CITY
OF
BOULDER

Water Conservation Plan

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Executive Summary

Conservation has long been an important component of the City of Boulder's (the city's) water management strategy, including outreach, education, and technical assistance programs that date back over 20 years. The purpose of this Water Conservation Plan is to provide guidance in updating and implementing the city's Water Conservation Program in a way that is compatible with the city's water supply system, existing conservation programs, water resources management strategy, and values of the community.

The city provides potable water to approximately 113,000 residents in its service area, which encompasses a total of just under 26 square miles. The city's total annual treated water demand is approximately 18,600 acre-feet (2007 demand), primarily supplied by surface water withdrawn from Boulder Creek, and secondarily from the Colorado-Big Thompson and Windy Gap Projects on the western slope. Residential single-family users make up most of the 28,500 connections in the service area. Across all sectors, citywide annual demand per connection totaled approximately 213,000 gallons in 2007. The city's total daily per capita water use has varied from year to year, from a low of 148 gallons per capita per day (gpcd) in 2004 and 2007 to a high of 209 gpcd in 1988. Since the adoption of the city's comprehensive conservation program following completion of the Water Conservation Futures Study in 1999, per capita water use has significantly declined, particularly from the severe drought year of 2002 to present.

The City of Boulder is approximately 90 percent built out and any additional improvements or additions to its water system will focus more on improving system operating flexibility than increasing capacity. In 2007, water revenues totaled over $19,385,000 for all customer classes in Boulder. Single family residential customers contributed approximately 40 percent of revenues, followed by commercial and industrial users (26 percent), and finally multifamily residential and sprinkler users (19 and 15 percent). As of 2007, the city has used a five-block rate structure based on established "water budgets" for each type of customer, an important component of the city's overall water conservation strategy.

In 1999, the city completed its Water Conservation Futures Study to examine existing water use patterns and recent trends, update future water demand projections and reliable supply capability, and reassess the role of water conservation programs in helping to meet the city's needs. The Water Conservation Futures Study led to the adoption of a Comprehensive Conservation Scenario to aggressively manage and conserve water. The study was followed in 2000 by the Treated Water Master Plan, which provides guidance for improvements to the city's water system. In 2003, a Drought Response Plan was developed that established water use reduction measures to be implemented in the event of a severe drought that would quickly, but temporarily, greatly reduce water demands during the critical drought period. The drought response measures work in concert with, but are separate from, the city's on-going water conservation efforts. In April 2009 the Source Water Master Plan was completed, and the Water Quality Strategic Plan was finalized in June 2009. Both plans address water conservation, to some degree. An update of the Drought Response Plan was initiated in early 2009. Volume I will be completed in the fall of 2009 and the update of Volume II will be completed in 2010.

Today, the city operates a wide range of conservation programs that address both indoor and outdoor water use, as well as a variety of customer categories. City Council has adopted a comprehensive water conservation program for the city to achieve an overall reduction of water use at build-out. Implementation of the city's goal has been accomplished through an extensive water conservation program that continues to develop. Achievement of these targets will result in an expected overall reduction in total demand in the range of 19 percent at build-out as compared to water use at build-out absent a Water Conservation Program. Per capita water use at build-out may be greater than 2007 levels due to increases in the population to jobs ratio but will be less than without the Water Conservation Program.

As its Water Conservation Program has evolved, the city has developed a number of criteria to screen both existing programs and potential new programs. These criteria, along with ongoing and potential new conservation programs, will be integrated into modifying forecasts as part of an update of the 2000 Treated Water Master Plan, which the city anticipates will take place in the next couple of years.

Completion and approval by the Colorado Water Conservation Board of this Water Conservation Plan is anticipated to occur by fall 2009. Monitoring of the city's water conservation progress will be carried out in a variety of ways, including but not limited to the tracking of billing system data, daily water and wastewater treatment and production, daily operations of the city's surface water supply system, annual program costs, number of rebates, and feedback from the public.

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1.0 Introduction

Throughout Colorado, municipalities face potential shortages of water supplies in the future as the competition and expense for surface water supplies increases and as climate change progresses. Fortunately, water system modeling under present hydrologic conditions shows that the City of Boulder (the city or Boulder) owns sufficient water supply to meet its water needs at build-out with planned, but infrequent, reductions in use during severe drought years. Even though modeling demonstrates an adequate water supply for the city under all but the most extreme climate change scenarios, it is based on assumptions that city-wide water conservation efforts will continue. Any water conservation savings above goals set by City Council will make the city's water supply even more resilient during drought periods and in the event that climate change conditions actually do result in reduced water availability for Boulder.

Programs to conserve water are important components to maintain water demand levels that are in alignment with city's available water supply. The conservation of water can also reduce expenses associated with conveyance and treatment of both potable water and wastewater. Finally, conservation not only reduces water demand, but can decrease the amount of energy needed to pump, treat, and heat water, although the city does generate electricity through hydroelectric facilities throughout the raw water system.

Conservation has long been an important component of the city's water management strategy, including outreach, education, and technical assistance programs that date back over 20 years. The city recognizes that conservation plans are useful tools in evolving and improving on conservation programs to more effectively conserve water while minimizing associated costs. They are most effective when incorporated into an overall water resources management strategy, as the city has done in the past with its 1999 Water Conservation Futures study and its 2000 Treated Water Master Plan.

The purpose of this Water Conservation Plan is twofold: 1) to comply with state law requiring water providers delivering 2000 acre-feet or more of retail water to submit a water conservation plan to the Colorado Water Conservation Board; and, 2) to provide guidance in updating and implementing the city's Water Conservation Program in a way that is compatible with the city's water supply system, water rights, existing conservation programs, water resources management strategy, and values of the community.

This Water Conservation Plan includes information regarding the city's historical and projected water demands and supplies. The Water Conservation Plan also includes a discussion of the city's water conservation goals and the greatest potential water savings through conservation, as well as a portfolio of conservation measures and programs. Implementation and monitoring methods are also addressed to assess the effectiveness of each measure and program. The Water Conservation Plan is organized into the following sections:

- Section 1 – Introduction
- Section 2 – Profile of Existing Water System
- Section 3 – Characterization of Water Use and Forecast Demand
- Section 4 – Proposed Facilities
- Section 5 – Conservation Goals

- Section 6 – Conservation Measures and Programs
- Section 7 – Evaluation and Selection of Conservation Measures and Programs
- Section 8 – Integration of Resources and Modification of Forecasts
- Section 9 – Implementation
- Section 10- Monitoring and Evaluation

2.0 Profile of Existing Water System

The following section provides a profile of the City of Boulder's existing water system, including major system components, water use, demographics, water supply, and water demand.

2.1 Physical Characteristics of the Existing Water Supply System

The city provides potable water to approximately 113,000 residents in its service area, which encompasses a total of just under 26 square miles (Figure 2.1, Figure 2.2). Water is treated at the city's two water treatment facilities (WTF), the Betasso WTF and the Boulder Reservoir WTF, and conveyed to users by over 400 miles of water distribution pipelines. Table 2.1 summarizes the city's service area and system characteristics.

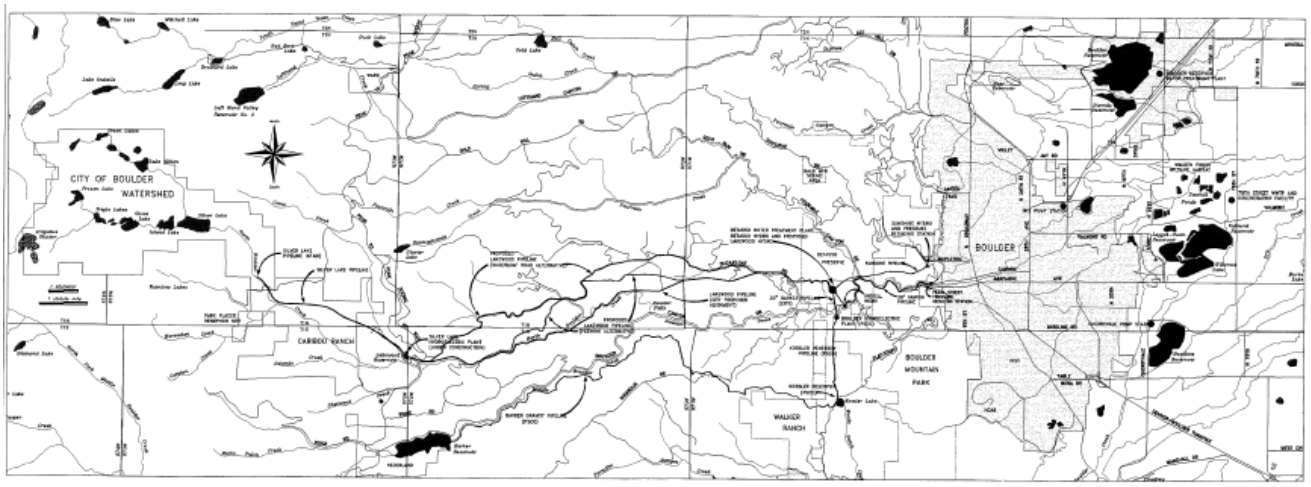

Figure 2.1 City of Boulder Water System Map

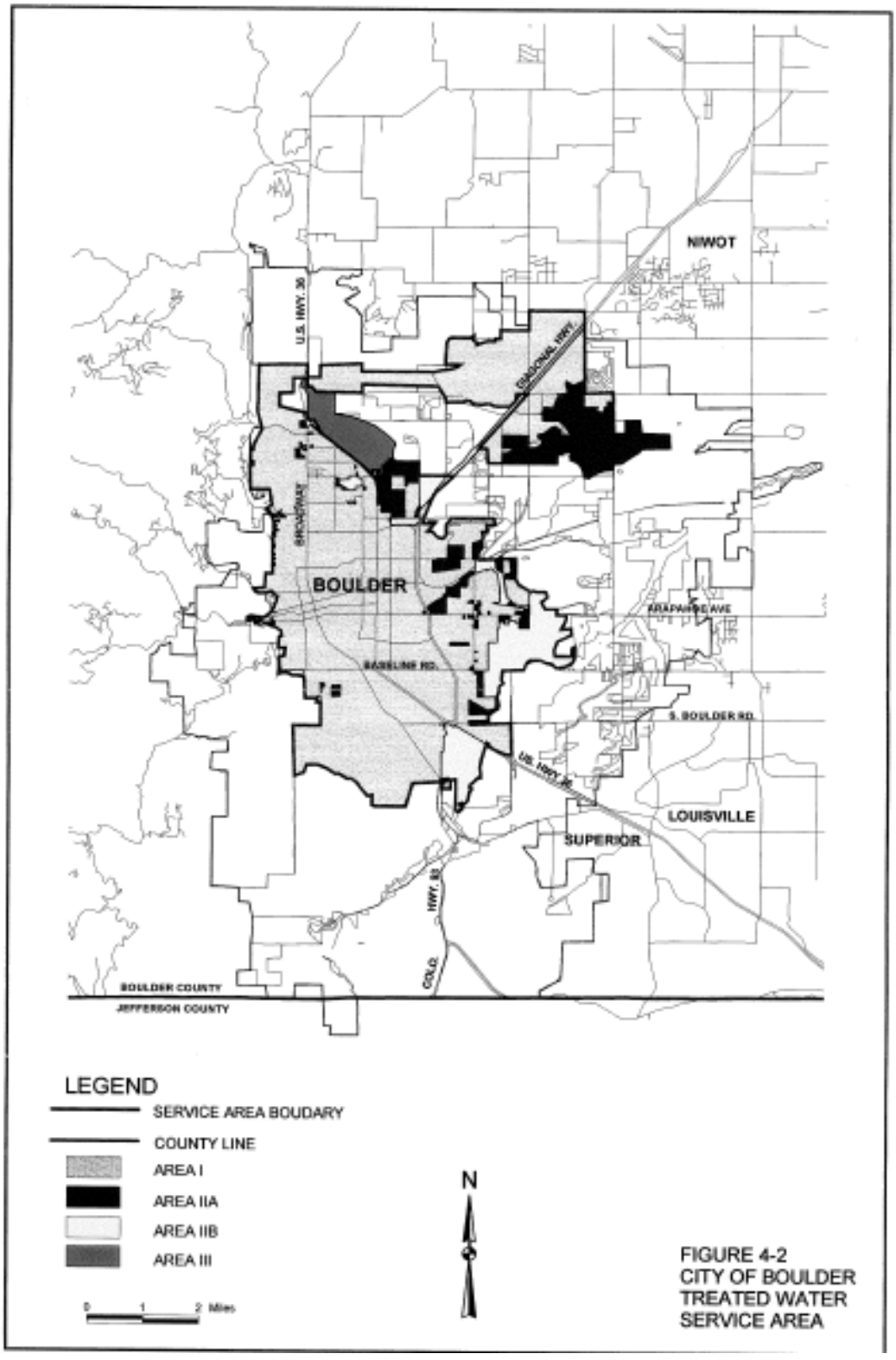

Figure 2.2 City of Boulder Treated Water Service Area

Table 2.1: Service Area Characteristics (2007)

Characteristic	Number
Estimated service population	113,000
Estimated service area (square miles)	26
Miles of treated water pipelines	408
Number of treatment plants	2
Number of separate water systems	1
Interconnection with other systems	1 (Left Hand Water District)

The city's total annual treated water demand was approximately 18,616 acre-feet in 2007, primarily supplied by surface water withdrawn from Boulder Creek, and secondarily from the Colorado-Big Thompson (CBT) Project and Windy Gap Project. The city is also 100 percent metered (Table 2.2).

Table 2.2: Annual Water Demand (2007)

Source	Annual volume (acre-feet)	Number of intakes or source points	Percent metered
Groundwater	0	0	NA
Surface water	18,616	2 (Betasso WTF (Boulder Creek basin sources) 71% and Boulder Reservoir WTF (thru CBT 29%)	100
Purchases: raw	0	0	NA
Purchases: treated	0	0	NA
Total demand	18,616	2	100

The city provides water to residential, commercial, industrial, and institutional users as well as irrigation users. Residential single-family connections make up most of the total connections. In 2007, there were just over 28,500 connections in the service area, with sales of approximately 5,582,396 thousand gallons (kgal) (Table 2.3).

Table 2.3: Service Connections and Water Sales (2007)

User Category	Connections	Water sales (kgal)	Percent metered
Residential, single-family	22,351	2,227,086	100
Residential, multi-family*	2,483	1,232,970	100
Commercial, industrial and institutional**	2,096	1,494,491	100
Irrigation	1,622	627,849	100
Total connections	28,552	5,582,396	100

Source: 2007 Annual Report
*Includes wholesale purchase by Hoover Hills, which is classified as one multi-family account with 254 units
** All non-residential, non-irrigation service connections counted as one connection under current system

Table 2.4 depicts average and maximum daily and hourly demand in the city of Boulder (Boulder) for 2007.

Table 2.4: Average and Peak Demand (2007)

Demand	Volume (mgd)	Total supply capacity (mgd)	Percent of total capacity
Average-day demand	16.6	56	30
Maximum-day demand	36.8 (July)	56	66
Maximum-hour demand	N/A	2.33	N/A
Source: 2007 Annual Report			

2.2 Sources of Water

The city obtains its water from two surface water basins, the upper watershed of Boulder Creek and the upper Colorado River basin via the Colorado-Big Thompson Project (CBT) trans-mountain diversion facilities which also carry Windy Gap Project water. Boulder Creek sources are further subdivided into the North Boulder Creek basin, including the city-owned Silver Lake Watershed area, and the Middle Boulder Creek basin above Barker Reservoir. The Colorado River trans-mountain diversion supply includes units of the CBT system, which is owned by the U.S. Bureau of Reclamation and operated by the Northern Colorado Water Conservancy District (NCWCD) and units of the more recent Windy Gap Project, which is owned and operated by the municipal sub-district of NCWCD.

The city's water system consists of raw water collection, storage, and conveyance facilities, hydropower facilities, two WTFs, and transmission, storage, and distribution facilities. This section provides an overview of the system, a current listing of equipment and facilities at the city's WTFs, and major elements of the distribution system.

Silver Lake Watershed

The city owns the 10-square-mile Silver Lake Watershed, having been granted the right to purchase most of the area by Congressional acts between 1907 and 1927. Source water derived primarily from snowmelt is stored in seven reservoirs and released as required. Silver Lake is the last reservoir in the series of Silver Lake Watershed reservoirs. Raw water released from Silver Lake is diverted from North Boulder Creek into the Silver Lake Pipeline approximately two miles below the reservoir. The Silver Lake Pipeline, originally built in 1919, was replaced during 1997 and 1998 to improve system reliability. A new hydroelectric generating facility was constructed along with the new pipeline.

The Silver Lake Pipeline terminates at Lakewood Reservoir, a small impoundment located north of Nederland used for flow equalization and as an additional diversion point from North Boulder and Como Creeks. From Lakewood Reservoir, water is conveyed approximately 9.5 miles to the Betasso WTF via the Lakewood Pipeline. This pipeline was originally constructed in 1906 and was first rebuilt in the 1940s and 1950s. A second replacement of the lower 1.1 miles of the

Pipeline was completed in 1995 with the remainder replaced in the early 2000s. A hydro plant was added at the end of Lakewood Pipeline at that time.

Barker Reservoir System

Barker Reservoir was constructed in 1909 by predecessors to Public Service Company of Colorado (PSCo, now Xcel Energy) to supply a hydroelectric generating facility in Boulder Canyon near Orodell. Raw water is piped from Barker Reservoir to Kossler Reservoir, and then from Kossler Reservoir to the Boulder Canyon Hydroelectric Plant. After spinning the turbine, the water discharges to Boulder Creek.

Water destined for municipal use is diverted from the penstock (high pressure pipeline feeding a hydroelectric turbine) immediately upstream from Boulder Canyon Hydro Plant and flows under high pressure through a pipeline to the Betasso Hydro Plant and Betasso WTF. The system from Barker Reservoir to the Boulder Canyon hydroelectric generating station was owned and maintained by PSCo until the city purchased the entire system in 2001. The city first entered into an agreement to use the Barker facilities for municipal water supply in 1954 and the system has gradually increased in its importance to the municipal water supply system since that time.

Trans-mountain Water Deliveries

Water is collected in a series of reservoirs located in the upper Colorado River watershed and diverted to the eastern slope of Colorado via the Colorado-Big Thompson (CBT) Project. In addition, the small Windy Gap Reservoir at the confluence of the Fraser River and the Colorado River serves as a diversion point into a pipeline pumping water up into the CBT system for use by participants in the Windy Gap Project. Water conveyed to the eastern slope through the CBT system mixes with water from the upper Big Thompson River watershed in Lake Estes. From Lake Estes water is directed to a number of Front Range storage reservoirs, including Carter Lake, for distribution to users by NCWCD.

The city’s allocation of this water is conveyed by the open channel Boulder Feeder Canal from Carter Lake to Boulder Reservoir. The city owns units in both the original CBT project and the Windy Gap project, entitling it to a certain amount of water annually. Each Windy Gap unit has a potential yield of 100 acre-feet of water annually. Each CBT unit has a maximum yield of one acre-foot per year with an average yield of 0.7 acre-feet. The quota per unit is set each year by the NCWCD and varies from year to year depending on the previous year's precipitation and water use. The city leases some of its unused water to agricultural users on an annual basis.

Water Resources Management

The city's raw water resources are managed by the Water Resources Group. This Group is responsible for managing the collection, storage, and delivery of raw water supplies to the city's water treatment facilities. In addition to operating and maintaining the city's raw water storage reservoirs and raw water pipelines and canals, the Water Resources Group maintains the water rights accounting for raw water used by the city and negotiates sales, acquisitions, and transfers of water between the city and other users. They also determine the amounts of water to be diverted from each source at any given time for optimal use of the city's water resources based

on a complex combination of interrelated factors including water rights priorities, storage levels, snow pack projections, and water quality.

2.3 System Limitations

No significant system limitations have been identified in the city's water system. The system does not experience frequent shortages or supply emergencies, nor does it have substantial unaccounted for or lost water. In addition, the city is approximately 90% built out and any additional improvements or additions to its water system will focus more on improving system operating flexibility than increasing capacity (Table 2.5).

Table 2.5: Summary of System Conditions

Planning Questions	Yes	No	Comment
Is the system in a designated critical water supply area?		X	There are no known critical water supply areas.
Does the system experience frequent shortages or supply emergencies?		X	There are no frequent shortages or supply emergencies.
Does the system have substantial unaccounted-for and lost water?		X	System leaks are an estimated 3.4 percent based on 2007 water use.
Is the system experiencing a high rate of population and/or demand growth?		X	No, the city is largely built out.
Is the system planning substantial improvements or additions?		X	Only as required by regulations or for operational improvements.
Are increases to wastewater system capacity anticipated within the planning horizon?		X	None anticipated.

2.4 Water Costs and Pricing

Revenues

From the period of 1999 through 2007, the city's annual total water revenues increased from just over $14 million to over $19 million. This period, however, saw two years in which revenues dropped from the prior years; 2002 (a drought year) and 2004 (a year with a wet summer). During these years, the city saw decreases in revenues across every user category with the exception of commercial/industrial. During this period, residential revenues comprised approximately 40 to 43 percent, multifamily residential 20 to 23 percent, commercial/industrial 19 to 23 percent, and irrigation-only accounts 9 to 16 percent of total revenues. Revenues by customer class for 2007 is shown in Table 2.6. Appendix A contains more detailed revenue and consumption history by customer class.

Table 2.6: 2007 Revenues by Customer Class

January thru December 2007
BILLED WATER REVENUES BY CUSTOMER CLASS

	Single-Family Residential	Multi-Family Residential	Commercial\ Industrial	Irrigation Only	TOTAL	% of TOTAL
Service Charge	$2,425,158	$768,230	$795,229	$254,238	$4,242,855	21.5%
Block 1	3,179,027	1,620,897	1,683,352	539,120	7,022,396	35.6%
Block 2	843,648	609,628	923,646	297,830	2,674,752	13.5%
Block 3	682,179	427,125	760,127	448,605	2,318,035	11.7%
Block 4	250,898	176,123	312,353	342,743	1,082,115	5.5%
Block 5	382,700	225,097	699,763	1,102,175	2,409,734	12.2%
Bill Adjustments	(72,945)	(84,573)	(112,632)	(94,365)	(364,515)	100.0%
TOTAL	$7,690,665	$3,742,526	$5,061,836	$2,890,345	$19,385,373	
% of TOTAL	40%	19%	26%	15%	100%	

Rate Structure

The city had a flat water rate structure until 1988 when it first implemented an increasing block rate structure. The three-tier structure used Average Winter Consumption (AWC) as the basis, defined as the average monthly use from December through March by each account, allowing this amount to be charged at Block 1 rates. Block 2 was set at 350 percent of Block 1 usage, allowing for reasonable outdoor use, with any usage above this amount charged at the highest rate in Block 3. In December of 2004, the City Council adopted a new structure, the water budget rate structure, which was implemented in 2007.

Beginning in January 2007, the city converted to a five-block rate structure based on established "water budgets" for each type of customer. As the amount of water use increases and moves into the next block, the cost per thousand gallons increases. Bulk water and metered hydrant rates are set at $8 per 1,000 gallons of water used. Tables 2.7 and 2.8 summarize the city's current water rate structure. Miscellaneous charges range from $10 to mail a water service termination notice to $200 for purchase of a water monitor, and also include meter reading and other account services (opening or closing an account, etc.).

Table 2.7 also summarizes the city's monthly wastewater service charges. During the four-winter month AWC calculation period, wastewater quantity charges are billed using actual water use for those months. For the remainder of the year, wastewater charges for residential customers are billed based on AWC or actual use, whichever is less. Non-residential customers are billed for

wastewater quantity charges based on each month's actual water use. Quantity charges per 1,000 gallons inside the city are $3.50 and $5.25 outside of Boulder.

Charges for water and wastewater are billed to customers monthly. All utility charges are due within 10 days after receipt of the bill. The billing date is determined by the area of Boulder in which a customer is located and the normal monthly reading cycle. The city has not recently experienced any unusual billing or revenue issues (e.g., nonpayment of water bills, fines for violations of water restrictions, revenue shortfalls, etc.).

Table 2.7: Monthly Water and Wastewater Service Charges (2007)

	Water Service Charges		Wastewater Service Charges	
Meter Size	**Inside City**	**Outside City**	**Inside City**	**Outside City**
3/4"	$8.55	$12.81	$0.74	$1.12
1"	$14.65	$21.93	$1.33	$1.99
1 1/2"	$31.93	$47.89	$2.98	$4.47
2"	$56.20	$84.29	$5.30	$7.94
3"	$125.46	$188.18	$11.91	$17.87
4"	$222.40	$333.61	$21.17	$31.76
6"	$499.55	$749.33	$47.65	$71.47
8"	$887.53	$1,331.29	$84.71	$127.06

Table 2.8: Monthly Quantity Charges Per 1,000 Gallons* (2007)

Blocks	Inside City	Outside City
Block 1	$1.88	$1.88
Block 2	$2.50	$2.50
Block 3	$5.00	$5.00
Block 4	$7.50	$7.50
Block 5	$12.50	$12.50

*Quantity charges apply to all customer classes.

2.5 Current Policies and Planning Initiatives

Treated Water Master Plan

In 2000, the city completed a Treated Water Master Plan (TWMP) update that provides guidance for improvements to its water system. The purpose of the TWMP update was to reflect current

conditions and serve as a guide for capital improvements planning and budgeting. The TWMP evaluated existing treatment and distribution facilities for adequacy and compatibility with long-term needs, and it identified capacity limitations or underutilized capacity. The updated TWMP provides the direction necessary to meet the following objectives:

- Provide the necessary facilities to meet future demands;
- Ensure that treated water delivered to customers meets or exceeds regulatory requirements at all times;
- Ensure that treated water quality and service meet customer expectations;
- Provide operating flexibility to meet variations in demand and raw water quality;
- Provide facilities that have adequate capacity and redundancy to satisfy the city's reliability criteria for water service; and
- Provide high quality water service to the city's customers at a reasonable cost.

The planning period for the TWMP spans the 20 years from 2000 to 2020. Projections were made from 1999 conditions to the end of the planning period in 2020, which coincides approximately with projected build-out of the service area. The city anticipates that an update to the 2000 TWMP will commence in the next couple of years.

Source Water Master Plan

In 1987, the city initiated a public review process to evaluate the water supplies that the city owned and to discuss options for future uses of this water. These studies resulted in the 1988 Raw Water Master Plan (RWMP). The focus of the RWMP was mainly on water yield and uses in Boulder and less on raw water system infrastructure. In April 2009, the Source Water Master Plan (SWMP) was completed which builds on the previous RWMP and focuses on the following objectives:

- Compile descriptive and background information for the assets and resources that comprise the city's source water system;
- Review and update water use statistics and water rights yields;
- Document policies that affect source water system development, use and management;
- Define current and emerging issues pertaining to the city's source water assets, facilities and resources;
- Review current operations and maintenance practices;
- Develop recommendations for future studies and improvements; and
- Provide general budgeting information and project prioritization to guide development of the ten-year Capital Improvement Program.

Current information on the impact of climate change on city's water supplies and possible city responses to climate change factors is also included in the SWMP.

Water Conservation Futures Study

In 1999 the city completed the Water Conservation Futures Study (WCFS) to examine Boulder’s existing water use patterns and recent trends, update future water demand projections and

reliable supply capability, and reassess the role of water conservation programs in helping to meet the city's needs, not only in the area of treated water supply, but in several important and related areas.

The WCFS led the city to adopt the Comprehensive Conservation Scenario as defined in the WCFS. The Comprehensive Conservation scenario promotes the indoor and outdoor conservation measures most likely to have a lasting impact on demand in Boulder. This program has helped to reduce future peak demand to a level that can be handled by current facilities upgraded to their rated capacities without adding new water supply facilities. Section 2.6, below, describes the various conservation measures implemented under the Comprehensive Conservation Scenario in more detail. The WCFS also recommended revisiting the city's water use rate structure, which also led to adoption of the city's water budget-based rates in January 2007.

Drought Plan

In 2003, the city completed a Drought Response Plan to provide a guidance document for recognizing droughts that will affect water supply availability for the city and for responding suitably to these droughts. The Drought Response Plan consists of two volumes. Volume I is the Drought Response Plan, which includes summary information on the city's water supplies, a categorization of drought levels according to severity, and detailed information on the particular actions that might be taken to respond to each drought alert level. Volume II is the Drought Technical Information and Analysis that provides the supporting documentation for the Drought Response Plan. Specifically, Volume II contains the detailed analysis (including what happened during the 2002 drought), data and history to help assess the city's water supply system. Throughout the Drought Response Plan, emphasis is placed on education and voluntary efforts with more restrictive mandatory response elements reserved for the most severe drought situations. In addition, the Drought Response Plan focuses on implementation of activities that will result in rapid reduction in water use during the critical drought period with the expectation that the severe use restrictions will be relaxed when wetter conditions return. The city's drought response measures work in concert with, but are separate from, the on-going water conservation efforts.

In early 2009, the city initiated an update to Volume I of the 2003 Drought Response Plan. The primary purpose of the update is to integrate the water budget rate structure in to the Drought Response Plan so it can be used as a tool to reduce water use in the event of a drought. It is anticipated that the Volume I update will be completed in fall 2009. An update to Volume II is anticipated in 2010.

2.6 Current Water Conservation Activities

The city operates a wide range of conservation programs that address both indoor and outdoor water use, as well as a variety of customer categories. Table 2.9 provides a summary of the city's past and current conservation activities, including a description of the program, implementation date, program results in terms of water savings potential, cost, and customers affected.

Table 2.9: Summary of Past and Current Conservation Activities

Water Conservation Measures and Programs	Implementation Date	Water Saving Potential (1= low, 5= high)	Program Cost (Low to High)	Customers Affected
Treated Water Master Plan: Recommended hiring a water conservation staff person to deliver an all-voluntary information and education program designed to reduce water consumption, the most cost-effective way to address increasing demand.	1990	5	Medium	All
Water Conservation Office (WCO): Staffed with 1.0 FTE to deliver 7-pronged program designed to increase awareness of water resources, water use patterns, and efficiency opportunities.	1992	5	Medium	All
The Water News-Yearly Insert: Produce a double-sided 11 x 17 insert that outlines current WCO activities including rebates, outreach, landscape seminars, design tips, and local resources. Delivered to all 30,000 accounts each March.	1992	2	Low	All
Xeriscape Seminars: The WCO continues to contract services to deliver free 3 to 4 free xeriscape seminars each spring.	1993	2	Low	SF, MF
Buffalograss Truckload Sale: One-time sale to promote experimentation with new turf-type buffalograss variety 609; delivered a truckload to over 40 water customers.	1993	4	Low	SF, MF
Resident Surveys: The city conducted four surveys of city water customers to assess their awareness of water issues, of the WCO, of water conservation opportunities, preferred city policies, and programs. Delivered in conjunction with the city survey group (93, 94) and National Research Group of Boulder (96, 99).	1993-1999	N/A	High	All
Xeriscape Awards Program: Two-year program that provided xeriscape awards in both residential and commercial landscape categories. In conjunction with the Boulder Museum of Contemporary Art. Publications received an award from the national American Society of Landscape Architects.	1993	2	Low	All

Customers Affected Codes:
All= All Customers; SF= Single Family; MF= Multi-family; Comm= Commercial; Irrig= Irrigation

Water Conservation Measures and Programs	Implementation Date	Water Saving Potential (1= low, 5= high)	Program Cost (Low to High)	Customers Affected
Landscape Consultations: Free, on-site review of existing conditions and conservation opportunities. Includes appropriate plant selection, system maintenance, local resources, handouts of free soil probe and rain gauges, and information materials.	1993	3	Med	SF, MF
Placemats for Kids: Created a series of placemats that used cartoon-style drawings to convey local water supply, conservation, and pollution prevention messages. Provided free to local restaurants and used regularly for several years. New designs and distribution in 2001.	1994	2	Low	Comm
Soil Moisture Sensor Study: In cooperation with Aquacraft Engineering and faculty and staff of University of Colorado School of Engineering. Published results showed effective control of irrigation water use, and limited monthly and annual maintenance.	1995	4	Medium	All
Rebate Program: Start of an ongoing program offering money back on the purchase of conservation products and services. Slow and steady growth in the early years has led to a robust program handling over 425 rebates each year. Highest numbers are for residential clothes washers (75 percent), with the balance to outdoor items. Rebate items have included: buffalograss sod, drip irrigation systems, irrigation audits, soil amendments, smart irrigation controllers, mini-rotor irrigation nozzles, compost tea, high efficiency toilets, and commercial clothes washers.	1995	4	High	All
Xeriscape CD ROM: Created with local xeriscape expert Jim Knopf, and Hobbs Design, this CD was the first in Colorado to include information on the 7 fundamentals of xeriscape, plant profiles, and listings of landscape supply centers. Made available for free check-out at local video stores and public libraries.	1995	2	Medium	All

Customers Affected Codes:
All= All Customers; SF= Single Family; MF= Multi-family; Comm= Commercial; Irrig= Irrigation

Water Conservation Measures and Programs	Implementation Date	Water Saving Potential (1= low, 5= high)	Program Cost (Low to High)	Customers Affected
Heatherwood End Use Study: In cooperation with Aquacraft Engineering and faculty and staff of University of Colorado School of Engineering. Published results showed residential water use patterns and saving potential, leading to nationwide American Water Works Association (AWWA) study.	1996	3	High	SF
Land & Water Fund Project: This project addressed both landscape water use savings and stormwater runoff quality control through an award-winning design that redirected site runoff for the benefit of both plants and water quality. WCO staff provided technical assistance, design budget support, outreach efforts, and creation of project video through local Channel 8. National award from the National Geographic Society.	1997	4	Low	Irrig
AWWARF End Use Study & Report: Boulder was one of 12 nationwide utilities participating in this ground-breaking research documenting single-family residential end-use patterns. Published report is one of all-time best-selling AWWARF reports.	1998	3	High	SF
Urban Tree Budget Support: Initiated financial support of city street tree program in an effort to maintain the many water-related environmental benefits of the urban forest.	1998	4	Low	All
Urban Forest Report: Created a baseline study of the environmental benefits derived from Boulder's Urban Forest. Multi-year study that combined field data from over 35 sites with remote-sensing data (land cover, tree canopy, impervious surfaces, etc.) to create first-time data on the energy, carbon-storage, stormwater, and water-use benefits derived from trees. Published report received an award from the Colorado Chapter American Society of Landscape Architects.	2000	3	Medium	All

Customers Affected Codes:
All= All Customers; SF= Single Family; MF= Multi-family; Comm= Commercial; Irrig= Irrigation

Water Conservation Measures and Programs	Implementation Date	Water Saving Potential (1= low, 5= high)	Program Cost (Low to High)	Customers Affected
Water Conservation Futures Report (WCF) & Treated Water Master Plan (TWMP) 2000: Multi-year review and projection of the effect of Boulder's current water conservation program and potential future program options, produced by Aquacraft and Hydrosphere. This solid background work led to the full adoption of the WCF study into the updated TWMP of 2000. The adopted TWMP included the WCF preferred conservation alternative: an increase in programs for both indoor and outdoor water uses, with specific impacts on system-wide demand through city build-out (2030).	2000	4	High	All
Garden in a Box Program: Initiated a program to offer pre-designed water-wise gardens, with design and plants available "in a box" for immediate incorporation into the landscape. Slow but steady growth and interest, with over 120 boxes sold in 2007.	2000	3	Medium	SF
Xeriscape Poster with Xeriscape Colorado! & Boulder Energy Conservation Center (BECC): This joint project produced a poster illustration of a residential xeriscape, including a plant identification guide. Poster was sold through Boulder art gallery, at the BECC, and through Xeriscape Colorado!	2001	2	Low	SF, MF
Annual Teacher Workshop Initiated annual K-12 teacher workshop in cooperation with Project WET. Teachers participate in water conservation classes and receive and interact with conservation resources and curricula they can use in the classroom. Annually, an average of 20 teachers participate.	2001	1	Low	SF, MF, Comm

Customers Affected Codes:
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Water Conservation Measures and Programs	Implementation Date	Water Saving Potential (1= low, 5= high)	Program Cost (Low to High)	Customers Affected
2002 Drought: Internal resources were marshaled to provide unparalleled outreach about outdoor watering restrictions, conservation opportunities within each customer class, and patrolling to identify non-compliance. Water use decreased about 20 percent, allowing continued, reliable service for most customer water uses, and many cooperative efforts with other water providers.	2002	5	High	Irrig-All
Urban Ecology: Sustainable Landscape Symposium: Symposium was a response to the drought and an opportunity to better address sustainable urban landscapes in semi-arid regions like Colorado. Due to the drought there was an attendance over 120 in 2002, while in following years it has averaged 75 industry professionals, about half Landscape Architects and half Landscape Contractors.	2002	2	Low	Irrig, MF
Water Efficiency Fund: This fund was created as a new source of money within the Utilities Department to finance water efficiency projects within city-related operations, primarily in the Parks and Streets/Medians work groups. This new source of funding has allowed for investment in raw water systems, system audits and evaluations, employee training, and high-efficiency equipment.	2002	5	High	Irrig-City
Slow the Flow- Boulder: The regular checking of irrigation systems started in 2003 in Boulder with the hiring of a summer intern with experience in Utah's successful Slow the Flow Program. Over 40 commercial properties were audited, with a tremendous increase in awareness of system inefficiencies and costs, and conservation opportunities.	2003	4	Medium	Irrig, MF
Farmers Market Outreach Booth: The WCO supports staff to provide information and education on water conservation issues and opportunities. The Farmers' Market is held on Wednesdays and Saturdays, April through November in Boulder and is highly attended.	2003	2	Low	All

Customers Affected Codes:
All= All Customers; SF= Single Family; MF= Multi-family; Comm= Commercial; Irrig= Irrigation

Water Conservation Measures and Programs	Implementation Date	Water Saving Potential (1= low, 5= high)	Program Cost (Low to High)	Customers Affected
WCO Budget Increase: Following the recommendation of the Water Conservation Futures Study, additional funding was added to the WCO budget to facilitate implementation of additional recommended program elements.	2003	5	Med-High	All
CSU Short Course: The WCO cooperates with the Colorado State University County Extension Office in producing a two-day horticultural short course, for both professionals and homeowners. All relevant topics, including water conservation, are covered. The event usually draws over 75 homeowners and 15 professionals. The WCO provides planning assistance and financing for publishing and breaks.	2004	2	Low	Irrig, MF
Slow the Flow Colorado: After the success of Boulder's 2003 program, the BECC (now the Center for Resource Conservation CRC) obtained a grant from the CWCB to offer the program to more cities within Boulder County. The WCO encouraged storm water staff in neighboring cities to implement Slow the Flow for water quality benefits; provided funding and staff for training; and participated as a member, performing over 200 audit hours this season. The CRC provided all program administration and support. In 2007, the Program performed 138 irrigation inspections in the City of Boulder service area.	2004	4	Medium	SF, MF

Customers Affected Codes:
All= All Customers; SF= Single Family; MF= Multi-family; Comm= Commercial; Irrig= Irrigation

Water Conservation Measures and Programs	Implementation Date	Water Saving Potential (1= low, 5= high)	Program Cost (Low to High)	Customers Affected
PACE LandScape: A cooperative effort with the Boulder County-based Partners for a Clean Environment (PACE) program. PACE has had great success in working with area businesses to increase their environmental awareness, and their incorporation of more environmentally-friendly practices. This year PACE started to work with landscape professionals, offering both training and testing for PACE-endorsement. This voluntary certification uses a third-party evaluation, providing local government a list of preferred landscape professionals for distribution to customers.	2004	2	Low	Irrig, SF
Water Budget Rate Structure: Following a multi-year review of available rate structures and water allocation systems, the Water Budget Rate Structure was adopted by the City Council in December 2004. A project outline was adopted that called for implementation in 2007.	2004	2	Low	All
ICI Site Audits: The WCO supported several on-site audits of commercial customers. These site audits identified conservation opportunities and costs, and outlined programmatic changes for each site manager.	2005	4	Medium	Comm

Customers Affected Codes:
All= All Customers; SF= Single Family; MF= Multi-family; Comm= Commercial; Irrig= Irrigation

Water Conservation Measures and Programs	Implementation Date	Water Saving Potential (1= low, 5= high)	Program Cost (Low to High)	Customers Affected
ICI Grant Projects 2005-2007: Following the success of local site audits, the WCO supported the Brendle Group in obtaining a grant from the Colorado Pollution Prevention Advisory Board (PPAB) for a collaborative effort to address this customer class. This grant project involved over a dozen northern front range water providers to identify customer needs, data needs, conservation and collaboration opportunities. The project then prioritized work elements to include creating a joint database of ICI water usage and evaluation of water usage characteristics. Second year grants from both the PPAB, and the U.S. Bureau of Reclamation led to further developments that address the ICI sector: a broader database including Denver Water accounts and a web-based tool that assists site investigations, product and process evaluation, and identification of conservation opportunity costs and benefits. This tool is scheduled to be housed on the Colorado WaterWise Council (CWWC) Web site in early 2008.	2005	4	Low	Comm
Pre- Rinse Spray Valve Project: This cooperative project with the PACE program provides staff for restaurant site visits, while the WCO funded the purchase of 50 pre-rinse spray valves. PACE staff provided educational material on-site, and installed new devices, which have proven to provide substantial water and energy savings.	2005	5	Medium	Comm

Customers Affected Codes:
All= All Customers; SF= Single Family; MF= Multi-family; Comm= Commercial; Irrig= Irrigation

Water Conservation Measures and Programs	Implementation Date	Water Saving Potential (1= low, 5= high)	Program Cost (Low to High)	Customers Affected
Zero In On Xeriscape Pilot Program 2005-2007: This program was designed to offer zero-interest loans to single-family homeowners to make water efficiency improvements, primarily in the landscape. The pilot program was limited to homeowners in four Boulder neighborhoods (East Boulder, Table Mesa, Martin Acres, East Central Boulder). Participants could borrow a minimum of $1,000 and a maximum of $3,000, at zero interest over three years. Outreach efforts included direct mailings, neighborhood postings, and materials at selected nurseries.	2005	3	High	SF
SWEEP 2006 and 2007: A cooperative effort with the city Office of Environmental Affairs (OEA) and Longs Peak Energy Conservation (Boulder County non profit). Using University of Colorado student volunteers, over 300 households receive a packet of energy, water, and resource conservation information in a 'sweep' through selected neighborhoods. In addition, several dozen of these households committed to a follow-up audit of their household to identify specific conservation opportunities. As an incentive to commit to the follow-up, the WCO provided 1 high-efficiency clothes washer to one participant chosen by OEA and Longs Peak.	2006	2	Low	SF
Tree Sale Program: A complement to the successful Garden In A Box Program; the city offered trees for sale to residents, purchased by the WCO through the Trees Across Colorado Program. All unsold trees were used in city tree planting programs.	2006	3	Medium	SF, MF

Customers Affected Codes:
All= All Customers; SF= Single Family; MF= Multi-family; Comm= Commercial; Irrig= Irrigation

Water Conservation Measures and Programs	Implementation Date	Water Saving Potential (1= low, 5= high)	Program Cost (Low to High)	Customers Affected
Operation Water Festival: Developed and distributed Operation Water Festival program which features festival preparation materials for 4th and 5th graders on fundamental water awareness including conservation. The packet includes a complete teacher's packet featuring teacher's guides, student worksheets, and flash cards on each water topic. Colorful stickers and certificates were given as study and performance measures. A key benefit of the Operation Water Festival materials is the take-home water agent book. This book features homework assignments for each activity. Students are encouraged to work with family members to complete the assignments. As a result, parents and siblings also learn about water conservation.	2006	2	Low	SF, MF
Water Rangers Classroom Program: Developed and continue to implement water conservation program for grades 4 and 5. This two-part program invites students and their families to observe water use behaviors, collect data and calculate home water use. Together families set water conservation goals.	2007	2	Low	SF, MF
Water Budget Rate Structure: In January 2007, Boulder's new water budget rate structure was implemented across all 30,000 accounts, in four customer classes. Each single family, multi-family, irrigation, and ICI customer received an individual water budget, with a 5-block structure that rewards efficient use and penalizes waste.	2007	4	High	All

Customers Affected Codes:
All= All Customers; SF= Single Family; MF= Multi-family; Comm= Commercial; Irrig= Irrigation

Water Conservation Measures and Programs	Implementation Date	Water Saving Potential (1= low, 5= high)	Program Cost (Low to High)	Customers Affected
Home Makeover: Another cooperative project with the OEA and the Colorado Energy Science Center (SciCtr). This project follows the success of the SciCtr projects with Xcel Energy over the past few years. A Boulder residence was chosen, through criteria and among applicants, to receive a substantial makeover that included energy and water efficiency improvements. The residence will be monitored over the next year, an additional 5 homes will receive lesser treatments to increase their resource efficiency, and outreach efforts in 2008 will identify opportunities for other homeowners.	2007	3	Medium	SF
Info Tour Pilot Program: This project is designed to deliver on-site interpretive information with more convenience, and at a lower cost, than on-site staff or materials. Site information about conservation and green building is delivered through cell phone technology, and offers site-specific scripts that direct visitors through the site to increase awareness of conservation practices and techniques.	2007	2	Medium	All
Water Conservation Field Technician: A 1-year temporary position to focus on irrigation outreach and education. This position primarily provides education on-site to irrigation professionals and property managers, identifying conservation opportunity costs and benefits, available local resources, and city programs supporting their efforts.	2007	4	High	Irrig, Comm

Customers Affected Codes:
All= All Customers; SF= Single Family; MF= Multi-family; Comm= Commercial; Irrig= Irrigation

3.0 Water Use and Forecast Demand

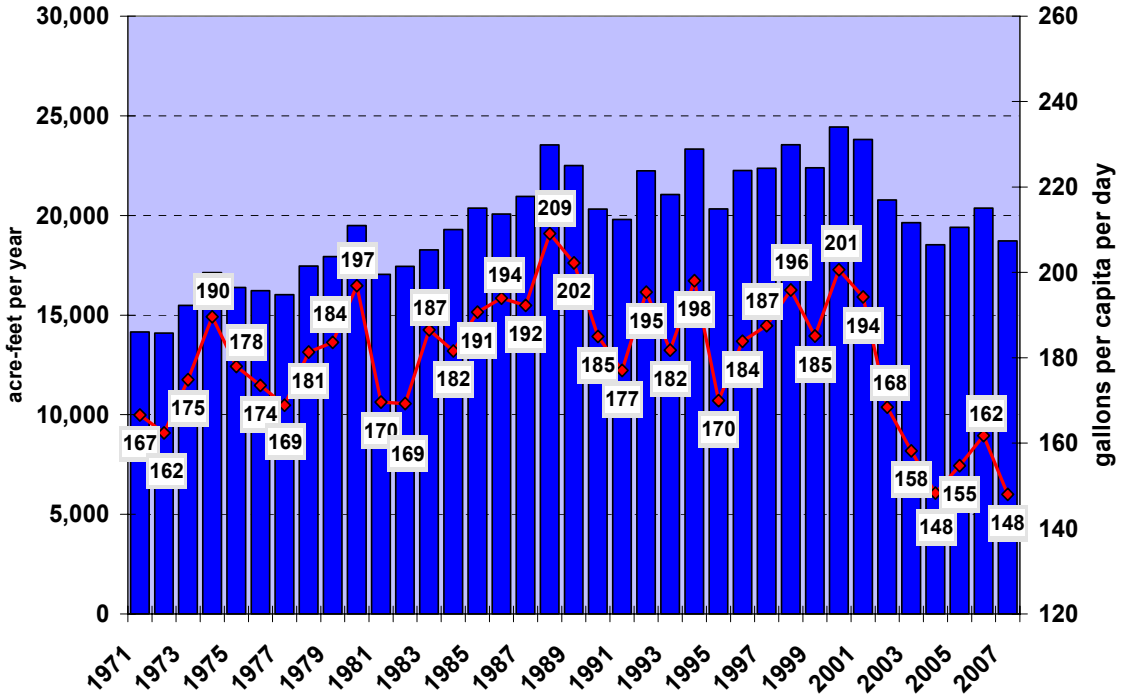
3.1 Current Water Use

The following graphs (Figure 3.1 through 3.6) depict the City of Boulder's (city's) total and per capita treated water use from the period of 1972 to 2007, as well as indoor and outdoor use, seasonal variations by month, and the top users. It should be noted that the city does not operate a non-potable water delivery system. The non-potable component of water use for a few municipal park areas, open space lands, the main University of Colorado campus, the NOAA/NIST campus and many private irrigators is met through several private irrigation ditch companies whose ditches have meandered through Boulder since the late 1800s.

As Figure 3.1 shows, Boulder's total per capita water use has varied from year to year, from a low of 148 gpcd in 2004 and 2007 to a high of 209 gpcd in 1988. Part of this variation is due to the large variation in lawn irrigation needs that occurs with varying annual weather conditions. Since the adoption of the city's Water Conservation Program, completion of the Water Conservation Futures Study (WCFS) in 1999 and the implementation of the Comprehensive Conservation Scenario from the WCFS, per capita water use has significantly declined, particularly apparent in data from the drought year of 2002 to present. The marked reduction since 2000 could be due to more efficient irrigation practices by Boulder residents and the city Parks and Recreation Department. Per capita water use is calculated by averaging total city-wide water use among Boulder residents including water uses such as parks irrigation, commercial, and industrial uses. If less irrigation water is required for parks in a particular year due to weather conditions, it will be reflected in a lower per capita use value for each resident.

Changing per capita use values also reflect variation in the resident jobs to population ratio (J/P ratio) since no per capita water use is directly attributed to the influx of workers Boulder experiences each day. A balanced J/P ratio for an average community is generally considered to be 0.65 jobs per resident because some residents are not part of the workforce. The J/P ratio in Boulder was 0.94 in 2000 which reflects Boulder's status as an employment center. The J/P ratio decreased to 0.90 between 2000 and 2004 as a result of increased population and a higher commercial and industrial vacancy rate. Employment in Boulder was 102,485 in 2000, 96,938 in 2002, 98,394 in 2003 and 101,077 in 2004. Due to the higher J/P ratio in Boulder than in other communities, water demands expressed as per capita use per resident may appear higher than in cities that are not employment centers. It is projected that the J/P ratio at build-out in Boulder in conformance with the 1995 Boulder Valley Comprehensive Plan Update will be as high as 1.37. This change will complicate comparison of current and future water use values expressed in terms of per capita water use.

Figure 3.1 Total and Per Capita Treated Water Use, 1971-2007



The overall trend since the 1970's for total indoor and outdoor water uses in Boulder has been upward, but has shown significant reduction in overall water use in recent years as shown in Figure 3.2. Permanent replacements of older, more water-intensive, indoor water fixtures are likely to have taken place since the 2002 drought, so the upward trend for indoor water use may be broken or stalled, as shown below in Figure 3.3. Outdoor water use decreased in 2002, but has increased since, as shown in Figure 3.4. Some permanent changes in outdoor use may have occurred through repair of leaky irrigation systems and xeriscaping. Much of the outdoor use reduction as compared to pre-drought years could be a residual effect of the water use education efforts during and since the 2002 drought. Overall, the percentage of indoor water use has shown a slight upward trend over the past several decades as shown in Figure 3.5.

Current water use in Boulder is comparable to 1995 levels, having increased from 1995 until 2001 and then decreased following the 2002 drought year. Overall annual demand in 2007 was more than 20 percent less than the highest water use in 2001 as shown in Figure 3.6. Total annual treated water deliveries were 18,616 acre-feet in 2007 compared to 20,311 acre-feet in 2006. In both 2007 and 2006, less treated water was delivered than was delivered in 2002 (20,773 acre-feet) when drought restrictions limited use in Boulder. In 2001, before the drought, 23,466 acre-feet were delivered out of the two water treatment facilities (WTFs).

Figure 3.2 City of Boulder Total Water Use from 2002 to 2007

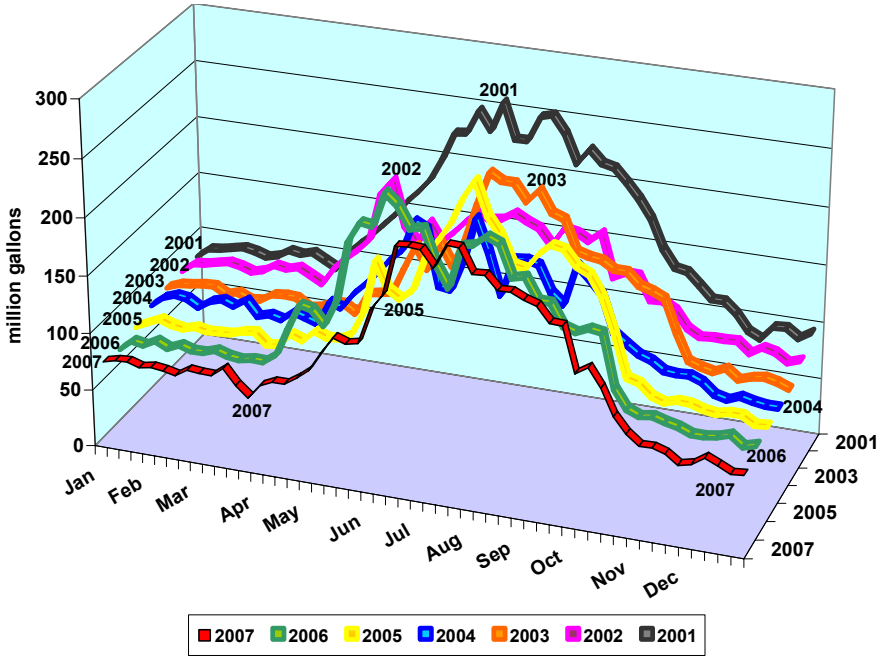


Figure 3.3 City of Boulder Total Indoor Water Use, 1971-2007

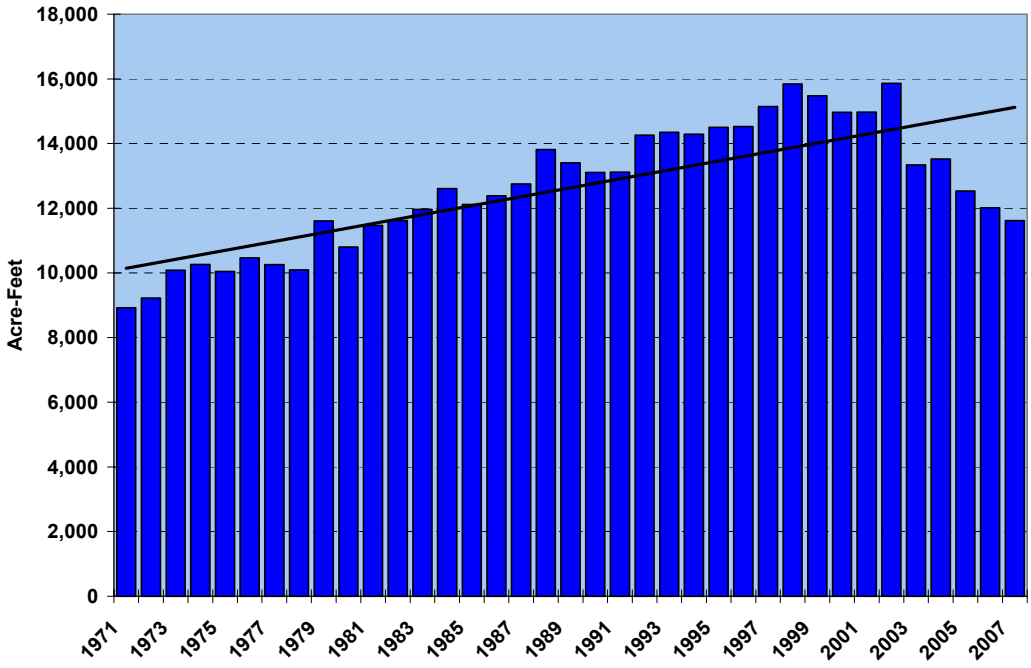


Figure 3.4 City of Boulder Total Outdoor Water Use, 1971-2007

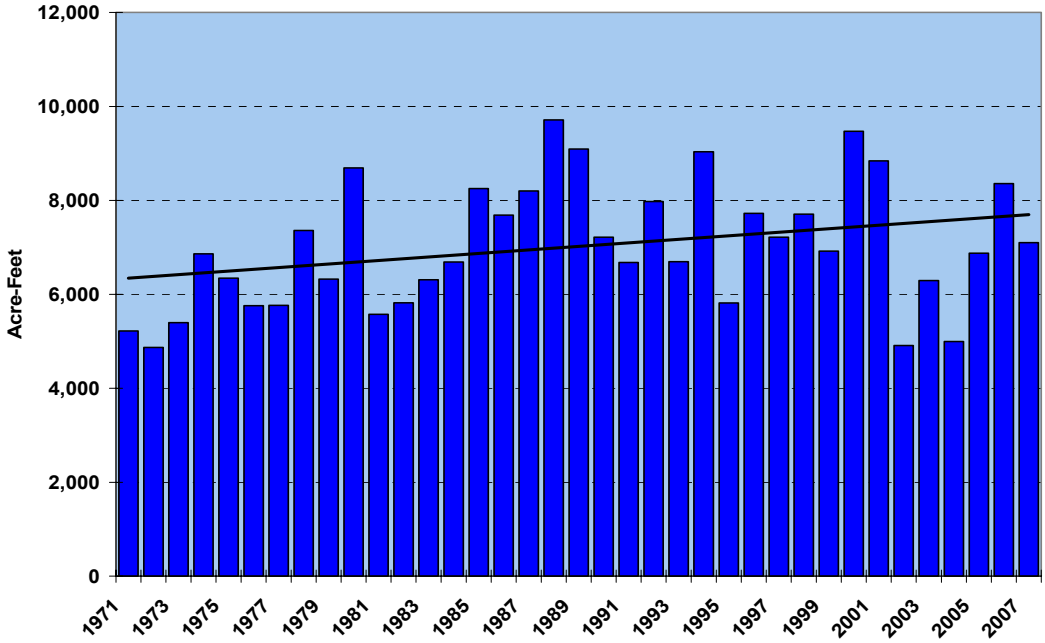


Figure 3.5 City of Boulder Total Indoor Water Use as a Percent of Total Use, 1971-2007

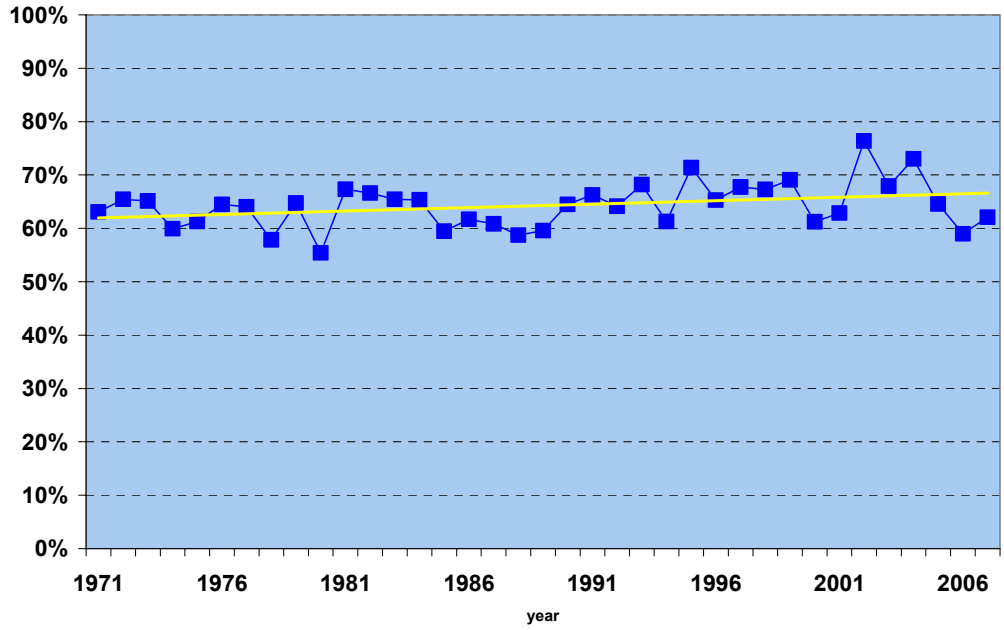


Figure 3.6 Comparison of Recent Water Use with Pre-2002 Drought Use

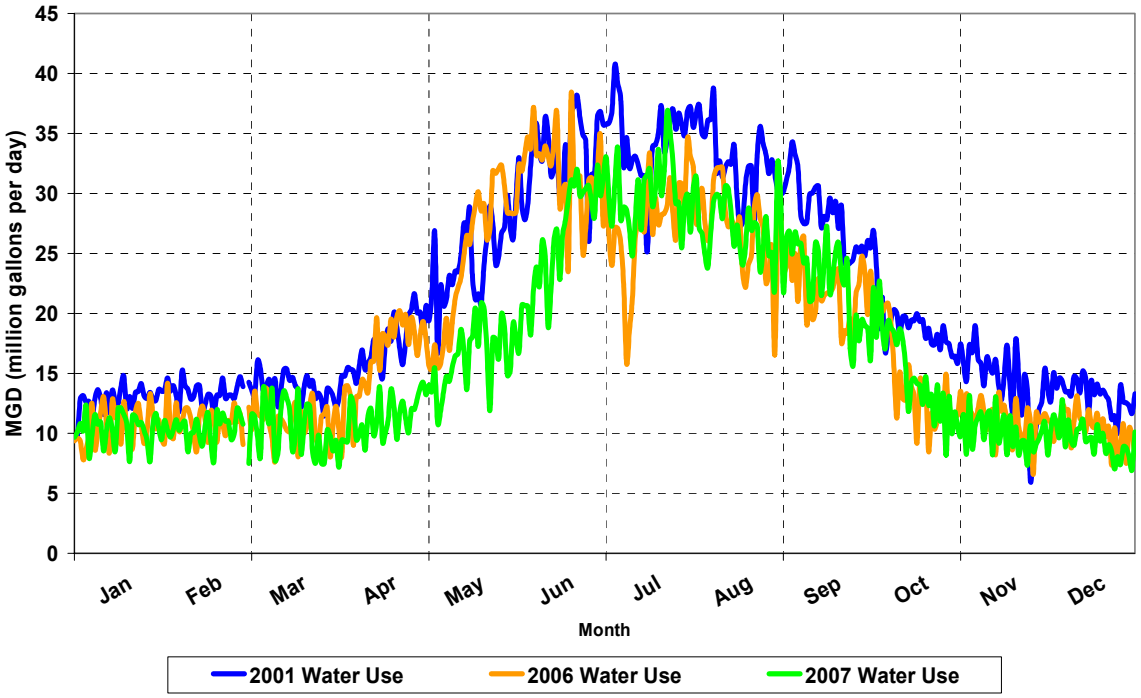


Table 3.1 lists Boulder's top water users. The University of Colorado is the largest single water user in the City of Boulder, followed by the city of Boulder (all Departments), IBM and Boulder Valley Schools.

Table 3.1: 2007 Top Water Users

User name	Consumption (kgal)	Percentage of Consumption
University of Colorado	360,0568	6.2
City of Boulder (all Departments)	269,881	4.7
IBM Corporation	93,709	1.6
Boulder Valley Schools	88,267	1.5
Countryside Village of Boulder	44,663	0.8
Boulder Housing Partners	43,982	0.8
Hoover Hills Water and Sewer District	40,591	0.7
Amgen	38,674	0.7
Boulder Community Hospital	37,960	0.7
Roche Colorado Corporation	37,628	0.7
NIST	33,769	0.6
Ball Aerospace	29,941	0.5
Boulder County Facilities Management	23,690	0.4
Frasier Meadows Manor	22,129	0.4

Table 3.2 depicts water use by customer class and block rate in 2007**.** Single-family residential use constitutes the largest category of water user, followed by business and multi-family. Irrigation only accounts used the most water in the two highest water blocks, blocks 4 and 5.

Table 3.2: Water Use by Customer Class (per thousand gallons) 2007

January thru December 2007

BILLED WATER USE BY CUSTOMER CLASS

(in thousand gallons)

	Single-Family Residential	Multi-Family Residential	Commercial Industrial	Irrigation Only	TOTAL	% of TOTAL
Block 1	1,689,125	862,182	875,678	285,123	3,712,108	66.5%
Block 2	337,393	243,896	369,312	119,132	1,069,733	19.2%
Block 3	136,499	85,401	151,873	89,721	463,494	8.3%
Block 4	33,453	23,483	41,647	45,699	144,282	2.6%
Block 5	30,616	18,008	55,981	88,174	192,779	3.5%
TOTAL	2,227,086	1,232,970	1,494,491	627,849	5,582,396	
% of TOTAL	40%	22%	27%	11%	100%	

3.2 Water Demand Forecasting Method

The city's water demand forecasting method was articulated in the 2000 Treated Water Master Plan (TWMP), with a planning period of 20 years, from 2000 to 2020. Projections were made from 1999 conditions to the end of the planning period. The city Planning Department does not specify a year for build-out of the city's service area contained in the BVCP, but it is estimated that build-out will occur between 2035 and 2050.

Distribution of water demand in the city's service area was determined by examining the types of activities that take place in different areas of Boulder that affect water use, as well as the distribution of the population. General land use categories in the city's service area include residential, business, industrial, and other. The "other" category includes parks and open space, agricultural, and public uses.

Previous projections of future land use and population were derived primarily from data presented in the city's 1999 Water Conservation Futures Study. That study, in turn, relied on data from the BVCP, city of Boulder Planning Department, and the city of Boulder Center for Program and Policy Analysis. Additional information was obtained from the 1999 Summary of Information about Boulder (1999 Information Summary) published by the city's Center for Program and Policy Analysis. The Water Conservation Futures Study assumed that population would increase at an annual growth rate of 0.8 percent.

Baseline water demands for the city's urban service area were developed in the WCFS for the year 1995 based on monthly metered end use data. Various adjustments were made to

accommodate factors such as weather and unaccounted for water. Total demand and demand by various end use categories was projected from the base year 1995 through 2020. The Water Conservation Futures Study also developed demand projections for a number of water conservation scenarios of varying degrees of intensity. Ultimately, as discussed above, the Comprehensive Conservation Scenario was selected by City Council for implementation.

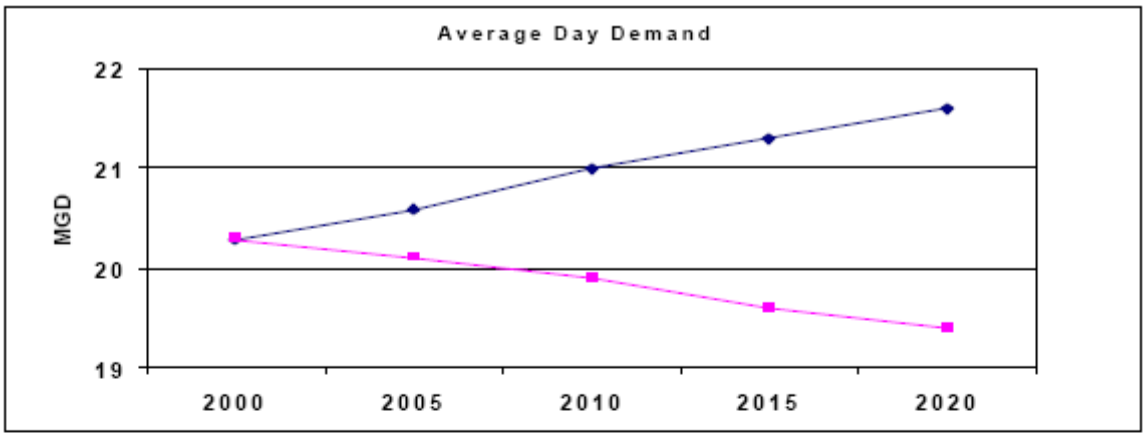
Projected population and employment estimates have subsequently been revised in the 2005 BVCP. The 2005 BVCP Update projects approximately 71,000 more jobs and 13,000 new residents at build-out than existed in 2004. Specific water demands for the updated estimates have not yet been calculated, but, based on comparison with previous population and employment projections, updated water demands will be equal to or less than prior projections.

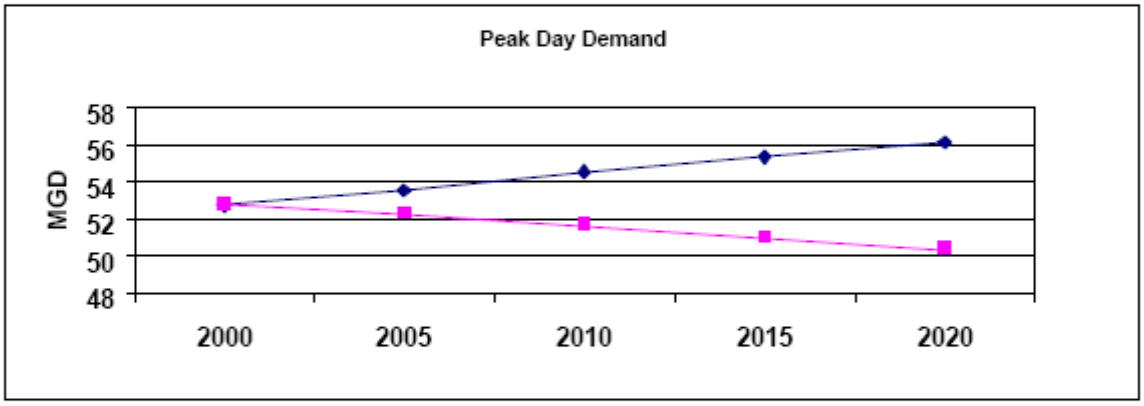
More information on the city's forecasting methods can be found in Chapter 4 of the Treated Water Master Plan. The city completed the Source Water Master Plan in April 2009 and anticipates updating the Treated Water Master Plan, including demand forecasts, within the next couple of years.

3.3 Water Demand Forecast

The WCFS recommended that the city implement the Comprehensive Conservation Scenario, which is substantially more conservation-intensive than the city's program in 1999. Figures 3.7 through 3.9 below, derived from the 2000 Treated Water Master Plan (TWMP), projected demand under then-current conditions, as well as under the Comprehensive Conservation Scenario.

Figures 3.7-3.9 Projected Average Day, Peak Day, and Peak Hour Demand with 1999 Water Conservation Program and with adoption of Comprehensive Conservation Program from the 2000 Treated Water Master Plan





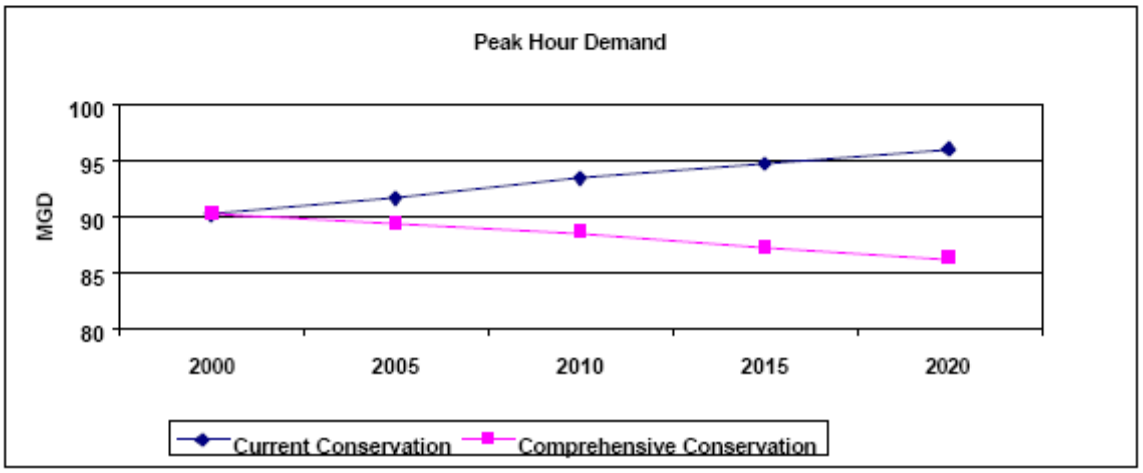


Table 3.3 provides estimates of demand by customer class.

Table 3.3: Historic and Projected Demand by Customer Class

(2000 Treated Water Master Plan)

	1995	2000	2005	2010	2015	2020
Residential						
Single-Family	8,390	8,418	8,447	8,476	8,504	8,533
Multi-Family	6,791	6,754	6,718	6,681	6,645	6,608
Total Residential	15,181	15,172	15,165	15,157	15,149	15,141
Business	6,471	6,794	7,117	7,439	7,762	8,085
Other	793	821	849	877	905	933
Total Acre-Feet	22,445	22,788	23,131	23,473	23,816	24,159
Total MGD	20.0	20.3	20.6	21.0	21.3	21.6

Actual total system water demands in 2000 and 2001 were higher than projected in the 2000 TWMP (published in early 2000 prior to availability of full data for the year.) In 2001, 23,466 acre-feet were delivered from the two water treatment facilities. Following the severe drought year of 2002, water use dropped dramatically in Boulder. Actual total system water demands in 2005 were lower than projected in the 2000 TWMP. In 2007, 18,616 acre-feet were delivered. Data from 2006 and 2007 indicate that per capita water use has remained lower than pre-drought levels. However, per capita water use at build-out is expected to be similar to pre-2000 levels simply because of the expected significant increase in the jobs to population ratio in Boulder.

The water demand projections for 2015 and 2020 are still believed to be valid. The majority of the savings from the water conservation program that were projected to occur during the 2000 to 2020 period may have been pushed to the earlier years of the period due to the drought in 2002. However, the total projected savings over the period was based on specific types and levels of fixture and behavior changes and is likely to be the same as projected. In other words, the achievement of the water conservation targets has progressed non-linearly, but the end target has not changed. Build-out water demand levels will be larger than the level shown for 2020 in the above table due to continued increases in population and employment after that time.

4.0 Proposed Facilities

4.1 Potential Facility Needs

Table 4.1 presents a summary of the capital improvements identified in the 2000 Treated Water Master Plan (TWMP), the latest planning effort to identify water system improvements in the City of Boulder (Boulder). Each item has been assigned a priority, a time frame for implementation, and a cost. Items designated as priority "A" are considered to be essential to the continued delivery of treated water that complies with all current and known future public health protection criteria and to maintain conformance with the city of Boulder's (city's) reliability and public safety criteria. Priority "B" items are important but not essential to meeting water quality or reliability standards. Most priority "B" items are associated with enhanced operability rather

than strengthening treatment barriers or improving distribution system reliability. Priority "C" items are those items that would facilitate the long-term provision of treated water service but do not warrant implementation in the short term at the expense or more essential items.

The implementation time frames indicate the relative degree of urgency associated with each item. Each item was assigned to a five year time period, either 2000 to 2005 or 2005 to 2010. Most of the items identified for 2000 to 2005 were accomplished. Scheduling a range of years for implementation allows flexible capital improvement planning by allowing adjustment based on availability of funding and human resources. In general, the implementation timing follows from the priority of the item. More urgent items need to be implemented sooner while lower priority items can be deferred.

The projected capital cost for each item is presented in third-quarter 2000 dollars. Budgeting prices were obtained from manufacturers of major pieces of equipment and allowances made for installation and miscellaneous work. Budget level estimates were also made for major structural modifications or construction.

Table 4.1: Proposed Facility Improvements

(2000 Treated Water Master Plan)

Recommended Improvements	Priority	Implementation Schedule		Projected Capital Cost
Betasso Water Treatment Facility				
Flocculation/Sedimentation Improvements				
New baffles in flocculation zone	A	2001-2003		$200,000
New baffles in sedimentation zone	A	2001-2003		$450,000
Install new sludge collection equipment	B	2000-2005		$450,000
Install new VFD flocculator drives	B	2000-2005		$200,000
Install Plate Settlers	C	2000-2005		$4,250,000
Automate chemical feed systems	C		2005-2010	$100,000
Lime feed system capacity & controls upgrades	B	2000-2005		$80,000
Upgrade pilot plant	C		2005-2010	$100,000
Instrumentation improvements	C		2005-2010	$200,000
Miscellaneous				
Filter aid polymer system	A	2000-2005		$80,000
Sludge collection equipment in backwash equalization basin	B	2000-2005		$75,000
Backwash treatment polymer system	B	2000-2005		$80,000
Relocate chlorine feed points	A	2000-2001		$40,000
Polyaluminum chloride storage & feed improvements	A	2000-2005		$60,000
Rehabilitate south sludge storage lagoon	B	2000-2005		$450,000
Replace effluent flow meters	B	2000-2005		$150,000
Boulder Reservoir Water Treatment Facility				
Canal intake improvements	C		2005-2010	$80,000
Multi-level reservoir Intake	C		2005-2010	$500,000
Rapid mix improvements	A	2000-2005		$100,000
Install tube settlers in sedimentation basin	A	2000-2005		$300,000
Provide filter-to-waste capability	B	2000-2005		$250,000
Filter backwash pretreatment facility	C		2005-2010	$1,500,000

Recommended Improvements	Priority	Implementation Schedule		Projected Capital Cost
Automate chemical feed systems	C		2005-2010	$100,000
Install pilot plant	C		2005-2010	$100,000
Instrumentation improvements	C		2005-2010	$100,000
Install VFDs on high service pumps	C		2005-2010	$80,000
Calibrate/replace effluent flow meter	B	2000-2005		$50,000
Disinfectant conversion	A	2000-2005		$750,000
Distribution System Facilities				
Parallel pipes to maintain fire flow pressures	A	2000-2005		$844,000
Zone 3 tank improvements	B	2000-2005		$355,000
System-wide zone isolation valve removal	B	2000-2005		$380,000
Parallel pipes and PRVs for high velocity problems	C		2005-2010	$2,400,000
New intermediate east zone 2	C		2005-2010	$700,000
Four Mile PRV Station replacement	A	2000-2005		$270,000
Iris Pump Station improvements	B	2000-2005		$50,000
Cherryvale Pump Station improvements	B	2000-2005		$50,000
Break prone pipe replacement	A	2000-2005		$3,150,000
Annual pipe replacement	B	2000-2005	2005-2010	$3,500,000/YR

2007 Water Utility Projects

Every year, the city prepares an Annual Report for its utilities, including the Water Utility, to provide an update on the status of capital improvement projects, among other topics. The most recent report, from 2007, identifies the following projects:

- Emphasis on the rehabilitation and improvement of the city's existing water system infrastructure continues, especially in the area of the deteriorated water distribution system. This priority is reflected in the significant funding for ongoing waterline replacement and several other rehabilitation projects to various water system facilities.

- Continued progress was made on the multi-year project to repair the facilities comprising the Barker Water System. Repairs to this water system are necessary to assure safe and reliable water deliveries to the Betasso WTF from Barker Reservoir. Priority work included repairs to the Barker Gravity Pipeline and the Boulder Canyon Hydro penstock.

- Funding was allocated for improvements to the Boulder Reservoir WTF. This work is necessary to expand the treatment capacity in compliance with federal Safe Drinking Water Act regulations. Work at the Boulder Reservoir WTF (and Boulder Reservoir Intake and Pumping, Iris Pump Station, and Cherryvale Pump Station) was prompted by staff review of the city's water delivery system in light of recent drought conditions. Water from the Northern Colorado Water Conservancy District (NCWCD) Colorado Big-Thompson Project will play an increasingly important role in the city's overall water system deliveries. This water is treated and delivered through these facilities and expansion of the treatment capacity is necessary due to this situation.

- Funding was allocated for the next phase (mid-term phase) of improvements to the Betasso WTF which will occur in 2010-2012. A recent analysis indicates that existing treatment processes will be adequate to meet water demands in compliance with federal Safe Drinking Water Act regulations until that time.

- Additional funding for planning was allocated for the NCWCD Carter Lake Pipeline. Whereas water conveyed by the Boulder Feeder Canal is subject to water quality concerns, water conveyed by a pipeline would be protected from contaminants. The NCWCD completed a feasibility study for a new pipeline from Carter Lake. The city is currently participating in the NCWCD-sponsored preliminary design along with other water providers, although work was temporarily suspended in early 2006 to allow additional time for water providers to evaluate participation in the project. Utilities Division staff is also evaluating various water source protection and treatment alternatives and a final report was developed in 2007. City staff also pursued Federal funding for this project.

4.2 Incremental Cost Analysis, and Preliminary Capacity and Cost Forecasts

No new system-level supply capacity is anticipated in the foreseeable future. Total system treated water demand is expected to increase by approximately 20 to 30% between current conditions and projected build-out sometime in the 2035 to 2050 timeframe. It is expected that this increase can be accommodated within existing system capacity although improvements may be required to system facilities for increased function and flexibility or to WTFs to meet new drinking water standards.

5.0 Conservation Goals

5.1 Water Conservation Goals

Following presentation of the 1999 Conservation Futures Study and the 2000 Treated Water Master Plan (TWMP) to City Council in 2000, City Council adopted the Comprehensive Conservation Scenario, as identified in the Water Conservation Futures Study, as a goal for the city of Boulder (city). This goal is based on the city's existing supply, forecasted demand, and extensive public input from the citizens of the City of Boulder who have long supported a comprehensive approach to conservation. The development of a program to implement the goal will continue to be refined over time. For example, in early 2009 the Source Water Master Plan was completed and the 2000 TWMP is anticipated to be updated in the next couple of years, which will include an evaluation of the role of conservation in meeting the city's water needs and responding to future conditions, such as climate change.

An overall programmatic goal of the city is to continue to evolve its already extensive comprehensive water conservation program for indoor and outdoor water use to achieve or exceed the overall reduction of water use needs at build-out as specified in the Comprehensive Conservation Scenario identified in the 2000 TWMP and Conservation Futures Study. The city will also continue to seek new and improved ways to meet its goal.

Implementation of the Comprehensive Conservation Scenario elements should result in achieving the following specific performance targets by build-out, projected for 2035 to 2050. These targets include:

- A 22 percent reduction in per meter use for the single-family residential sector;
- A 26 percent reduction in per meter use for multifamily residential sector;
- A 14 percent reduction in per meter use for the commercial/industrial sector;
- A 1 percent reduction in overall municipal use, and
- A 15 percent reduction in real and apparent losses of water.

Achievement of these targets will result in an expected overall reduction in total demand in the range of 19 percent at build-out as compared to water use at build-out absent the Comprehensive Conservation Program. Per capita water use at build-out may be greater than 2007 levels due to increases in the population to jobs ratio, but will be less than without the water conservation program. An additional city goal that has emerged from the implementation of water budget-based rates in 2007 is for all water customers in the service area to stay within their allocated water budget.

5.2 Goal Development Process

The city recognizes that the development of water conservation goals is an iterative process. It requires identifying needs for demand management based on water supply limitations and other considerations, followed by a review of the available implementation resources and legal limitations that may exist and ultimately impact conservation implementation. Goals may need to be revised after completion of revised forecasts, which will be completed as recommended in the 2009 Source Water Master Plan. Once this Water Conservation Plan is implemented, the targets discussed above will be revised based on the monitoring, evaluation, and revision of tasks that follow in an adaptive management approach. Extensive public input will also be an important part of the examination of goals and ultimate selection of conservation measures.

6.0 Conservation Measures and Programs

6.1 Ongoing Conservation Measures and Programs

The City of Boulder currently has a number of water conservation efforts that are based on the City Council-adopted Comprehensive Conservation Scenario and cover a wide range of topic areas and customer classes. The city's first water conservation efforts date back to 1988, when the city increased block rates, developed water bill inserts, and held spring xeriscape seminars (see Figure 6.1).

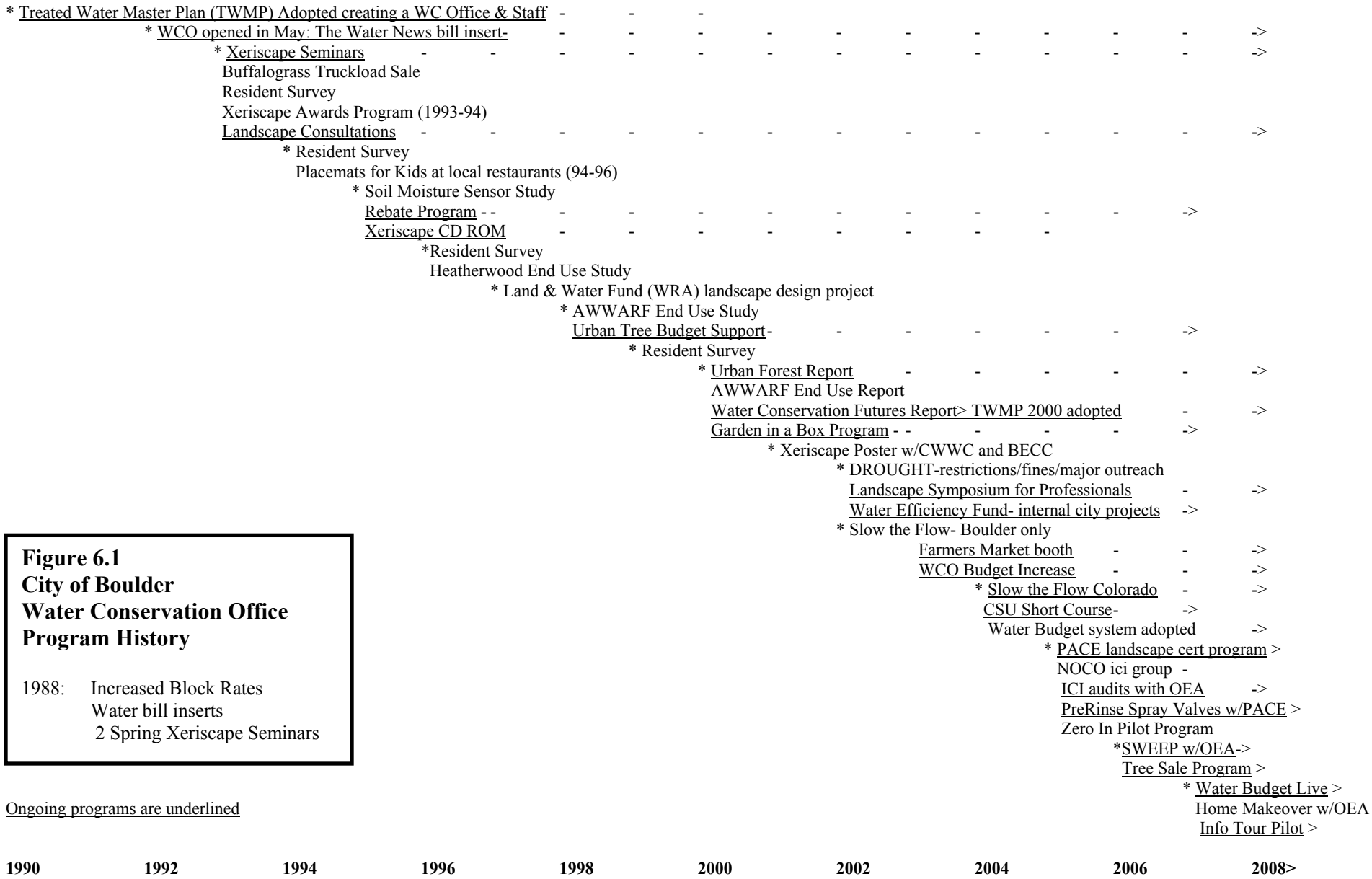


Figure 6.1
City of Boulder
Water Conservation Office
Program History

1988: Increased Block Rates
Water bill inserts
2 Spring Xeriscape Seminars

Ongoing programs are underlined

Many of these programs have been functional for several years, and the city intends to continue these programs into the future. See Table 2-10 for additional description of conservation measures, both past and on-going. Current programs will continue to be evaluated on effectiveness, and modified as necessary.

The budget for the city's Water Conservation Office for 2008, including personnel and programs, was approximately $ 453,000, and is similar for 2009.

6.2 Screening Criteria for Conservation Measures

As the water conservation program has evolved since the acceptance of the Water Conservation Futures Study and the 2000 TWMP by City Council and the adoption of the Water Conservation Program, the city has developed a number of criteria to screen both existing programs and potential new programs. These criteria include the following:

- The customers impacted by the measure;
- The potential water savings on a scale of 1 (limited savings) to 5 (significant savings);
- Likelihood of adoption and ease of implementation.
- Technical & community support available: products, training, and service
- Drought response benefit; and
- Program costs.

6.3 Screen Conservation Measures and Programs

Applying the screening criteria above, the city will screen its conservation measures both quantitatively and qualitatively using a method like that shown in Table 6.1.

Table 6.1: Water Conservation Measures Screening Tool

Measures	Current Measure	Customers Impacted	Water Savings	Ease of Adoption/ Implementation	Technical/ Community Support	Drought Response Benefit	Program Costs
1.Education and Public Information							
a							
b							
c							
2. Water Rates and Usage Information							
a							
b							
c							

7.0 Selection of Conservation Measures and Programs

7.1 Create Combinations of Measures and Programs

As shown in Table 6.1, above, the city of Boulder (city) has combined and grouped conservation measures and programs to allow for a more integrated assessment of the potential benefits that may be derived from their implementation. This is done because measures and programs are often used in conjunction with one another, and to avoid double-counting of water savings or implementation costs. Table 2.9 describes each ongoing measure, measure/program, or group of measures/programs, including the anticipated scale of the program and its effectiveness.

7.2 Estimate Costs and Water Savings of Conservation Options

The 1999 Water Conservation Futures Study (WCFS) included extensive information on installation rates, unit costs, and savings for the various conservation elements included in the Comprehensive Conservation Scenario.

7.3 Benefits and Costs

The 1999 WCFS includes an extensive evaluation of many of the city's ongoing conservation measures and programs, including their costs and net benefits.

7.4 Evaluation Criteria

Table 6.1 identifies the criteria that the city will continue to use to screen and evaluate conservation measures. In addition, ongoing dialogue among the public, city staff, and elected officials will play an important role in the ultimate use of future conservation measures.

7.5 Select Conservation Measures and Programs

The 1999 WCFS includes an extensive evaluation of many of the city's ongoing conservation measures and programs, including those that were considered but not implemented during the selection process. That study also includes estimated water savings of selected measures and other considerations. It is anticipated that as the city moves forward with its water system and conservation planning process, it will similarly evaluate potential conservation measures and subject them to a selection process.

8.0 Integrate Resources and Modify Forecasts

This section of the Water Conservation Plan addresses five main topics:

- Revise demand forecasts;
- Identify project-specific savings;
- Revise supply capacity forecasts;
- Summarize forecast modifications and benefits of conservation; and
- Consider revenue effects.

The city currently has many ongoing water system projects and water conservation programs, as well as long-range planning documents, including the 2000 Treated Water Master Plan and the 2009 Source Water Master Plan. Some issues have evolved since the preparation of the previous

1988 Raw Water Master Plan, the 1999 Water Conservation Futures Study and the 2000 Treated Water Master Plan. These include the drought of 2002, a 2005 update to the BVCP with changes to projected population and employment at build-out, and implementation of the 2007 water budget rate structure which is expected to further encourage conservation. These considerations will be integrated into modified demand forecasts in future master plan updates. The Source Water Master Plan was completed in April 2009 and it is anticipated the Treated Water Master Plan will be updated in the next couple of years. During these planning processes, demand forecasts will be revised to account for changes in projected population and employment estimates for build-out conditions, current levels of water use, and expected water savings due to water conservation measures to be employed in the future.

Also, the city will identify the anticipated effects of conservation on the capacity needed for proposed water system improvements that are sized based on demand requirements. This will include evaluating the extent to which conservation efforts might enable elimination, downsizing, or postponement of capital projects during the planning period. Potential savings in capital and operating costs will also be identified. This information may be used to revise project capacities, if appropriate. Graphs showing anticipated demand and anticipated supply with and without implementation of the selected conservation measures and programs will be revised, and a revenue analysis similar to the one included in the 2000 Treated Water Master Plan will be prepared.

9.0 Implementation Plan

9.1 Develop Implementation Schedule

As existing and potential new conservation programs are evaluated over time, the city of Boulder (city) will identify significant implementation actions for each selected conservation measure or combination of measures and programs, including implementation opportunities and challenges and an overall schedule. Table 9.1 indicates the city's schedule for this Water Conservation Plan review and approval.

Table 9.1 Major Milestones for Water Conservation Plan Review and Approval

Element	Approximate Timeline
City Water Resources Advisory Board Review	February 2008 meeting
Public Comment Period and Feedback	March 10, 2008 - April 14, 2008 (Posted on city Web site) Daily Camera newspaper ads - March 16, March 23, and April 13, 2008
Colorado Water Conservation Board Review	May 2008 - February 2009
Resubmit Water Conservation Plan for Public Comment per Colorado Water Conservation Board Recommendation	May 5, 2009 - May 29, 2009 (Posted on city Web) Daily Camera newspaper ads – May 11 and May 13, 2009
Resubmit to Colorado Water Conservation Board for Review	August 2009

9.2 Develop Plan for Public Participation in Implementation

As the city moves forward with its water system planning and conservation activities, a public participation plan will be developed for involving the public in the planning process. This plan will include touch points for public participation, including meetings, newsletters, surveys, and other methods. The city is committed to engaging the public in its conservation planning on an early and ongoing basis, as well as involving the public in implementation, monitoring, and evaluation to the extent appropriate. The public was actively involved in the development of the Source Water Master Plan through a series of Community Study Group meetings, and a public involvement process will be implemented when the Treated Water Master Plan is updated.

9.3 Develop Plan for Monitoring and Evaluation Processes

As shown in Table 2.10, the city has already established several conservation programs and methods to track progress, including level of involvement and actual water savings. The city generally collects data on the effectiveness of conservation measures using rebate counts, seminar attendance, audits performed and occasional customer surveys. It is anticipated that this monitoring and evaluation process will continue, and will evolve as new conservation programs are developed or existing programs revised.

9.4 Develop Plan for Updating and Revising the Conservation Plan

In the next couple of years, the city will embark on an update of the 2000 Treated Water Master Plan. At that time, the Water Conservation Plan may be revisited and updated to incorporate updated demand forecasts, system issues, regional conditions, and public input.

9.5 Define Plan Adoption Date/Plan Completed Date/Plan Approved Date

Approval of the Water Conservation Plan by the Colorado Water Conservation Board is anticipated to occur by fall 2009.

10.0 Monitoring and Evaluation

The success of the Water Conservation Plan depends on establishing an effective monitoring and evaluation process. As shown in this document and other documents incorporated by reference (1999 Water Conservation Futures Study and 2000 Treated Water System Master Plan), the city of Boulder (city) already has in place systems to collect and track data, including its conservation programs (Table 2.10). As the city continues to acquire more data, correlation between water demands and conservation measures/ programs may be established which will improve the ability to assess the effectiveness of the Water Conservation Plan.

Monitoring of the city's water conservation progress can be carried out in a variety of ways, including, but not limited to, the tracking of billing system data, daily water and wastewater treatment plant production, daily operations of the city's raw water supply system, annual program costs, number of conservation rebates, and feedback from the public. The city will collect data periodically, much of it on an annual basis, and use the data to evaluate program effectiveness, and make adjustments if necessary.

11.0 References

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Appendix A: 1999-2007 Revenues and Consumption by Customer Class

2007 REVENUES BY CUSTOMER CLASS

	Single-Family Residential	Multifamily Residential	Comm/Industrial/ Institutional	Metered Irrigation	Total
WATER					
Bulk Water	4,616		85,448		90,064
Administrative Fees			360		360
Inside City					
Meter Service Charge	2,292,631	737,644	747,372	247,994	4,025,430
Block 1 Inside City	3,035,746	1,529,648	1,571,834	522,901	6,660,129
Block 2 Inside City	802,511	599,413	902,266	290,558	2,594,747
Block 3 Inside City	650,824	418,690	744,627	436,790	2,250,930
Block 4 Inside City	240,113	173,670	306,825	335,610	1,056,218
Block 5 Inside City	373,775	224,884	687,938	1,083,113	2,369,709
Subtotal Inside City	7,395,599	3,683,949	4,960,862	2,916,965	18,957,164
Outside City					
Meter Service Charge	132,115	30,428	23,807	6,244	192,595
Block 1 Outside City	138,665	91,250	53,629	13,130	296,674
Block 2 Outside City	41,137	10,215	21,380	7,273	80,005
Block 3 Outside City	31,355	8,435	15,500	11,815	67,105
Block 4 Outside City	10,785	2,453	5,528	7,133	25,898
Block 5 Outside City	8,925	213	11,825	19,063	40,025
Subtotal Outside City	362,983	142,993	131,668	64,657	702,300
Subtotal Water	7,763,197	3,826,942	5,178,338	2,981,622	19,749,888
Adjustments	*(101,530)*	*(96,810)*	*(129,377)*	*(104,026)*	*(431,743)*
YE BFS Adj & Misc Interest Adj					*66,897*
TOTAL WATER	7,661,667	3,730,132	5,048,961	2,877,596	19,385,042
	39.52%	19.24%	26.05%	14.84%	
WASTEWATER					
Administrative Fees			420		420
City Adjustment					-3,898
Inside City	3,927,890	3,293,435	4,694,621	3,404	11,919,349
Outside City	273,428	109,639	118,182		501,250
Subtotal Wastewater	4,201,318	3,403,074	4,813,224	3,404	12,417,121
(Adjustments)	*(14,241)*	*(6,084)*	*(7,619)*	*(8,530)*	*(36,474)*
TOTAL WASTEWATER	4,187,078	3,396,990	4,805,604	-5,126	12,380,648
	33.82%	27.44%	38.82%	-0.04%	

2007 CONSUMPTION BY CUSTOMER CLASS

	Single Family Residential	Multi Family Residential	Comm/Industrial/ Institutional	Metered Irrigation	TOTAL
WATER					
Bulk Water	577		10,681		11,258
Inside City					
Block 1 Inside City	1,614,768	813,645	836,090	278,139	3,542,642
Block 2 Inside City	320,907	239,810	360,518	116,223	1,037,458
Block 3 Inside City	130,205	83,714	148,755	87,358	450,032
Block 4 Inside City	32,015	23,156	40,910	44,748	140,829
Block 5 Inside City	29,902	17,991	55,035	86,649	189,577
Subtotal Inside City	2,127,797	1,178,316	1,441,308	613,117	5,360,538
Outside City					
Block 1 Outside City	73,780	48,537	28,907	6,984	158,208
Block 2 Outside City	16,486	4,086	8,794	2,909	32,275
Block 3 Outside City	6,294	1,687	3,118	2,363	13,462
Block 4 Outside City	1,438	327	737	951	3,453
Block 5 Outside City	714	17	946	1,525	3,202
Subtotal Outside City	98,712	54,654	42,502	14,732	210,600
TOTAL WATER	2,227,086	1,232,970	1,494,491	627,849	5,582,396
	39.89%	22.09%	26.77%	11.25%	
WASTEWATER					
Inside City	1,065,948	921,559	1,321,954	956	3,310,417
Outside City	49,348	20,291	22,261		91,900
TOTAL WASTEWATER	1,115,296	941,850	1,344,215	956	3,402,317
	32.78%	27.68%	39.51%	0.03%	

2006 REVENUES BY CUSTOMER CLASS 13-Apr-07

	Single-Family Residential	Multi-Family Residential	Commercial\ Industrial	Sprinkler	TOTAL
WATER					
INSIDE CITY					
Service Charge	2,199,025	704,682	718,760	384,320	4,006,807
Block 1	2,141,475	1,656,469	1,653,461	(1,161,434)	4,489,990
Block 2	3,001,049	1,046,955	1,222,428	1,717,865	6,988,297
Block 3	1,543,599	208,901	597,830	2,778,822	5,129,152
subtotal inside city	8,885,149	3,617,005	4,392,519	3,719,574	20,614,247
OUTSIDE CITY					
Service Charge	127,460	29,971	23,713	5,821	186,965
Block 1	86,018	43,582	52,582	0	182,182
Block 2	103,009	68,493	54,137	25,133	250,773
Block 3	118,362	41,013	35,629	57,373	252,378
subtotal outside city	434,849	183,060	166,061	88,328	872,297
TOTAL WATER	9,319,998	3,800,065	4,558,580	3,807,901	21,486,544
% of TOTAL	43.38%	17.69%	21.22%	17.72%	100.00%
WASTEWATER					
INSIDE CITY	3,763,079	3,053,126	4,470,375	1,713	11,288,292
OUTSIDE CITY	271,254	130,062	97,730	5	499,051
TOTAL WASTEWATER	4,034,333	3,183,188	4,568,105	1,718	11,787,343
% of TOTAL	34.23%	27.01%	38.75%	0.01%	100.00%

2006 CONSUMPTION BY CUSTOMER CLASS 13-Apr-07
per thousand gallons

	Single-Family Residential	Multi-Family Residential	Commercial\ Industrial	Sprinkler	TOTAL
WATER					
INSIDE CITY					
Block 1	1,149,643	671,407	1,054,317	249	3,075,616
Block 2	833,540	289,021	338,267	477,166	1,937,993
Block 3	259,667	34,988	100,373	466,875	861,903
subtotal inside city	2,242,850	1,195,416	1,492,957	944,289	5,875,512
OUTSIDE CITY					
Block 1	46,554	23,558	29,508	0	99,620
Block 2	38,990	20,785	16,837	6,982	83,594
Block 3	19,886	6,893	6,097	9,643	42,519
subtotal outside city	105,430	51,236	52,442	16,624	225,732
TOTAL WATER	2,348,280	1,246,652	1,545,399	960,913	6,101,244
% of TOTAL	38.49%	20.43%	25.33%	15.75%	100.00%
WASTEWATER					
INSIDE CITY	1,106,269	914,168	1,372,604	687	3,393,728
OUTSIDE CITY	53,156	26,196	20,351	1	99,704
TOTAL WASTEWATER	1,159,425	940,364	1,392,955	688	3,493,432
% of TOTAL	33.19%	26.92%	39.87%	0.02%	100.00%

REVENUES BY CUSTOMER CLASS 28-Mar-06

Total Revenue for January 2005 through December 2005

	Single-Family Residential	Trailer Parks & Districts	Multi-Family Residential	Commercial\ Industrial	Sprinkler	TOTAL
WATER						
INSIDE CITY						
Service Charge	$1,967,119	$40,478	$905,580	$665,014	$226,394	$3,804,585
Block 1	1,844,496	150,133	1,709,420	1,701,482	4,758	5,410,289
Block 2	2,484,921	61,105	964,737	1,035,646	1,060,718	5,607,127
Block 3	1,155,317	(586)	167,304	447,367	1,720,784	3,490,186
subtotal inside city	$7,451,853	$251,131	$3,747,041	$3,849,509	$3,012,654	$18,312,187
OUTSIDE CITY						
Service Charge	$114,008	$22,821	$15,977	$23,454	$5,789	$182,048
Block 1	75,045	27,564	11,114	36,642	(155)	150,211
Block 2	117,453	43,845	5,898	80,353	22,960	270,508
Block 3	80,239	27,143	638	20,993	41,411	170,425
subtotal outside city	$386,746	$121,373	$33,626	$161,442	$70,005	$773,192
TOTAL WATER	$7,838,598	$372,504	$3,780,667	$4,010,951	$3,082,659	$19,085,380
% of TOTAL	41.07%	1.95%	19.81%	21.02%	16.15%	100.00%
WASTEWATER						
INSIDE CITY	$2,898,974	$257,333	$2,669,912	$3,545,132	$18,683	$9,390,035
OUTSIDE CITY	210,341	83,771	28,270	88,559	3,520	414,462
TOTAL WASTEWATER	$3,109,316	$341,104	$2,698,183	$3,633,691	$22,204	$9,804,497
% of TOTAL	31.71%	3.48%	27.52%	37.06%	0.23%	100.00%

CONSUMPTION BY CUSTOMER CLASS 28-Mar-06

Thousands of Gallons for January 2005 through December 2005

	Single-Family Residential	Trailer Parks & Districts	Multi-Family Residential	Commercial\ Industrial	Sprinkler	TOTAL
WATER						
INSIDE CITY						
Block 1	1,046,216	86,239	982,204	973,334	672	3,088,665
Block 2	710,305	17,066	275,637	290,815	302,732	1,596,555
Block 3	202,659	(137)	29,096	78,024	302,368	612,010
subtotal inside city	1,959,180	103,168	1,286,937	1,342,173	605,772	5,297,230
OUTSIDE CITY						
Block 1	42,742	15,751	6,360	31,423	10	96,286
Block 2	33,497	12,527	1,685	22,978	6,560	77,247
Block 3	14,138	4,762	112	3,700	7,265	29,977
subtotal outside city	90,377	33,040	8,157	58,101	13,835	203,510
TOTAL WATER	2,049,557	136,208	1,295,094	1,400,274	619,607	5,500,740
% of TOTAL	37.26%	2.48%	23.54%	25.46%	11.26%	100.00%
WASTEWATER						
INSIDE CITY	989,549	88,812	955,491	1,290,614	6,762	3,331,228
OUTSIDE CITY	49,037	19,627	6,620	21,403	851	97,538
TOTAL WASTEWATER	1,038,586	108,439	962,111	1,312,017	7,613	3,428,766
% of TOTAL	30.29%	3.16%	28.06%	38.26%	0.22%	100.00%

2004 REVENUES BY CUSTOMER CLASS 29-Nov-07

	Single-Family Residential	Trailer Parks & Districts	Multi-Family Residential	Commercial\ Industrial	Sprinkler	TOTAL
WATER						
INSIDE CITY						
Service Charge	$1,928,522	$35,616	$878,371	$642,778	$214,875	$3,700,162
Block 1	1,751,042	112,595	1,767,730	1,598,886	9,807	5,240,060
Block 2	1,915,718	81,286	757,290	871,619	892,702	4,518,615
Block 3	546,346	7,772	108,085	361,448	1,157,602	2,181,253
subtotal inside city	$6,141,628	$237,269	$3,511,476	$3,474,731	$2,274,986	$15,640,090
OUTSIDE CITY						
Service Charge	$112,565	$19,288	$15,954	$22,894	$5,640	$176,341
Block 1	72,291	21,779	10,068	42,412	0	146,550
Block 2	94,635	41,385	6,147	48,854	20,080	211,101
Block 3	45,858	27,352	1,987	10,439	22,565	108,201
subtotal outside city	$325,349	$109,804	$34,156	$124,599	$48,285	$642,193
TOTAL WATER	$6,466,977	$347,073	$3,545,632	$3,599,330	$2,323,271	$16,282,283
% of TOTAL	39.72%	2.13%	21.78%	22.11%	14.27%	100.00%
WASTEWATER						
INSIDE CITY	$2,448,421	$172,997	$2,304,362	$2,973,602	$11,227	$7,910,609
OUTSIDE CITY	190,864	58,250	26,070	73,892	2,462	351,538
TOTAL WASTEWATER	$2,639,285	$231,247	$2,330,432	$3,047,494	$13,689	$8,262,147
% of TOTAL	31.94%	2.80%	28.21%	36.89%	0.17%	100.00%

2004 CONSUMPTION BY CUSTOMER CLASS 29-Nov-07

per thousand gallons

	Single-Family Residential	Trailer Parks & Districts	Multi-Family Residential	Commercial\ Industrial	Sprinkler	TOTAL
WATER						
INSIDE CITY						
Block 1	1,048,758	69,689	1,071,635	951,740	33	3,141,855
Block 2	577,934	24,632	229,982	268,230	270,847	1,371,625
Block 3	75,951	1,374	18,648	68,610	207,745	372,328
subtotal inside city	1,702,643	95,695	1,320,265	1,288,580	478,625	4,885,808
OUTSIDE CITY						
Block 1	43,600	13,201	6,099	26,450	0	89,350
Block 2	28,690	12,541	1,863	15,411	6,085	64,590
Block 3	8,279	4,973	351	1,912	4,092	19,607
subtotal outside city	80,569	30,715	8,313	43,773	10,177	173,547
TOTAL WATER	1,783,212	126,410	1,328,578	1,332,353	488,802	5,059,355
% of TOTAL	35.25%	2.50%	26.26%	26.33%	9.66%	100.00%
WASTEWATER						
INSIDE CITY	1,027,051	74,842	998,316	1,304,079	4,858	3,409,146
OUTSIDE CITY	48,955	14,986	6,930	21,584	716	93,171
TOTAL WASTEWATER	1,076,006	89,828	1,005,246	1,325,663	5,574	3,502,317
% of TOTAL	30.72%	2.56%	28.70%	37.85%	0.16%	100.00%

2003 REVENUES BY CUSTOMER CLASS 29-Nov-07

	Single-Family Residential	Trailer Parks & Districts	Multi-Family Residential	Commercial\ Industrial	Sprinkler	TOTAL
WATER						
INSIDE CITY						
Service Charge	$1,921,463	$35,830	$853,819	$646,538	$210,621	$3,668,270
Block 1	1,837,699	107,656	1,849,032	1,677,231	20,127	5,491,745
Block 2	2,372,779	66,526	919,679	871,206	978,028	5,208,217
Block 3	1,207,449	14,253	163,623	220,088	1,732,909	3,338,321
subtotal inside city	$7,339,389	$224,265	$3,786,152	$3,415,063	$2,941,684	$17,706,553
OUTSIDE CITY						
Service Charge	$112,826	$19,203	$18,168	$23,624	$5,655	$179,477
Block 1	77,217	23,873	33,264	47,867	14	182,235
Block 2	115,182	40,240	22,918	38,093	21,705	238,138
Block 3	93,991	41,109	53	3,540	43,096	181,789
subtotal outside city	$399,217	$124,425	$74,403	$113,125	$70,469	$781,639
TOTAL WATER	$7,738,606	$348,691	$3,860,555	$3,528,187	$3,012,153	$18,488,192
% of TOTAL	41.86%	1.89%	20.88%	19.08%	16.29%	100.00%
WASTEWATER						
INSIDE CITY	$2,418,453	$148,264	$2,210,602	$2,950,391	$13,247	$7,740,956
OUTSIDE CITY	193,098	58,721	29,166	64,396	2,434	347,815
TOTAL WASTEWATER	$2,611,550	$206,985	$2,239,768	$3,014,786	$15,681	$8,088,771
% of TOTAL	32.29%	2.56%	27.69%	37.27%	0.19%	100.00%

2003 CONSUMPTION BY CUSTOMER CLASS 29-Nov-07

per thousand gallons

	Single-Family Residential	Trailer Parks & Districts	Multi-Family Residential	Commercial\ Industrial	Sprinkler	TOTAL
WATER						
INSIDE CITY						
Block 1	1,103,927	65,246	1,123,508	1,001,820	(226)	3,294,275
Block 2	685,488	19,173	273,125	287,490	291,983	1,557,259
Block 3	170,000	2,045	24,147	50,114	247,139	493,445
subtotal inside city	1,959,415	86,464	1,420,780	1,339,424	538,896	5,344,979
OUTSIDE CITY						
Block 1	46,638	14,469	20,107	24,104	0	105,318
Block 2	34,385	11,411	6,891	9,993	6,364	69,044
Block 3	13,910	7,374	12	965	6,245	28,506
subtotal outside city	94,933	33,254	27,010	35,062	12,609	202,868
TOTAL WATER	2,054,348	119,718	1,447,790	1,374,486	551,505	5,547,847
% of TOTAL	37.03%	2.16%	26.10%	24.78%	9.94%	100.00%
WASTEWATER						
INSIDE CITY	1,086,298	69,229	1,023,919	1,379,135	6,146	3,564,727
OUTSIDE CITY	52,585	17,105	8,159	19,756	752	98,357
TOTAL WASTEWATER	1,138,883	86,334	1,032,078	1,398,891	6,898	3,663,084
% of TOTAL	31.09%	2.36%	28.18%	38.19%	0.19%	100.00%

2002 REVENUES BY CUSTOMER CLASS 29-Nov-07

	Single-Family Residential	Trailer Parks & Districts	Multi-Family Residential	Commercial\ Industrial	Sprinkler	TOTAL
WATER						
INSIDE CITY						
Service Charge	$1,915,505	$35,592	$842,600	$636,677	$207,253	$3,637,627
Block 1	1,893,857	135,642	1,876,823	1,775,423	4,880	5,686,625
Block 2	2,115,764	74,279	819,471	892,129	756,303	4,657,946
Block 3	505,945	408	92,401	183,843	491,629	1,274,226
subtotal inside city	$6,431,071	$245,921	$3,631,295	$3,488,072	$1,460,065	$15,256,424
OUTSIDE CITY						
Service Charge	$113,110	$20,791	$15,927	$22,848	$5,394	$178,070
Block 1	81,372	24,852	13,665	35,914	0	155,803
Block 2	107,559	55,418	3,151	22,722	18,681	207,531
Block 3	40,501	9,979	192	6,273	7,094	64,039
subtotal outside city	$342,542	$111,040	$32,935	$87,757	$31,169	$605,443
TOTAL WATER	$6,773,613	$356,961	$3,664,230	$3,575,829	$1,491,234	$15,861,867
% of TOTAL	42.70%	2.25%	23.10%	22.54%	9.40%	100.00%
WASTEWATER						
INSIDE CITY	$2,243,253	$170,494	$2,053,548	$2,872,778	$12,333	$7,352,406
OUTSIDE CITY	180,991	61,030	27,580	61,065	1,868	332,534
TOTAL WASTEWATER	$2,424,244	$231,524	$2,081,128	$2,933,843	$14,201	$7,684,940
% of TOTAL	31.55%	3.01%	27.08%	38.18%	0.18%	100.00%

2002 CONSUMPTION BY CUSTOMER CLASS 29-Nov-07

per thousand gallons

	Single-Family Residential	Trailer Parks & Districts	Multi-Family Residential	Commercial\ Industrial	Sprinkler	TOTAL
WATER						
INSIDE CITY						
Block 1	1,166,549	84,776	1,161,346	1,087,197	716	3,500,584
Block 2	742,251	26,063	281,457	309,465	265,893	1,625,129
Block 3	118,128	96	21,494	42,967	115,659	298,344
subtotal inside city	2,026,928	110,935	1,464,297	1,439,629	382,268	5,424,057
OUTSIDE CITY						
Block 1	50,810	15,590	8,399	22,959	0	97,758
Block 2	37,757	19,484	1,149	8,032	6,554	72,976
Block 3	9,589	2,348	45	1,476	1,669	15,127
subtotal outside city	98,156	37,422	9,593	32,467	8,223	185,861
TOTAL WATER	2,125,084	148,357	1,473,890	1,472,096	390,491	5,609,918
% of TOTAL	37.88%	2.64%	26.27%	26.24%	6.96%	100.00%
WASTEWATER						
INSIDE CITY	1,125,260	89,641	1,065,794	1,510,056	6,508	3,797,259
OUTSIDE CITY	55,004	20,034	8,634	21,028	642	105,342
TOTAL WASTEWATER	1,180,264	109,675	1,074,428	1,531,084	7,150	3,902,601
% of TOTAL	30.24%	2.81%	27.53%	39.23%	0.18%	100.00%

2001 REVENUES BY CUSTOMER CLASS 29-Nov-07

	Single-Family Residential	Trailer Parks & Districts	Multi-Family Residential	Commercial\ Industrial	Sprinkler	TOTAL
WATER						
INSIDE CITY						
Service Charge	$1,764,893	$33,023	$768,184	$586,837	$188,523	$3,341,460
Block 1	1,836,075	136,801	1,871,395	1,674,382	(5,225)	5,513,428
Block 2	2,219,440	110,988	902,246	864,204	847,206	4,944,084
Block 3	1,021,533	11,862	154,145	333,526	1,193,788	2,714,854
subtotal inside city	$6,841,941	$292,674	$3,695,970	$3,458,949	$2,224,292	$16,513,826
OUTSIDE CITY						
Service Charge	$104,576	$19,782	$14,956	$24,636	$4,656	$168,606
Block 1	76,634	17,253	11,773	39,446	1,874	146,980
Block 2	108,483	39,703	4,938	29,756	13,993	196,873
Block 3	80,345	42,803	0	9,110	30,260	162,518
subtotal outside city	$370,038	$119,541	$31,667	$102,948	$50,783	$674,977
TOTAL WATER	$7,211,979	$412,215	$3,727,637	$3,561,897	$2,275,075	$17,188,803
% of TOTAL	41.96%	2.40%	21.69%	20.72%	13.24%	100.00%
WASTEWATER						
INSIDE CITY	$2,080,004	$161,622	$1,968,484	$2,623,227	$10,372	$6,843,709
OUTSIDE CITY	191,534	45,310	25,541	61,578	2,823	326,786
TOTAL WASTEWATER	$2,271,538	$206,932	$1,994,025	$2,684,805	$13,195	$7,170,495
% of TOTAL	31.68%	2.89%	27.81%	37.44%	0.18%	100.00%

2001 CONSUMPTION BY CUSTOMER CLASS 29-Nov-07

per thousand gallons

	Single-Family Residential	Trailer Parks & Districts	Multi-Family Residential	Commercial\ Industrial	Sprinkler	TOTAL
WATER						
INSIDE CITY						
Block 1	1,218,108	91,192	1,237,540	1,099,476	593	3,646,909
Block 2	874,284	43,524	353,895	336,681	332,099	1,940,483
Block 3	262,750	3,081	40,068	89,943	310,078	705,920
subtotal inside city	2,355,142	137,797	1,631,503	1,526,100	642,770	6,293,312
OUTSIDE CITY						
Block 1	51,676	11,501	7,874	26,837	0	97,888
Block 2	42,564	15,570	1,936	11,669	5,690	77,429
Block 3	20,923	11,118	0	2,366	8,283	42,690
subtotal outside city	115,163	38,189	9,810	40,872	13,973	218,007
TOTAL WATER	2,470,305	175,986	1,641,313	1,566,972	656,743	6,511,319
% of TOTAL	37.94%	2.70%	25.21%	24.07%	10.09%	100.00%
WASTEWATER						
INSIDE CITY	1,165,719	96,509	1,159,113	1,521,459	6,072	3,948,872
OUTSIDE CITY	56,750	14,989	7,733	23,006	1,084	103,562
TOTAL WASTEWATER	1,222,469	111,498	1,166,846	1,544,465	7,156	4,052,434
% of TOTAL	30.17%	2.75%	28.79%	38.11%	0.18%	100.00%

2000 REVENUES BY CUSTOMER CLASS 29-Nov-07

	Single-Family Residential	Trailer Parks & Districts	Multi-Family Residential	Commercial\ Industrial	Sprinkler	TOTAL
WATER						
INSIDE CITY						
Service Charge	$1,520,123	$28,548	$663,625	$499,497	$160,900	$2,872,693
Block 1	1,972,036	140,383	1,876,770	1,732,794	7,388	5,729,371
Block 2	2,055,809	136,301	764,232	754,381	788,760	4,499,483
Block 3	864,981	8,629	172,087	333,195	1,041,373	2,420,265
subtotal inside city	$6,412,949	$313,861	$3,476,714	$3,319,867	$1,998,421	$15,521,812
OUTSIDE CITY						
Service Charge	$91,038	$18,468	$13,056	$21,622	$4,191	$148,375
Block 1	83,457	25,112	12,916	48,242	0	169,727
Block 2	107,390	29,279	4,844	52,657	14,411	208,581
Block 3	72,335	15,758	0	8,304	31,616	128,013
subtotal outside city	$354,220	$88,617	$30,816	$130,825	$50,218	$654,696
TOTAL WATER	$6,767,169	$402,478	$3,507,530	$3,450,692	$2,048,639	$16,176,508
% of TOTAL	41.83%	2.49%	21.68%	21.33%	12.66%	100.00%
WASTEWATER						
INSIDE CITY	$2,057,661	$160,041	$1,885,869	$2,528,911	$15,003	$6,647,485
OUTSIDE CITY	189,509	53,833	26,327	71,808	2,168	343,645
TOTAL WASTEWATER	$2,247,170	$213,874	$1,912,196	$2,600,719	$17,171	$6,991,130
% of TOTAL	32.14%	3.06%	27.35%	37.20%	0.25%	100.00%

2000 CONSUMPTION BY CUSTOMER CLASS 29-Nov-07

per thousand gallons

	Single-Family Residential	Trailer Parks & Districts	Multi-Family Residential	Commercial\ Industrial	Sprinkler	TOTAL
WATER						
INSIDE CITY						
Block 1	1,309,308	93,588	1,250,144	1,144,447	3,171	3,800,658
Block 2	956,234	63,396	355,516	347,384	366,713	2,089,243
Block 3	262,493	2,615	52,228	108,229	315,675	741,240
subtotal inside city	2,528,035	159,599	1,657,888	1,600,060	685,559	6,631,141
OUTSIDE CITY						
Block 1	55,593	16,742	8,610	32,886	0	113,831
Block 2	49,969	13,618	2,253	24,492	6,703	97,035
Block 3	22,123	4,775	0	2,531	9,581	39,010
subtotal outside city	127,685	35,135	10,863	59,909	16,284	249,876
TOTAL WATER	2,655,720	194,734	1,668,751	1,659,969	701,843	6,881,017
% of TOTAL	38.59%	2.83%	24.25%	24.12%	10.20%	100.00%
WASTEWATER						
INSIDE CITY	1,229,316	101,716	1,179,307	1,592,043	9,835	4,112,217
OUTSIDE CITY	59,424	19,405	8,544	28,958	870	117,201
TOTAL WASTEWATER	1,288,740	121,121	1,187,851	1,621,001	10,705	4,229,418
% of TOTAL	30.47%	2.86%	28.09%	38.33%	0.25%	100.00%

1999 REVENUES BY CUSTOMER CLASS 29-Nov-07

	Single-Family Residential	Trailer Parks & Districts	Multi-Family Residential	Commercial\ Industrial	Sprinkler	TOTAL
WATER						
INSIDE CITY						
Service Charge	$1,465,304	$28,042	$640,831	$481,815	$152,215	$2,768,207
Block 1	1,872,989	118,460	1,802,616	1,660,449	8,585	5,463,099
Block 2	1,533,873	79,740	633,684	730,290	632,779	3,610,366
Block 3	502,537	8,922	101,363	269,537	786,366	1,668,725
subtotal inside city	$5,374,703	$235,164	$3,178,494	$3,142,091	$1,579,945	$13,510,397
OUTSIDE CITY						
Service Charge	$88,175	$17,928	$12,680	$20,935	$3,370	$143,088
Block 1	78,703	28,905	12,904	52,080	0	172,592
Block 2	81,534	32,516	3,646	57,661	10,690	186,047
Block 3	41,678	12,832	275	17,432	21,174	93,391
subtotal outside city	$290,090	$92,181	$29,505	$148,108	$35,234	$595,118
TOTAL WATER	$5,664,793	$327,345	$3,207,999	$3,290,199	$1,615,179	$14,105,515
% of TOTAL	40.16%	2.32%	22.74%	23.33%	11.45%	100.00%
WASTEWATER						
INSIDE CITY	$1,994,220	$138,767	$1,823,724	$2,363,483	$12,629	$6,332,823
OUTSIDE CITY	183,461	62,777	26,090	65,232	1,747	339,307
TOTAL WASTEWATER	$2,177,681	$201,544	$1,849,814	$2,428,715	$14,376	$6,672,130
% of TOTAL	32.64%	3.02%	27.72%	36.40%	0.22%	100.00%

1999 CONSUMPTION BY CUSTOMER CLASS 29-Nov-07

per thousand gallons

	Single-Family Residential	Trailer Parks & Districts	Multi-Family Residential	Commercial\ Industrial	Sprinkler	TOTAL
WATER						
INSIDE CITY						
Block 1	1,287,616	81,952	1,244,000	1,136,354	219	3,750,141
Block 2	748,249	38,898	309,183	353,565	308,913	1,758,808
Block 3	157,116	2,788	31,630	84,723	245,956	522,213
subtotal inside city	2,192,981	123,638	1,584,813	1,574,642	555,088	6,031,162
OUTSIDE CITY						
Block 1	54,415	19,934	8,900	36,530	0	119,779
Block 2	39,795	15,862	1,779	28,128	5,217	90,781
Block 3	13,040	4,010	79	5,447	6,617	29,193
subtotal outside city	107,250	39,806	10,758	70,105	11,834	239,753
TOTAL WATER	2,300,231	163,444	1,595,571	1,644,747	566,922	6,270,915
% of TOTAL	36.68%	2.61%	25.44%	26.23%	9.04%	100.00%
WASTEWATER						
INSIDE CITY	1,231,845	90,971	1,179,106	1,470,451	580	3,972,953
OUTSIDE CITY	59,294	24,144	8,801	27,005	710	119,954
TOTAL WASTEWATER	1,291,139	115,115	1,187,907	1,497,456	1,290	4,092,907
% of TOTAL	31.55%	2.81%	29.02%	36.59%	0.03%	100.00%

Appendix B: Additional Information on 2007 Water Budgeting Procedures

How to Calculate a Single-Family Residential Customer Water Budget

The single-family residential water budget is the sum of an indoor and outdoor allocation. The indoor allocation is 7,000 gallons per month. The outdoor allocation is based on customer-specific irrigable area as provided by the city's geographical information system (GIS) and changes monthly based on seasonal watering needs. The annual outdoor allocation is calculated as follows:

- The first 5,000 square feet of irrigable area gets 15 gallons of water per square foot (gpsf),
- The next 9,000 square feet of irrigable area gets 12 gpsf, and
- All excess irrigable area gets 10 gpsf.

For example, a customer with 14,400 square feet of irrigable area would have the following annual outdoor allocation:

Irrigable Area (square feet)	Gallons per Square Foot	Gallons
5,000	15	75,000
9,000	12	108,000
400	10	4,000
Annual Outdoor Allocation		**187,000**

The annual outdoor allocation is distributed throughout the year to meet changing monthly seasonal outdoor watering needs. The table below shows the percentages by month that will be applied to the annual outdoor allocation. These percentages were derived from historic data.

Percentage of Monthly Outdoor Allocation Distribution	
Month	Percent of Annual Outdoor Allocation
January	0%
February	0%
March	1%
April	7%
May	14%
June	20%
July	20%
August	18%
September	12%
October	7%
November	1%
December	0%
Total	**100%**

For example, if a customer's annual outdoor allocation was 187,000 gallons, they would receive 20% of that, or 37,400 gallons, in June and 7%, or 13,090 gallons, in October.

A customer with 14,400 square feet of irrigable area would have the following water budget:

Month	Indoor Allocation	Outdoor Allocation	Total Estimated * Water Budget (rounded up to the nearest 1,000 gallons)
January	7,000	0	**7,000**
February	7,000	0	**7,000**
March	7,000	1,870	**9,000**
April	7,000	13,090	**21,000**
May	7,000	26,180	**34,000**
June	7,000	37,400	**45,000**
July	7,000	37,400	**45,000**
August	7,000	33,660	**41,000**
September	7,000	22,440	**30,000**
October	7,000	13,090	**21,000**
November	7,000	1,870	**9,000**
December	7,000	0	**7,000**
TOTAL	84,000	187,000	**276,000**

* Monthly water budgets are shown as estimates because actual water budget amounts could change depending on what date the water meter is read each month.

If this customer used 4,000 gallons in February and had a monthly budget of 7,000 gallons, their usage would be billed as follows:

Rate Block	% of Budget	Gallons per Rate Block **	Water Usage (gallons)
Block 1	0-60% of budget	0 – 5,000	4,000
Block 2	61-100% of budget	5,001 – 7,000	0
Block 3	101-150% of budget	7,000 – 11,000	0
Block 4	151-200% of budget	11,001 – 14,000	0
Block 5	over 201% of budget	Over 14,000	0

If this customer used 10,000 gallons in February and had a monthly budget of 7,000 gallons, their water usage would be billed as follows:

Rate Block	% of Budget	Gallons per Rate Block **	Water Usage (gallons)
Block 1	0-60% of budget	0 – 5,000	5,000
Block 2	61-100% of budget	5,001 – 7,000	2,000
Block 3	101-150% of budget	7,000 – 11,000	3,000
Block 4	151-200% of budget	11,001 – 14,000	0
Block 5	over 201% of budget	Over 14,000	0

** Gallons per Rate Block are rounded up to the nearest thousand gallons to benefit the customer.

How to Calculate a Multi-Family Residential Customer Water Budget

The multi-family residential water budget is the sum of an indoor and outdoor allocation. The indoor allocation is 4,000 gallons per month per living unit within the building. The outdoor allocation is based on customer-specific irrigable area as provided by the city's geographical information system (GIS) and changes monthly based on seasonal watering needs. The annual outdoor allocation is calculated as follows:

- Irrigable area gets 15 gallons of water per square foot (gpsf)

For example, a customer with 10,200 square feet of irrigable area would have the following annual outdoor allocation:

Irrigable Area (square feet)	Gallons per Square Foot	Gallons
10,200	15	153,000
Annual Outdoor Allocation		**153,000**

The annual outdoor allocation is distributed throughout the year to meet changing monthly seasonal outdoor watering needs. The table below shows the percentages by month that will be applied to the annual outdoor allocation. These percentages were derived from historic data.

Percentage of Monthly Outdoor Allocation Distribution	
Month	Percent of Annual Outdoor Allocation
January	0%
February	0%
March	1%
April	7%
May	14%
June	20%
July	20%
August	18%
September	12%
October	7%
November	1%
December	0%
Total	**100%**

For example, if a customer's annual outdoor allocation was 153,000 gallons, they would receive 20% of that, or 30,600 gallons, in June and 7%, or 10,710 gallons, in October.

A multi-family residential account that has 10 living units and an irrigable area of 10,200 square feet would have the following water budget:

Month	Indoor Allocation	Outdoor Allocation	Total Estimated * Water Budget (rounded up to the nearest 1,000 gallons)
January	40,000	0	**40,000**
February	40,000	0	**40,000**
March	40,000	1,530	**42,000**
April	40,000	10,710	**51,000**
May	40,000	21,420	**62,000**
June	40,000	30,600	**71,000**
July	40,000	30,600	**71,000**
August	40,000	27,540	**68,000**
September	40,000	18,360	**59,000**
October	40,000	10,710	**51,000**
November	40,000	1,530	**42,000**
December	40,000	0	**40,000**
TOTAL	480,000	153,000	**637,000**

* Monthly water budgets are shown as estimates because actual water budget amounts could change depending on what date the water meter is read each month.

If this customer used 45,000 gallons in October and had a monthly budget of 51,000 gallons, their usage would be billed as follows:

Rate Block	% of Budget	Gallons per Rate Block **	Water Usage (gallons)
Block 1	0-60% of budget	0 –31,000	31,000
Block 2	61-100% of budget	31,001 – 51,000	14,000
Block 3	101-150% of budget	51,001 – 77,000	0
Block 4	151-200% of budget	77,001 – 102,000	0
Block 5	over 201% of budget	Over 102,000	0

If this customer used 88,000 gallons in October and had a monthly budget of 51,000 gallons, their water usage would be billed as follows:

Rate Block	% of Budget	Gallons per Rate Block **	Water Usage (gallons)
Block 1	0-60% of budget	0 –31,000	31,000
Block 2	61-100% of budget	31,001 – 51,000	20,000
Block 3	101-150% of budget	51,001 – 77,000	26,000
Block 4	151-200% of budget	77,001 – 102,000	11,000
Block 5	over 201% of budget	Over 102,000	0

** Gallons per Rate Block are rounded up to the nearest thousand gallons to benefit the customer.

How to Calculate a Commercial/ Industrial Customer Water Budget

A commercial/industrial account's water budget is calculated based on average monthly usage (AMU) and does not change from month to month. The budget is based on customer-specific 2005 actual water usage and is calculated by taking 2005 annual water usage and dividing it by twelve.

For example, a customer with 2005 annual water usage of 795,000 gallons of water would have a monthly water budget of 67,000 gallons as shown in the table below.

Month	Calculated Average Monthly Usage	Total Estimated * Water Budget (rounded up to the nearest 1,000 gallons)
January	66,250	**67,000**
February	66,250	**67,000**
March	66,250	**67,000**
April	66,250	**67,000**
May	66,250	**67,000**
June	66,250	**67,000**
July	66,250	**67,000**
August	66,250	**67,000**
September	66,250	**67,000**
October	66,250	**67,000**
November	66,250	**67,000**
December	66,250	**67,000**
TOTAL	795,000	**804,000**

* Monthly water budgets are shown as estimates because actual water budget amounts could change depending on what date the water meter is read each month.

If this customer used 58,000 gallons in August and had a monthly budget of 67,000 gallons, their usage would be billed as follows:

Rate Block	% of Budget	Gallons per Rate Block **	Water Usage (gallons)
Block 1	0-60% of budget	0 –41,000	41,000
Block 2	61-100% of budget	41,001 – 67,000	17,000
Block 3	101-150% of budget	67,001 – 101,000	0
Block 4	151-200% of budget	101,001 – 134,000	0
Block 5	over 201% of budget	Over 134,000	0

How to Calculate a Metered Irrigation Customer Water Budget

A metered irrigation account's water budget consists only of an outdoor allocation. The outdoor allocation is based on customer-specific irrigable area as provided by the city's geographical information system (GIS) and changes monthly based on seasonal watering needs. The annual outdoor allocation is calculated as follows:

- Irrigable area gets 15 gallons of water per square foot (gpsf)

For example, a customer with 30,500 square feet of irrigable area would have the following annual outdoor allocation:

Irrigable Area (square feet)	Gallons per Square Foot	Gallons
30,500	15	457,500
Annual Outdoor Allocation		**457,500**

The annual outdoor allocation is distributed throughout the year to meet changing monthly seasonal outdoor watering needs. The table below shows the percentages by month that will be applied to the annual outdoor allocation. These percentages were derived from historic data.

Percentage of Monthly Outdoor Allocation Distribution	
Month	Percent of Annual Outdoor Allocation
January	1%
February	1%
March	1%
April	7%
May	14%
June	20%
July	20%
August	18%
September	12%
October	7%
November	1%
December	1%

For example, if a customer's annual outdoor allocation was 457,500 gallons, they would receive 20% of that, or 91,500 gallons, in June and 7%, or 32,025 gallons, in October.

An irrigation only account that has an irrigable area of 30,500 square feet would have the following water budget:

Month	Outdoor Allocation	Total Estimated * Water Budget (rounded up to the nearest 1,000 gallons)
January	4,575	**5,000**
February	4,575	**5,000**
March	4,575	**5,000**
April	32,025	**33,000**
May	64,050	**65,000**
June	91,500	**92,000**
July	91,500	**92,000**
August	82,350	**83,000**
September	54,900	**55,000**
October	32,025	**33,000**
November	4,575	**5,000**
December	4,575	**5,000**
TOTAL	471,225	**478,000**

* Monthly water budgets are shown as estimates because actual water budget amounts could change depending on what date the water meter is read each month.

If this customer used 58,000 gallons in May and had a monthly budget of 65,000 gallons, their usage would be billed as follows:

Rate Block	% of Budget	Gallons per Rate Block **	Water Usage (gallons)
Block 1	0-60% of budget	0 –39,000	39,000
Block 2	61-100% of budget	39,001 – 65,000	19,000
Block 3	101-150% of budget	65,001 – 98,000	0
Block 4	151-200% of budget	98,001 – 130,000	0
Block 5	over 201% of budget	Over 130,000	0

If this customer used 87,000 gallons in May and had a monthly budget of 65,000 gallons, their water usage would be billed as follows:

Rate Block	% of Budget	Gallons per Rate Block **	Water Usage (gallons)
Block 1	0-60% of budget	0 –39,000	39,000
Block 2	61-100% of budget	39,001 – 65,000	26,000
Block 3	101-150% of budget	65,001 – 98,000	22,000
Block 4	151-200% of budget	98,001 – 130,000	0
Block 5	over 201% of budget	Over 130,000	0

** Gallons per Rate Block are rounded up to the nearest thousand gallons to benefit the customer.

Appendix C: Comments from Boulder Water Resources Advisory Board (WRAB) and the Public

The Water Conservation Plan was presented at the 25 February 2008 Water Resource Advisory Board (WRAB) meeting, which was convened as a public meeting. The Water Conservation Plan was also posted on a city of Boulder Web site, at www.bouldersaveswater.net, for the period of March 10, 2008 through April 14, 2008. Notification of this posting was provided in the March 2008 city of Boulder (city) utility bill as a utility bill insert and also advertised in the Daily Camera newspaper on March 16th and 23rd, and April 13th, 2008. No formal comments were received during the February 25, 2008 WRAB public meeting or the March 10, 2008 through April 14, 2008 posting period on the city Web site.

After completing the public comment process the Water Conservation Plan was submitted to the Colorado Water Conservation Board (CWCB) in May 2008 for review and comment. Comments by CWCB on the Water Conservation Plan were received in February 2009. One of the primary comments from CWCB was that the city did not meet the state required 60 day public comment period. From May 5, 2009 through May 29, 2009 the city re-posted the Water Conservation Plan for public comment on the city's Web site. Notification of the public comment period was published in the Daily Camera newspaper on May 11th and May 13th, 2009. With the second public comment period the city feels they have met the public comment period required by CWCB.

Provided below is a summary of comments received on the Water Conservation Plan from WRAB and the public, and the city's response to comments.

A. WRAB Comments:

1. Expand the descriptions in sections 7.5 and 9.3. *These changes were completed.*

2. Start documenting comments for an internal review of the city's water conservation program, separate from this state review. Bring public and state staff comments back to WRAB later this year to continue discussion about city program improvements. W*ater conservation program discussions were held during various 2008 WRAB meetings and will continue.*

B. Public Comments - 2008

No public comments were received during the February 25, 2008 WRAB public meeting or the period of posting on the city Web site from March 10, 2008 through April 14, 2008.

C. Public Comments – 2009

During the May 5, 2009 through May 29, 2009 public comment period the only comments received were from Western Resource Advocates. The May 28, 2009 Western Resource Advocates comment letter is provided in Appendix D. Provided below are the city's responses to comments from Western Resource Advocates in the order provided in their comment letter.

Plan Approach: *Western Resource Advocates recommends that future water conservation strategies should be identified.* Section 6.0 of the Water Conservation Plan does identify an extensive list of past and current water conservation programs and projects that have been

implemented and performance monitored. Additional efforts are being considered for 2009 and 2010 to further enhance the Water Conservation program, and include: development of an Industrial, Commercial and Institutional (ICI) water use and conservation study; evaluation of water conservation benefits/water savings based on programs and projects completed or implemented to date; update of the water consumption model to evaluate water savings; and, evaluation of the current rebate program and identification of possible rebate program modifications.

Rate Structure: *Western Resource Advocates suggests the city should review the current methodology for determining water budget allocations to see if smaller budgets can enhance water conservation and efficiency.* The city water budget rate structure was not soley developed to encourage water conservation, but it has been an effective water conservation tool since its implementation in January 2007. In developing the water budget rate structure a balance between producing sufficient revenue to assure continued operation of the Water Utility, encouraging wise water use, providing market signals to reduce water use during drought periods and avoidance of punishing low water users and those on limited incomes. Reductions in water budget allocations are being considered in the update to Volume I the Drought Response Plan, which should be completed in 2009.

Energy/Water Nexus: *Western Resource Advocates suggests the city recognize and quantify the link between saving water and saving energy.* The city keeps track of energy usage required to treat water, plus the energy required to treat waste water, and recognizes the benefits and energy savings if both water treatment and wastewater treatment can be reduced. The city is currently initiating energy audits for the city's two water treatment facilities and wastewater treatment facility. This information will provide a baseline and could be used to better quantify energy and cost savings due to water conservation.

Western Resource Advocates also recommends the city enhance its rebate program to include rebates for dish washers, showerheads, spray-rinse valves, boilers and commercial laundry facilities. Currently, the city's Water Conservation program does provide rebates for commercial facilities, such as laundry facilities, offering rebates on water efficient washers and low-flow toilets. The city also provides funding, or materials, to Partners for a Clean Environment (PACE) for the replacement of spray-rinse values in restaurants and to educate the commercial sector on water conservation. The city also provides funding and materials, such as low-flow shower heads, to city of Boulder Departments such as Boulder Housing Partners, and Boulder County programs such as the Longs Peak Energy Conservation Sweeps, to install low-flow shower heads as part of the energy sweeps programs in the city of Boulder. As part of the 2009 and 2010 evaluation of the city's Water Conservation Program the city will evaluate the rebate program and has already discussed the possibility of providing rebate forms that could be used at local merchants to purchase approved water conservation devices.

It also needs to be recognized that the city, through an extensive hydropower program, generates electricity through the transfer of raw water. The city's water system has a typical net gain of 5887kWh per million gallons of water even after accounting for treating and transporting water to its customers. Therefore, water conservation measures to help reduce the city of Boulder carbon footprint should target hot water use in commercial and residential sectors. This focus will be considered as part of the 2009 and 2010 Water Conservation Program evaluation.

Large Users. *Western Resource Advocates states that the city can save water by targeting its institutional, commercial and industrial (ICI) customers.* As mentioned in the response to Plan Approach above, the city anticipates completing an ICI study in 2009 - 2010. Based on preliminary research there seems to be limited ICI information and studies available to reference at the start of the study, and if Western Resource Advocates has ICI information that would be useful to the city, having that information would be helpful.

Regarding the top water users in the city of Boulder, the city recognizes that the University of Colorado (CU), city Parks and Recreation Department and Boulder Valley Schools are three of the top water users. In June 2009, the city met with CU to discuss water use and water conservation efforts. CU has made great strides in water conservation efforts in recent years and has recently implemented water conservation competitions between school Departments. The city will assist CU in providing water conservation education and outreach starting in fall 2009 focusing on CU students and their water use habits. This is an area that CU identified as needing some assistance. In spring 2009, the city met with Boulder Valley Schools to discuss water conservation and possible grant funding. Boulder Valley Schools is in the process of finishing an energy efficiency study for all schools in Boulder County and were including water use, and the status of water use features (toilets, showers, etc.) to better determine where water conservation efforts should be focused as part of school improvement projects. The city plans on meeting with Boulder Valley Schools again in late 2009.

Western Resource Advocates also recommended that a water budget be provided to the city Parks and Recreation Department. A water budget has been in place for the Parks Department for a number of years, as has all other city Departments and facilities. In spring 2009, water use in city Departments and at city facilities was presented to City Council and discussions were held on water savings made by some city Departments and facilities and areas where more focus on efficient water uses is necessary. The city's Water Conservation Program has a Water Efficiency Fund that provides matching funds for eligible water conservation measures taken at city facilities. This program has been popular for many years with the Parks Department historically taking the most advantage of the program.

Sustainable Growth: *Western Resource Advocates suggests the city work with developers to encourage construction of new water-efficient homes and businesses.* Current city Building Code, under Plumbing Code Chapter 10-10, has provisions equal to the International Plumbing Code relating to water efficiency requirements for fixtures to be installed for new development. The city also has a Green Building and Green Points program as part of the city of Boulder Residential Building Code. Credits can be obtained under this program for meeting sustainability requirements, including water efficiency. The city has also used Land Use Planning requirements to require additional water use efficiencies, as was done as part of the approval process for the 29th Street Mall. The city feels there are sufficient requirements in city code, and programs such, as Green Points, to efficiently meet water use reduction goals outlined in the Water Conservation Plan. These requirements also support the city's overall sustainability goals, which go beyond water.

Peak Day Reduction Strategies: *Western Resource Advocates recommends the city enact programs that will reduce maximum day water demand.* The city's Water Conservation Program was designed to focus on peak day water demands since its inception. One of the first goals was to delay increasing capacity at the Boulder Reservoir Water Treatment Facility, which has worked. The city's Water Conservation Program also teams with the Center for Resource

Conservation to provide substantial public education and outreach to educate the residences and businesses in the City of Boulder on water savings and practices such as the most water efficient time and method to irrigate lawn areas and other vegetation, and provides free water audits for residential water customers.

Water Use Trends. *Western Resource Advocates feels the city needs to "arrest" the recent increase in per capita water use, comparing water use from 2004 through 2006.* While there was a 9 percent increase in per capita water use between 2004 and 2006 this is too short a time frame to evaluate a true trend in water use and does not account for factors affecting water use other than residential population. As shown in Figure 3-1 of the Water Conservation Plan, the highest peak per capita water use, since 1972, was 209 gallons per capita per day (gpcpd) in 1988, with another high of 201 gpcpd in 2001. Since the 2002 drought, water use dropped to a low of 148 gpcpd in 2004, increased up to 161 gpcpd then dropped back to 148 gpcpd in 2007. When evaluating water use a longer time frame needs to be evaluated to better reflect non-population driven variations in water use and account for natural factors such as temperature and precipitation, specifically during the irrigation season. Based on per capita water use from 2000 through 2007, there has been approximately a 25 percent decrease in water use. The city feels that the per capita water use between 2003 and through 2007 represents a stable range of water use that reflect changes in weather, employment numbers and University of Colorado student population, none of which are fully captured when water use is reduced to a per capita basis based on number of residents.

Appendix D: Comments from Western Resource Advocates

WESTERN RESOURCE
ADVOCATES

May 28, 2009

Bret Linenfelser
City of Boulder Public Works
Water Quality and Environmental Services
4049 N. 75th St.
Boulder, CO 80301

Re: Comments on the City of Boulder's Draft Water Conservation Plan

Introduction
Western Resource Advocates (WRA) appreciates the opportunity to comment on the City of Boulder's Draft Water Conservation Plan (herein as "Plan"). We hope the City will take the following comments into consideration when finalizing the Plan.

The City of Boulder is recognized as a leader in water conservation throughout the State of Colorado. Over the past two decades, the City has implemented many progressive water conservation strategies, such as water budget-based billing, while simultaneously engaging the general public in all water planning initiatives. Even as previous strategies have been successful, renewed effort and funding is needed to keep Boulder heading along its course. The City has identified three primary reasons to conserve water: maintaining demand within supply; saving money on water treatment and distribution; and reducing energy use and green house gas emissions. The following recommendations will help Boulder achieve these goals and improve the current Water Conservation Plan.

Plan Approach
The Draft Plan should identify future water conservation strategies. The current Plan provides no analysis of potential projects and programs, rather, it only establishes a plan for how to rate and implement future possibilities. The City lists 11 pages of past conservation approaches, surely there are a few more the City is thinking of pursuing over the next few years. The City should also analyze the benefits and costs of water conservation based on up-to-date data. Using the 1999 Water Conservation Futures Study as a basis for these calculations is not appropriate given the significant technological gains in water conservation that have occurred over the past decade.

Rate Structure
Boulder should review its current methodology for determining budget allocations to see if smaller budgets can help incentivize greater conservation and efficiency. Boulder is one of the few communities nation-wide that uses a water budget-based rate structure, and while this is a step in the right direction, many water professionals in Boulder believe the existing budget

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allocation is too generous.[1] The City should also make an effort to compare the total amount of water allocated across all budgets to the City's total water supply and the City's conservation goals.

Energy/Water Nexus

The City should recognize and quantify the link between saving water and saving energy. The process of treating, transporting, heating, and disposing of water uses a tremendous amount of energy. Any water conservation measures will reduce the City's energy footprint, especially when hot water is saved. Rebate programs in both the residential and commercial sector should be pursued, and could include rebates for: dish washers, showerheads, spray-rinse valves, boilers, or commercial laundry facilities. WRA has experience in helping Front Range communities quantify the energy savings associated with water conservation and would be happy to help Boulder perform a similar analysis.

Large Users

The City of Boulder can achieve great water savings by targeting its institutional, commercial, and industrial (ICI) customers. The University of Colorado, the City's Parks Department, and Boulder Valley Schools are the 3 largest water users in Boulder, demanding over 11% of the City's treated water supply. Replacement programs targeting indoor fixtures at the University and School District have the potential for large water savings given the age of the building stock and likelihood of old, inefficient fixtures currently in use. Outdoor irrigation at the educational facilities and for all of the Parks Department's fields should be controlled with a "Smart" ET-based irrigation timer. These timers are inexpensive and have been demonstrated to save a significant amount of water compared to "set it and forget it" controllers. The City should also look into designating a water budget for the Parks Department so that the Department can prioritize water needs during times of shortage.

Sustainable Growth

It is essential that the City of Boulder work with developers to encourage the construction of new water-efficient homes and businesses through build-out. Revisions to the current plumbing code or other ordinances requiring the use of state-of-the-art water conserving appliances, such as EPA's WaterSense products, can have a significant impact in determining the water use of new residents. Developers who have pursued water-smart projects have found that these homes sell for very competitive prices.

A reduction in the "tap-fee" for home builders who can demonstrate that their homes use less water than the average, may be one way to incentivize and encourage more water smart development. A competition for building permits that rates projects based on their water and energy conservation measures is another possibility; Westminster has had great success following this approach for commercial development. The City should also require submetering of all new multi-family residences to encourage higher rates of conservation across all customer classes.

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[1] Based on personal communication with Paul Lander, former Water Conservation Coordinator for the City of Boulder; Bart Miller, former Boulder WRAB member; and Peter Mayer, Principal at Aquacraft.

Peak Day Reduction Strategies

The City should enact programs that will reduce maximum day demand. Currently, peak day demands reach 95% of supply capacity and these peak days are often the driving force for costly infrastructure expansion and upgrades. Some potential options include:

- Water credits or discounted water rates for opting in to a "brown your lawn in the summer if needed" program (similar to reduced electric rates for having your A/C cycled off during peak summer demands)
- Summertime watering schedule or time of day irrigation ordinance
- Identify and aggressively target "peakers" in all categories
- No new lawn planting from June to August
- Ban turf areas that serve only aesthetic purposes

Water Use Trends

Boulder needs to arrest the recent increase in per person water use. In 2004 water use was 148 gallons per capita per day (gpcd), in 2005 it rose to 155 gpcd, and in 2006 it climbed again to 161 gpcd (a 9% increase in 2 years). A concerted effort and an effective conservation program should lead to a stabilization of per capita water use.

Conclusion

We encourage the City of Boulder to maintain its position as a conservation leader. While the City has yet to rehire a Water Conservation Coordinator, we believe conservation should be prioritized and vigorously pursued in light of its ability to return immediate water and cost savings while simultaneously strengthening the City's supply portfolio in the face of climate change. Funding water conservation is imperative for the continued success of any conservation program, and WRA strongly encourages the City to rehire its lead water conservation position. We look forward to working with the City of Boulder as it moves further towards proactive, conservation-oriented solutions.

Respectfully,

Drew Beckwith
Water Policy Analyst
Western Resource Advocates