt	Not Involved No Information
CITY OF REDDING							
Assistant City Manager			X				
Community Services			X				
Development Services		X	X	X			
Housing		X	X				
Industrial Waste		X	X				
Public Works		X	X	X	X		
Redding Electric Utility			X				
Redevelopment		X	X				
Storm Drain Utility		X	X	X			
Wastewater Utility		X	X				
Water Utility	X	X	X	X	X		
WATER SUPPLIERS							
Anderson Cottonwood Irrigation District			X				
Bella Vista Water District			X				
Centerville CSD			X				
City of Anderson			X				
City of Shasta Lake			X				

Table 1
Coordination and Public Involvement (continued)

Agency	Participated in UWMP Development	Contacted for Assistance	Sent Copy of Draft	Commented on Draft	Attended Public Meeting	Sent Notice of Intent to Adopt	Not Involved No Information
WATER SUPPLIERS							
Clear Creek CSD			X				
Mountain Gate CSD			X				
Shasta CSD			X				
OTHER STAKEHOLDERS							
CH2M Hill			X				
Greater Redding Chamber of Commerce			X				
McConnell Foundation			X				
Pace Engineering			X	X			
Redding Rancheria			X				
Sharrah Dunlap Sawyer, Inc			X				
Shasta Builders Exchange			X				
Shasta EDC			X				
Sierra Pacific Industries			X				
Turtle Bay Exploration Park			X				
WaterWorks Engineers			X				
Wheelabrator Shasta Energy Company			X				

Table 1
Coordination and Public Involvement (continued)

Agency	Participated in UWMP Development	Contacted for Assistance	Sent Copy of Draft	Commented on Draft	Attended Public Meeting	Sent Notice of Intent to Adopt	Not Involved No Information
CITIZENS GROUPS							
Sacramento Watersheds Action Group			X				
Western Shasta Resource Conservation District			X				
Shasta Conservation Council			X				
GOVERNMENT AGENCIES							
United States Bureau of Reclamation		X	X				
Department of Water Resources		X	X				
Department of Public Health			X	X	X		
Public Library			X				
Shasta County Public Works		X	X	X			

CSD – Community Services District
EDC – Economic Development Corporation

Source: ***Appendix A***

1.4 Public Participation

(Water Code Section 10640 – 10645)

Public participation in the development of this UWMP was encouraged through direct e-mails, posting on the City's website, and notices of public hearing. The public hearing was held on April 5, 2012 with public notices of the hearing appearing in the Redding newspaper, *The Record Searchlight*, on March 23 and March 29 (see ***Appendix I***). Shasta County was notified February 9, 2012, that the City's UWMP was under review and modification (see ***Appendix K***). A special effort was made to include neighboring water districts, community and public interest organizations, the Chamber of Commerce, members of the Redding Area Water Council (RAWC), members of the Water Resource Managers of Shasta County (WRMS), and

government agencies who might have an interest. Copies of the draft UWMP were made available for public review at City Hall—in the Public Works office and at the Visitor Information Desk—and at the Public Works Field Operations Office, 20055 Viking Way, Building #3. The draft UWMP was also available for public review on the City's website (see Notice of Public Meeting and Public Review Availability Documentation in ***Appendix I***).

1.5 Plan Adoption and Implementation

The City of Redding prepared this update of its UWMP during 2011 and 2012. The UWMP will be submitted to the DWR and a copy sent to the California State Library and to Shasta County within 30 days of adoption (***Appendix L***). See ***Appendix M*** for a timeline of the UWMP preparation, review and adoption process. A copy of the City Council agenda and signed *Resolution of Plan Adoption* is included in ***Appendix J***. This UWMP includes all information necessary to meet the requirements of California Water Code Division 6, Part 2.6 - Urban Water Management Planning—see UWMP Completed Checklist in ***Appendix S***. The implementation of conservation measures discussed in Section 6 will be coordinated by the City's Water Conservation Specialist with sufficient lead time to reach Interim 2015 water conservation targets.

This page has been intentionally left blank.

SECTION 2: SYSTEM DESCRIPTION

2.1 City Service Area

The City of Redding lies along the banks of the Sacramento River about 150 miles north of Sacramento and 100 miles south of the Oregon border in the County of Shasta in Northern California. It sits at the far northern end of the Sacramento Valley where the foothills meet the Cascade Mountain Range. Mountains to the north, east and west surround Redding, which has an average elevation of approximately 550 feet MSL. *Figure 1* (following page) shows the physical location of Redding and Shasta County. The City of Redding is one of three incorporated cities within the county and serves as the county seat.

The City of Redding began building its own water system in 1937 and was granted a water permit by the State Board of Health on December 31, 1937. In 1941, the City purchased the California Water Service Company, which had served portions of the City, and integrated components of both operations into a citywide distribution system. In 1976, the Enterprise Public Utility District (EPUD) and the Cascade Community Services District (CCSD) were annexed into the City. The water systems from both these special districts, which were supplied by groundwater wells, were integrated into the City's water system with the construction of major cross-town transmission mains. Currently, the City serves water to both City and county residents as per the Local Agency Formation Commission (LAFCO) guidelines. Total service area is approximately 53 square miles and total population served is approximately 91,000. Some areas of the City are served by neighboring water districts, which are shown in *Figure 2* (***Appendix N***).

FIGURE 1

Physical Location of Shasta County - Northern California

2.2 Climate

The Redding area has hot, dry summers and cool, rainy winters typical of a Mediterranean-type climate. Summer temperatures over 100 ºF occur and subfreezing winter temperatures are common. Average annual precipitation (1996-2008) is 34.23 inches and occurs mostly during winter months. About 75-90% of the total rainfall falls between November 1st and April 30th. Relative humidity is generally low to moderate.

Average wind velocity is 5.8 miles per hour. The predominant wind direction is from the North-Northwest. *Table 2*, below, presents average precipitation, temperatures, and evapo-transpiration data.

Table 2
Climate Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Avg. Total Precipitation (inches)[1]	5.93	6.24	3.26	2.53	1.84	0.53	0.14	0.12	0.52	1.78	4.37	6.96	34.23
Avg. max temp (ºF)[1]	54.7	58.8	65.6	70.1	81.1	90.7	99.0	97.0	90.5	77.7	62.8	55.2	75.3
Avg. min temp (ºF)[1]	37.4	39.6	42.7	46.0	54.2	61.5	65.9	63.1	57.7	49.0	41.9	37.3	49.7
Average ETo[2]	1.04	1.81	3.46	5.03	6.62	7.91	8.73	7.40	5.75	4.06	1.80	1.13	54.74

Sources:

(1) National Weather Service, Redding Municipal Airport, California, 1996-2008; data obtained from http://www.wrcc.dri.edu/summary/rdd.ca.html– Climate Summary;

(2) California Irrigation Management Information System (CIMIS), Reference EvapoTranspiration (Eto) Zones; data obtained from Information Center, ET overview, Station 008; http://wwwcimis.water.ca.gov/cimis/infoEtoOverview.jsp

Redding's climate, particularly its hot, dry summers, create a pattern of annual water use that is highlighted by large increases in consumption during the months of May through October, generally peaking in August. Increases in landscape watering of commercial and residential areas and the use of seasonal recreational facilities such as swimming pools are the primary reasons for summertime demand increases (see *Table 3* and *Figure 3*).

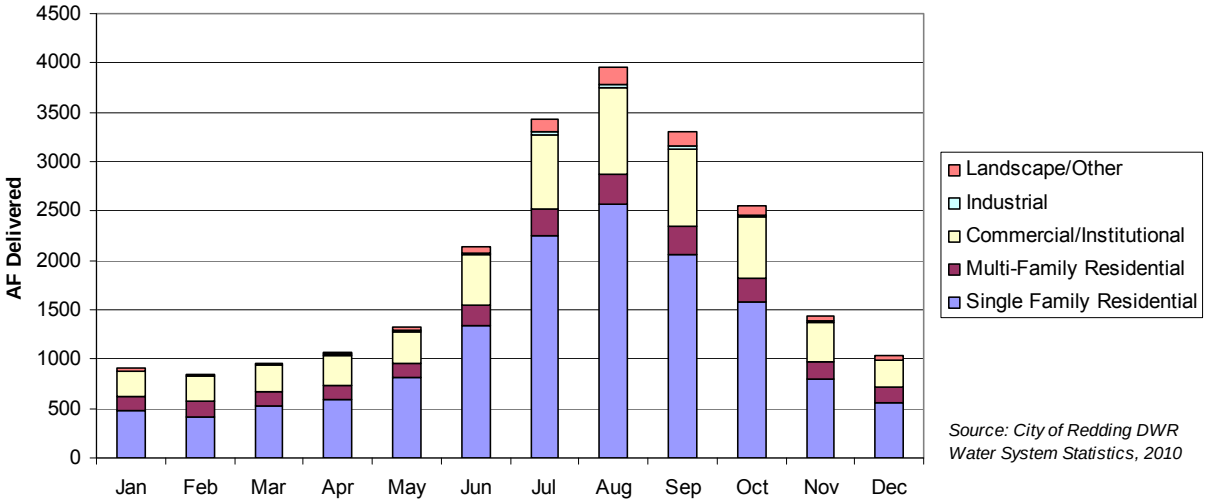
Table 3
Monthly Water Consumption by Customer Type – Year 2010

Customer	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
Single-Family Residential	483	410	534	595	807	1,345	2,250	2,572	2,064	1,584	802	565	14,011
Multi-Family Residential	134	170	140	139	150	199	268	304	279	230	167	148	2,328
Commercial/ Governmental/ Institutional	262	247	265	307	323	507	757	876	787	625	404	274	5,634
Industrial	6	5	7	9	9	18	28	28	24	19	12	8	173
Landscape/Other	17	8	9	26	35	76	127	171	147	102	58	35	811
Total	902	840	955	1,076	1,324	2,145	3,430	3,951	3,301	2,560	1,443	1,030	22,957

Units: AF per month

Source: *DWR Water System Statistics Report 2010.*

Figure 3: City of Redding 2010 Monthly Water Use by Sector



2.3 Service Area Population

Redding was founded in 1872 and incorporated in 1887 at the northern terminus of the California and Oregon Railroad. The City's early growth was stimulated by the railroad and by the move of the county seat from Shasta in 1884. Mining played a major role in the economic life of Redding around the turn of the century, but declined as the twentieth century progressed. In 1938, the construction of Shasta Dam provided another stimulus to growth in Redding. The construction boom after World War II boosted the lumber industry, which became the mainstay of Redding's economy. In more recent years, retail trade, construction, and tourism have become more significant activities as lumber industry volumes have declined. Redding has become a major regional center for shopping, health care, education, and government. Year 2010 and projected future service area populations are presented in *Table 4*.

Table 4
Population Projections

	2010	2015	2020	2025	2030
Service Area Population	90,732	92,991	97,475	104,250	111,028

Source: *City of Redding 2010 Water Master Plan – Table 3-5, Demand Projection Summary*

2.4 Water Use by Customer Type – Past, Current and Future

Water demand over the last 25 years has increased greatly due to expansion of the service area and development inside the City. One noteworthy expansion was the annexation of the Enterprise area in November of 1976. About 20,000 people were added to the service area. Once annexation occurred, per capita water consumption substantially decreased due to the fact that the Enterprise region of the City was primarily residential with relatively small irrigation and landscaping water demands.

In order to determine the future needs of a water system, it is first necessary to establish the limits of the service area and to estimate the population for that area at various times in the future. The water service area for Redding, shown in *Figure 2* (***Appendix N***), was determined mainly by constraints such as: outlying water district boundaries; Redding's contract boundaries with the United States Bureau of Reclamation (Bureau); natural boundaries such as rivers, ridges, and other topographical features; the City's General Plan; and engineering considerations such as pressure limits and supply limitations. Any further expansion would generally be an encroachment into another water agency's jurisdiction where, in many cases, water system facilities already exist. Because expansion beyond the service boundary is unlikely, population growth and development inside the service area are primary the factors that will determine future water consumption.

Among the planning assumptions used to determine future demand:

- The long-term growth rate for water service connections will approximate overall population growth. In other words, population and housing growth are proxy measures for growth of all water user types (residential, commercial, public, etc.)

- Growth in the Redding urban area from 2010 to 2030 will vary between 0.6 percent and 2.0 percent per year, resulting in a population of approximately 127,000 in 2030. The 2030 water service area population will be approximately 111,000 (see *Table 4*).

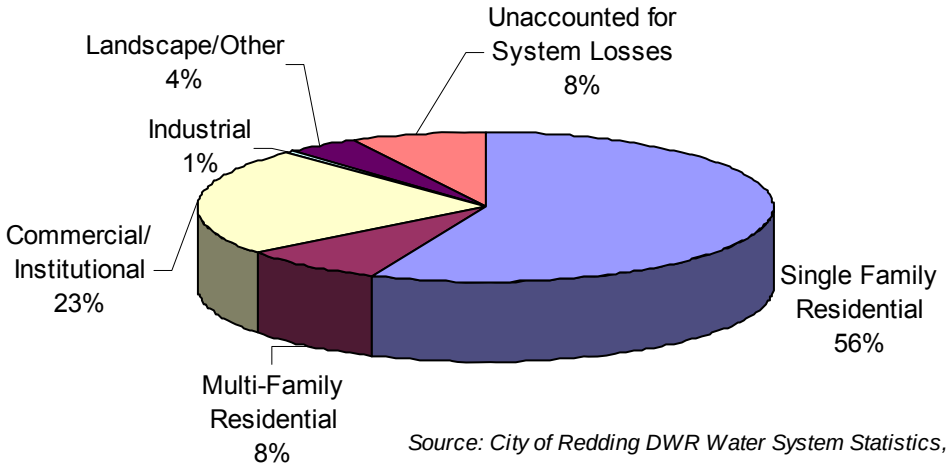
- The average person per household (pph) remains steady at 2.36 pph per the General Plan. The ratio of population to water service connections remains generally constant at 3.2 persons per connection.

- Projected average annual daily per capita demand is assumed to meet the 2015 and 2020 water use targets as calculated in Section 3.2 and the 2020 target is assumed to be maintained through the year 2030. These per capita targets are multiplied by City population projections (*Table 4*) to obtain estimates of future water demand.

- Future water demand by sector is estimated based on the assumption that the historically constant mix of service connection types within the City will continue to exist at 2010 proportions.

The General Plan identifies land use designations within major categories (sectors), which also can be used to track water usage. *Figure 4*, below, illustrates percentages of total service area water use by various sectors during the years 2006-2010.

Figure 4: City of Redding Percentage Average Water Use by Sector, 2006-2010



Source: City of Redding DWR Water System Statistics, 2006-2010

Residential Sector

The single largest sector of customers is the Residential Sector, which includes both Single-Family and Multi-Family designations. Eight residential categories are identified in the General Plan and these provide for a full range of housing types for City inhabitants.

Commercial Sector

The General Plan includes eight commercial land use designations: Limited Office, General Office, Neighborhood Commercial, Shopping Center, Regional Commercial, General Commercial, Mixed-use Core and Heavy Commercial. These land-use designations range from small, neighborhood-serving commercial projects to commercial projects that are regional in scale. There is a mix of commercial customers, ranging from markets, small restaurants, insurance offices, beauty shops, and gas stations to office buildings, regional shopping centers, high-volume restaurants, and other facilities serving both the permanent and visitor population.

Industrial Sector

The General Plan includes two industrial designations: General Industry and Heavy Industry. The Industrial land use classifications allow different types of warehousing, manufacturing, or processing businesses to be located in appropriate areas by accommodating a variety of

manufacturing and employment activities ranging from small, employee-intensive businesses to large, capital-intensive businesses.

Institutional/Governmental Sector

The City has a relatively stable institutional/governmental sector. Redding has become a major regional center for government (federal, state, and local), healthcare, and education. This sector will keep pace with the growth of the city.

Landscape/Recreational Sector

This sector is comprised primarily of community parks and golf courses. Landscape and Recreational customer demand is expected to increase in proportion to the growing population.

This page has been intentionally left blank.

SECTION 3 – SYSTEM DEMANDS

3.1 Actual Water Deliveries

Data illustrating actual water deliveries, by sector, for calendar years 2005 (*Table 5*) and 2010 (*Table 6*) are presented below. All water deliveries by the City of Redding are metered, and no non-metered deliveries are planned

Table 5
Water Deliveries—Actual, 2005

	Metered				Not Metered	Total
Water Use Sectors	**# of Accounts**	**Volume**	**% of Total Volume**	**% of Total Connections**	**# of Accounts**	**Volume**
Single-Family residential	22,359	14,987	60	82	0	14,987
Multi-Family residential	1,607	2,263	9	6	0	2,263
Commercial/ Institutional/ Governmental	2,790	6,410	26	10	0	6,410
Industrial	141	148	1	1	0	148
Landscape/Other	322	1,262	4	1	0	1,262
Total	27,219	25,070	100	100	0	25,070
						Units: AFY

Source: DWR Public Water System Statistics 2005 report

Table 6
Water Deliveries—Actual, 2010

	Metered				Not Metered	Total
Water Use Sectors	**# of Accounts**	**Volume**	**% of Total Volume**	**% of Total Connections**	**# of Accounts**	**Volume**
Single-Family residential	23,021	14,011	61	82	0	14,011
Multi-Family residential	1,905	2,328	10	7	0	2,328
Commercial/ Institutional/ Governmental	2,782	5,634	25	10	0	5,634
Industrial	169	173	<1	<1	0	173
Landscape/Other	335	811	4	1	0	811
Total	28,212	22,957	100	100		22,957
						Units: AFY

Source: DWR Public Water System Statistics 2010 report.

3.2 Calculation of Base Period Average Daily Use

Since the City of Redding did not deliver any recycled water in 2008, UWMP guidelines (*Methodologies for Calculating Baseline and Compliance Urban per Capita Water Use*, p. 31) specify that in preparation of this UWMP the City must use a continuous 10-year period to calculate Base Daily Per Capita Use (baseline use). The chosen 10-year period can end no earlier than December 31, 2004 and no later than December 31, 2010. A required additional check involves calculating the baseline use for a continuous 5-year period ending no earlier than December 31, 2007, and no later than December 31, 2010 (*Methodologies*, p. 32).

For Redding, the most advantageous periods were 1999-2008 for calculation of our 10-year baseline use and 2004-2008 for the 5-year base period, as summarized in *Table 7*. *Table 8* and *Table 9* present Redding's 10-year average baseline use as 280 gallons per capita per day (GPCD) and its 5-year value is 285 GPCD. All baseline use calculations in this report refer to calendar years, not fiscal or water years, and were completed using the assumption of 0% meter error. For consistency, future calculations to determine compliance must also use calendar-year data and assume 0% meter error.

Table 7
Base Period Ranges

Base	Parameter	Value	Units
10- to 15-year base period	2008 total water deliveries	27,145	AF
	2008 total volume of delivered recycled water	0	AF
	2008 recycled water as a percent of total deliveries	0	%
	Number of years in base period	10	years
	Year beginning base period range	1999	
	Year ending base period range	2008	
5-year base period	Year beginning base period range	2004	
	Year ending base period range	2008	

Sources: Stillwater WWTP staff; *Guideline for Preparing 2010 UWMP, Section M*

Table 8
Base Daily Per Capita Water Use—10-year Range

Base period year		Distribution System Population	System Gross Water Use [AFY]	System Gross Water Use [millions of gallons]	Annual Daily Per Capita Water Use [GPCD]
Sequence Year	Calendar Year				
Year 1	1999	78,427	23,929	7,798	272
Year 2	2000	79,593	24,328	7,928	273
Year 3	2001	85,000	26,225	8,547	275
Year 4	2002	86,300	26,915	8,772	278
Year 5	2003	87,300	26,742	8,715	274
Year 6	2004	85,703	28,285	9,218	295
Year 7	2005	88,459	26,882	8,716	271
Year 8	2006	89,973	27,760	9,047	275
Year 9	2007	90,045	28,706	9,355	285
Year 10	2008	90,491	30,133	9,820	297
				10-year baseline use [GPCD]: (average of yearly values)	**280**

Source: *DWR Water System Statistics reports, 1999-2008*

Note:
Assumptions used here which will also be used in future compliance calculations:
1) Data is for calendar years.
2) Water meter error is 0%.

Table 9
Base Daily Per Capita Water Use—5-year Range

Base period year		Distribution System Population	Daily System Gross Water Use [AF]	Daily System Gross Water Use [MGD]	Annual Daily Per Capita Water Use [GPCD]
Sequence Year	Calendar Year				
Year 1	2004	85,703	28,285	9,218	295
Year 2	2005	88,459	26,882	8,716	271
Year 3	2006	89,973	27,760	9,047	275
Year 4	2007	90,045	28,706	9,355	285
Year 5	2008	90,491	30,133	9,820	297
				5-year Baseline use [GPCD]: (average of yearly values)	**285**

Source: *DWR Water System Statistics reports, 2004-2008*

Note:
Assumptions used here which will also be used in future compliance calculations:
1) Data is for calendar years.
2) Water meter error is 0%.

Once a district's 10-year baseline use is calculated (*Table 8*), the Water Conservation Bill of 2009 provides the option of four methodologies for calculating Interim (2015) and 2020 per capita water use targets (targets):

Method 1: 80% (2020) and 90% (2015) of 10-year baseline use

Method 2: Involves calculating/estimating, and then summing, daily per capita use volumes for indoor use, landscaped areas, and Commercial/Industrial/Institutional (CII) purposes. Due to prohibitive data and labor requirements in estimating landscaped area within the service area, Method 2 calculations were not undertaken in this UWMP.

Method 3: 95% of Department of Water Resources (DWR) Target for the Sacramento River Hydrologic Region (see *Figure 5*) or 95% of the 5-year baseline use (*Table 9*), whichever is lower.

Method 4: Identifies water savings through selected conservation practices in each of three sectors—residential, CII, and landscape—and subtracts them from the 10-year baseline use. Researching other 2010 UWMPs indicated that Method 4 method generally yields targets at or below those of Method 1 and, in addition, results in decreased flexibility since specific conservation measures must be specified in the calculation. For these reasons, 2015 and 2020 targets using Method 4 were not determined.

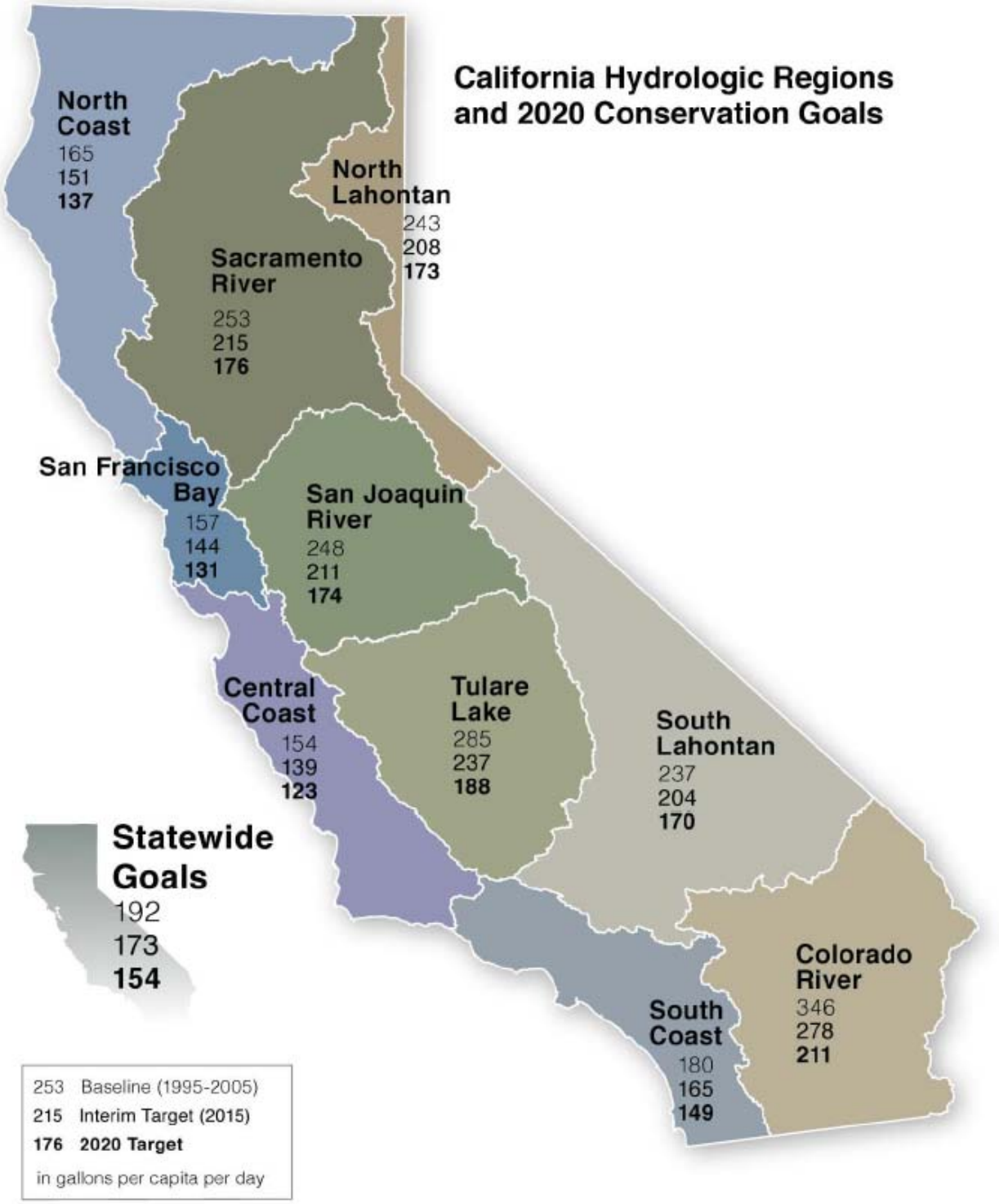
Per DWR instructions in *Methodologies*—and using the 10-year baseline use value calculated above (*Table 8*)—urban water use targets for the City of Redding were calculated using Methods 1 and 3, as summarized in *Table 10*. The result from Method 1, 224 GPCD, was selected as the City's 20 x 2020 target.

Table 10
2020 Urban Water Use Target Calculation

	CALCULATE URBAN WATER USE TARGET	Value	Units
1	10-year Base Daily Per Capita Use (1/1/1999 through 12/31/2008, see *Table 8*)	280	GPCD
	Method 1: 80% of Baseline Use		
2	Urban Water Use Target = 0.80 x Line 1 =	224	GPCD
	Method 3: 95% of Regional Target		
7	Target for Sacramento River Hydrologic Region (2010 UWMP Guidebook) =	176	GPCD
	Urban Water Use Target = 0.95 x Line 7 =	167	GPCD
	SELECTED 2020 URBAN WATER USE TARGET:	**224**	**GPCD**

Sources: *Table 8*; *2010 Urban Water Management Plan Guidebook*

Figure 5: California Hydrologic Regions and 2020 Conservation Goals (GPCD)



Source: 2010 Urban Water Management Plan Guidebook, p.D-11

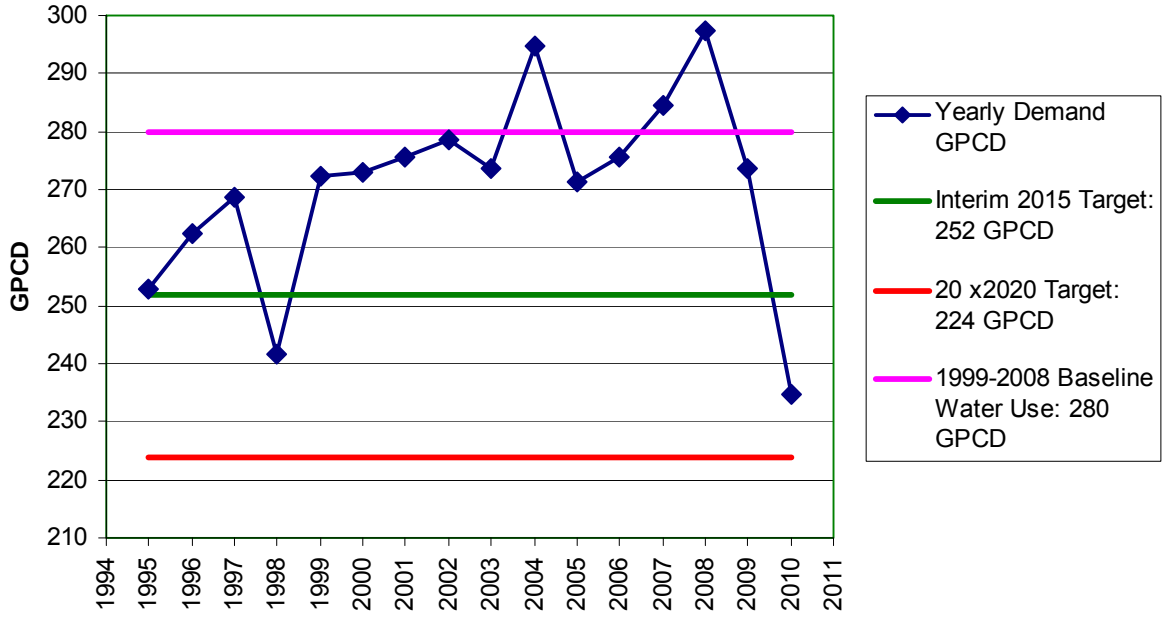
The final step was to check (*Table 11*) that the City's 2020 target falls below a minimum reduction value—defined in Senate Bill X7-7 as 95% of the 5-year baseline use (*Table 9*). This check exists in order not to penalize districts or cities that have implemented aggressive conservation measures on their own initiative. Many such California water suppliers have already reduced water use to 80% of their 10-year baseline and therefore prefer to make use of their hydrologic region targets (*Figure 5*) and Method 3 to determine their 2020 targets. As summarized in *Table 11*, no adjustment was needed to the City's 2020 target of 224 GPCD and the City of Redding's 2015 interim target is 252 GPCD. *Figure 6* illustrates recent annual GPCD water use levels compared to the City's 10-year baseline use and calculated targets.

Table 11
2020 Urban Water Use Target and Interim Target Check

1	10-year Base Daily Per Capita Use (*Table 8*) =	280	GPCD
2	5-year Base Daily Per Capita Use = (1/1/2004 through 12/31/2008, see *Table 9*)	285	GPCD
3	**Since Line 2 > 100 GPCD, calculate 95% of Line 2 =**	270.5	GPCD
4	2020 Urban Water Use Target (Method 1, *Table 10*)	224	GPCD
	Since Line 4 < Line 3, no adjustment to target is needed:		
5	**2020 Urban Water Use Target =**	**224**	**GPCD**
6	**2015 Interim Urban Water Use Target = (Line 1 + Line 5)/2 =**	**252**	**GPCD**

Sources: *Table 10; 2010 Urban Water Management Plan Guidebook*

Figure 6: City of Redding Historical Yearly Water Demand & 2015, 2020 Water Use Targets



In addition, results presented in ***Appendix Q***—two Excel worksheets developed by the California Urban Water Conservation Council (CUWCC) to aid in the completion of CUWCC 2010 required reporting—corroborate the accuracy of the calculations in this section as well as the downward 2009-2010 trend in GPCD demand illustrated in *Figure 6*.

3.3 Water Demand Projections

Projected water deliveries for the years 2015, 2020, 2025, and 2030 were determined by using the targets calculated in *Table 10* and *Table 11* according to the following methodology:

- "Unaccounted for system losses" equals 5.9% of total production, determined by finding the ten-year average (2001-2010) of yearly differences between total water production and total metered deliveries. In other words, 94.1% of total water production is assumed to delivered to customers and 5.9% is lost due to causes such as leaks and distribution system flushing to remove iron and manganese deposits.

- For the year 2015, total delivery volume was calculated as the product of projected population (*Table 2*) and the Interim (2015) Urban Water Use Target (see *Table 11*) minus unaccounted for system losses:

  2015 Total Delivery Volume = [*2015 target* (GPCD) x *projected population*] x *0.941*

- For the year 2020, total delivery volume was calculated as the product of projected population (*Table 2*) and the Urban Water Use Target (*Table 11*) minus unaccounted for system losses:

  2020 Total Delivery Volume = [*2020 target* (GPCD) x *projected population*] x *0.941*

- The number of total metered connections was calculated based on the assumption (*City of Redding Water Master Plan 2010*) that average persons/connection will remain constant at approximately 3.2.

- 2010 sector percentages of total metered connections and total volume for each sector (*Table 6*) were used to calculate 2015 and 2020 sector connections and volumes.

Since the City will implement conservation programs for each water use sector to comply with the 2009 Water Conservation act, the above methodology and *Tables 12-14* assume an equal sharing of the 20 x 2020 use reduction across all sectors.

Table 12
Water Deliveries—Projected, 2015

	Metered		Not Metered		Total
Water Use Sectors	**# of Accounts**	**Volume**	**# Accounts**	**Volume**	**Volume**
Single-Family residential	23,713	15,118			15,118
Multi-Family residential	1,962	2,513			2,622
Commercial/Institutional/ Governmental	2,866	6,082			6,196
Industrial	174	187			248
Landscape/Other	345	876			991
Total	29,060	24,783			24,783
					Units: AFY

Sources: *Table 11; DWR Public Water System Statistics 2010 Report*
Notes:

1. The number of total connections (accounts) is based on population projections (*Table 4*) and an average of 3.2 persons per connection. (Source: 2010 Water Master Plan Staff)
2. Volumes and #'s of connections for each sector are based on 2010 percentages (*Table 6*).
3. Volumes reflect 2015 Urban Water Use Interim target (*Table 11*) minus system losses.

Table 13
Water Deliveries—Projected, 2020

	Metered		Not Metered		Total
Water Use Sectors	**# of Accounts**	**Volume**	**# Accounts**	**Volume**	**Volume**
Single-Family residential	24,856	14,093			14,093
Multi-Family residential	2,057	2,342			2,342
Commercial/Institutional/ Governmental	3,004	5,667			5,667
Industrial	182	174			174
Landscape/Other	362	816			816
Total	30,461	23,092			23,092
					Units: AFY

Sources: *Table 11*, *DWR Public Water System Statistics 2010 Report*
Notes:

1. The number of total connections (accounts) is based on population projections (*Table 4*) and 3.2 persons per connection. (Source: 2010 Water Master Plan Staff)
2. Volumes and #'s of connections for each sector are based on 2010 percentages (*Table 6*).
3. Volumes reflect 2020 Urban Water Use target (*Table 11*) minus system losses.

For projected water deliveries in 2025 and 2030, average daily use was assumed to hold steady at 224 GPCD. Total water deliveries were calculated as the product of 224 GPCD and the projected population (*Table 4*) minus unaccounted for system losses (5.9%, see *Table 17*). Water use reductions are assumed to be shared equally among all sectors.

Table 14
Water Deliveries—Projected, 2025 & 2030

	2025		2030	
	Metered[4]		Metered[4]	
Water Use Sectors	**# Accounts[1,2]**	**Volume[2,3]**	**# Accounts[1,2]**	**Volume[2,3]**
Single-Family residential	26,584	15,073	28,312	16,053
Multi-Family residential	2,200	2,504	2,343	2,667
Commercial/Institutional/ Governmental	3,213	6,061	3,421	6,455
Industrial	195	186	208	198
Landscape/Other	387	872	412	929
Total	32,579	24,679	34,696	26,302
				Units: AFY

Sources: *Table 11, DWR Water System Statistics 2010 Report*

Notes:
1. The number of total connections (accounts) is based on population projections (*Table 4*) and 3.2 persons per connection. (Source: 2010 Water Master Plan Staff)
2. Volumes and #'s of connections for each sector are based on 2010 percentages (*Table 6*).
3. Volumes reflect 2020 Urban Water Use target (*Table 11*) minus system losses.
4. All connections within the service area are metered.

3.4 Projected Water Demand from Future Lower-Income Housing Units

The City of Redding Redevelopment Agency supplied data in July 2011 on projects scheduled for completion through July 2013. Using details from this data, including number, type and size of units, 2015 and 2020 total demand for planned future units was calculated with the assumption of meeting the 2015 Interim target (252 GPCD) and 2020 Compliance Target (224 GPCD). Additionally, water demand in 2025 and 2030 for currently planned lower income units is assumed to stay relatively constant at the 2020 Water Use Target of 224 GPCD.

In addition to specific planned projects, the City of Redding Redevelopment Agency has an approximate target of 20-25 lower income units per year. Using the upper value of 25 new units per year after July 2013, future demand was calculated by multiplying Interim and 2020 Water Use per capita targets by the projected number of additional lower income housing residents. Total projected lower income demands are the sum of demand from specific, currently planned units and projected demand from target per year increase in lower income units (see *Table 15* below). Though the lower income demands presented in *Table 15* are included in the overall Single-Family/Multi-Family water use projections detailed in *Tables 12-14*, the City is required to illustrate that sufficient water supplies will be available to serve the lower income sector.

Table 15
Lower-income Projected Water Demands

Low Income Water Demands*	2015	2020	2025	2030
Demand for planned Lower Income units (86 units built through July, 2013—average 1.7 persons/unit)	40.9	36.3	36.3	36.3
Demand for projected 25 additional lower income units per year after July 2013 at 1.7 persons/unit	27.7	77.5	130.4	183.3
Total Lower Income Single-Family/Multi-Family residential demand	68.6	113.8	166.7	219.6
Lower Income Demand as % of total Single-Family and Multi-Family Demand	0.5%	0.8%	1.1%	1.4%

Units: AFY

Source: City of Redding Redevelopment Agency Senior Project Coordinator

Notes:

1. Assumed Interim Target (252 GPCD) will be met in 2015 and the 2020 Target (224 GPCD) will be met for the years 2020-2030.
2. The Water Conservation Act of 2009 defines a lower income household as one earning 80 percent or less of median income, adjusted for family size.
3. For the calculations in this UWMP, demand calculations were limited to lower-income housing units specifically identified by the Redding Redevelopment Agency and not on house-by-house income analysis over the entire city. Therefore, the lower-income demands presented in *Table 15* are likely to be underestimated.

3.5 Sales/Connections to Other Agencies

Though the City of Redding has emergency service inter-ties with Bella Vista Water District (1.4 MGD), the City of Shasta Lake (0.6 MGD), and the Centerville Community Services District (0.2 MGD), the existing inter-ties do not have adequate capacity to provide significant supply on a regular basis. (Source: *City of Redding 2010 Water Master Plan Table 2-7 Inter-Agency Connection Data* and *City of Redding 2000 Water Master Plan Table 4-4 Emergency Supply Inter-ties.)*

Table 16
Sales/Connections to Other Agencies

	Inter-ties		Water Distributed					
	#	Sizes (in)	2005	2010	2015	2020	2025	2030
Bella Vista Water	3	6, 8, 12	0	0	0	0	0	0
Centerville CSD	3	6,8,12	0	0	0	0	0	0
City of Anderson	1	8	0	0	0	0	0	0
City of Shasta Lake	2	6,6	0	0	0	0	0	0
Shasta CSD[1]	0	0	0	0	0	0	0	0
Total	9		0	0	0	0	0	0

Units: AFY

Source: City of Redding 2010 Water Master Plan Table 2-7

Note:

1. The City has an agreement to establish an inter-tie with Shasta CSD near the Buckeye Water Treatment Plant, but actual infrastructure is yet to be built.

3.6 Total Actual and Projected Water Use

Total actual and projected system water demands, including deliveries (*Tables 5-6, 12-14*) and system losses (*Table 17*), are summarized in *Table 18* below. The City of Redding makes only retail water deliveries and has no current or planned wholesale contracts. *Figure 7* presents 2010 monthly water use by sector, including unaccounted-for losses.

Table 17
Additional Water Uses and Losses

Water Use	2005[1]	2010[1]	2015[2]	2020[2]	2025[2]	2030[2]
Unaccounted For System Losses	1,812	1,100	1,460	1,360	1,460	1,550

Units: AFY

Source: DWR Water System Statistics reports 2000-2010

Notes:
1. Actual data from DWR statistics.
2. 2001-2010 average unaccounted for system water losses were 5.9%. Projected system losses are calculated as 5.9% of total use (Target x Projected Population).

Table 18
Total Water Use

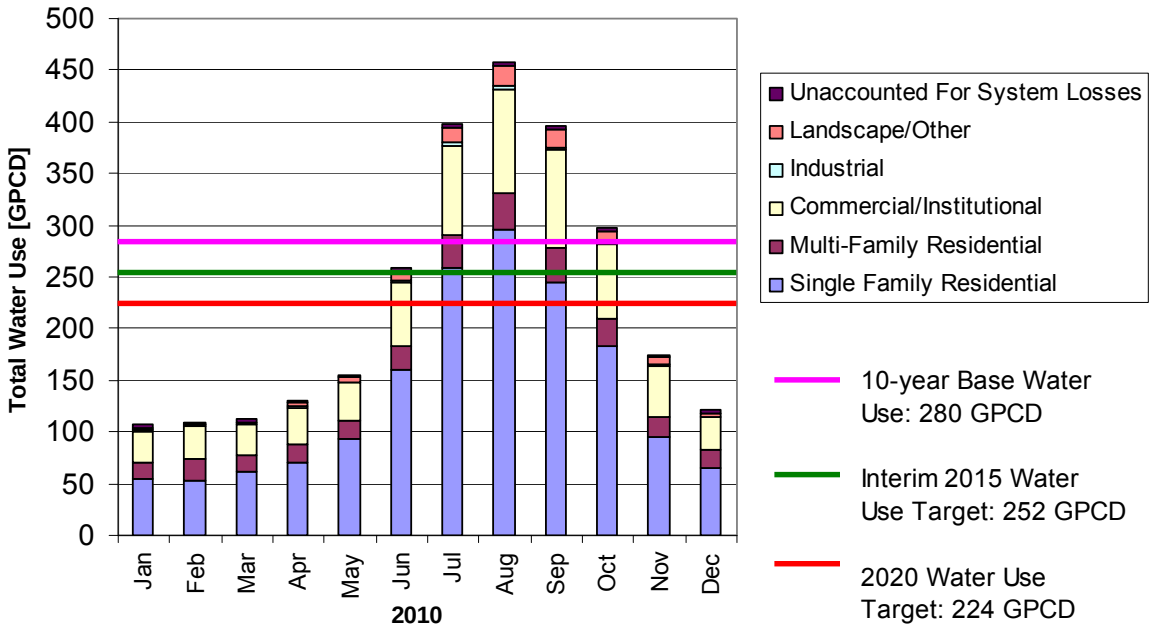
Water Use	2005[1]	2010[1]	2015[2]	2020[2]	2025[2]	2030[2]
M & I Sales	25,070	22,957	24,783	23,092	24,697	26,302
Unaccounted For System Losses	1,812	1,100	1,460	1,360	1,460	1,550
Sales to Other Agencies	0	0	0	0	0	0
Total	26,894	24,057	26,243	24,452	26,157	27,852

Units: AFY

Source: DWR Water System Statistics 2000-2010.

Notes:
1. Actual data from DWR statistics.
2. 2001-2010 average unaccounted for system water losses were 5.9%. Projected system losses are calculated as 5.9% of total use (Target x Projected Population).

Figure 7: City of Redding GPCD Water Use Targets and Per Capita Monthly Use by Sector, 2010



3.7 Water Use Reduction Plan

The City has selected Method 1 for establishing its long-term water use targets.

Since 2008, the City's per capita water consumption has been declining and the 2015 interim target has already been achieved. The City recognizes that the economy has played a part in declining consumption and realizes that per capita water use may increase as economic conditions improve. To that end, the City continues to implement its Water Use Efficiency Program designed around the principles of education, outreach, aggressive leak detection and repair, and quality control through timely customer account audits. The City will also continue to implement water-efficiency measures for new customers, including the Water Efficient Landscape Ordinance, ***Appendix O***, and the CalGreen Building Code. Future efforts include specific targeting of Commercial/Industrial/Institutional (CII) customers through an audit program and improvements to our single-family residential customer service outreach program. BMP Implementation efforts as referenced in Section 6 will form the foundation for achieving sustainable water savings over time and enable the City to meet the requirements of SBx7-7.

SECTION 4 – SYSTEM SUPPLIES

4.1 Water Sources – General

The City of Redding has three primary sources from which to supply its municipal water system:

1. Surface water is drawn from the Sacramento River at Pump Station #1, located one-quarter mile upstream from Diestelhorst Bridge with a pumping capacity of 30.6 million gallons per day (MGD). The river pump station, consisting of 5 large pumps, lifts raw water to the Foothill Water Treatment Plant (WTP), which has a current treatment capacity of 24 MGD and expansion possibilities up to 42 MGD.

2. Surface water is drawn from Whiskeytown Lake via the Spring Creek Conduit. The water is gravity fed to the Buckeye WTP, where up to 14 MGD of water can be treated and sent into the distribution system.

Together, these surface water sources account for approximately 6 billion gallons of water per year, or about 70% of the City's total annual production.

3. Groundwater is pumped by sixteen wells located over the Redding Groundwater Basin (RGWB)—see map of areal extent, *Figure 8*. The City's wells are operated during the warmer, drier months of May through October that typically see increased demand. The active wells in the Enterprise (southeast) and Cascade (south-central) areas of the City have capacities of approximately 15.8 MGD and 0.7 MGD, respectively. Together these wells provide the City with about 2.8 billion gallons of water per year, approximately 30% of total annual production.

Figure 2 (***Appendix N***) shows the location of supply sources for the City of Redding, *Figure 9* illustrates actual monthly water production by source for 2010, and *Table 19* summarizes the current and projected water supplies from the sources described in this section.

Figure 8: Areal Extent of Redding Groundwater Basin 5-6

Source: *Redding Basin Water Resources Management Plan Environmental Impact Report (2007)*

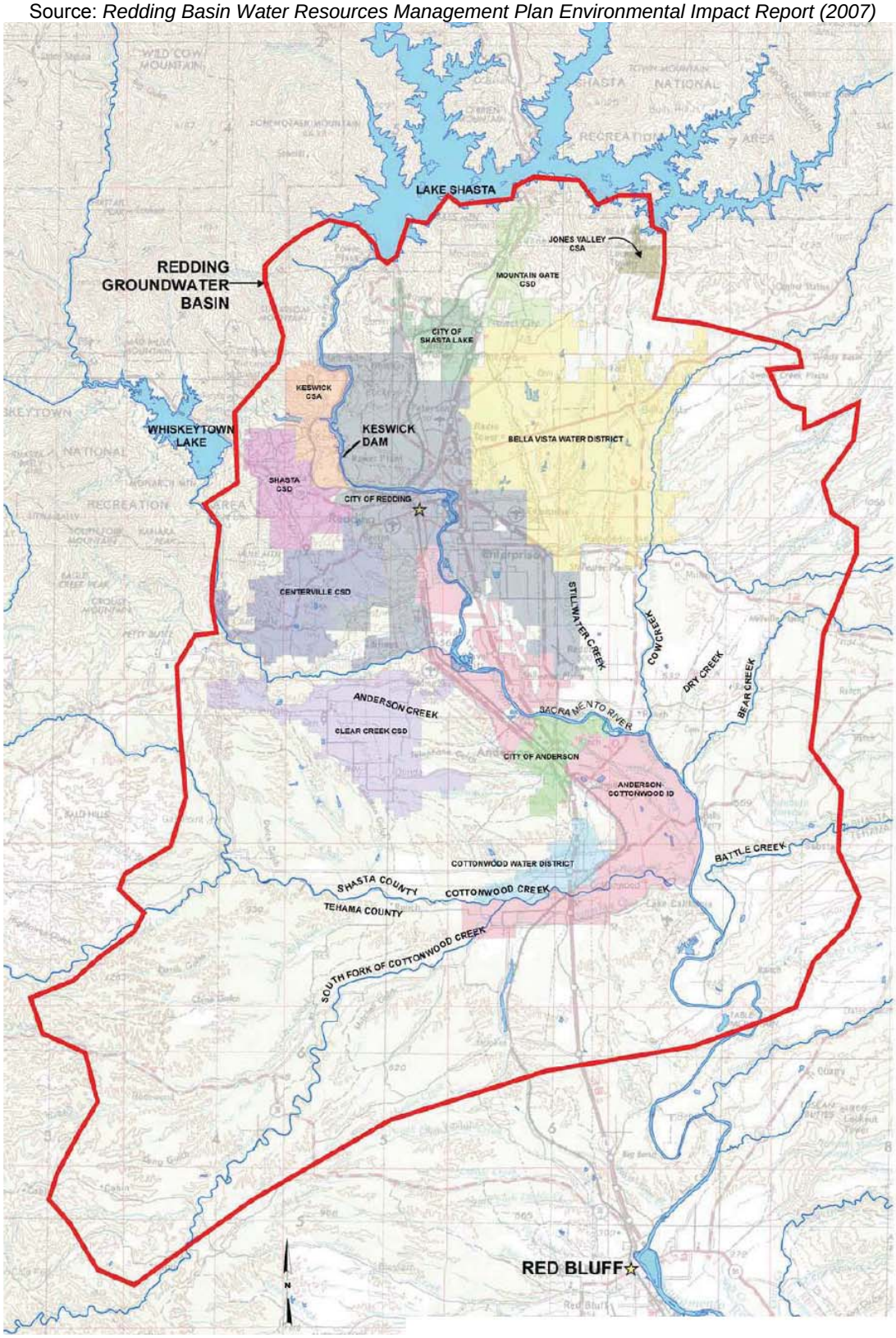
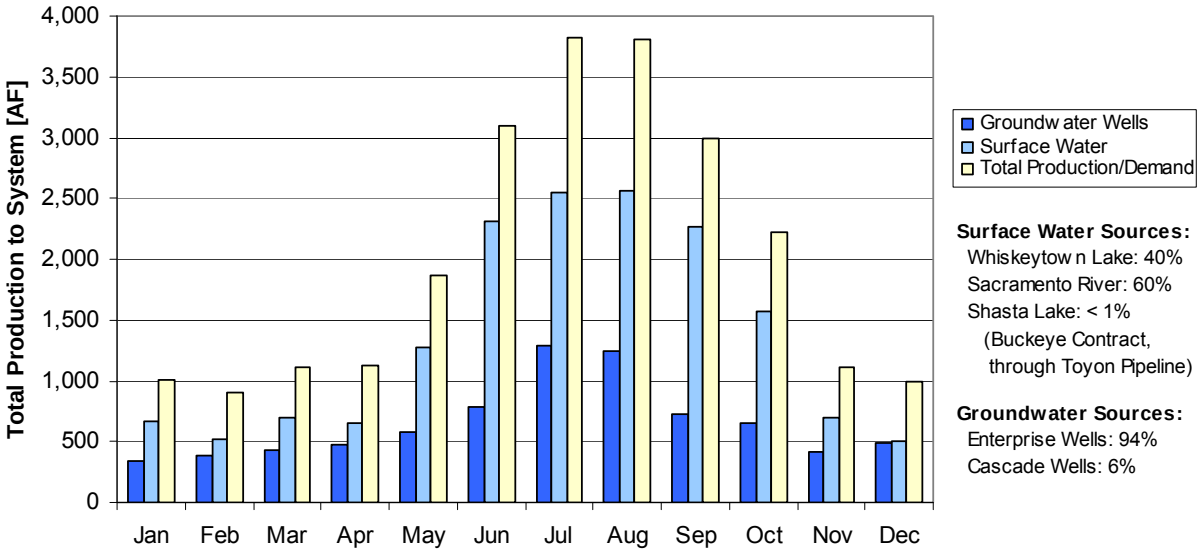


Figure 9: City of Redding Monthly Water Production by Source, 2010



Source City of Redding DWR Water System Statistics, 2010

Table 19
Water Supplies, Current & Projected

Water Supply Sources	2010	2015	2020	2025	2030
Surface water—Sacramento River[1]	21,000	21,000	21,000	21,000	21,000
Surface water—Whiskeytown Lake[2]	6,140	6,140	6,140	6,140	6,140
Redding Groundwater Basin[3]	11,005	11,005	13,405	13,405	13,405
Transfers	0	0	0	0	0
Other	0	0	0	0	0
Total	38,145	38,145	40,545	40,545	40,545
					Units: AFY

Source: *City of Redding 2010 Water Master Plan, Tables 5-1 & 5-2*

Note:
1. Bureau Redding Contract, #14-06-200-2871A.
2. Bureau Buckeye Contract, #14-06-200-5272A.
3. Groundwater production is based on 50% of total capacity—the City does not currently pump year-round.

4.2 Water Sources – Groundwater

The Redding Groundwater Basin (RGWB), identified in DWR Bulletin 118 as a class B, provided the City with approximately 7,500-10,000 acre-feet of water per year (AFY) through sixteen wells during the years 2006-2010 (see *Table 20*). The wells range in depth from 170 feet to 600 feet and are run primarily during periods of high water demand, especially the months of June, July and August (see *Figure 9*). The return flow of groundwater to the river from the City's wastewater treatment facilities contributes to water supplies for downstream users.

The well water is generally of very high quality with the exception of arsenic concentrations above the Primary Maximum Contaminant Level (MCL) at wells #11 and #13 and manganese levels above the Secondary MCL in all Enterprise wells except #3 and #4. As defined by the United States Environmental Protection Agency (USEPA), a Primary MCL provides a standard to protect public health while a Secondary MCL exists to prevent aesthetic issues such as taste, color and odor. In Enterprise area wells, leaching from natural deposits can result in dissolved manganese concentrations near or above the Secondary MCL and requires treatment in order to avoid the black color that develops as manganese precipitates out of solution. Treatment consists of application of chemical sequestering agents which bind the manganese in solution. None of the Cascade zone wells require sequestration, and iron levels above the Secondary MCL have not been encountered at any of the City's wells.

Due to detection of arsenic concentrations above the USEPA Primary MCL at wells #11 and #13, these two wells have not been operated for water supply since 2008—though they could conceivably be used on a limited basis if the water were to be blended with other well output in order to reduce the overall arsenic level below the Primary MCL limit. Potential sources of arsenic contamination in general include erosion of natural deposits, runoff from orchards, and glass and electronics production wastes. The City plans in the near future to change the permit status of wells #11 and #13 to "Standby," which would limit pumping to short-term emergencies of five consecutive days or less and for less than fifteen total calendar days per year.

The City is a member of the Redding Area Water Council (RAWC), a consortium of water purveyors that operate in Shasta County. In 1998, the Shasta County Water Agency, on behalf of the RAWC, prepared a comprehensive groundwater management plan for the RGWB (see copy of the *Coordinated AB3030 Groundwater Management Plan* in ***Appendix B***).

The RGWB is not an adjudicated basin. As the basin is not in overdraft, no legal pumping limit has been set—therefore, no overdraft mitigation efforts are currently underway. Though no safe yield has been established for the RGWB, groundwater modeling as part of the *Coordinated AB3030 Groundwater Management Plan* indicates that the RGWB is resilient to severe drought conditions and is able to recover with one year of normal rainfall. There were no limitations to pumping groundwater during the period 2006-2010, as groundwater wells supplement the surface water supply and are used primarily to meet increased water demand during the summer. During the spring, fall and winter months only a few wells out of the sixteen are operated, since operating the surface WTPs is less costly produces higher water quality. Enterprise wells #11 & #13 (for locations, see *Figure 2*, ***Appendix N***) have been put out of service due to arsenic levels testing close to and above the Maximum Contaminant Level (MCL) of 10 mg/L.

During the 2005-2010 period, groundwater volumes were sufficient as a seasonal supplement to surface water sources, providing approximately 30% of total annual water production (see *Table 20*). Groundwater wells can supply enough water to supplement existing surface water contracts with the Bureau (see *Figure 9*, Section 4.1) without any noted overdraft conditions in the local groundwater basin (*Bulletin 118 2003 Update* for basin 5-6). *Table 21* indicates that future well pumping at 50% of annual capacity would be enough to supply nearly 50% of demand once two wells (new or rehabilitated) are put into service by the year 2020. See *Table 27,* Section 4.6 for description of future groundwater supply projects and *Figure 11*, Section 5.2 for an illustration of groundwater contribution to meeting projected future demands.

Table 20
Groundwater—Volume Pumped 2006-2010

	2006	2007	2008	2009	2010
Redding Groundwater Basin (5-6)	8,837	9,923	8,871	8,901	7,817
Total Supply	27,760	28,706	30,133	27,869	24,057
Groundwater as a % of Total Water Supply	32%	35%	29%	32%	32%
					Units: AFY

Source: *DWR Water System Statistics 2006-2010*

Table 21
Groundwater—Volume Projected to be Pumped

Basin Name	2015	2020	2025	2030
Redding Groundwater Basin (5-6)	11,005	13,405	13,405	13,405
% of Total Water Supply	39%	51%	50%	48%
				Units: AFY

Sources:
1. Groundwater pumping projections—*2010 Water Master Plan, Tables 5-1 & 5-2*
2. Groundwater as a percent of total water supply derived from *Table 18*—projected total water use.

Note: Groundwater volumes assume pumping at 50% of annual capacity.

4.3 Transfer and Exchange Opportunities

The City has inter-ties with three nearby water districts and two neighboring cities (see *Table 16*) and transfers of water can be obtained from these water suppliers to meet a short-term deficiency. In addition, the City has recently negotiated with Anderson Cottonwood Irrigation District (ACID) for water transfers of up to 4,000 AFY. Under drought conditions, the maximum yearly transfer to the City from ACID would be reduced to 3,000 AFY.

Table 22
Transfer and Exchange Opportunities

Transfer agency	Transfer or Exchange	Proposed Volume
Anderson-Cottonwood Irrigation District	Transfer	up to 4,000
Units: AFY Total:		≤ 4,000

Figure 11, Section 5.2 illustrates the potential ACID transfer volume relative to volumes from other supply sources.

4.4 Desalinated Water Opportunities

The City is located in the Sacramento Valley approximately 150 miles from the Pacific Ocean. In addition, there is no brackish water in the RGWB and both the Sacramento River and Whiskeytown Lake are fresh water sources. Therefore, no opportunity exists for use of desalinated water as a future water supply.

4.5 Recycled Water Opportunities

4.5.1 Wastewater Quantity, Quality, and Current Uses

Collection System

The City's Wastewater Utility is organized into three divisions: Collection, Treatment and Industrial Waste. The Wastewater Collection division provides sanitary sewer services to City residents and is tasked with the operations and maintenance of a complex system of sewer mains, trunk lines, interceptors and lift stations which collectively transport waste to one of two City Wastewater Treatment Plants.

There are 430 miles of sewer pipeline and 7,800 manholes that provide access to the collection system for maintenance and flow monitoring. Seventeen lift stations located throughout the system utilize pumps to lift the wastewater to a higher elevation where it again enters the gravity-flow collection system.

Of the seventeen facilities, seven are major lift stations with average daily dry weather flows ranging from 0.35 million gallons per day (MGD) to 2.0 MGD. These major facilities have more sophisticated control systems that allow the pumping to automatically increase and decrease according to the flow rates. They include flow monitoring and equipment diagnostic instrumentation as well as emergency generator systems to ensure continuation of operations in the event of electrical power loss. The remaining ten facilities are smaller lift stations with flows ranging from 1,000 to 52,000 gallons per day (GPD) to 1,000 GPD.

The Collection division also maintains five rain gauges throughout the system that monitor rainfall amounts and track the effects of rain on the collection system through infiltration and inflow.
Source: City Wastewater Collection Department Staff

Wastewater Treatment Plants and Processes

The City currently runs two wastewater treatment plants, both of which are considered tertiary treatment facilities: Stillwater Wastewater Treatment Plant (SWWTP) and Clear Creek Wastewater Treatment Plant (CCWWTP).

Wastewater from the Redding area west of the Sacramento River is collected and treated at the CCWWTP, situated along the western shore of the Sacramento River at the southern boundary of the City's service area (see *Figure 2*, ***Appendix N***). In 2010, the treatment facility discharged effluent at an annual average rate of 9.57 MGD and the effluent total suspended solids (TSS) concentration of the wastewater averaged 1.0 mg/L (79.8 lbs/day). Recycled water used for landscape irrigation and wash down purposes at the treatment site is not measured, while the remainder of the effluent is discharged into the Sacramento River where it is repeatedly diverted and treated for reuse by water agencies further downstream.

Wastewater from the Redding area east of the Sacramento River is collected and treated at the SWWTP, situated at the southern extreme of the City's service area along the Sacramento River's eastern shore (see *Figure 2*, ***Appendix N***). In 2010, the Stillwater treatment facility discharged effluent at an annual average rate of 4.0 MGD with effluent total suspended solids (TSS) averaging 1.47 mg/L (49.0 lbs/day). Recycled water used for landscape irrigation and wash down purposes on-site is not measured. Recycled water used for crop irrigation is permitted under Waste Discharge Requirement #96-0169 and volume delivered fluctuates—2.9 million gallons (8.8 AF, 2009) and 6.2 million gallons (19.0 AF, 2010)—depending on weather conditions and crop cycles. The remainder of effluent is discharged into the Sacramento River.

The wastewater treatment plants' service areas include mostly residential and commercial customers with a small number of industrial clients which do not contribute heavy metals or other toxic industrial waste. A source control program monitors industrial and commercial enterprises to ensure that toxic substances and other pollutants to ensure that wastewater discharged to the collection system will neither upset treatment plant processes nor contain contaminant levels that violate regulatory discharge limits.

The City's wastewater treatment plants employ the following processes in order to achieve tertiary treatment:

Clear Creek Wastewater Treatment Plant	Stillwater Wastewater Treatment Plant
1. Primary Sedimentation - Grit Removal	1. Activated Sludge - Conventional
2. Activated Sludge - Complete Mix	2. Filtration
3. Filtration	3. Chlorination/Dechlorination
4. Chlorination/Dechlorination	4. Wastewater Disposal
5. Wastewater Disposal	

Estimated Wastewater Disposal Quantities

Detailed projections of city-wide and treatment plant specific wastewater flows from the forthcoming update to the City of Redding Wastewater Master Plan are not yet available. Instead, wastewater volumes at SWWTP were estimated using the growth and collection system flow projections for the Stillwater Basin taken from the 2008 Stillwater Wastewater Treatment Plant Facilities Plan (Facilities Plan) prepared by WaterWorks Engineers of Redding, CA. Treated wastewater volumes at CCWWTP were calculated based on the following assumptions:

- The 2010 population using the Clear Creek collection system is equal to the total current population minus the calculated Stillwater basin population as presented in the SWWTP Facilities Plan.
- Clear Creek basin population will grow at the same yearly rate as estimated for the City of Redding as a whole in the City of Redding 2010 Water Master Plan (see *Table 2*).
- Volume of wastewater produced will increase in the Clear Creek basin at the same rate at which its population increases—in other words, the gallons of wastewater produced per capita per day will remain relatively unchanged.

Wastewater flow estimates in *Table 23* & *Table 24* for both wastewater treatment plants are based on the best available planning data and assumptions concerning future development. Therefore, results for 2015-2030 should be understood only as approximate values.

Table 23
Recycled Water—Wastewater Collection and Treatment

Type of Wastewater		2005[1]	2010[1]	2015[2]	2020[2]	2025[2]	2030[2]
Wastewater volume collected and treated in service area	Stillwater WWTP	4,102	4,518	5,100	6,600	7,200	7,800
	Clear Creek WWTP	8,558	10,946	11,900	12,700	13,000	13,400
	Total	12,660	15,464	17,000	19,300	20,300	21,200
Volume that meets recycled water standard:		All	All	All	All	All	All

Units: AFY

Sources:
2005, 2010: WWTP monthly/yearly reports
2015-2030 Stillwater*:* Projections based on *2009 Stillwater WWTP Facilities Plan* (see text above)
2015-2030 Clear Creek: Projections based on 2010 volumes and population growth estimates from the *City of Redding 2010 Master Plan*

Notes:
1. 2005 and 2010 values are based on actual flow data.
2. Approximate values based on calculations and assumptions described above.
3. Neither calculation method (for SWWTP or CCWWTP) takes into account the expected reduction in usage reflected in the 2015 and 2020 water use targets. Therefore, *Table 23* results are likely to be an overestimate of treated wastewater volumes, adding to the inherent uncertainty in calculations based upon projections of future population growth and development patterns.

Table 24
Recycled Water—Non-recycled Wastewater Disposal

Method of Disposal	Treatment Level	2010	2015[1]	2020[1]	2025[1]	2030[1]
Sacramento River - SWWTP	Tertiary	4,508	5,000	6,500	7,100	7,700
Sacramento River - CCWWTP	Tertiary	10,574	11,600	12,400	12,700	13,000
	Total:	15,102	16,600	18,900	19,800	20,700

Units: AFY

Sources:
2010: City of Redding Wastewater Utility Staff & Monthly/Yearly Reports
2015-2030: 97.7% of treated wastewater (*Table 23*)—based on 2010 averages from wastewater treatment plant monthly reports.

Note:
1. Projected wastewater disposal quantities in *Table 24* for 2015-2030 are based on multiple planning assumptions (see above narrative) and therefore should be taken as approximate values.

4.5.2 Recycled Water Potential and Projected Use

Although the volume and quality of treated effluent are suitable for reclamation, the idea of reusing the water in the City's service area for irrigation purposes has several drawbacks. First, the contracts between the City and the United States Bureau of Reclamation (Bureau) state that any wastewaters that result from diverted Sacramento River water are the property of the Bureau, which could limit the possibility of the City's selling recycled water to other water agencies or reusing the water itself. In addition, due to the expense of distribution, reuse options are mostly limited to the use of treated effluent for on-site irrigation and agricultural crops within the immediate vicinity of the City's two wastewater treatment plants—the 19.0 AF of recycled water in 2010 was delivered by SWWTP to irrigate 30 acres for one agricultural customer. However, since SWWTP lies outside the City's water service boundary, this delivery did not offset any potable water demand. Actual delivery volumes are at the discretion of the landowner and fluctuate with crop climate variations and crop rotation, increasing from 11.5 AF in 2005 to 19.0 AF in 2010. For the purpose of this UWMP recycled water deliveries (*Table 25*) are estimated to remain constant through 2030 and to come strictly from SWWTP.

Finally, the Anderson-Cottonwood Irrigation District (ACID) currently supplies water for irrigation in the Redding area—diverting from the Sacramento River and delivering flows to agricultural customers without treatment and almost exclusively by gravity. City recycled water would necessarily be more expensive due to the required distribution infrastructure and upgrade pumping from its treatment plants. As such, the selling of recycled water at this juncture would be neither financially feasible nor energy efficient.

Table 25
Recycled Water—Potential Future Use

User Type	Description	Feasibility	2015	2020	2025	2030
Agricultural irrigation	Delivery to single customer from Stillwater WWTP	feasible	19.0	19.0	19.0	19.0
	Total:		19.0	19.0	19.0	19.0

Units: AFY

Note: Though clarified filter backwash water is recycled back into the raw water stream at the City's water treatment plants, this volume does not appear in *Table 25* because it has already been metered and accounted for upon withdrawal from the surface water source (Sacramento River or Whiskeytown Lake).

Table 26
Recycled Water—2005 UWMP Use Projection Compared to 2010 Actual Use

User Type	2010 Actual Use	2005 Projection for 2010
Agricultural irrigation	19.0	11.51

Units: AFY

Source: SWWTP 2010 monthly/annual reports

4.6 Future Water Projects

In anticipation of projected demands, two new wells on the east side of the City are scheduled for construction by the year 2020 (alternatively, two existing out-of-service wells will be rehabilitated). These wells will provide a reliable additional supply in an area in which the City is growing and supplement the Sacramento River and Whiskeytown Lake sources.

Water conservation measures outlined in this plan will reduce future consumption and postpone the need for new supply sources. In 2007, the City completed an expansion of the Buckeye Water Treatment Plant (WTP) from 7 MGD to 14 MGD capacity, facilitating meeting increased summer water demands in the Buckeye area. This expansion, coupled with renegotiated Bureau contracts, gives the City the option of taking the Foothill WTP completely offline for maintenance during low-demand winter months. *Table 27* summarizes planned future water projects. Projected sources and supplies are illustrated in *Figure 10,* Section 5.2.

Table 27
Future Water Supply Projects

				Multiple-Dry years to Agency		
Project Name	**Projected Completion Date**	**Normal Year to Agency**	**Single Dry Year to Agency**	**Year 1**	**Year 2**	**Year 3**
Well #17 or Well #11 Rehab	2020	1,200	1,200	1,200	1,200	1,200
Well #18 or Well #13 Rehab	2020	1,200	1,200	1,200	1,200	1,200
Total		2,400	2,400	2,400	2,400	2,400

Units: AFY

Source: *City of Redding 2010 Water Master Plan*

SECTION 5: WATER SUPPLY RELIABILITY AND SHORTAGE CONTINGENCY PLANNING

5.1 Water Supply Reliability

Water Supply: Historical Context

The City of Redding is a United States Bureau of Reclamation (Bureau) contractor and receives water from the Central Valley Project (CVP) under two separate agreements.

In 1966, the City entered into a long-term supply contract with the Bureau, with an initial term from April 1964 to March 31, 2004. The Redding Contract, one of a group of Bureau supply contracts generally referred to as "Settlement Contracts," was intended to resolve legal water rights conflicts that arose between senior pre-1914 water rights holders along the Sacramento River and the Bureau following completion of the CVP. In 2005 the Redding Contract was extended for another forty years, until March 31, 2045. The Redding Contract supply is allocated into two classifications—Base supply of 17,850 acre-feet per year (AFY) and Project supply of 3,150 AFY.

In 1971, the City entered into the original Buckeye Contract with the Bureau, which assigned the Buckeye Service Area (Buckeye) to the City and made available CVP supply to the City to serve the Buckeye area. Amendments to the Buckeye Contract were made in 1990 and again in 1994. The 1994 amended Buckeye Contract governs the supply to the City's Buckeye Water Treatment Plant, which came online in 1995. In 2005, the Buckeye Contract was extended another forty years until February 28, 2045. The Buckeye Contract provides the City with 6,140 acre-feet (AF) of Project water.

In addition to the two surface water contracts with the Bureau, the City has two groundwater supply sources, the Enterprise well field and the Cascade well field. Enterprise well field provides most of the City's groundwater, while the Cascade well field provides a relatively minor local supply to the southern end of the Cascade service area only. These well fields are located within the Redding Groundwater Basin (RGWB) which is deemed to be approximately 510 square miles in size and which can provide a considerable augmented supply (see areal map of RGWB in *Figure 8*, Section 4.1)

The Shasta County Water Agency performed groundwater modeling as part of development of the Redding Area Groundwater Management planning process. Modeling conditions of the 1930's California drought coupled with 2025 projected demand, the aquifer was able to recover with just one year of normal rainfall—leading to the conclusion that the Redding Area Groundwater Basin (5-6) is very resilient and able to meet all reasonably expected demand.
Source: Shasta County Water Agency (Shasta County Public Works)

Water Supply Reliability and Future City Growth

The *Public Facilities Element* of the General Plan Policy Document establishes goals with regard to the development of infrastructure within the City's planning area. These goals are intended to ensure that water supply and supply capacity are able to meet the demands for future growth. *See* ***Appendix C****, City of Redding General Plan: Public Facilities Element.*

Natural resources contribute to the City's economy and are important elements of Redding's quality of life. Both responsible management and protection of these resources are needed.

The General Plan seeks to balance the need to accommodate growth with the need for the conservation, protection, and enhancement of the area's natural resources. The *Natural Resource Element* establishes goals and policies with regard to surface and groundwater resources. These goals are intended to insure that the City can maintain excellent water quality and an adequate water supply to meet future growth demands. See **Appendix D**, *City of Redding General Plan: Natural Resource Element.*

5.2 Historic and Current Supply During Drought Conditions

The Bureau defines a critical water year as one in which projected in-flows to Shasta Reservoir equal less than 3.2 million AF. When a critical-year condition is declared for Shasta Reservoir, the Bureau can reduce the Redding Contract supply by up to 25% of the average April-October volumes withdrawn under that contract during the previous three non-critical water years. From initiation of the City's Bureau contracts to present, the Sacramento River (Redding Contract) supply has been reduced in this manner in 1977, 1991, 1992, and 1994.

During a critical or constrained water year (less severe than a critical water year), the Buckeye Contract supply can be reduced to 75% of the average yearly use during the previous three non-constrained water years. The City's Buckeye Contract supply is Project (CVP) water and is therefore more susceptible to Bureau restrictions. Buckeye Contract supplies have been reduced in such fashion nine times since 1971: 1990-1994, 1999, 2001, 2008 and 2009. Only once since 1971 did the Bureau reduce the Buckeye allotment further, to 65% of total contract allotment in 1977. Though a future 35% reduction is unlikely, this takes a conservative approach in calculating drought period supply in this UWMP by assuming a reduction to 65% of historical use in the third consecutive constrained water year (*Table 31* & *Table 34*).

In summary, Bureau dry year policies stipulate a reduction of the Redding Contract by subtracting up to 25% of April-October historical use (previous three non-impacted years) from the contractual amount of 17, 850 AFY and Buckeye Contract supply can be limited to 75% of total average use for the previous three non-constrained water years. Both policies create disincentives to conserving water during good years—i.e. the more water produced during non-reduction years, the higher the quantity that will be available for withdrawal during dry years. For this reason, current City practice is to use total Buckeye allotment first, since City infrastructure now permits transfer of Buckeye WTP water to other pressure zones, and to use Sacramento River water second. Such practice achieves the goal of maximizing Bureau-allowed withdrawals from both contracts during years of low runoff.

Bureau historical statistics for total calculated annual inflows into Shasta Lake were used in order to determine the City's single dry year, median runoff year, and multiple dry year periods. Shasta Lake inflow data was complete for Bureau water years (October-September) 1971-2010, and multiple year moving averages were calculated for 3, 4, 5, and 6-year periods. The lowest multi-year average for at least three years occurred from 1990-1992, as summarized in *Table 28*. *Table 29* compares available water supplies during the driest single year and driest three-year period since 1971. The "Percentage of Normal Year" supply calculation in *Table 29* for the year 1977 is artificially low due to two primary factors: an increase in the supply allotments from the Bureau between 1977 and 2005, as outlined in the City's Buckeye and Redding contracts (***Appendix R***), and growth in groundwater pumping capacity during this time period due to construction of additional wells. Finally, *Table 30* qualitatively summarizes factors with potential to limit the City's water supply.

Table 28
Basis of Water Year Data

Water Year Type	Base Year(s)	Historical Sequence
Average Water Year[1,2]	2005	1971-2010
Single Dry Water Year[3]	1977	1971-2010
Multiple Dry Water Year[4]	1990-92	1971-2010

Source: United States Bureau of Reclamation, Central Valley Operations office—Shasta Lake Inflow statistics. Data is for Bureau water years, defined as October of previous year through September of reference year.

Notes:

1. *Average Year — a year* or an averaged range of years in the historical sequence that most closely represents median runoff levels and patterns. It is defined as the year the previous 30 years or more (in this case, 1971-2010) which saw the median runoff value.
2. *Single dry year* —the lowest annual runoff for a watershed within the previous 30 years or more.
3. *Multiple-dry year period* — multi-year period during the previous 30 years or more in which the lowest average runoff occurred.

Table 29
Supply Reliability—Historic Conditions

	Average/Normal Water Year	Single Dry Water Year	Multiple Dry Water Years		
	2005	**1977**[1]	**1990**[3]	**1991**[2,3]	**1992**[2,3]
Buckeye Contract	5,280	917	1,582	1,582	1,582
Redding Contract	21,000	8,250	16,300	16,600	16,900
Groundwater Wells[4]	9,500	4,429	6,112	7,328	7,328
Total	35,780	13,595	23,994	25,510	25,810
Percent of Average/Normal Year (2005):		38%[4]	67%	71%	72%

Units: AFY (total supply available)

Notes:

1. Calculated using well-capacity data from the 1982 Water Master Plan (assumes wells are operating at 50% of yearly capacity). The City's Redding and Buckeye Contracts were cut to 75% and 65% of 1977 contract allotments, respectively. (see ***Appendix R***)
2. The Buckeye Contract was cut to 75% of 3-year historical use in 1990-92.
3. An additional groundwater well came online in 1991.
4. All wells assumed to operate at 50% of annual capacity.
5. Besides reductions described in #1, the low % for 1977is due in part to increased Bureau contract allotments (see ***Appendix R***) and groundwater well capacity in 2005 compared to 1977.

Table 30
Factors Resulting in Inconsistency of Supply

Name of Supply	Legal/ Contractual	Environmental	Water Quality	Climatic
Sacramento River	X			X
Whiskeytown Lake	X			X
Redding Groundwater Basin			X	

Source: City of Redding Water Utility Staff

Concerning surface water sources, the City of Redding's water contracts with the Bureau are subject to the contractual constraints described at the start of Section 5.2. The Redding Groundwater Basin (RGWB) has proven to be an extremely reliable source of water and supplies the City with additional supply during periods of high water usage. The two primary groundwater quality concerns include the high arsenic levels in wells #11 and #13 and elevated manganese concentrations in Enterprise zone wells—see the more detailed discussion in Section 4.2. The City intends to apply for a permit amendment to change the status of wells #11 and #13 to "Standby" in the near future, though they could still be used in emergency situations for a very limited time.

Supply reliability during drought periods, subject to Bureau contract restraints as discussed above, is summarized in *Table 31*. *Table 32* and *Figure 10* present a supply and demand comparison for a normal water year, and *Tables 33, Table 34* and *Figure 11* compare projected supplies and demands during drought periods.

Table 31
Supply Reliability—Current Water Sources

Water Source	Average/Normal Water Year	Multiple Dry Years Water Supply		
		2011[1]	2012	2013
Sacramento River (Bureau Redding Contract)[2]	21,000	18,480	18,480	18,480
Whiskeytown Lake (Bureau Buckeye Contract)[3]	6,140	4,056	4,056	3,515
Redding Groundwater Basin[4]	11,005	11,005	11,005	11,005
Total	38,145	33,541	33,541	33,000

Units: AFY

Notes:
1. 2011 data illustrates supply totals for a single dry year.
2. Redding Contract 2011 hypothetical reduction =
   0.25 x (2008-2010 average April-Oct Sacramento River withdrawals) = 2,520 AF
3. Buckeye Contract hypothetical 2011 single dry year supply equals 75% of average contract use during the last three non-constrained Project water years =
   0.75 x (Average 2006, 2007 & 2010 Project water use) = 4,056 AFY;
   Third year drought supply could be reduced to 65%, at Bureau's direction (assumed for 2013 values).
4. Source: *City of Redding 2010 Water Master Plan*

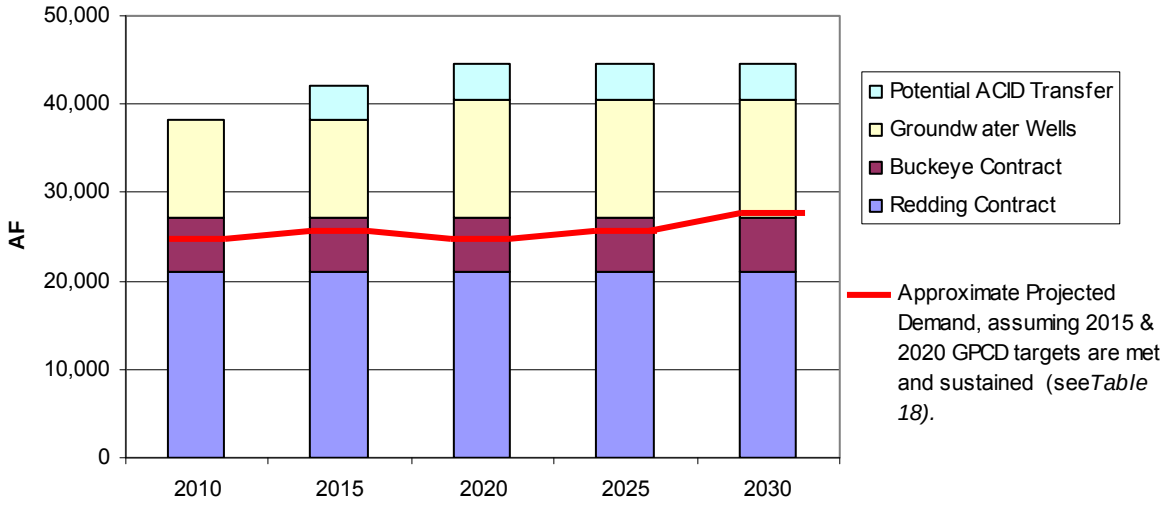
Table 32
Supply and Demand Comparison—Normal Year

	2015	2020[1]	2025	2030
Redding Contract Supply	21,000	21,000	21,000	21,000
Buckeye Contract Supply	6,140	6,140	6,140	6,140
Groundwater Well Supply	11,005	13,405	13,405	13,405
Supply Totals[3]	38,145	40,545	40,545	40,545
Demand Totals[2,4]	26,245	24,454	26,154	27,854
Difference	11,900	16,091	14,391	12,691
Difference as % of Supply	31%	40%	35%	31%
Difference as % of Demand	45%	66%	55%	46%

Units: AFY

Notes:
1. Two additional groundwater wells are assumed to come online by 2020 (see *Table 27, Section 4.6)*.
2. Water demands in this table reflect the assumption that the City will meet interim and 2020 targets and that the 2020 GPCD target will be maintained through 2030. Additionally, groundwater wells are assumed to pump at 50% of yearly capacity.
3. From *Table 19*.
4. From *Table 18*.

Figure 10: City of Redding Projected Demand and Source Supplies, Normal Water Year



Note: As of 2020, groundwater well capacity is projected to increase with two additional supply wells.

Table 33
Supply and Demand Comparison—Single Dry Year[1]

	2015[3]	2020[2,3]	2025[3]	2030[3]
Supply Totals[4,6] (from *Table 31*)	33,541	35,941	35,941	35,941
Demand Totals[5] (from *Table 18*)	26,245	24,454	26,154	27,854
Difference	7,296	11,487	9,787	8,087
Difference as % of Supply	22%	32%	27%	23%
Difference as % of Demand	28%	47%	37%	29%

Units: AFY

Notes:
1. For explanation concerning the determination of single dry year water supply volumes, see *Table 28* and the introduction to Section 5.2.
2. Two new (or rehabilitated) groundwater wells are assumed to come online by 2020 (see *Table 27)*.
3. Water demands in this table reflect the assumption that the City will meet interim (2015) and 2020 targets and that the 2020 GPCD target will be maintained through 2030. Additionally, groundwater wells are assumed to pump at 50% of yearly capacity.
4. From *Table 31*.
5. From *Table 18*.
6. Increases in future Redding Contract dry year reductions due to increased April-October usage (by a larger population) after 2011 are assumed negligible relative to total supply.

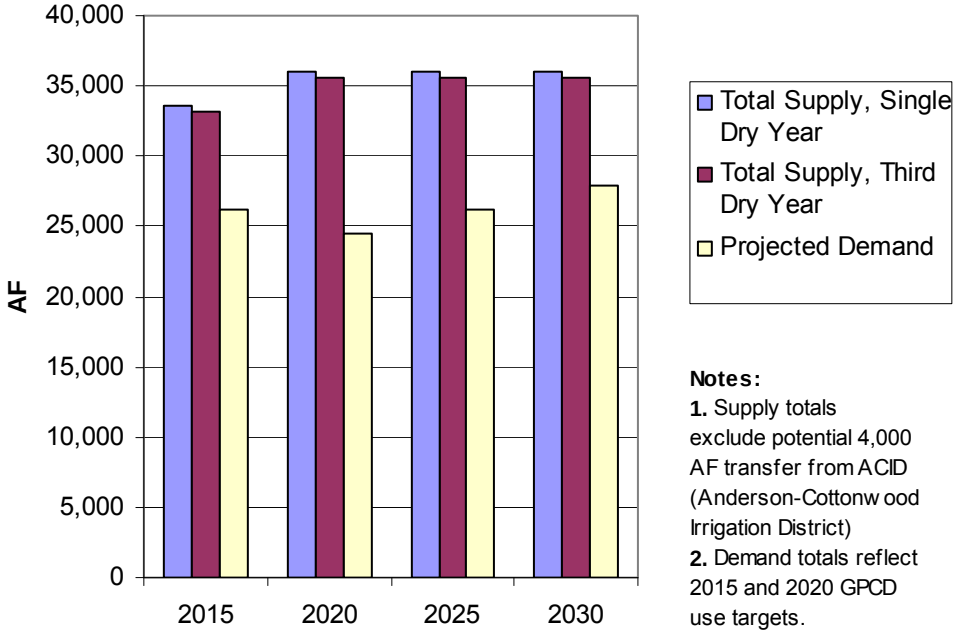
Table 34
Supply and Demand Comparison—Multiple Dry Year Events[4]

		2015	2020[5]	2025	2030
Multiple dry year first year supply	Supply totals [1, 2]	33,541	35,941	35,941	35,941
	Demand totals[3]	27,985	26,338	27,059	27,781
	Difference	7,296	11,487	9,787	8,087
	Difference as % of Supply	22%	32%	27%	23%
	Difference as % of Demand	28%	47%	37%	29%
Multiple dry year second year supply	Supply totals[1,2]	33,541	35,941	35,941	35,941
	Demand totals[3]	26,245	24,454	26,154	27,854
	Difference	7,296	11,487	9,787	8,087
	Difference as % of Supply	22%	32%	27%	23%
	Difference as % of Demand	28%	47%	37%	29%
Multiple dry year third year supply	Supply totals[1,2]	33,000	35,400	35,400	35,400
	Demand totals[3]	26,245	24,454	26,154	27,854
	Difference	6,755	10,946	9,246	7,546
	Difference as % of Supply	20%	31%	26%	21%
	Difference as % of Demand	26%	45%	35%	27%

Units: AFY

Notes:
1. Water supply sources are the same as in *Table 31,* with groundwater wells pumping at 50% capacity.
2. For explanation of determining single dry year and multiple dry year water supply volumes, see introduction to Section 5.2 and *Table 28.*
3. Water demands in this table reflect the assumption that the City will meet interim and 2020 urban water use targets and that the 2020 GPCD target will be maintained through 2030 (see *Table 18*).
4. *Table 34* data is also presented in *Figure 11*.
5. Two new (or rehabilitated) groundwater wells are assumed to come online by 2020 (see *Table 27)*.

Figure 11: City of Redding Projected Water Demands and Supplies, Dry Years



5.3 Water Quality

As required by the *Federal Safe Drinking Water Act*, City water supplies must meet stringent water quality standards set by the State Department of Public Health - Division of Drinking Water, the United States Environmental Protection Agency (USEPA), and the Food and Drug Administration (FDA). An annual *Water Quality Report* is published and distributed to all water customers. The City consistently meets or falls below Maximum Contaminant Levels set by Federal and State Agencies thereby ensuring that Water Quality Standards are met throughout the year. ***Appendix H*** contains water quality information in the City Water Utility's *2010 Consumer Confidence Report.*

Source Water Assessment and Sanitary Survey

The City of Redding conducted drinking water source assessments of its surface water sources in the *City of Redding Surface Water Source Assessment* (SWSA) in June 2001 and as part of the *Redding Area 2011 Watershed Sanitary Survey* (Sanitary Survey). Additionally, the City performed a Groundwater Source Assessment (GWSA) in May 2002. According to source assessments, the City's surface sources are at highest risk of contamination from sewage spills, railway and major roadway accidents, illegal dumping, historic mining activities and recreational use.

According to the GWSA of May 2002, wells in more industrial areas, including Cascade Well 5 and Enterprise Wells 8, 9, 12, and 13, are most vulnerable to:

1) Airports—Maintenance/fueling areas
2) Septic systems and sewer collection system overflows/leaks
3) Wastewater Treatment Plant

4) Lumber processing and manufacturing
5) Biosolids land application
6) Natural gas pipelines
7) Roads and streets

All other wells are located in residential areas and are considered most vulnerable to the following contamination sources:
1) High density housing
2) High density of septic systems
3) Sewer collection system overflows or leaks
4) Roads and streets
5) Grazing
6) Chemical/Natural gas pipelines

Water quality related excerpts from the executive summary of the 2011 Sanitary Survey include the following:

- The overall quality of water from the four watersheds is quite good due in part to:
    1) The large volumes of water captured by the watersheds, which dilute contaminants;
    2) The presence of five lakes, which allow contaminants to settle out of the water;
    3) Land management regulations of local, state, and federal agencies.

- The greatest likely threats to water quality are potential high turbidity from landslides and erosion, particularly in the Trinity and Whiskeytown Watersheds, and possible contamination due to accidental spills resulting from highway and railroad accidents—particularly for the Sacramento River and Shasta Lake.

- Forty-nine months of raw water sampling by the City of Redding, Bella Vista Water District, and Clear Creek CSD for *Cryptosporidium* in the Spring Creek conduit and Sacramento River, as required under the Long Term 2 Enhanced Surface Water Treatment Rule (LT2ESWTR), indicate that no addition of *Cryptosporidium* removal or inactivation technology will be required. The very chlorine-resistant *Cryptosporidium* has been the culprit in several noteworthy outbreaks of gastroenteritis attributed to contamination of U.S. surface water supplies.

- Although disinfection byproducts are a concern for some treatment plants within the Redding Area Watershed, City of Redding water treatment staff analysis confirms that neither the Buckeye nor the Foothill Water Treatment Plants have an issue with excessive formation of disinfection byproducts within the treatment plants or distribution system.

Proactive prevention of invasive species, such as quagga mussels (*Dreissena rostriformis bugensis)*, will also be important for preserving source water quality and protecting water system infrastructure. Quagga mussels can rapidly colonize hard surfaces and clog water intake structures such as pipes and screens, thereby reducing supply water pumping capabilities. In addition, quagga mussels can disrupt the food web by rapid filtration of phytoplankton and suspended particulate matter from the water, leading to increased water clarity, decreases in chlorophyll concentrations, and accumulations of pseudofeces. The clearer water allows more light penetration, causing aquatic plants to proliferate, and decomposition of pseudofeces can deplete dissolved oxygen content. Finally, the highly concentrated levels of waterborne pollutants in pseudofeces move up the food chain, increasing toxicity exposure to

fish and other aquatic life. (Source: *Dreissena Species FAQs, a Closer Look*—U.S. Geological Survey).

Water quality factors identified in the 2011 Sanitary Survey, the 2002 GWSA, and the 2001 SWSA are summarized in *Table 35*.

Table 35
Water Quality—Current and Potential Water Supply Impacts

Water Source	Description of Condition	2010	2015	2020	2025	2030
Sacramento River	High turbidity from landslides and erosion	X	X	X	X	X
	Accidental spills from highway and railroad accidents	X	X	X	X	X
Whiskeytown Lake	High turbidity from landslides and erosion	X	X	X	X	X
	Invasive mussel species	X	X	X	X	X
Redding Groundwater Basin	Wells #11 and #13 not currently operating due to arsenic levels near the MCL[1]	X	X			
	Need for dilution of water from wells #11 & #12 to dilute manganese levels below the secondary standard	X	X	X	X	X

Sources: *Redding Area 2011 Watershed Sanitary Survey; City of Redding Groundwater Source Assessment (2002)* and *Surface Water Source Assessment (2001); 2010 Consumer Confidence Report (Appendix H)*

Note:
1. Installation of treatment capabilities at wells 11 and 13 is being considered (tentatively by the year 2020).

5.4 Water Shortage Contingency Plans

(Water Code Section 10632)

A water emergency plan, as distinguished from a water conservation plan, describes strict measures that would be carried out only during times of severe water shortage. Since the City has extensive surface water rights and groundwater to draw from, severe water shortages have never been experienced, though the likelihood of a future water shortage is possible. The diversification of the City's supply system to include both ground and surface water sources helps the City from being dependent on one type of supply. If a water shortage were to occur, it is not likely that both supplies would become unreliable. The City does require both voluntary and mandatory actions in the event of a water shortage.

The City maintains inter-ties with three nearby water districts and two neighboring cities and transfers of water can be obtained from these water suppliers to meet a short-term deficiency (see *Table 16*). In addition, the City recognizes the need to prepare for a water shortage or water emergency and has adopted a *Drought Management Plan* ordinance as outlined below and in ***Appendix G***. Furthermore, the *Disaster Response Plan* in ***Appendix F*** details the City's strategy for responding to a short term water quality or supply emergency.

Disaster Response and Water Shortage Response Plans

The City's *Water Utility Disaster Response Plan* (***Appendix F***) will be implemented in the event of a water quality or water shortage emergency and outlines procedures to notify the media and public in addition to City/County personnel and local hospitals and medical clinics. Notification of the majority of the public could be accomplished within two or three hours. Also, *Tables 36-39* summarize stages, reductions, and penalties that are part of the City's *Drought Management Plan* (***Appendix G***), which would take effect during a more prolonged water supply shortage.

Table 36
Water Supply Shortage Stages and Conditions

Stage Number	Water Supply Conditions	% Shortage
Stage 1 - Voluntary Reduction	Drought or Emergency	15%
Stage 2 - Mandatory Reduction	Drought or Emergency	25%
Stage 3 - Mandatory Reduction	Drought or Emergency	35%
Stage 4 - Mandatory Reduction	Drought or Emergency	50%

Source: *City of Redding Drought Management Plan, Redding Municipal Code Chapter 14.09*

Table 37
Mandatory Prohibitions

Examples of Prohibitions	Stage When Prohibition Becomes Mandatory
Using potable water for street sweeping	Stage 2
Failure to repair leaks	Stage 2

Source: *City of Redding Drought Management Plan, Redding Municipal Code Chapter 14.09*

Table 38
Consumption Reduction Methods

Consumption Reduction Method	Stage When Method takes Effect	Projected Reduction (%)
Customer Allocations	Stage 2, 3, 4	15% - 50%
Irrigation Limited to Certain Days	Not mandatory but could be voluntarily implemented to achieve reduction	15% - 50%
Decorative Fountain Restrictions	Not mandatory but could be voluntarily implemented to achieve reduction	35% - 50%
Swimming Pool Refilling	Not mandatory but could be voluntarily implemented to achieve reduction	50%
New Services - postpone landscaping	Stage 2, 3, 4	25% - 50%
New Services must be reviewed and approved by City Council	Stage 4	50%

Source: *City of Redding Drought Management Plan, Redding Municipal Code Chapter 14.09*

Table 39
Water Shortage Contingency—Penalties and Charges

Penalty or Charge	Stage When Penalty takes Effect
$2.50 per ccf over allocation	Stage 2
$5.00 per ccf over allocation	Stage 3
$7.50 per ccf over allocation	Stage 4

Source: *City of Redding Drought Management Plan, Redding Municipal Code Chapter 14.09*
Note: 1 ccf = 100 cubic feet

5.5 Analysis of Revenue Impacts of Reduced Sales during Shortages

City Council Policy 412 dictates that the Water Utility maintain a minimum 5% cash reserve balance. Revenue in excess of expenditures is added to that reserve. Should the Utility experience revenue shortfall as a result of a water shortage, reserves can be used for operating expenses or to fund conservation activities and capital expenditures. In addition, a cost of service study to assess the Water Utility's financial stability is currently underway. The future needs of the Utility will be evaluated, alternative pricing structures will be addressed, and a recommendation will be made to City Council to protect the long-term viability of the Utility.

SECTION 6 – DEMAND MANAGEMENT MEASURES

(Water Code Section 10631.5)

As a United States Bureau of Reclamation (Bureau) contractor, the City of Redding is required by the Central Valley Project Improvement Act (CVPIA) of 1992, Public law 102-575, Section 3045(e) to develop and implement a Federal Water Management Plan (FWMP) that includes Best Management Practices (BMPs) developed by the California Urban Water Conservation Council (CUWCC). The current required update of the City's progress toward full implementation is being prepared concurrently with this Urban Water Management Plan (UWMP).

The FWMP is an essential element of the City's contractual CUWCC obligations with the Bureau and the City is required to complete the CUWCC annual report, which includes BMP reporting. This report, completed annually by signatories to the CUWCC Memorandum of Understanding (MOU) and by Bureau contractors, defines implementation requirements for Municipal and Industrial BMPs or Demand Management Measures (DMMs). A 2010 MOU amendment reorganized the original BMPs into 5 new categories and allowed water purveyors to choose a Flex Track menu for implementing BMPs. The City has chosen the Flex Track option; implementation is discussed below in *Table 40*. For the purpose of responding to Urban Water Management Planning Act and as allowed by law, the City will also submit the relevant BMP activity reports excerpted from the City's 2010 FWMP update. See ***Appendix E*** for the City of Redding's 2010 Annual CUWCC Report.

Table 40
Best Management Practices

BMP	Current or Proposed Action	Status	Scheduling/Tracking/Monitoring
FOUNDATIONAL			
Utility Operations			
Conservation Coordinator	The City has funded a full-time water conservation specialist since 2008	Ongoing	Time and resources spent on various aspects of the Water Use Efficiency Program is tracked through the use of Job Order Numbers.
Water Waste Prevention	The City has two ordinances which prohibit Water Waste year-round	Ongoing	Water Waste calls are a defined issue for work order program and enforcement takes place during normal business hours. The Utility is implementing a new Asset Management System that will allow easier querying and reporting of water waste calls and accompanying data.
Water Loss Control	The City performs a yearly water loss analysis and results are reported in annual accounting to the Department of Water Resources	Ongoing	Public Works and Utility personnel respond promptly to reports of leaks and perform distribution system leak detection when warranted; Utility personnel repair leaks as necessary.
Metering with Commodity Rates	The City is 100% metered and bills its customers monthly based on actual water usage (meter reads)	Ongoing	Each monthly bill includes the prior year's meter read to assist customers in managing their water consumption. Customer Service Representatives can also provide consumption data upon request. Three year's use/billing data is available for customers to access online with account # and last four digits of SS#.
Conservation Pricing	The City bills water consumption by volume at a uniform rate for all customer classes	Ongoing	The Water Utility is currently conducting a cost of service study. Pricing structures related to equity and feasibility across customer classes will be studied. A multi-year rate increase recommendation will be made to City Council.

BMP	Current or Proposed Action	Status	Scheduling/Tracking/Monitoring
FOUNDATIONAL			
Education Programs			
Public Information Programs	The City has a well-established and comprehensive Public Education Program and is always looking for new ways to engage the public in water education. Public Outreach is carried out by utility personnel and includes topics such as water conservation, storm water pollution prevention, water quality, water supply and treatment, watershed protection, wastewater collection and treatment and industrial waste processes. Outreach activities are targeted to the following: • General Public • Community Groups • Business Leaders • Building and Landscape Professionals • Government Organizations • City Departments	Ongoing	Utility staff engage or participate in the following: • Annual City Services & Energy Fair, Whole Earth and Watershed Festival and other community events where we provide information to the public in the form of displays and interactive activities • Docent training at local natural resources museum • Public Event days at the local museum • Collaboration with local environmental interests to provide workshops • Development of multi-media advertising, including radio, TV and print ads • Website development and maintenance • Interagency partnerships In addition, the Utility offers: • Tours of Water & Wastewater Treatment Facilities • Guest speaker/lecturer for community groups • Funding to support natural resource exhibits at local museum • A WaterWise Gardening CD for residential customers • Low-flow showerheads and conservation kits upon request • Materials that encourage water conservation, including notices that can be hung on customers' doors that encourage inspection of landscape irrigation systems for possible water waste Future endeavors include: • Establishing a single website for water, wastewater and storm water pollution prevention information • Developing a more comprehensive message that encompasses water, wastewater and storm water pollution prevention • Exploring additional partnership opportunities with area other agencies and non-profits • Exploring the possibility of offering residential water-efficient landscaping workshops • Possible conversion of Waterwise Landscaping CD to Web viewing

BMP	Current or Proposed Action	Status	Scheduling/Tracking/Monitoring
School Education Programs	The City has implemented a school education program that includes providing instructional assistance to K – 14 classes and materials that both meet California state framework requirements and are age-level appropriate.	Ongoing	The Utility has purchased instructional materials for loan to area schools and has prepared a summary of available materials in a Water Education Lending Library (WELL) catalog available to educators through a link on website Utility staff also engage or participate in the following: • Continuing education in the form of workshops, webinars, conferences • Host Project WET and Project Learning Tree Workshops • Environmental Education Initiative training In addition, the Utility offers: • Tours of Water & Wastewater Treatment Facilities to school groups • Guest speaker/lecturer for K-8, high school and local college classes • Groundwater Model demonstrations
PROGRAMMATIC			
Residential			
Assistance Program	The City provides onsite leak detection assistance for customers	Ongoing assistance provided during normal business hours	Work Orders are generated when a customer calls requesting assistance. A Utility Customer Service Worker visits the site and tries to isolate the leak if possible. If appropriate, repairs to public system are made and recommendations given regarding private plumbing and irrigation systems. Customers are shown how to read their water meter and how to check for leaks.
High-Efficiency Clothes Washers (HECWs)	The City has suspended its High-Efficiency Clothes Washers Rebate Program	N/A	Over 2,000 rebates were processed during the fiscal years 2006-2007 through 2010-2011 while this BMP was being implemented.
High Bill Contact with Single-Family and Multi-Family Customers	The City provides Customer Service assistance to customers with concerns	Ongoing during normal business hours	Customer Service Representatives review meter reads and bills with customers and can provide consumption data for 3 years upon request. Work orders are generated if on-site assistance is requested.
Educate Residential Customers about Behavioral Aspects of Water Conservation	The City provides Customer Service assistance to customers with concerns	Ongoing during normal business hours	Customer Service Representatives and Field personnel are educated in conservation practices and provide information to customers.

BMP	Current or Proposed Action	Status	Scheduling/Tracking/Monitoring
Notify Residential Customers of Leaks on the Customer's side of Meter	Meter Readers and/or Customer Service Representatives notify customer when meter reads are out of the ordinary	Ongoing during normal business hours	Meter Readers leave door hangers for customers and log information that appears on an internal report. Service Orders are generated and remain on an Open Service Order report until such time as the issue is resolved. Customer Service Representatives follow-up with customers and any additional conversations or measures implemented are documented in the customer service database.
Implement an Automatic Meter Reading Program for Residential Customers	The City will research alternatives to determine feasibility of implementing an AMI/AMR program	In Process	The Utility has had several meetings with a company that can deploy AMI infrastructure. Financing remains an impediment at this time but will be discussed during the next budget cycle. Public reluctance may be an issue and steps will be taken to address customer concerns should the program move forward.
PROGRAMMATIC			
Commercial, Institutional and Industrial (CII)			
Gray Water	Gray Water Systems fall under the jurisdiction of Shasta County Environmental Health	N/A	
Pond and Water Feature Recirculation	In January 2010, the City passed Ordinance 16.70 *Water Efficient Landscape* which requires that recirculated water be used for all new decorative water features and irrigation systems unless an exemption is granted for public health reasons.	Ongoing	Compliance is ensured through the permit process.
Submetering	The City offers Commercial/Industrial/ Institutional (CII) customers the option of installing landscape submeters in lieu of paying a full connection fee for a separate water meter.	Ongoing	The City bills Commercial/Industrial/ Institutional (CII) customers for sewer based on water volume and strength of discharged flow. During the sewer audit process, existing customers are made aware of and encouraged to install submeters as a means to isolate water used for irrigation versus water used for other purposes. In the process, customers are educated about indoor and outdoor water consumption as well as ways to reduce that consumption by ensuring leaks are found and repaired.

BMP	Current or Proposed Action	Status	Scheduling/Tracking/Monitoring
PROGRAMMATIC			
Landscape			
Monitor and Report on Landscape Water Use	The City will research alternatives to determine the best method of monitoring Landscape Water Use	Planned for fiscal year 2012-2013	The majority of existing meters are mixed-use meters and the Utility's current billing program cannot distinguish between landscape water use and water use for domestic purposes. In order to develop a meaningful monitoring program, many departments will have to be consulted and involved in the decision-making process to either modify or replace the current program. That could delay or hinder implementation of a comprehensive program. The City does have some irrigation-only meters and has recently allowed the installation of submeters for the purpose of measuring landscape water use. The use of submeters allows the City to comply with AB1881 while saving customers the full cost of a separate connection fee. While it will be easier to track water use using separate meters, modifications to the billing system and a coordinated effort to implement will be necessary.
Provide Technical Landscape Resources and Training	The City will explore the possibility of offering residential water-efficient landscape workshops	Planned for fiscal year 2012-2013	The Utility has designed a water-efficient landscape class outline and will contact some or all of the following to discuss partnerships in offering training: • Turtle Bay Exploration Park & Botanical Gardens • Shasta College Master Gardener Program • Native Plant Society • Local nurseries • Landscaping professionals • Other interested professionals
Develop Holistic Approach to Landscape Water Use Efficiency	The City is committed to overall landscape water-use efficiency through both current and planned activities	Ongoing	Ensuring compliance with landscape ordinances coupled with current education and outreach efforts such as distribution of Water-Wise Landscaping CD form the basis of a broad-based approach to landscape water-use efficiency. Future efforts should allow for tracking and monitoring water use reduction.

BMP	Current or Proposed Action	Status	Scheduling/Tracking/Monitoring
ADDITIONAL PROGRAMMATIC MEASURES FOR IMPLEMENTATION			
Participate in Local and Regional Planning and Regulatory Activities	The City participates in meetings of local water resource managers, maintains membership in organizations that track, monitor, and support conservation legislation, and participates in integrated regional water planning efforts. The water and electric utilities collaborate to disseminate important information regarding regulatory activities	Ongoing	Utility staff attend meetings, contribute information and plan activities through participation in the following: • Water Resource Managers of Shasta County • Redding Area Water Council • Northern Sacramento Valley Integrated Regional Water Management Planning group • Shasta County Environmental Education Working Group Memberships the Utility maintains include: • American WaterWorks Association – National and Cal-Nevada Section • Northern California Water Association • Association of California Water Agencies • Central Valley Project Water Association • California Municipal Utilities Association
Offer Water Saving Devices	The City provides water-saving devices to its customers on upon request	Ongoing during normal business hours	The Utility offers the following to its customers upon request: • Low-flow showerheads • Faucet aerators • Toilet dye tabs • Water conserving garden hose nozzles
Commercial/ Industrial/ Institutional (CII) Water Audits	The City will conduct research to determine the feasibility of offering CII water audits upon request	Planned for fiscal year 2012-2013	The Utility does not have the staff or expertise to conduct Commercial/Industrial/ Institutional (CII) audits at this time. To provide assistance to CII customers, the Utility proposes the following: • Investigate the types and costs of CII Audits being offered by other agencies • Determine typical water savings that might be achieved through a CII audit • Define likely parameters to be addressed in a CII audit • Research the availability of individuals or firms that possess the necessary expertise to conduct CII audits • Explore partnership opportunities in offering CII audits to lower the overall cost • Develop a draft Request for Proposal to initiate a pilot program • If the outcome proposal for a pilot program is favorable, move forward with using a consultant/contractor to perform CII audits

BMP	Current or Proposed Action	Status	Scheduling/Tracking/Monitoring
Sewer Bill Inquiry	The City provides Customer Service assistance to customers with concerns about their high sewer bills, which are based in part on water consumption	Ongoing during normal business hours	Sewer bill inquiries are generated by a call from a CII customer or a referral from the Industrial Waste Division. Because the City determines sewer charges by water volume as well as strength of flow, a water use evaluation of the business is integral to the inquiry. That evaluation may include but not be limited to: • A review of water use history • An assessment of irrigation use on the property • An assessment of non-discharge industrial processes • For food service customers, an assessment of technology in place and calculation of the average water use per customer served • A study to validate the end use of water Depending on the results of the evaluation, the following suggestions to reduce water consumption may be made: • Replacement of Pre-rinse Spray Valves • Installation of water efficient dishwashers, flow restricting devices, high-efficiency washing machines, low-flow toilets and showerheads, faucet aerators, and auto shut-off nozzles • Seek assistance from a plumber to locate and get leaks repaired • Turn off automatic irrigation systems during winter months
Sewer Audits	The City conducts approximately 2,600 sewer audits per year as a result of new water use billing data generated for the winter months December through February. An evaluation of water consumption, including leaks and irrigation water use is part of this audit.	Ongoing during normal business hours from March through May	Each year, monthly sewer fees are re-calculated for all CII customers. Preliminary billing data is received by Customer Service Representatives who then review the account data for errors or significant year-to-year changes. The goal of the audit process is to: • Identify customers with possible leaks after historical comparisons of water use data • Discuss water consumption with customer and advise that plumber or leak detection personnel may be necessary • Advise customer that once leak is repaired and City receives copy, adjustments can be made to sewer billing calculations • Recalculate sewer fees and document water leak repair

SECTION 7 – MISCELLANEOUS PROVISIONS

(Water Code Section 10650-10657)

Agencies subject to the Urban Water Management Planning Act must have adopted a complete UWMP that meets the requirements of the law and submitted it to DWR to be eligible for drought assistance from the State and funds administered by DWR.