STERLING
A Colorado Treasure
www.sterlingcolo.com

November 30, 3009

RECEIVED
DEC 03 2009
Richard P. Arber Associates, Inc.
DENVER, CO

Ms. Taryn Hutchins-Cabibi
CWCB Office of Water Conservation and Drought Planning Section
1313 Sherman Street, Room 721
Denver, CO 80203

RE: City of Sterling Water Conservation Plan – Final Submittal

Dear Ms. Hutchins-Cabibi:

The City of Sterling has completed the final Water Conservation Plan (Plan). This cover letter includes the required information per Section 5a. of the *Guidelines for the Office to Review Water Conservation Plans Submitted by Covered Entities*.

Name and Contact Information for the City of Sterling

Joseph D. Kiolbasa, City Manager
City of Sterling
421 North Fourth Street, PO Box 4000
Sterling, Colorado 80751-0400

List of Organizations and Individuals Assisting in Plan Development

Rob Demis, P.E., Project Manager, Richard P. Arber Associates
D. Ryan Walsh, Design Engineer, Richard P. Arber Associates
Michael A. Saylor, P.E., Principal, Bishop-Brogden Associates, Inc.
Laurel E. Stadjuhar, P.E., Project Manager, Bishop-Brogden Asssociates, Inc.

Quantify Retail Water Delivery for the Last Five Years

Table 1 – Total Water Demand by Customer Category

Year	SF [1] Residential (mgd)	MF [1] Residential (mgd)	Commercial (mgd)	Industrial [2] (mgd)	Government (mgd)	Parks (mgd)	Total (mgd)
2003	1.40	0.26	0.40	-	0.49	0.53	3.08
2004	1.40	0.27	0.47	-	0.53	0.43	3.10
2005	1.40	0.27	0.26	0.07	0.49	0.36	2.85
2006	1.60	0.31	0.48	0.58	0.57	0.68	4.22
2007	1.44	0.28	0.45	0.54	0.58	0.63	3.92
2008	1.44	0.27	0.45	0.62	0.59	0.68	4.05

[1] SF = Single-Family; MF = Multi-Family.
[2] Industrial demand includes an ethanol plant beginning in the year 2006. The ethanol plant has its own well for process water. Water produced from this well is not purchased from the City.

Identify Population Served by Retail Water Delivery

Table 2 – Historic Population

Year	Population
2003	13,866
2004	13,665
2005	13,695
2006	13,556
2007	13,695
2008	13,900

Provide Public Review and Comment Information

The City of Sterling held a 60-day public comment period during which time people could submit comments by email, mail, phone, or in person on the draft Plan. The public comment period was announced in the Sterling Journal-Advocate on March 24th, March 31st, April 21st and April 28th of 2009. The Plan was made available at the Public Works Department and electronically on the City's website. No comments were received during the public comment period.

On behalf of the City of Sterling, I would like to assure that the City is prepared to commit the resources necessary for the implementation of the Water Conservation Plan.

Please contact me with any further requirements. I can be reached at 970-522-9700.

Sincerely,

Joseph D Kiolbasa

Joseph D. Kiolbasa
City Manager

Attachment (1)

STERLING
A Colorado Treasure

Water Conservation Plan

January 2010

Submitted by

Arber
Water, Wastewater & Reuse Engineers

Richard P. Arber Associates, Inc.
198 Union Blvd., Ste. 200
Lakewood, Colorado 80228
303-831-4700
www.arber.com

TABLE OF CONTENTS

PAGE

EXECUTIVE SUMMARY **ES-1**
Existing Water System **ES-1**
Current and Planned Water Conservation Activities **ES-2**
Conservation Goals and Benefits **ES-2**
Identification and Selection of Conservation Measures and Programs **ES-3**
Demand Side Measures and Programs **ES-5**
Supply Side Measures and Programs **ES-5**
Water Conservation Plan Implementation **ES-6**
Benefits and Cost of Conservation Measures and Programs, By Group **ES-7**
Monitor, Evaluate and Revise Conservation Activities **ES-7**

INTRODUCTION **1**

CHAPTER 1 EXISTING WATER SYSTEM **2**
1.1 Characteristics of the Existing Water Supply System **2**
1.2 Sources of Water **3**
1.2.1 Potable System **3**
1.3 System Limitations **4**
1.3.1 Designated Critical Water Supply Area **5**
1.3.2 Unaccounted For and Lost Water **5**
1.3.3 Plan for Substantial Improvements **5**
1.3.4 Water Reuse Limitations **5**
1.4 Water Costs and Pricing **6**
1.4.1 Water Service Charges **6**
1.4.2 Water Tap Fees and Plant Investment Fees **7**
1.5 Current Policies and Planning Initiatives **7**
1.6 Current Water Conservation Activities **8**
1.6.1 Watering Restrictions **8**
1.6.2 Tiered Rate Structure **8**
1.6.3 Increased Metering **8**
1.6.4 Educational Outreach **9**
1.6.5 Water Savings from Existing Conservation Activities **9**

CHAPTER 2 WATER USE AND FORECAST DEMAND **10**
2.1 Current Water Use **10**
2.1.1 Customer Classes **10**
2.1.2 Potable Water Production and Demands **11**
2.1.3 Large Customers **12**
2.1.4 Indoor and Outdoor Use **12**

2.1.5 Seasonality of Water Use 13
2.1.6 Historic Water Use 13
2.2 Forecasting Method 14
2.3 Demand Forecast 14

CHAPTER 3 PROPOSED FACILITIES 16
3.1 Potential Facility Needs 16
3.1.1 Water Treatment Plant 16
3.1.2 Water Supply 16
3.2 Incremental Cost Analysis 17
3.3 Preliminary Capacity Forecast 18

CHAPTER 4 CONSERVATION GOALS 19
4.1 Water Conservation Goals 19
4.2 Goal Development Process 20

CHAPTER 5 CONSERVATION MEASURES AND PROGRAMS 21
5.1 Conservation Measures and Programs 21
5.2 Screening Criteria 22
5.3 Conservation Measures and Programs Selected for Further Analysis 23

CHAPTER 6 SELECTION OF CONSERVATION MEASURES AND PROGRAMS 25
6.1 Combinations of Measures and Programs 25
6.2 Costs and Water Savings of Conservation Options 27
6.3 Benefits and Costs 27
6.4 Evaluation Criteria 27
6.5 Selection of Conservation Measures and Programs 27

CHAPTER 7 INTEGRATION OF RESOURCES AND MODIFICATION OF FORECASTS 30
7.1 Demand Forecast Modifications 30
7.2 Project-Specific Savings and Supply-Capacity Forecasts 31
7.3 Revenue Effects 32

CHAPTER 8 IMPLEMENTATION PLAN 33
8.1 Implementation Schedule 33
8.2 Plan for Public Participation in Implementation 35
8.3 Plan for Monitoring and Evaluation Processes 35
8.4 Plan for Updating the Conservation Plan 35
8.5 Water Conservation Plan Adoption, Completion, and Approval 35

CHAPTER 9 MONITOR, EVALUATE AND REVISE CONSERVATION ACTIVITIES 36

9.1 FUTURE WATER CONSERVATION PLAN ACTIVITIES 36

REFERENCES 37

APPENDICES

Appendix A Worksheets
Appendix B State Engineers Map
Appendix C Public Participation
Appendix D Resolution No. 7-4-09

LIST OF TABLES

PAGE

Table ES-1: Water Conservation Goals ES-3
Table ES-2: Water Conservation Measures Evaluated ES-4
Table ES-3: Estimated Savings ES-5
Table ES-4: Implementation Schedule for Measures and Programs ES-6
Table ES-5: Benefits and Costs for Each Group ES-7
Table 1-1: Types of Service Connections 2
Table 1-2: Water Demands By Customer Class (Year 2008) 3
Table 1-3: Summary of Potable Wells and Water Production 4
Table 1-4: Rate Structure – Minimum Monthly Charge 6
Table 1-5: Rate Structure – Charge per Consumption 7
Table 1-6: Plant Investment Fee Structure 7
Table 2-1: Historic Average Demand 10
Table 2-2: Potable Water Production Summary 12
Table 2-3: Top Water Demands 12
Table 3-1: Major Milestones for the Water Treatment Plant Project 16
Table 3-2: Projected Water Supply Projects 17
Table 3-3: Incremental Supply Costs 18
Table 4-1: Water Conservation Goals 19
Table 5-1: Water Conservation Measures Evaluated 22
Table 6-1: Summary of Groups 26
Table 6-2: Benefits and Costs for Each Group 27
Table 6-3: Selection Criteria 28
Table 7-1: Estimated Savings 31
Table 8-1: Implementation Schedule for Measures and Programs 34

LIST OF FIGURES

PAGE

FIGURE 1-1 – CITY OF STERLING SERVICE AREA .....Following 3

FIGURE 2-1: DEMANDS BY USE CLASS 11

FIGURE 2-2: OUTDOOR VS. INDOOR USAGE 13

FIGURE 2-3: HISTORIC DEMAND BY USER CLASS 14

FIGURE 2-4: DEMAND PROJECTIONS WITH NO ADDITIONAL CONSERVATION..... 15

FIGURE 7-1: PROJECTED DEMANDS WITH ADDITIONAL FUTURE WATER CONSERVATION MEASURES 30

EXECUTIVE SUMMARY

The State of Colorado Water Conservation Act of 2004 (HB 1365) requires that entities that supply more than 2,000 acre-feet of retail water annually for domestic, commercial or industrial use, prepare and submit a Water Conservation Plan (WCP) to the Colorado Water Conservation Board (CWCB). The City of Sterling developed its latest WCP in 1996 under the 1991 State of Colorado Water Conservation Act (HB 1154). Water conservation measures adopted in accordance with the 1996 are outlined in this plan.

This Water Conservation Plan was developed based on guidance provided by the Water Conservation Plan Development Guidance Document by the Colorado Water Conservation Board. The Plan has been developed to allow for the evolution, exploration and implementation of new ideas as well as improvements upon existing measures and regulations.

This Water Conservation Plan is a general plan of policy and action and does not address specific actions, but rather general categories of actions. Specific actions will be developed and implemented by members of the City of Sterling staff.

Existing Water System

The City of Sterling is located approximately 120 miles northeast of Denver along Highway I-76, and is located adjacent to the South Platte River. Primary water uses in the City of Sterling include residential, commercial, and industrial water use, as well as irrigation. The City water system serves a residential population of approximately 13,900 people, and approximately 4,570 service taps.

The City's water system is currently supplied by existing wells. There are two main well fields serving the City: the East Well Field located east of the City near highway I-76, and the West Well Field located west of the City. The City's wells are typically 60 to 100 feet deep.

The City has a potable water supply well production capacity of approximately 9,795 gallons per minute (gpm) if all wells are in operation. The total decreed well capacity for the potable system is 9,969 gpm. The City of Sterling water system has two pressure zones containing four water storage tanks. The main pressure zone serves the majority of the City with the exception of a small area on the east side of the City, which is served by the second pressure zone. Two ground level tanks are located in the West Well Field and have water storage volumes of 7.5 million gallons (MG) and 2.0 MG. Two elevated tanks are located within the City (North and South Tanks), and both have a water storage volume of 250,000 gallons each.

Current and Planned Water Conservation Activities

The following summarizes the City's current and planned water conservation activities:

- Watering restrictions for residential irrigation, golf course rough, vehicle fleet washing, personal vehicle washing and restaurants serving water have been implemented by the City.
- A tiered rate structure has been implemented by the City.
- Increase in overall water rates has been implemented by the City.
- A rate study has been completed by the City.
- Increased metering of City facilities and parks has been implemented.
- The City supports an annual water festival in May for fourth through sixth grade age children and families in northeastern Colorado.

The exact quantity of water conserved by the conservation activities currently implemented by the City is unknown. Most of Sterling's existing conservation activities are in the form of regulations and policies that encourage conservation by water users. It is difficult to quantify water savings from behavioral conservation practices in comparison to specific actions that limit water usage.

One estimation of the quantity of water conserved is residential per capita use. According to the 1996 Water Conservation Plan, the residential per capita use for the City of Sterling was 135 gallons per capita per day (gpcd) in 1995. The average residential per capita use for the years 2003 – 2008 was 126 gpcd. This reflects a 7% decrease in residential per capita use from the mid 1990's to the present time.

Conservation Goals and Benefits

Continual population growth and recent droughts in Colorado have made water conservation an essential component of planning for most utilities. The City of Sterling is no exception and the City has been implementing and considering water conservation programs and measures for a number of years. Table ES-1 summarizes the City of Sterling's water conservation goals and the type of savings targeted by each.

Table ES-1: Water Conservation Goals

Use	Goal	Type of Demand Targeted
Per capita residential demand	Savings in residential demands with a focus on irrigation	Average and Peak Day Demand
Per connection non-residential demand	Savings in per connection non-residential demand with a focus on large water users	Average Demand
Total park irrigation demand	Savings in total City irrigation	Average and Peak Day Demand
Unaccounted for water	Decrease the unaccounted for water by increasing metering and targeting potential leaks	Average Demand

Residential irrigation demand and per-connection non-residential demand were targeted in order to lower total water usage and limit required water right acquisitions. Outdoor use accounts for 43% of the overall average demand. Therefore, targeting outdoor use would reduce overall demand, limiting future required water right acquisitions.

The City of Sterling averages approximately 17% unaccounted for water annually. It is estimated that 11% of the demand within the potable system is leaks. By reducing the amount of unaccounted for water, the City will have the ability to determine how much of the demand is truly leaks.

The City has set a goal of 8.5% total reduction of their average demand by 2022. By saving 8.5% of the overall demand, the City would be saving 181 million gallons (555 ac-ft) per year by the year 2022. In addition to overall savings, the City has set a goal to reduce the projected peak day demand in the year 2022 by 6.7%.

Identification and Selection of Conservation Measures and Programs

Numerous water conservation measures and programs were identified based on lists supplied by the Colorado Water Conservation Board. A series of screening criteria were used to identify measures and programs that aligned with the City's goals and resources.

The City has already implemented some water conservation programs, including a tiered rate structure, overall rate increases, watering restrictions, and educational outreach. These programs have decreased the City's water demands. Additional measures and programs were selected for further screening. Table ES-2 summarizes the water conservation measures that were considered as a part of this Water Conservation Plan.

Table ES-2: Water Conservation Measures Evaluated

Water Conservation Measure	Target User	Target Demand
Showerhead giveaway program	Single-family residential	Average Demand
Efficient washing machine rebate program	Single-family residential	Average Demand
Installation of ET [(1)] monitors and irrigation audit for City parks	Parks	Average and Peak Day Demands
Residential irrigation system controller rebate program	Single-family residential	Average and Peak Day Demands
Xeriscape rebate program	Single-family residential	Average and Peak Day Demands
Voluntary water audit program	All users	Average and Peak Day Demands
Leak detection program	Unaccounted for water	Average Demand
Increased metering coverage	Unaccounted for water	Average Demand
Water conservation educational outreach program	All users	Average and Peak Day Demands
Water-saving landscape demonstration at City Hall	All users	Average and Peak Day Demands
Water rate increase	All users	Average and Peak Day Demands

[(1)] ET = Evapotranspiration

The measures and programs that were identified were screened based on a number of factors. These factors include:

- The measures and programs had to be within the City's ability to implement.
- The City does not have the resources available to implement any programs with high start up costs.
- Programs and measures that require significant administration efforts were generally excluded.
- Programs and measures requiring significant financial burden on residential users were eliminated from further consideration.
- Programs and measures that require a significant cost to savings ratio when compared to other measures were generally excluded from further consideration.
- Several programs and measures were simply not applicable to the City.

The measures and programs that were selected to be analyzed were combined in appropriate groups to allow for a more integrated assessment of the potential benefits that may be derived from their implementation. The conservation measures and programs that were selected for further analysis are explained below.

Demand Side Measures and Programs

- Increasing the number of water-efficient fixtures by evaluating a showerhead giveaway program.
- Increasing the number of water-efficient appliances by evaluating an efficient washing machine rebate program.
- Efficient irrigation by implementing an irrigation system controller rebate program.
- Efficient irrigation by installing evapotranspiration (ET) monitors on park irrigation systems.
- Landscape efficiency by implementing a xeriscape rebate program.
- Encouragement of water conservation by implementation of a voluntary water audit program.
- Water conservation encouraged by the use of public education.
- The new water treatment plant will trigger a substantial increase in water rates.

Supply Side Measures and Programs

- Implementation of a leak detection and repair program.
- Increasing the total coverage of metered users. This would mainly target the government buildings that are not currently metered.

As a result of implementing selected water conservation measures and programs, the average day and peak day water demand would be reduced. Table ES-3 summarizes the estimated savings by implementing future water conservation measures.

Table ES-3: Estimated Savings

Year	Type of Demand	Without Additional Conservation	With Additional Conservation	% Savings
2012	Total Annual Average	5.0 mgd	4.9 mgd	2.0%
	Potable Annual Average	3.8 mgd	3.8 mgd	0.0%
	Potable Peak Day Demand	9.0 mgd	8.8 mgd	2.2%
2022	Total Annual Average (1)	5.9 mgd	5.4 mgd	8.5%
	Potable Annual Average	4.5 mgd	4.3 mgd	4.4%
	Potable Peak Day Demand (2)	10.6 mgd	9.9 mgd	6.7%
2032	Total Annual Average	6.6 mgd	6.0 mgd	9.1%
	Potable Annual Average	5.2 mgd	4.9 mgd	5.8%
	Potable Peak Day Demand	12.0 mgd	11.2 mgd	6.7%

(1) It is estimated that total annual average savings by 2022 may vary from 5 - 15%.
(2) It is estimated that potable peak day demand savings by 2022 may vary from 5 - 10%.

The estimated savings outlined in Table ES-3 are based on programs and measures that will best serve the City and its residents. Estimated savings were calculated based on available water conservation information. True savings may be more or less based on the level of success realized after the implementation of selected water conservation measures and programs. However, these projections have been used by the City for planning purposes.

Water Conservation Plan Implementation

The implementation of the measures and programs will be spread throughout the 20 year planning period of this Water Conservation Plan. Measures and programs will be phased in order to spread out the capital costs and increased administrative efforts required for the projects. Table ES-4 summarizes the implementation schedule for the existing conservation activities and the chosen future measures and programs.

Table ES-4: Implementation Schedule for Measures and Programs

Line	Measure/Program	Required Action	Scheduled Beginning Date	Expected Completion Date
CHOSEN FUTURE MEASURES AND PROGRAMS				
Group 1 (Rebate program)				
1	Showerhead giveaways	Purchase the first 1,000 showerheads. Replenish as necessary.	2010	2019
2	Washing machine rebates	Develop water bill insert to advertise the program.	2010	2019
3	Irrigation controller rebates	Include advertising for this program with program from line 2	2010	2019
Group 2 (Reduction of Irrigation Demand in City Parks)				
4	Installation of ET monitors in City parks	Purchase and install ET monitors	2010	2014
5	Irrigation water audit for City parks	Select a consultant specializing in efficient irrigation techniques	2010	2014
Group 4 (Reduction in Non-Account Water)				
6	Leak detection and repair program	Contract with leak detection specialist	Ongoing	2014
7	Decrease unmetered connections	Inventory all unmetered connections, purchase meters, and install	2010	2011
8	Water accounting	Develop a database for tracking water production and demand	Ongoing	2010
Group 5 (Reduction in Per Capita Residential and Per Connection Non-Residential)				
9	Customer water audits	Select a consultant specializing in residential, commercial, and industrial water audits	2012	2016
10	Education/information dissemination	Include conservation techniques in monthly water bill inserts	Implemented with Group 1	Ongoing
11	Increase water rates	Administrative action	Ongoing	Ongoing
EXISTING CONSERVATION ACIVITIES				
12	Watering restrictions	Odd addresses water Tuesday, Thursday, and Saturday; and even addresses water Wednesday, Friday, and Sunday	2003	Ongoing
13	Watering restrictions	Golf courses using City water cannot water roughs	2003	Ongoing
14	Watering restrictions	Vehicle fleets and vehicles in auto dealerships cannot be washed more than once each week	2003	Ongoing
15	Watering restrictions	Personal vehicles must be washed only on watering days	2003	Ongoing
16	Watering restrictions	Restaurants may serve water only upon request	2003	Ongoing
17	Rate structure	City has implemented a tiered rate structure	2005	Ongoing
18	Rate increases	City has begun to increase water rates	Latest Increase February 1, 2009	Ongoing
19	Educational outreach	City supports an annual water festival for fourth through sixth grade age children and families in northeastern Colorado	Ongoing	Ongoing

The City intends to update the plan, at a minimum, every 7 years and will update the plan when significant changes occur to the system. When updating the plan the City will examine the costs and benefits of the measures and programs that were implemented in the previous plan. The City will also have the opportunity to add additional water saving measures and programs.

Benefits and Cost of Conservation Measures and Programs, By Group

Table ES-5 summarizes each group and outlines the savings and the costs for each.

Table ES-5: Benefits and Costs for Each Group

Group	Water Savings	Total Cost	Implementation Period	Cost/1,000 Gal Saved
Group 1: Rebate program	Annual: 16.4 MG Peak Day: 0.005 mgd	$32,000	10 years	$0.20
Group 2: Reduction in Parks Irrigation	Annual: 72.6 MG Peak Day: 0.1 mgd (1)	$34,000	5 years	$0.09
Group 3: Reduction in Residential Irrigation	Annual: 0.51 MG Peak Day: 0.004 mgd	$45,000	10 years	$8.82
Group 4: Reduction in Non-Account Water	Annual: 1.5 MG	$95,000	10 years	$12.67
Group 5: Per capita residential & per connection non-residential	Annual: 24.6 MG Peak Day: 0.1 mgd	$180,000	10 years	$0.73

(1) Peak day savings represented is for the potable irrigation only.

Monitor, Evaluate and Revise Conservation Activities

The measures and programs outlined in this plan will be monitored for their water savings and associated costs. This data will be collected annually so that the programs effectiveness can be tracked. Because there will be multiple conservation measures and programs happening at the same time, it may be difficult to track some of the water savings by individual measures or programs. The measures and programs that are relatively easy to track individually (rebates, park irrigation, large water user audits, etc.) will be tracked; however, overall water savings will also be tracked to evaluate the effectiveness of the Water Conservation Plan as a whole. Monitoring and evaluating the plan at frequent intervals will also allow the City to discontinue a measure or program that is found to be ineffective or too costly.

INTRODUCTION

The State of Colorado Water Conservation Act of 2004 (HB 1365) requires that entities that supply more than 2,000 acre-feet of retail water annually for domestic, commercial or industrial use, prepare and submit a water conservation plan to the Colorado Water Conservation Board. Although prompted by HB1365 to develop a formal plan at this time, the City of Sterling has been involved in implementing water conservation measures as a matter of good practice.

This Water Conservation Plan was developed based on guidance provided by the Water Conservation Plan Development Guidance Document by the Colorado Water Conservation Board. The Plan has been developed to allow for the evolution, exploration and implementation of new ideas as well as improvements upon existing measures and regulations.

This Water Conservation Plan is a general plan of policy and action. Some of the measures and programs outlined address specific actions; however, many of the programs are general categories of actions that will be developed and implemented by members of the City of Sterling staff.

CHAPTER 1
EXISTING WATER SYSTEM

This chapter summarizes the service and operational characteristics of City of Sterling water system. Baseline conditions established in this chapter will be used to evaluate the importance, feasibility and value of water conservation in the following sections. This section also helps the City recognize the benefit of managing future water resources using water conservation principles.

1.1 CHARACTERISTICS OF THE EXISTING WATER SUPPLY SYSTEM

This City of Sterling operates under a Council/Manager form of government. The City of Sterling is located within Logan County approximately 120 miles northeast of Denver along Interstate 76 adjacent to the South Platte River. Sterling's City limits encompass 5.38 square miles. Primary water uses in the City of Sterling include residential, commercial, industrial, and government water use, as well as irrigation. The City water system serves a residential population of approximately 13,900 people and 4,626 service taps. Table 1-1 summarizes the types of service connections in the City.

Table 1-1: Types of Service Connections

Type of Service Connection	Number of Connections
Single Family Residential	3,656
Multi-Family Residential	391
Commercial	520
Industrial	13
Government	50
Parks	30
Total	*4,659*

The City of Sterling does not have a centralized water treatment plant. Drinking water is pumped from alluvial wells, chlorinated, and conveyed to the distribution system. The City of Sterling water system has two pressure zones containing four water storage tanks. The main pressure zone serves the majority of the City with the exception of a small area on the east side of the City, which is served by the second pressure zone. Two ground level tanks are located in the West Well Field and have water storage volumes of 7.5 million gallons (MG) and 2.0 MG. Two elevated tanks are located within the City (North and South Tanks), and both have a water storage volume of 250,000 gallons each. The distribution system includes a network of 85 miles of transmission and distribution lines. Pipe diameters in the system range from 6-inch to 24-inch.

Irrigation for parks, cemeteries, sports fields, and golf courses is supplied by a combination of irrigation-only wells and dedicated irrigation connections to the potable water distribution system. The ethanol plant, located in the north east side of town has two dedicated wells. Water for the ethanol plant is treated with a reverse osmosis (RO) process.

Figure 1-1 illustrates the major components of the distribution system including wells, pumps, and water storage tanks. The City's current water demands, broken down by category, are summarized in Table 1-2. The water demands presented in Table 1-2 are based on billing records. A more detailed analysis comparing water production to demand is found in Chapter 2. Worksheet 1-1 (Appendix A) provides additional information about the key characteristics of the system.

Table 1-2: Water Demands By Customer Class (Year 2008)

Customer Class	Annual Usage (MG) [1]	Percent of Total Annual Usage (%)
Single Family Residential	525	35%
Multi-Family Residential	100	7%
Commercial	164	11%
Industrial	223	15%
Government	215	15%
Parks	247	17%
Total	*1,474*	*100%*

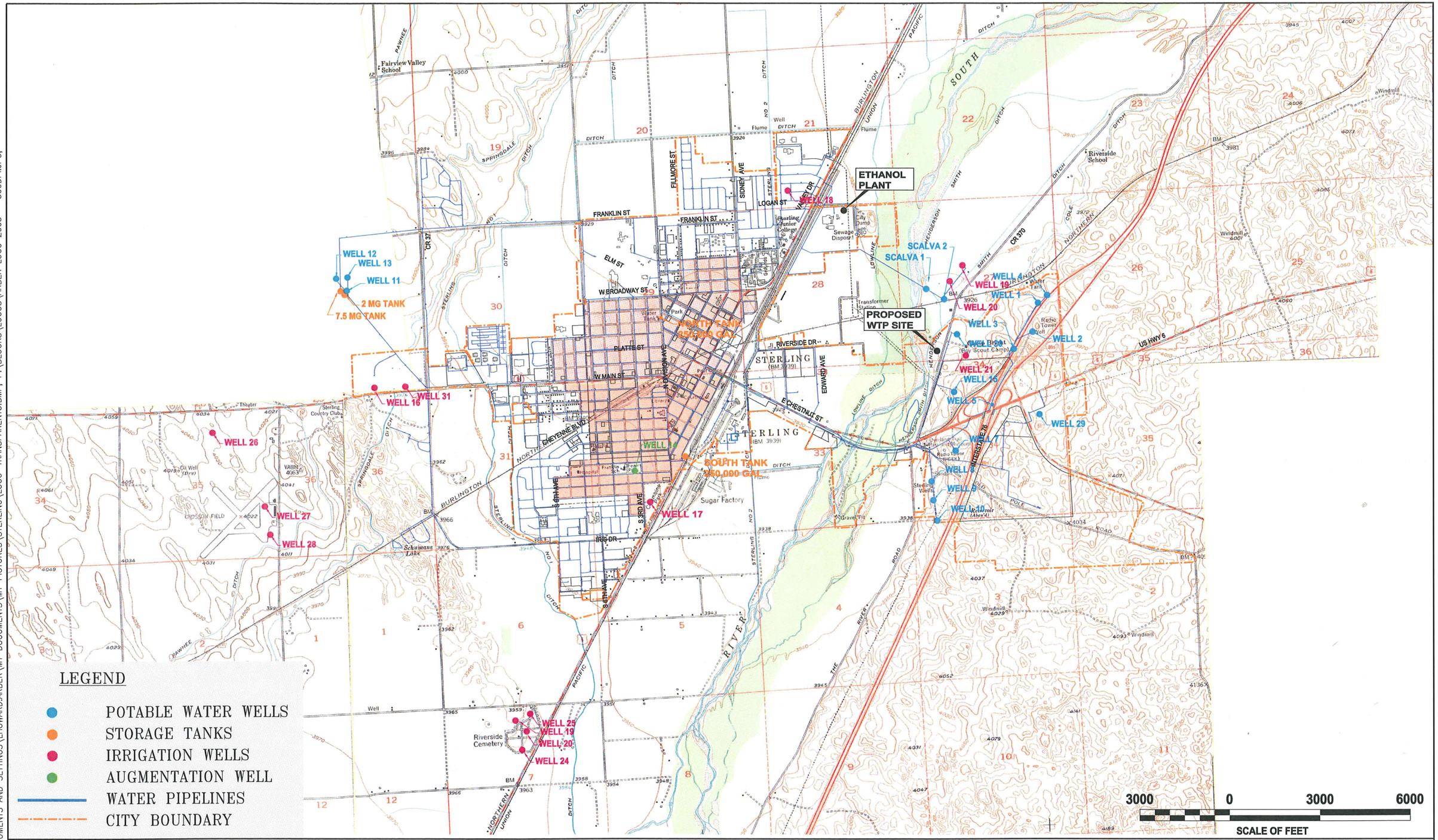
[1] MG = million gallons

1.2 SOURCES OF WATER

The City is currently supplied by 30 existing wells. The potable distribution system is served by 15 of the 29 wells. The irrigation-only wells consist of 12 of 29 wells. The ethanol plant is served by two wells. One well is dedicated to providing augmentation water only, and is not used for potable use or irrigation. The City recently has added two more potable wells (i.e., the Scalva Wells), which are not yet part of City's distribution system. The City intends to include these wells upon approval from the CDPHE.

1.2.1 Potable System

There are two main well fields providing potable water for the City: the East Well Field located east of the City near highway I-76 with 12 wells, and the West Well Field located west of the City with 3 wells. The City's wells are typically 60 to 100 feet deep. Water production for each well was supplied by the City in October 2008. Table 1-3 provides information for the City's wells.



Arber
Water, Wastewater & Reuse Engineers
Richard P. Arber Associates
198 Union Boulevard, Suite 200
Lakewood, Colorado 80228
Website: www.arber.com
Phone: 303.831.4700
Fax: 303.831.0290

STERLING
A Colorado Treasure

FIGURE 1-1
WATER CONSERVATION PLAN
CITY WATER SYSTEM

2/18/09 15:11 LHOWARD R17 P:\STERLING\STERLING02\FIGS\WATER CONS PLAN\FIG1BASE.DWG XREFS: P:\STERLING\STERLING02\FIGS\TM4\TOPO.DWG;
IMAGES: C:\DOCUMENTS AND SETTINGS\LHOWARD.ARBER\MY DOCUMENTS\MY PICTURES\STERLING\LOGO-TRANSPARENT3.BMP; P:\BLOCKS\LOGOS\ARBER LOGO 2005 - 300DPI.JPG;

Table 1-3: Summary of Potable Wells and Water Production

Well Number	Well Field	Typical Water Production (GPM)
1	EAST	300
2	EAST	420
3	EAST	210
4	EAST	650
5	EAST	350
7	EAST	380
8	EAST	470
9	EAST	290
10	EAST	360
15	EAST	750
29	EAST	See note 1
30	EAST	840
Scalva Well 1	EAST	1,250
Scalva Well 2	EAST	1,250
SUBTOTAL	**EAST**	**7,520**
11	WEST	500
12	WEST	1,035
13	WEST	740
SUBTOTAL	**WEST**	**2,275**
	Total Water Production	**9,795** [(2)]

[(1)] Well 29 does not have production data.
[(2)] Well 11, 12 are seasonal wells. Well 13 is an emergency well.

The City has a potable water supply well production capacity of approximately 9,795 gpm if all wells are in operation. This does not include Well No. 29, which supplies a small area to the east of the City. The total decreed well capacity for the potable system is 9,969 gpm.

Wells 11, 12 are used seasonally. Well 13 is an emergency standby well. Due to source water quality issues with respect to uranium and disinfection byproducts (total trihalomethanes), the City is in the process of designing and building a new water treatment plant. The new plant will be located on the east side of the city on the east side of the South Platte River. Once the new plant is placed online, the wells located in the West Well Field will be used as emergency standby wells.

1.3 SYSTEM LIMITATIONS

In order to determine areas of the City's operation that could be improved, the next part of this plan examines the system's limitations. Worksheet 1-2 (Appendix A) provides a summary of basic system conditions and limitations.

1.3.1 Designated Critical Water Supply Area

A map of the designated critical water supply areas on the Colorado Front Range was obtained from the State Engineer's website (Appendix B). The map indicates that the southeastern portion of Logan County is part of a critical water supply. The City of Sterling is located just southwest of the center of the County; therefore, Sterling is not located in a designated critical water supply area.

1.3.2 Unaccounted For and Lost Water

One measure of efficiency for water distribution systems is lost and unaccounted for water. Unaccounted for water is the difference between the water that is produced and the sum of water sold and accounted for losses in the system. Unaccounted water typically consists of system leakage, meter inaccuracies, illegal connections, and uses that are unmetered such as main flushing and fire fighting. A value of under 10% is typically considered acceptable for most water systems according to the American Water Works Association Leak Detection and Water Accountability Committee.

The Water Conservation Plan from 1996 estimated the average percentage of unaccounted for water at 24%. System losses were estimated at approximately 15%. Recent records for total water pumped for the calendar year were compared to the total amount of water billed. According to billing and production data for the years 2006 – 2008, the average unaccounted for water is approximately 17%. It is estimated that system losses are approximately 11%. Most of the City's municipal buildings are unmetered, which accounts for approximately 6%.

1.3.3 Plan for Substantial Improvements

The City is currently in violation of two primary drinking water standards. To ensure long-term compliance, the City is working on planning and preliminary design for a water treatment system. A treatment plant will supply potable water for all of the City's customers. The project is described in greater detail in Section 1.5 – Current Planning Policies and Planning Initiatives and Chapter 3 – Proposed Facilities.

The City plans to construct additional recharge facilities in 2009, 2012 and 2019. The additional recharge sites will supply additional augmentation water to the City to help re-time the Senior Water Rights currently in excess during the irrigation season. The City will also build two storage reservoirs during the planning horizon. These projects are described in greater detail in Chapter 3 – Proposed Facilities.

1.3.4 Water Reuse Limitations

The City of Sterling owns and operates a wastewater treatment plant (WWTP) located approximately four (4) miles northeast of the City along County Road 370. Wastewater is

collected from the City by gravity and pumped from a lift station through a four mile forcemain to the WWTP.

The City's existing Water Court decree states the following:

> "9.1.8.1 Limit on Reuse: This paragraph is notwithstanding, Sterling will not reuse, successively use, dispose of or otherwise fully consume water applied under these water rights to irrigation of lawns, gardens, parks, parkways, golf courses, cemetaries and other public spaces, but Sterling shall be entitled to take credit for return flows from such irrigation use in determining its replacement oblication under the plan for augmentation, as described in paragraph 10.6 of this decree."

As indicated in the paragraph above, Sterling does not have the legal right to reuse wastewater effluent.

1.4 WATER COSTS AND PRICING

The water system receives revenue from three major sources to cover the capital and annual operation and maintenance (O&M) costs associated with operating the system; water rates, water tap fees, and plant investment fees. These three revenue sources are discussed in the following paragraphs.

1.4.1 Water Service Charges

One of the City's revenue sources for the water system comes from the sales of water based on actual water consumption for each customer. There are two different rate structures, one for customers within City boundaries and one for customers outside of City boundaries. The minimum monthly rate varies based upon tap size. The City has a tiered rate structure to encourage water conservation. Table 1-4 summarizes the current monthly minimum and Table 1-5 summarizes the current rate structure based on consumption.

Table 1-4: Rate Structure – Minimum Monthly Charge

Meter Size	Monthly Minimum (Inside City Limits)	Monthly Minimum (Outside City Limits)
5/8-inch – 3/4-inch	$8.25	$10.68
1-inch	$9.10	$11.80
1 1/2-inch	$11.18	$14.52
2-inch	$13.66	$17.77
3-inch	$19.46	$25.37
4-inch	$27.75	$36.22
6-inch	$48.48	$63.38
8-inch	$64.83	$84.80
10-inch	$77.92	$110.95

Table 1-5: Rate Structure – Charge per Consumption

Consumption (Thousands of Gallons Per Month)	Charge per Thousand Gallons (Inside City Limits)	Charge Per Thousand Gallons (Outside City Limits)
2-10	$1.44	$1.78
11-20	$1.46	$1.81
21-50	$1.49	$1.85
51-100	$1.53	$1.89
Greater Than 100	$1.63	$1.98

1.4.2 Water Tap Fees and Plant Investment Fees

Another source of revenue for the water utility is derived from tap fees and plant investment fees. A tap fee is a one-time capital charge for a new (or enlarged/increased) connection to the system and is based upon the tap sizes. The current charge for a tap of 1-inch or smaller is a flat rate of $470. Tap fees for taps larger than 1-inch are assessed on a case by case basis. Plant investment fees are based on tap size. Table 1-6 summarizes the plant investment fees based on tap size.

Table 1-6: Plant Investment Fee Structure

Tap Size	Plant Investment Fee (Inside City Limits)	Plant Investment Fee (Outside City Limits)
5/8-inch – 3/4-inch	$1,255	$1,644
1-inch	$2,095	$2,744
1 1/2-inch	$4,190	$5,489
2-inch	$6,700	$8,777
3-inch	$13,400	$17,544
4-inch	$20,940	$27,431
6-inch	$41,880	$54,758
8-inch	$67,000	$87,770
10-inch	$96,325	$126,186

The tap fee and plant investment fee revenues are utilized for repayment of debt service and funding capital projects associated with the expansion of the water system.

1.5 CURRENT POLICIES AND PLANNING INITIATIVES

The City does not have any major policies that affect water use under normal conditions. Currently, there are no restrictions on the number of new taps that may be installed in the City per year.

The City of Sterling is in the process of designing a WTP to address exceedances of primary National Drinking Water Standards for uranium and disinfection by-products (DBP). The City is in the preliminary design phase of the project. The selected treatment processes consists of two separate treatment trains. One of the treatment trains primarily satisfies the need for filtration via

microfiltration membranes or other filtration technology, and the other treatment train provides advanced treatment for both primary and secondary drinking water standards with nanofiltration. The costs associated and timeline associated with the WTP project are discussed in Chapter 3 – Proposed Facilities.

The City has several water supply projects planned over the next 20 years. The water supply projects include three recharge sites and additional storage. The projected water supply projects and their associated costs are discussed in greater detail in Chapter 3 – Proposed Facilities.

1.6 CURRENT WATER CONSERVATION ACTIVITIES

The City practices two major water conservation measures; watering restrictions and a tiered rate structure. In addition to the two major water conservation measures, the City has recently installed meters on all parks irrigating with potable water and some government buildings.

1.6.1 Watering Restrictions

Beginning in the year 2003, the City has enforced watering restrictions. The following is a list of the water restrictions implemented by the City of Sterling.

- Residential irrigation is restricted to Tuesday through Sunday.
- Odd numbered addresses may only water on Tuesday, Thursday, and Saturday. Even numbered addresses may only water on Wednesday, Friday, and Sunday.
- Golf courses using City water may not water roughs.
- Vehicle fleets and vehicles in auto dealerships may not be washed more than once each week.
- Personal vehicles may be washed only on watering days.
- Restaurants may only serve water upon request.

1.6.2 Tiered Rate Structure

Beginning in the year 2005, the City has used a tiered rate structure. This rate structure was introduced in Section 1.4.5 – Water Service Charges. The tiered rate structure encourages water conservation by charging higher rates with increasing water usage. The City has recently completed a rate study. It is anticipated that new rates will be approved by the City Council in April 2010. The rate study is available under a separate cover.

1.6.3 Increased Metering

Prior to 2006, most of the City's municipal buildings and all of the City's parks were unmetered. Beginning in 2006 the City installed meters on all of the park irrigation connections to the potable distribution system. This reduces the amount of unaccounted for water and provides a more thorough water accounting system.

1.6.4 Educational Outreach

The City supports an annual water festival for northeastern Colorado held in May. The purpose of the annual water festival is to educate fourth to sixth grade age children and their families on responsible water practices.

1.6.5 Water Savings From Existing Conservation Activities

The exact quantity of water conserved by the conservation activities currently implemented by the City is unknown. Most of Sterling's existing conservation activities are in the form of regulations and policies that encourage conservation by water users. It is difficult to quantify water savings from behavioral conservation practices in comparison to specific engineering actions that limit water usage. The metering of water services and tiered water rate structures are recognized to be some of the most effective means to encourage conservation by water users. In addition, irrigation is typically one of the largest demands on a water system. Irrigation watering restrictions are an effective way to reduce usage and dampen peaks.

One estimation of the quantity of water conserved is residential per capita use. According to the 1996 Water Conservation Plan, the residential per capita use for the City of Sterling was 135 gallons per capita per day (gpcd) in 1995. The average residential per capita use for the years 2003 – 2008 was 126 gpcd. This reflects a 7% decrease in residential per capita use from the mid 1990's to the present time.

CHAPTER 2
WATER USE AND FORECAST DEMAND

This section focuses on estimating the future water needs and demands of the City and identifying potential gaps in the existing water supply system. The information in this section was largely taken from projections developed in the planning for the water treatment project.

2.1 CURRENT WATER USE

Current water use in the City's service area can be broken down into a variety of categories. An understanding of the types of use is important to aid in identifying appropriate conservation measures and programs. The following sections characterize water demand by user type.

2.1.1 Customer Classes

The City classifies five main types of demands; residential, commercial, industrial, government, and parks. Residential water sales can be further broken down into two types: single-family and multi-family.

Table 2-1 summarizes the water usage among the classes of demands over the last three years.

Table 2-1: Historic Average Demand

Year	Single-Family Residential (MG)	Multi-Family Residential (MG)	Commercial (MG)	Industrial (MG)	Government (MG)	Parks (MG)	Total (MG)
2006	584	114	176	210	209	247	1,540
2007	527	102	165	198	210	230	1,432
2008	525	100	164	224	215	247	1,475
Average	545	105	168	211	212	242	1,482

(1) Demands presented are for all users.

(1) Data is based on billing and pumping records from the Sterling Finance Department and the Sterling Public Works Department.

According to Table 2-1, demands over the last three years for Sterling have been relatively constant. Figure 2-1 graphically illustrates the division among the various water users in the City.

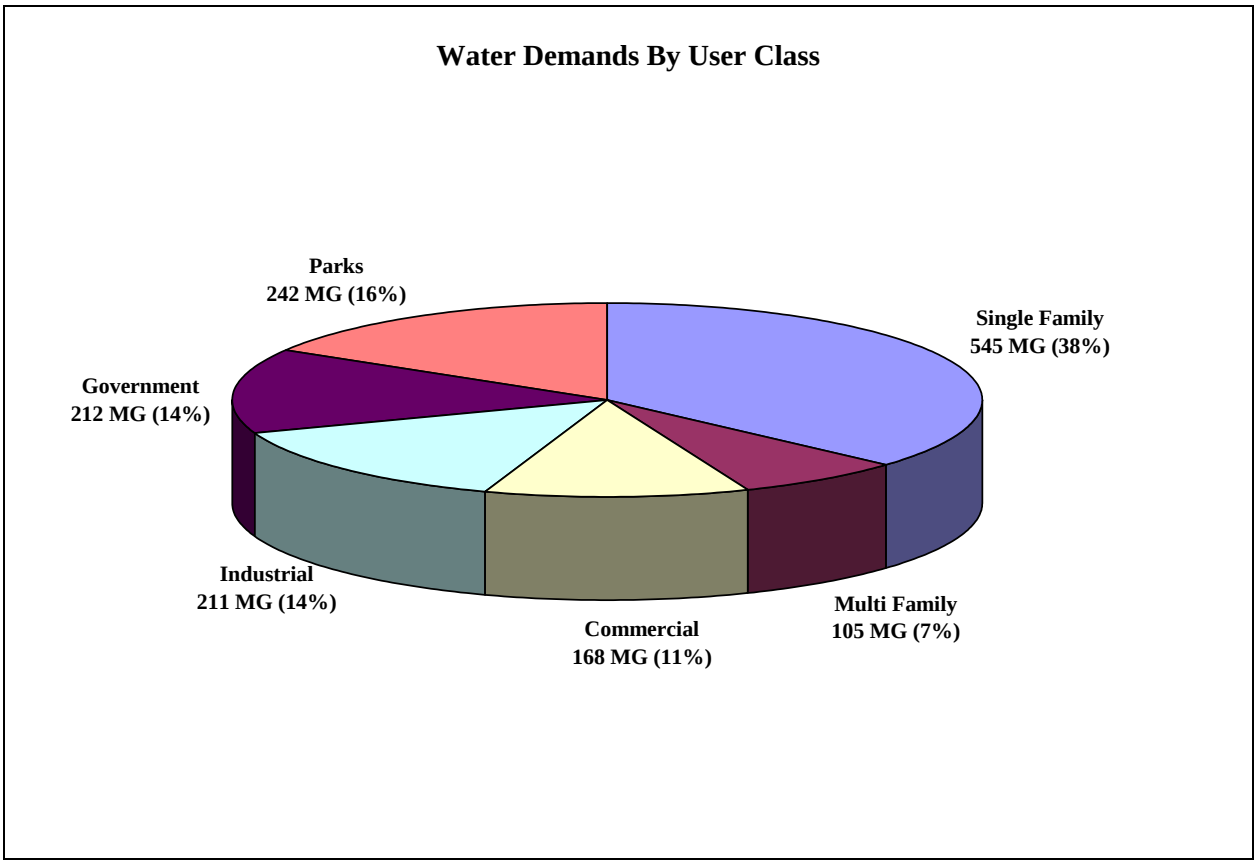


FIGURE 2-1: DEMANDS BY USE CLASS

The largest user class with respect to demand is single family residential, and the second largest user class is parks. Parks represents irrigation water for parks, sports fields, cemeteries, and golf courses. Parks does not include residential irrigation.

2.1.2 Potable Water Production and Demands

The wells that supply the potable water distribution system serve the user classes of residential, commercial, industrial (except for the ethanol plant), and government. Additionally, the wells supplying the potable water distribution system supply a fraction of the parks irrigation water. The potable water demands have been further broken down into peak day demands for planning purposes. The new water treatment plant will be constructed to meet the future peak day demand. Table 2-2 summarizes the current average day and peak day production for the potable water wells.

Table 2-2: Potable Water Production Summary

Demand Type	Potable Water Production (mgd)
Average Day	3.6
Peak Day	8.0
Peak Day to Average Day Peaking Factor	2.22

2.1.3 Large Customers

Based on current billing information, the largest water users were identified. These users are summarized in Table 2-3. Their water use is presented on both a total and percentage basis.

Table 2-3: Top Water Demands

Customer Name	Amount of Water Consumed Annually (MG)	Percentage of Total Water Demand (%)
Sterling Ethanol	222	15%
Colorado Department of Corrections	169	11%
Sterling Living Center	20	1.4%
Colorado Department of Transportation	20	1.4%
Applewood Sterling	9.1	0.6%
Sterling Regional Medical Center	7.5	0.5%
Logan County Justice Center	5.7	0.4%
Devonshire Acres	5.4	0.4%
Logan County Courthouse	3.9	0.3%
Sterling Housing Authority – Macgregor	4.0	0.3%
TOTAL	**467**	**32%**

2.1.4 Indoor and Outdoor Use

The indoor versus outdoor usage for the City is calculated based on the billed usage for the City's parks plus an estimation of residential irrigation. The estimation of residential irrigation is based on Lawn Irrigation Return Flow (LIRF) studies prepared for the City by Bishop-Brogden Associates, Inc. According to the LIRF studies, indoor residential water usage can be estimated by calculating the usage during the months of December to February. Figure 2-2 illustrates the indoor and outdoor usage for the various categories of water users in the City of Sterling.

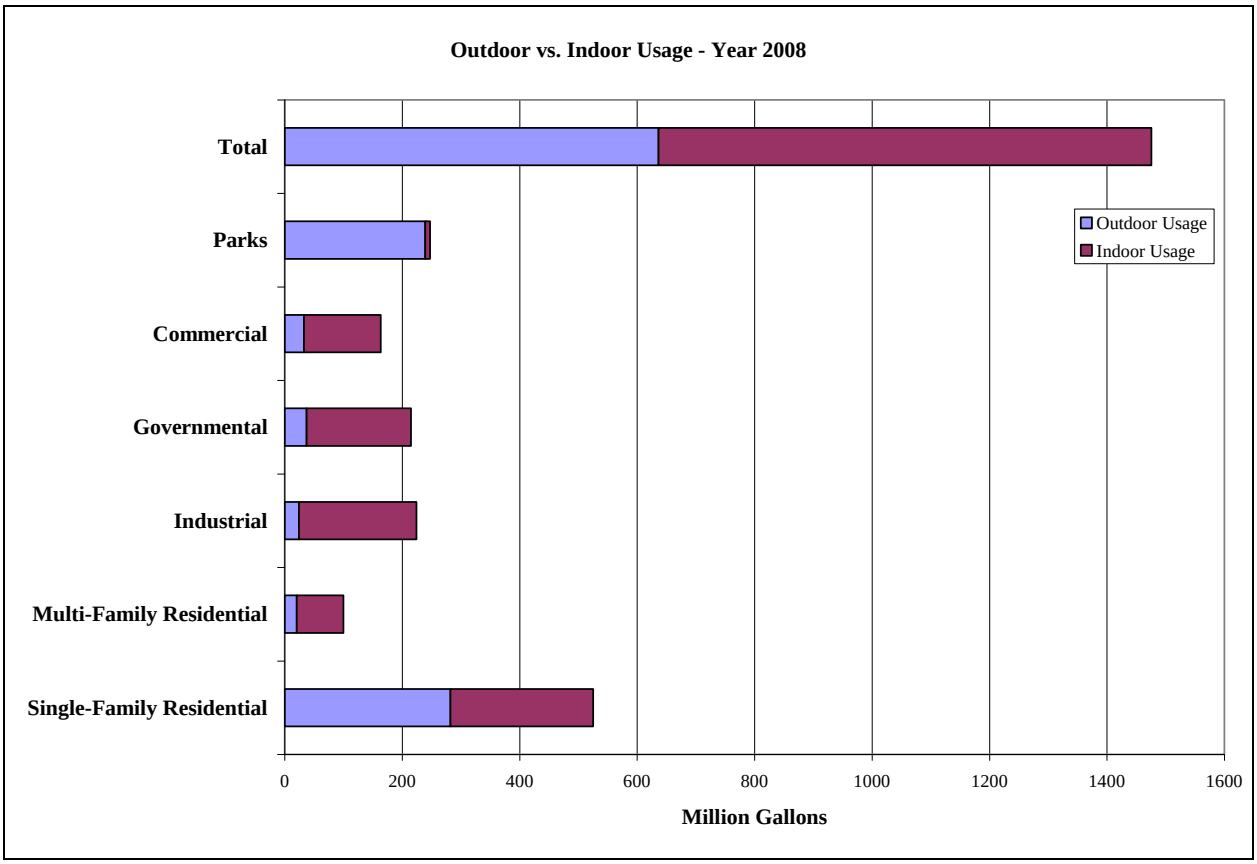


FIGURE 2-2: OUTDOOR VS. INDOOR USAGE

2.1.5 Seasonality of Water Use

Most of the irrigation water use occurs during the summer months when the temperatures are high and the amount of precipitation is limited. The irrigation season in Colorado is generally from May to October. Because of the increase in irrigation, the majority of water use occurs in the summer months. During the winter months, water demand mainly consists of indoor water use.

2.1.6 Historic Water Use

The City of Sterling has experienced little growth over the recent years. Figure 2-3 illustrates the historic water use by customer type for the years 2003 – 2008. The ethanol plant was brought online in 2005, which explains the sudden increase in industrial water usage in 2005. The increase in parks usage in the year 2006 is a result of increased metering. Prior to 2006, a portion of park irrigation was unaccounted for. The trend from 2006 – 2008 for parks irrigation is more representative of the parks use.

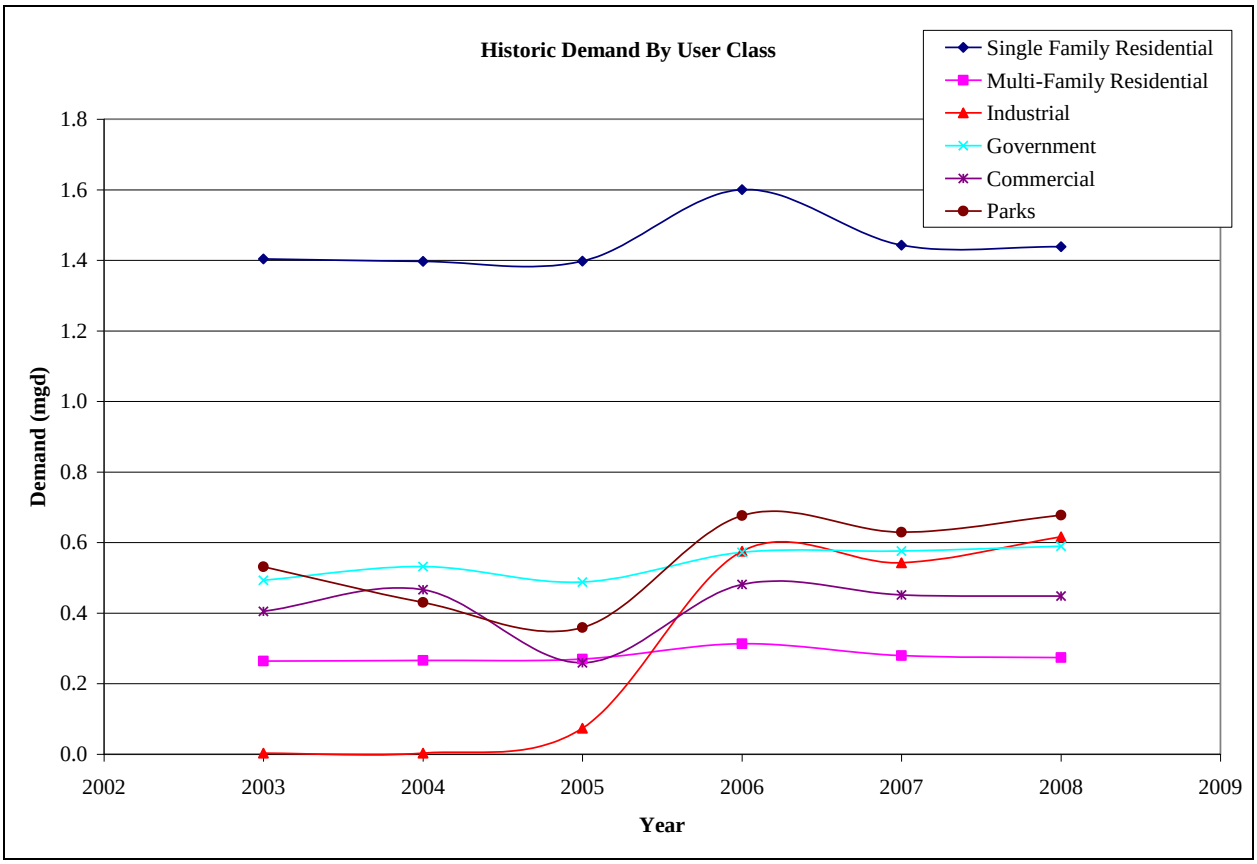


FIGURE 2-3: HISTORIC DEMAND BY USER CLASS

2.2 FORECASTING METHOD

Future water demands with no additional water conservation were estimated using Worksheet 2-1 (Appendix A). The most current data from a variety of sources was collected in order to complete the forecast. Demand was broken down by the different types of water use including residential, non-residential, government, and parks. Also included in the current and future water demands is unaccounted for water. It is estimated that unaccounted water as a percentage of total water use from the distribution system will remain constant throughout the planning horizon.

2.3 DEMAND FORECAST

This demand forecast reflects existing conservation measures within the City. The adjustments from future planned water conservation activities will be addressed later in the plan. Figure 2-4 presents the demand forecast in graphical form.

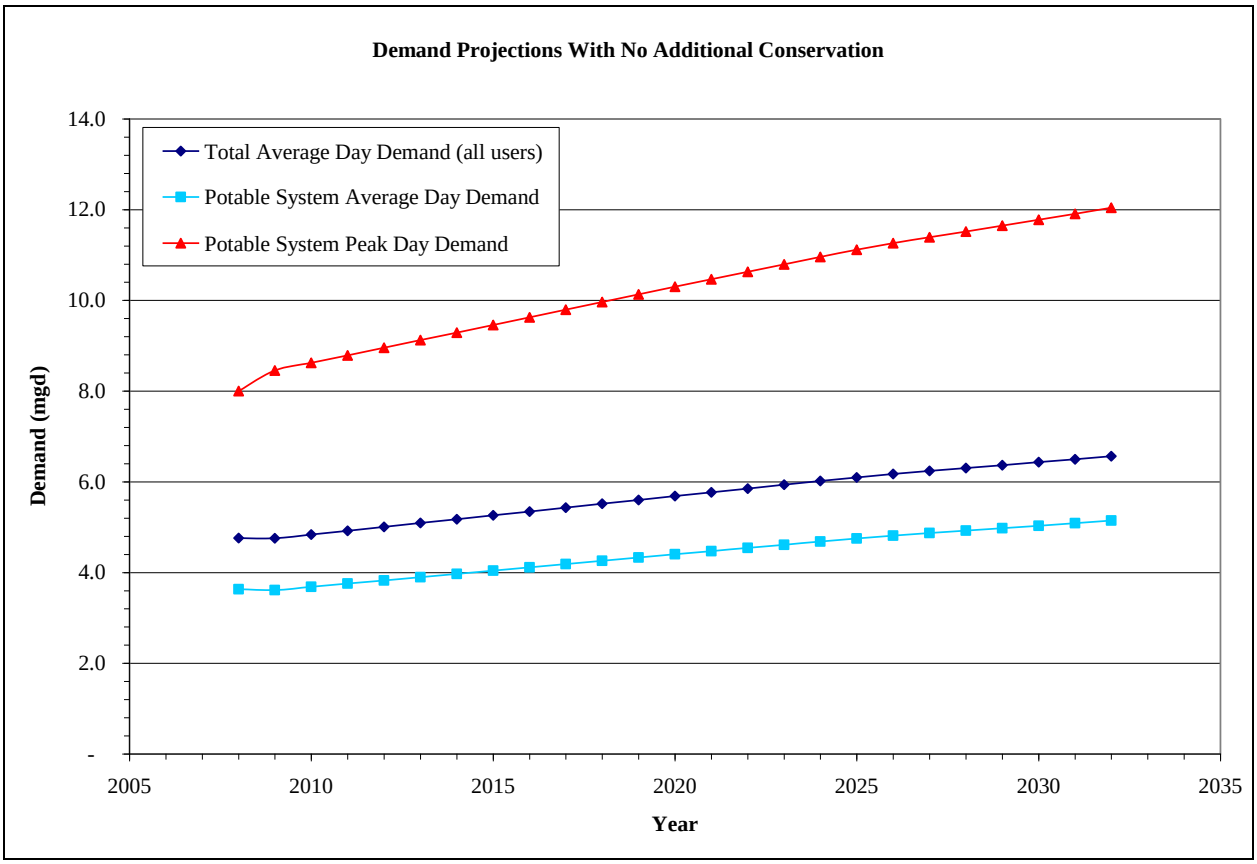


FIGURE 2-4: DEMAND PROJECTIONS WITH NO ADDITIONAL CONSERVATION

CHAPTER 3
PROPOSED FACILITIES

This chapter describes the improvements planned for the system and their associated costs. The planning horizon for the proposed facilities is 20 years.

3.1 POTENTIAL FACILITY NEEDS

The City of Sterling has projected needs for water treatment and water supply facilities over the 20 year planning horizon. The following sections summarize the projected facility needs.

3.1.1 Water Treatment Plant

The City of Sterling is in the process of designing a new water treatment plant (WTP) to address exceedances of primary National Drinking Water Standards for uranium and disinfection by-products (DBP). The proposed facility will process all the potable water for the City of Sterling. A portion of the raw water will be treated using nanofiltration. A blending stream will be treated using microfiltration or other filtration technology. The proposed facility will also include disinfection, storage and pumping systems for the finished water.

The WTP will be constructed to supply the projected peak day demand for the 10 year planning horizon. The plant will be placed online in the year 2012, and the 2022 peak day demand has been estimated at 9.9 mgd. Planning has been done for the new facility with future additional water conservation measures in mind. Room will be built into the facility building in order to accommodate additional expansion of capacity beyond the 10 year planning horizon. Table 3-1 summarizes the major milestones for the WTP project.

Table 3-1: Major Milestones for the Water Treatment Plant Project

Milestone	Date Completed
Submit Preliminary Engineering Report to State	July 1, 2009
Submit Final Design Report to State	November 1, 2009
Submit Final Design Plans and Specifications to State	May 1, 2010
Complete Construction/Implementation of Improvements	December 31, 2011

Cost information for the project is provided in Worksheet 3-1 (Appendix A).

3.1.2 Water Supply

The projected water supply projects, the year they are anticipated to be needed, and the reason for each project are summarized in Table 3-2.

Table 3-2: Projected Water Supply Projects

Project	Year Anticipated	Reason
Construct Recharge Site No. 5	2009	Provide recharge basin for augmentation
Construct Recharge Site No. 2	2012	Provide recharge basin for augmentation
Construct Recharge Site No. 3	2019	Provide recharge basin for augmentation
200 Ac-Ft of Additional Storage	2012	Provide additional storage of augmentation water
200 Ac-Ft of Additional Storage	2030	Provide additional storage of augmentation water

The City of Sterling has begun the initial design process for construction of Recharge Site No. 5. Recharge Site No. 5 has become necessary to provide additional recharge accretions as an augmentation supply regardless of the change in demands and replacement supplies. During the irrigation season, the City has excess credits from Senior Water Rights. Running these excess credits into the new recharge facility, as well as running water into the facility during times of free river will add additional augmentation water to cover the well depletions supplying the City's WTP. The City plans to have Site No. 5 constructed by July 2009. The other two recharge facilities will be built in 2012 and 2019.

In order to construct the Recharge Facilities, there will be approximately $50,000 of improvements required per site. This cost includes the cost to survey the area, scrape the recharge site to the appropriate depth, and build a berm. In addition, the cost of measurement equipment is included in the estimate. Due to the sites for the recharge to be built in 2012 and 2019, the berm height will likely be higher, therefore the sites could cost up to double the construction costs of Site #5. Therefore the total construction costs for all recharge facilities could total $250,000.

The City of Sterling will need to construct two storage reservoirs over the planning horizon, one in 2012 and one in 2030. Each reservoir will be 200 acre-feet. The cost to construct the reservoir will be approximately $3,000 per acre-foot, plus additional measurement equipment and engineering costs. The total cost to construct each reservoir will be approximately $600,000, plus additional measurement equipment and engineering costs.

With existing demands and the construction of the new WTP facilities, the City will need to lease up to 70 acre-feet of water in the month of November or December from 2009 through 2014. These leases are necessary to augment all depletions throughout the planning horizon assuming a worst-case call scenario. The cost of an augmentation supply lease varies, however the City could possibly obtain this amount of water for less than $3,000 each year.

3.2 INCREMENTAL COST ANALYSIS

An incremental cost analysis was conducted for the City to determine the cost each additional gallon of water will cost using Worksheet 3-2 (Appendix A). Table 3-3 summarizes the cost-per-gallon for the new water treatment plant.

Table 3-3: Incremental Supply Costs

Project	Incremental Cost/1,000 Gallons Supplied
New Water Treatment Plant	$1.75/1,000 gallons

The costs summarized in Table 3-3 reflect estimated operation and maintenance costs for the new WTP. Capital costs were not included, as it has been concluded that the capital costs for the new WTP and additional water supply projects do not change with or without water conservation measures.

3.3 PRELIMINARY CAPACITY FORECAST

Worksheet 3-4 (Appendix A) was used to forecast the City's supply for the next 20 years with the assumption that no additional water conservation measures be implemented. The total amount of required supply at year 2032 is 7,356 acre feet per year. The City currently has the required water supply to serve projected growth over the 20 year planning horizon.

CHAPTER 4
CONSERVATION GOALS

The process used to develop reasonable and measurable water conservation goals is documented in Chapter 4. Conservation goals established in this plan aim to provide benefits to both the City and its customers. The existing water conservation goals for the City were examined and used in the development of new goals.

4.1 WATER CONSERVATION GOALS

Continual population growth and recent droughts in Colorado have made water conservation an essential component of planning for most utilities. The City of Sterling is no exception and the City has been implementing and considering water conservation programs and measures for a number of years. The process of preparing this Water Conservation Plan provided an opportunity for the City to focus its current water conservation efforts and to assist in planning for additional efforts.

Table 4-1 summarizes the City of Sterling's water conservation goals and the type of savings targeted by each. The rational behind these goals and the measures implemented to achieve them are discussed in detail in Chapter 5 – Conservation Measures and Programs.

Table 4-1: Water Conservation Goals

Use	Goal	Type of Demand Targeted
Per capita residential demand	Savings in residential demands with a focus on irrigation	Average and Peak Day Demand
Per connection non-residential demand	Savings in per connection non-residential demand with a focus on large water users	Average Demand
Total park irrigation demand	Savings in total City irrigation	Average and Peak Day Demand
Unaccounted for water	Decrease the unaccounted for water by increasing metering and targeting potential leaks	Average Demand

Residential irrigation demand and per-connection non-residential demand were targeted in order to lower total water usage and limit required water right acquisitions.

Outdoor use accounts for 43% of the overall average demand. Therefore, targeting outdoor use would reduce overall demand, limiting future required water right acquisitions. Additionally, outdoor use occurs during irrigation season; therefore, reducing the overall outdoor use would reduce the peak demands within the system.

The City of Sterling averages approximately 17% unaccounted for water annually. It is estimated that 11% of the demand within the potable system is leaks. By reducing the amount of unaccounted for water, the City will have the ability to determine how much of the demand is truly leaks. Accounting for all water demands will be important in order to measure the success of each water conservation measure and program implemented in the future. Additionally, a leak detection program could reduce the overall demand within the potable system and is a good management practice.

The City has set a goal of 8.5% total reduction of their average demand by 2022. Projections with no additional water conservation measures or programs show the City using 2,136 million gallons (6,557 ac-ft) per year in 2022. By saving 8.5% of the overall demand, the City would be saving 181 million gallons (555 ac-ft) per year by the year 2022. In addition to overall savings, the City has set a goal reduce the projected peak day demand in the year 2022 by 6.7%. Projections with no additional water conservation measures or programs indicate a peak day demand of 10.6 mgd in 2020. A 6.7% reduction would result in a peak day demand of 9.9 mgd in 2022.

Water accounting will be useful for tracking the progress of the water conservation effort over time. Adjustments can be made and measures or programs strengthened if the desired progress is not realized.

4.2 GOAL DEVELOPMENT PROCESS

The City of Sterling has implemented water conservation measures in the past. The development of this Water Conservation Plan has provided an opportunity to evaluate the areas which have the greatest potential for savings and the areas which make the most economic sense.

Water conservation goals were presented to the City and discussed in a conference call held on March 18, 2009. The Water Conservation Plan was advertised and made available to the public on the City's website and at City Hall from March 23, 2009 to May 21, 2009. The City received no public comments. The correspondence with the public is documented in Appendix C.

CHAPTER 5
CONSERVATION MEASURES AND PROGRAMS

In this chapter, possible conservation measures and programs were identified. From the initial list, the measures and programs that aligned with the City's goals and resources were selected for additional consideration in Chapter 6.

5.1 CONSERVATION MEASURES AND PROGRAMS

Conservation measures are specific technologies or practices that directly reduce water use. The customer rather than the water provider must implement demand-side measures. For instance, it is ultimately the customer who replaces an old toilet with a water-efficient model. On the other hand, the water provider implements supply-side measures, such as leak repair. Conservation programs are the activities that a water provider or local government undertakes to encourage or require conservation measures. For example, the utility can offer rebates to customers who replace old toilets. Programs do not themselves save water. For instance, a leak identification program does not save water. It is, of course, a key precursor to leak repair, a measure that does save water.

The City has already implemented some water conservation programs, including a tiered rate structure, overall rate increases, and watering restrictions. These programs have decreased the City's water demands. Additional measures and programs were selected for further screening. Table 5-1 summarizes the water conservation measures that were considered as a part of this Water Conservation Plan. Worksheets 5-1 and 5-2 (Appendix A) provide additional information about the measures and programs that were evaluated.

Table 5-1: Water Conservation Measures Evaluated

Water Conservation Measure	Target User	Target Demand
Showerhead giveaway program	Single-family residential	Average Demand
Efficient washing machine rebate program	Single-family residential	Average Demand
Installation of ET [(1)] monitors and irrigation audit for City parks	Parks	Average and Peak Day Demands
Residential irrigation system controller rebate program	Single-family residential	Average and Peak Day Demands
Xeriscape rebate program	Single-family residential	Average and Peak Day Demands
Voluntary water audit program	All users	Average and Peak Day Demands
Leak detection program	Unaccounted for water	Average Demand
Increased metering coverage	Unaccounted for water	Average Demand
Water conservation educational outreach program	All users	Average and Peak Day Demands
Water-saving landscape demonstration at City Hall	All users	Average and Peak Day Demands
Water rate increase	All users	Average and Peak Day Demands

[(1)] ET = Evapotranspiration

5.2 SCREENING CRITERIA

The measures and programs that were identified were screened based on a number of factors.

1) The measures and programs had to be within the City's ability to implement. If the City does not have the required legal rights to implement a measure or program it was automatically excluded.

2) The City does not have the resources available to implement any programs with high start up costs. For this reason, programs and measures with large amounts of money required to start were excluded.

3) Programs and measures that require significant administration efforts were generally excluded.

4) Programs and measures requiring significant financial burden on residential users were eliminated from further consideration. These measures or programs are not anticipated to have a high level of participation.

5) Programs and measures that require a significant cost to savings ratio when compared to other measures were generally excluded from further consideration.

6) Several programs and measures were simply not applicable to the City.

5.3 CONSERVATION MEASURES AND PROGRAMS SELECTED FOR FURTHER ANALYSIS

The conservation measures and programs that were selected for further analysis in the following chapter are explained below. The criteria for why programs or measures were eliminated from further consideration are found in Worksheets 5-1 and 5-2 (Appendix A).

Demand Side Measures and Programs

- Increasing the number of water-efficient fixtures by evaluating a showerhead giveaway program. The program would consist of customers bringing in an old showerhead from their home and getting a replacement showerhead from the City with a flow rate of 1.5 gpm.

- Increasing the number of water-efficient appliances by evaluating an efficient washing machine rebate program. The program would allow customers to show receipts for the purchase of a water efficient washing machine and receive a $100 rebate.

- Efficient irrigation by implementing an irrigation system controller rebate program. This program would allow customers to show receipts for the purchase of an irrigation system controller with rain sensor and receive a $50 rebate.

- Efficient irrigation by installing evapotranspiration (ET) monitors on park irrigation systems will be evaluated. This would be coupled with an overall park irrigation audit conducted by an outside consultant selected by the City.

- Landscape efficiency by implementing a xeriscape rebate program. Customers would be encouraged to install xeriscape landscaping. The City would match 50% the cost of the landscaping up to a maximum of $1,000 per installation.

- Encouragement of water conservation by implementation of a voluntary water audit program. The audits would be performed by outside consultants selected by the City. Any costs would be paid for by the City. Residential and non-residential users would be encouraged to participate.

- Water conservation encouraged by the use of public education. This program would be implemented along with other programs in monthly inserts into water bills.

- The new water treatment plant will trigger a substantial increase in water rates. Water rates have already begun to increase. The latest increase was effective as of February 1, 2009. A rate study has been completed by the City. It is anticipated that additional increases will encourage consumers to conserve.

Supply Side Measures and Programs

- Implementation of a leak detection and repair program will be evaluated. This measure would decrease the amount of non-account water lost in the system. Implementation of this measure is currently ongoing.

- Increasing the total coverage of metered users. This would mainly target the government buildings that are not currently metered.

CHAPTER 6
SELECTION OF CONSERVATION MEASURES AND PROGRAMS

The initial list of measures and programs identified in Chapter 5 for further evaluation were analyzed using cost effectiveness and other criteria in this section. During the evaluation process, five groups of measures and programs were selected for implementation.

6.1 COMBINATIONS OF MEASURES AND PROGRAMS

The measures and programs that were selected to be analyzed in Chapter 5 were combined in appropriate groups to allow for a more integrated assessment of the potential benefits that may be derived from their implementation. This is an important step because measures and programs are often used in conjunction with one another, and by grouping them together it is possible to avoid double-counting of water savings or implementation costs. Table 6-1 describes the groups of measures and programs and includes the anticipated number of installations or uses and the expected lifespan of the group.

Table 6-1: Summary of Groups

Main Category	Specific Measure/Program	Anticipated Number Of Installations Or Uses	Expected Lifespan Of The Group
DEMAND-SIDE MEASURES AND PROGRAMS			
Group 1 (Rebate program)			
Water-efficient fixtures	Showerhead giveaways	2,800 fixtures	10 years
Water-efficient appliances	Washing machine rebates	55 washers	10 years
Landscape efficiency	Irrigation controller rebates	55 controllers	10 years
Group 2 (Reduction of Irrigation Demand in City Parks)			
Landscape efficiency	Install ET monitors on City park irrigation systems	16 ET monitors	5 years
	Irrigation water audit for all City parks	n/a	5 years
Group 3 (Reduction of Irrigation Demand for Residential Users)			
Low water use landscape	Implement a xeriscape rebate program for residential users	45 xeriscape installations	10 years
Group 4 (Reduction in Non-Account Water)			
Distribution system efficiency	Implement a leak detection and repair program	n/a	10 years
	Decrease unmetered connections	n/a	10 years
Group 5 (Reduction in Per Capita Residential and Per Connection Non-Residential)			
Customer water audits	Implement a residential and non-residential voluntary water audit program	400 audits	10 years
Education/information dissemination	Provide water conservation education inserts in monthly water bills	45,000 inserts	10 years
Rate structures and billing systems designed to encourage efficiency	Increase in water rates triggered by new water treatment plant	All	Immediate

6.2 COSTS AND WATER SAVINGS OF CONSERVATION OPTIONS

The costs and water savings for each of the groups of measures and programs were analyzed using Worksheet 6-1 (Appendix A). Worksheet 6-2 (Appendix A) summarizes the cost effectiveness and net benefits of each of the groups.

6.3 BENEFITS AND COSTS

Based on the information in Worksheets 6-1 and 6-2 the amount of water saved and the cost for each group of measure and program could be easily compared. Table 6-2 summarizes each group and outlines the savings and the costs for each.

Table 6-2: Benefits and Costs for Each Group

Group	Water Savings	Total Cost	Implementation Period	Cost/1,000 Gal Saved
Group 1: Rebate program	Annual: 16.4 MG Peak Day: 0.005 mgd	$32,000	10 years	$0.20
Group 2: Reduction in Parks Irrigation	Annual: 72.6 MG Peak Day: 0.1 mgd (1)	$34,000	5 years	$0.09
Group 3: Reduction in Residential Irrigation	Annual: 0.51 MG Peak Day: 0.004 mgd	$45,000	10 years	$8.82
Group 4: Reduction in Non-Account Water	Annual: 1.5 MG	$95,000	10 years	$12.67
Group 5: Per capita residential & per connection non-residential	Annual: 24.6 MG Peak Day: 0.1 mgd	$180,000	10 years	$0.73

(1) Peak day savings represented is for the potable irrigation only.

6.4 EVALUATION CRITERIA

The groups of measures and programs were evaluated based on a number of criteria. While cost was an important factor in determining the measures selected for implementation, other factors were considered as well. The non-monetary factors that were the most important in the evaluation were ease of implementation, staff resources and capabilities, consumer cost impacts, pubic perception, overall effectiveness, and overall water savings.

6.5 SELECTION OF CONSERVATION MEASURES AND PROGRAMS

The measures listed in Table 6-2 were presented to the City. The City reviewed the measures and programs, and a conference call was held on March 18, 2009 to select the measures and programs that would be implemented as part of this plan and to discuss the logistics of their implementation. The participants of the conference call included members of the City's staff along with engineers from Richard P. Arber Associates and Bishop-Brogden Associates, Inc.

Groups 1, 2, 4, and 5 were selected for implementation. The selection of conservation measures and programs is summarized in Worksheet 6-3 (Appendix A). Table 6-3 outlines the general criteria used to select or not select each group.

Table 6-3: Selection Criteria

Group	Selected (yes/no)	Reason
Group 1: Rebate program	Yes	Public perception, ease of implementation
Group 2: Reduction in Parks Irrigation	Yes	Magnitude of annual savings, cost effectiveness
Group 3: Reduction in Residential Irrigation	No	High consumer cost impact, cost ineffectiveness
Group 4: Reduction in Non-Account Water	Yes	Good management practice, improves accounting capability
Group 5: Per capita residential & per connection non-residential	Yes	Public perception, effectiveness across entire user base

The rebate program (Group 1) results in significant savings, and it is the second most cost effective group. In addition, there may be other benefits to the measure. It is anticipated that measure will urge residents who normally would not think about water conservation to begin practicing water conservation measures. The idea of the City making strides to save water is anticipated to have a positive public perception.

The group that results in the largest savings overall is Group 2. An evaluation of park irrigation practices across the city indicates that a significant savings in irrigation is possible (30%) with the installation of ET monitors. This would result in an annual average and peak day savings.

A combination of measures and programs (Group 5) is anticipated to reduce the residential per capita usage and the non-residential per connection usage. The new water plant project will raise water rates significantly. The City has already begun to raise rates, with the last rate increase becoming effective February 1, 2009. As rates increase, users will begin to investigate ways to save water. One method that will be made available to users is voluntary water audits. An educational outreach program will be implemented by inserting water conservation educational material in monthly water bills. The inserts will also advertise the voluntary water audits and the rebate/giveaway program. The public perception of increasing water rates will be more positive as the City takes steps to assist users in reducing water demands.

It is difficult to determine the exact distribution of non-account water in the system. By installing meters on all government buildings, the system losses can be clearly defined, thereby making the water accounting system more transparent. It is estimated that some system losses can be reduced by implementing a leak detection program. Leak detection programs are a good management practice to reduce system losses that may otherwise go unnoticed. This measure may not result in a large savings; however, it will be important to the overall water conservation effort by enhancing the accounting ability of the City. Water accounting will be an important way to evaluate progress.

Xeriscaping is widely accepted as a good management practice to reduce irrigation demands. However, xeriscaping is costly. The high cost of xeriscaping may inhibit many users from participating; therefore, the xeriscape rebate program was not selected.

CHAPTER 7
INTEGRATION OF RESOURCES AND MODIFICATION OF FORECASTS

Chapter 7 focuses on modifying water demand and supply capacity forecasts to reflect the anticipated effects of conservation. The measures and programs are evaluated to determine whether and how water savings from conservation will allow the City to eliminate, downsize, or postpone new facilities and water rights acquisitions.

7.1 DEMAND FORECAST MODIFICATIONS

The demand forecasts that were presented in Chapter 2 were modified to reflect changes based on the introduction of the proposed conservation measures that were selected in Chapter 6. These modifications are presented in Worksheet 7-1 (Appendix A). Figure 7-1 illustrates the projected demands with implementation of future water conservation practices. Table 7-1 summarizes the estimated savings by implementing future water conservation measures.

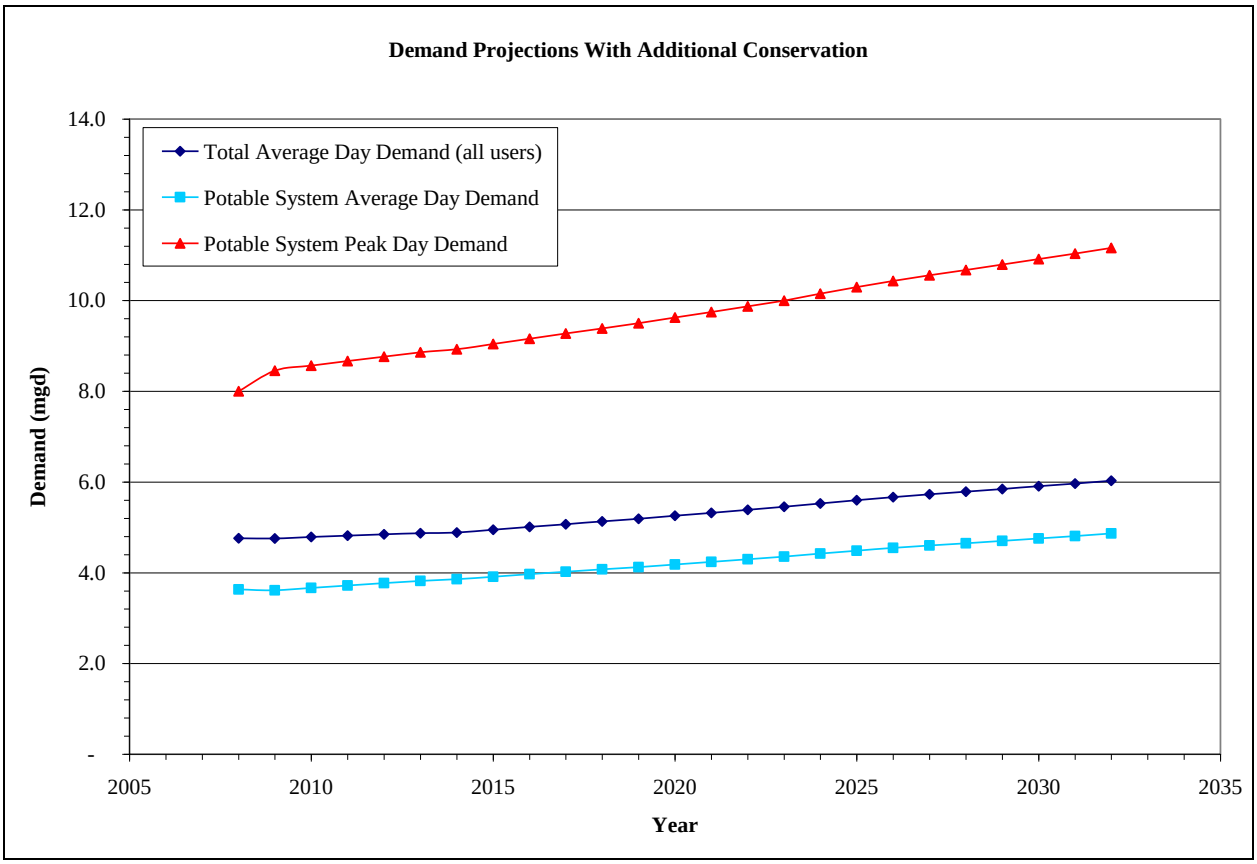


FIGURE 7-1: PROJECTED DEMANDS WITH ADDITIONAL FUTURE WATER CONSERVATION MEASURES

Table 7-1: Estimated Savings

Year	Type of Demand	Without Additional Conservation	With Additional Conservation	% Savings
2012	Total Annual Average	5.0 mgd	4.9 mgd	2.0%
	Potable Annual Average	3.8 mgd	3.8 mgd	0.0%
	Potable Peak Day Demand	9.0 mgd	8.8 mgd	2.2%
2022	Total Annual Average (1)	5.9 mgd	5.4 mgd	8.5%
	Potable Annual Average (2)	4.5 mgd	4.3 mgd	4.4%
	Potable Peak Day Demand	10.6 mgd	9.9 mgd	6.7%
2032	Total Annual Average	6.6 mgd	6.0 mgd	9.1%
	Potable Annual Average	5.2 mgd	4.9 mgd	5.8%
	Potable Peak Day Demand	12.0 mgd	11.2 mgd	6.7%

(1) It is estimated that total annual average savings by 2022 may vary from 5 - 15%.
(2) It is estimated that potable peak day demand savings by 2022 may vary from 5 - 10%.

The estimated savings outlined in Table 7-1 are based on programs and measures that will best serve the City and its residents. Estimated savings were calculated based on available water conservation information. True savings may be more or less based on the level of success realized after the implementation of the selected water conservation measures and programs. However, these projections have been used by the City for planning purposes.

This Water Conservation Plan provides a good model for the City of Sterling. However, an important part of water conservation is continuing to account for the effectiveness of each program or measure. If a program or measure is not proving to be successful, it should be re-evaluated, and either modified, eliminated, or replaced with a different measure or program in order to meet the goals that have been established.

7.2 PROJECT-SPECIFIC SAVINGS AND SUPPLY-CAPACITY FORECASTS

The forecasts presented in the previous section estimate savings in the future as a result of current and future water conservation practices. The new WTP capacity has been planned with water conservation in mind. The plant will be constructed with capacity to treat water for the 10 year horizon. Space will be left in the building to accommodate additional treatment capacity beyond the 10 year planning horizon. There is no project specific savings associated with future water conservation measures, as the capacity of the plant has already been planned with water conservation accounted for.

The augmentation supplies required to replace all of the City's depletions associated with the well pumping only change slightly when considering additional water conservation measures. With the new WTP and with additional conservation measures in place, the City will need to lease up to 55 acre-feet in November or December of 2009 through 2013 in order to fully augment all depletions. The cost of an augmentation supply lease varies; however, the City could possible obtain this amount of water for less than $2,200 each year. If no additional water conservation measures are implemented, the City will need to lease up to 70 acre-feet in

November or December of 2009 through 2014. The cost of an augmentation supply lease varies, however the City could possibly obtain this amount of water for less than $3,000 each year.

7.3 REVENUE EFFECTS

The water conservation programs and measures that are planned have significant costs associated with them. The costs of water conservation coupled with the debt service the City will incur as a result of capital projects will need to be evaluated. A cash flow analysis is difficult at this time, as the estimated costs for capital facilities are at the planning level of detail. As the water treatment project progresses, the City plans to implement a rate structure that takes into account debt payment, operating costs, and the reduced revenue from water not sold due to water conservation. Additionally, rate increases must be implemented such that excessive financial burden on the citizens of Sterling is avoided.

CHAPTER 8
IMPLEMENTATION PLAN

Chapter 8 presents a strategy and timetable for implementing conservation measures and other elements of the Water Conservation Plan. This includes monitoring and evaluating the water conservation activities and revising and updating the Water Conservation Plan.

A conference call was held on March 18, 2009 to select the measures and programs that would be implemented as part of this plan and to discuss the logistics of their implementation. The participants of the conference call included members of the City's staff along with engineers from Richard P. Arber Associates and Bishop-Brogden Associates, Inc.

8.1 IMPLEMENTATION SCHEDULE

The implementation of the measures and programs will be spread throughout the 20 year planning period of this Water Conservation Plan. Measures and programs will be phased in order to spread out the capital costs and increased administrative efforts required for the projects. Table 8-1 summarizes the implementation schedule for the existing conservation activities and the chosen future measures and programs.

Table 8-1: Implementation Schedule for Measures and Programs

Line	Measure/Program	Required Action	Scheduled Beginning Date	Expected Completion Date
CHOSEN FUTURE MEASURES AND PROGRAMS				
Group 1 (Rebate program)				
1	Showerhead giveaways	Purchase the first 1,000 showerheads. Replenish as necessary.	2010	2019
2	Washing machine rebates	Develop water bill insert to advertise the program.	2010	2019
3	Irrigation controller rebates	Include advertising for this program with program from line 2	2010	2019
Group 2 (Reduction of Irrigation Demand in City Parks)				
4	Installation of ET monitors in City parks	Purchase and install ET monitors	2010	2014
5	Irrigation water audit for City parks	Select a consultant specializing in efficient irrigation techniques	2010	2014
Group 4 (Reduction in Non-Account Water)				
6	Leak detection and repair program	Contract with leak detection specialist	Ongoing	2014
7	Decrease unmetered connections	Inventory all unmetered connections, purchase meters, and install	2010	2011
8	Water accounting	Develop a database for tracking water production and demand	Ongoing	2010
Group 5 (Reduction in Per Capita Residential and Per Connection Non-Residential)				
9	Customer water audits	Select a consultant specializing in residential, commercial, and industrial water audits	2012	2016
10	Education/information dissemination	Include conservation techniques in monthly water bill inserts	Implemented with Group 1	Ongoing
11	Increase water rates	Administrative action	Ongoing	Ongoing
EXISTING CONSERVATION ACIVITIES				
12	Watering restrictions	Odd addresses water Tuesday, Thursday, and Saturday; and even addresses water Wednesday, Friday, and Sunday	2003	Ongoing
13	Watering restrictions	Golf courses using City water cannot water roughs	2003	Ongoing
14	Watering restrictions	Vehicle fleets and vehicles in auto dealerships cannot be washed more than once each week	2003	Ongoing
15	Watering restrictions	Personal vehicles must be washed only on watering days	2003	Ongoing
16	Watering restrictions	Restaurants may serve water only upon request	2003	Ongoing
17	Rate structure	City has implemented a tiered rate structure	2005	Ongoing
18	Rate increases	City has begun to increase water rates	Latest Increase February 1, 2009	Ongoing
19	Educational outreach	City supports an annual water festival for fourth through sixth grade age children and families in northeastern Colorado	Ongoing	Ongoing

8.2 PLAN FOR PUBLIC PARTICIPATION IN IMPLEMENTATION

Public participation is important to the implementation of a Water Conservation Plan because it increases the likelihood of success by increasing customer buy-in of the new measures and programs. An advertisement for a 60-day public comment period for the Water Conservation Plan was made in The Journal Advocate. A copy of the Water Conservation Plan was available at City Hall for public review during the public comment period. Additionally, the Water Conservation Plan was made available for download on the City's website. There were no comments received from the public. The proof of publication is documented in Appendix C.

8.3 PLAN FOR MONITORING AND EVALUATION PROCESSES

The measures and programs outlined in this plan will be monitored for their water savings and associated costs. This data will be collected annually so that the programs effectiveness can be tracked. Because there will be multiple conservation measures and programs happening at the same time, it may be difficult to track some of the water savings by individual measures or programs. The measures and programs that are relatively easy to track individually (rebates, park irrigation, large water user audits, etc.) will be tracked; however, overall water savings will also be tracked to evaluate the effectiveness of the Water Conservation Plan as a whole. Monitoring and evaluating the plan at frequent intervals will also allow the City to discontinue a measure or program that is found to be ineffective or too costly.

8.4 PLAN FOR UPDATING THE CONSERVATION PLAN

The City intends to update the plan, at a minimum, every 7 years and will update the plan when significant changes occur to the system. When updating the plan the City will examine the costs and benefits of the measures and programs that were implemented in the previous plan. The City will also have the opportunity to add additional water saving measures and programs.

A benefit of updating the plan at a minimum every 7 years will be to examine the actual water use compared to the forecasted water use. The forecasts should be updated and revised.

8.5 WATER CONSERVATION PLAN ADOPTION, COMPLETION, AND APPROVAL

This Water Conservation Plan was developed in conjunction with the City of Sterling staff. Following completion of the 100% draft report, the plan was approved through the following series of steps:

1. Public comment period from March 23, 2009 to May 21, 2009
2. Initial approval by the City of Sterling on July 28, 2009 (Appendix D)
3. Colorado Water Conservation Board review and approval
4. Final approval by the City of Sterling

CHAPTER 9
MONITOR, EVALUATE AND REVISE CONSERVATION ACTIVITIES

9.1 FUTURE WATER CONSERVATION PLAN ACTIVITIES

Implementation of the Water Conservation Plan is a long term activity that involves continual evaluation and refinement of the plan. The Water Conservation Plan will begin to be implemented following adoption by the City of Sterling, and will be implemented in general conformance with the key activities identified in this report, including:

- Initiation of water conservation measures and programs according to the schedule identified in Table 8-1.
- Tracking system performance and water savings. Several years of data will likely be required to evaluate the impacts and performance of the measures and programs implemented as a result of this Water Conservation Plan.
- Refining the Water Conservation Plan as a result of increasing water demands, the addition of new water supply sources, and any other changes to the nature of the City over time. Changes to the plan can be adopted at any time.
- Periodic involvement of the public through public meetings, and on-going involvement from the City of Sterling.

REFERENCES

- *City of Aurora, Reuse Water Master Plan Update*, Richard P. Arber Associates (2008).

- *City of Sterling, Lawn Irrigation Return Flow Analysis*, Bishop-Brogden Associates, Inc. (2007).

- *City of Sterling Water Conservation Plan* (1996).

- *Erie Water Conservation Plan*, Camp Dresser McKee, (2008).

- *Smart Water, A Comparative Study of Urban Water Use Efficiency Across the Southwest*, Western Resource Advocates (2003).

- *Treated Water Distribution System Master Plan Update, City of Aurora*, Black and Veatch (2006).

T:\PROJECTS---CLIENTS\STERLING\STRLNG02\1-PREDESIGN\REPORTS\WATER CONSERVATION PLAN\FINAL PLAN\STERLING FINAL WCP 2-22-10.DOC

APPENDIX A

Worksheet 1-1: Water System Profile

A	SERVICE CHARACTERISTICS	Number		
1	Estimated service population	13,900 residents		
2	Estimated service area (square miles)	5.38 square miles		
3	Miles of mains	85 miles transmission and distribution mains		
4	Number of treatment plants	Zero		
5	Number of separate water systems	One		
6	Interconnections with other systems	None		
B	**ANNUAL WATER SUPPLY**	**2008 Annual volume**	**Number of intake or source points**	**Percent metered**
7	Groundwater	1,733 million gallons	29 Wells	100%
8	Surface water	0	0	N/A
9	Purchases: raw	0	0	N/A
10	Purchases: treated	0	0	N/A
11	Total annual water supply	1,733 million gallons	29 Wells	100%
C	**SERVICE CONNECTIONS**	**2008 Connections**	**2008 Annual Demand**	**Percent metered**
12	Residential, single-family	3,656	525 million gallons	100%
13	Residential, multi-family	391	100 million gallons	100%
14	Industrial	13	224 million gallons	100%
15	Government	49	215 million gallons	No data
16	Commercial	520	164 million gallons	100%
17	Parks	30	247 million gallons	No data
15	Total connections	4,659	1,475 million gallons	No data
D	**WATER DEMAND**	**2008 Annual volume**	**Percent of total**	**Per connection**
16	Residential	625 million gallons	36%	0.15 million gallons
17	Nonresidential	850 million gallons	49%	1.4 million gallons
18	Other (construction)	N/A	N/A	N/A
19	Nonaccount water [1]	259 million gallons	15%	N/A
20	Total system demand (total use)	1,734 million gallons	100%	0.37 million gallons
E	**AVERAGE & PEAK DEMAND (Potable System)**	**2008 Demand**	**Total supply capacity**	**Percent of total capacity**
21	Average-day demand	3.4 MGD	14.4 MGD	24%
22	Maximum-day demand	8.0 MGD	14.4 MGD	55%
23	Maximum-hour demand	No data	No data	No data
F	**PLANNING**	**Prepared a plan**	**Date**	**Filed with state**
24	Capital, facility, or supply plan	N/A	N/A	N/A
25	Drought or emergency plan	N/A	N/A	N/A
26	Water conservation plan	In Progress	In Progress	In Progress

[1] Non-account water is 17% of the potable distribution system.

Worksheet 1-2: Summary of System Conditions

PLANNING QUESTIONS	YES	NO
Is the system in a designated critical water supply area?		X
Does the system experience shortages or supply emergencies?		X
Does the system have substantial unaccounted-for and lost water	X	
Is the system experiencing high rate of population growth?		X
Is the system planning substantial improvements or additions?	X	
Are increases to wastewater system capacity anticipated within the planning horizon?		X

Worksheet 1-3: Summary of Current Conservation Activities

Water conservation measures and programs	*Approximate* annual water savings [if known]	Implemented since (date)	Is continued implementation planned?
Regulations/Ordinances			
Watering restrictions	N/A	2003	Yes
Rate structures and billing systems designed to encourage efficiency			
Tiered rate structure	N/A	2005	Yes
Increased rate structure	N/A	2009	Yes
Distribution system efficiency			
Increased metering of parks	N/A	2006	Yes

Worksheet 2-1: Preliminary Water Demand Forecast

Line	Item	Year (2008)	Year (2012)	Year (2022)	20-Year Forecast (2032)
A	**RESIDENTIAL DEMAND**				
1	Current annual water residential demand (total million gallons)	627			
2	Current population served	13,900			
3	Residential sales per capita (line 1 divided by line 2)	0.0451			
4	Projected population [a]		15,610	19,192	22,212
5	Projected annual residential water demand (line 3 multiplied by line 4)		704	866	1,002
B	**NONRESIDENTIAL DEMAND**				
6	Current annual water nonresidential demand (total million gallons)	165			
7	Current number of service connections [b]	532			
8	Water use per tap equivalent (line 6 divided by line 7)	0.310			
9	Projected number of service connections [c]		582	716	829
10	Projected annual nonresidential water demand (line 8 multiplied by line 9)		181	222	257
C	**GOVERNMENT DEMAND**				
11	Current annual government demand (total million gallons) [d]	215			
12	Projected annual government demand [e]		215	215	215
D	**ETHANOL PLAND DEMAND**				
13	Current ethanol plant demand (total million gallons)	223			
14	Projected ethanol plant demand [f]		223	223	223
E	**POTABLE IRRIGATION DEMAND (EXCLUDING RESIDENTIAL)**				
15	Current potable irrigation demand (total million gallons) [g]	61			
16	Projected potable irrigation demand [h]		64	79	91
F	**IRRIGATION-ONLY WELLS DEMAND**				
17	Current irrigation-only wells demand (total million gallons [i]	198			
18	Projected irrigation-only wells demand [j]		208	255	296
G	**NON-ACCOUNT WATER (WATER NOT SOLD TO CUSTOMERS)**				
19	Current non-account water demand [k]	224			
20	Projected non-account water demand [l]		233	276	313
H	**WATER SYSTEM TOTAL DEMAND**				
21	Current total annual water demand (add lines 1, 6, 11, 13, 15, 17, and 19)	1,713			
22	Projected total annual water demand (add lines 5,10, 12, 14, 16, 18, and 20)		1,827	2,136	2,397
23	Adjustments to forecast (+ or -)		0	0	0
24	Current (line 21) and adjusted total annual water demand forecast (add lines 22 and 23)	1,713	1,827	2,136	2,397
25	Current and projected annual supply capacity	9,830	9,830	9,830	9,830
26	Difference between total use and total supply (+ or -) (subtract line 21 from 25)	8,117	8,003	7,694	7,433
I	**AVERAGE-DAY AND MAXIMUM-DAY DEMAND (POTABLE WATER)**				
27	Current total annual potable water demand (add lines 1, 6, 11, 15, and 19)	1,292			
28	Projected total annual potable water demand (add lines 5, 10, 12, 16, and 20)		1,396	1,658	1,878
29	Current average-day demand (line 27 divided by 365)	3.54			
30	Projected average-day demand (line 28 divided by 365)		3.83	4.54	5.15
31	Current maximum-day demand	7.99			
32	Maximum-day to average-day demand ratio [m]	2.34			
33	Projected maximum-day demand (line 18 multiplied by line 20 for all forecast years)		8.95	10.63	12.04
34	Adjustment to maximum-day demand		0.00	0.00	0.00
35	Current (line 31) and adjusted maximum-day demand forecast (add lines 33 and 34)	7.99	8.95	10.63	12.04
36	Daily supply capacity (potable wells only)	14.4	14.4	14.4	14.4
37	Ratio of maximum-day demand to daily supply capacity (divide line 35 by 36)	0.55	0.62	0.74	0.84

[a] Population projections are based on the Department of Local Affairs (DOLA).
[b] Number of service connections used instead of number of employees.
[c] Growth in number of service connections equivalent to annual population growth.
[d] Government sales represent the Department of Corrections.
[e] Department of Corrections is at full capacity and demand will remain constant.
[f] Ethanol plant at capacity and demands anticipated to be constant into the future.
[g] Potable irrigation includes irrigation of parks, sportsfields, and cemetaries with water from distribution system.
[h] Growth in potable irrigation equivalent to annual population growth.
[i] Irrigation-only wells includes irrigaiton of parks, sportsfields, and cemetaries with wells not connected to distribution system.
[j] Growth in irrigation-only wells equivalent to annual population growth.
[k] 2008 non-account water approximately 24% of demand from the distribution system (residentail, non-residential, government, potable irrigation).
[l] 20% of the demand from the distribution system (residential, non-residential, governement, potable irrigation). Average calculated from 2006 - 2008.
[m] Maximum-day to average-day demand ratio calculated as average from previous three years of production and demand data.

Worksheet 3-1: Anticipated Improvements and Additions

Type(s) of Project(s) [a]	Improvement	New Capacity	Start date	End date
Source of supply	☑			
Water treatment facilities			2008	2012
Treated water storage			2009	
Major transmission lines				

Need(s) for Project(s) (Check all that apply)		Notes
Enhance compliance with regulations	☑	Drinking water standards
Replace older equipment or facilities		_____
Meet average-day demand		_____
Meet maximum-day demand		_____
Meet future growth needs		_____

Funding

Project: Sterling Water Treatment Project
Project Cost: $24,140,000
Financing Cost: $11,390,000 (Assuming 4.0% annual project interest rate, 20 year loan)
Total Capital Cost: $35,530,000

Water purchases

Anticipated future water purchases	None
Cost of water purchases	None

Worksheet 3-2: Cost of Supply-Side Facilities

Line	Item	Facilities for meeting average-day demand	Facilities for meeting maximum-day demand			Water purchases needed to meet demand	Estimate of simple incremental supply cost ($/ gallons)
		Source of supply	Water treatment facilities (average day demand)	Treated water storage	Major transmission lines		
A	**SUPPLY CAPACITY IN MILLION GALLONS PER DAY**						
1	Current installed capacity or water purchases		0.00	10.0			
2	Planned improvements and additions		4.30	0.00			
3	Planned retirements		0.00	0.00			
4	Future installed capacity or purchases (line 1 plus line 2 less line 3)		4.30	10.0			
B	**COST OF PLANNED IMPROVEMENTS AND ADDITIONS**						
5	Approximate total cost of planned improvements and additions identified in line 2 (including financing costs) [a]		See note a				
6	Expected life of new facilities (years) [a]		See note a				
7	Estimated annual capital costs (line 5 divided by line 6) [a]		See note a				
8	Estimated total annual operating costs		$2,750,000				
9	Estimated total annual costs (line 7 plus line 8)		$2,750,000				
10	Per unit cost of new facilities (line 9 divided by (line 2 multiplied by 365 multiplied by 1,000,000))		$0.00175				
11	Simple incremental supply cost (add all entries from line 10)						**$0.00175**

[a] The incremental supply cost used to compare groups of water conservation measures and programs are based on O&M costs. Capital costs are not included in the comparison, as there are no anticipated capital savings as a result of additional future water conservation.

Worksheet 5-1: Conservation Measures Identified in the Planning Process

Measure [a]	Already Implemented?	Evaluated in this Plan (Step 5)?	Evaluated in this Plan (Step 6)?	Comments [b]
DEMAND-SIDE MEASURES				
Water-efficient fixtures and appliances				
Toilets	X			Federal standard of 1.6 gallons per flush enacted in 1994. New homes will automatically have ultra-low flush toilets.
Urinals	X			Federal standards require new construction to have urinals that use 1.0 gallons per flush or less.
Showerheads		X	X	
Faucets	X			Federal standard of 2.2 gallons per minute was enacted in 1994.
Washing Machines		X	X	
Other [specify]				
Landscape efficiency				
Low water use landscapes		X	X	
Drought-resistant vegetation		X	X	
Efficient Irrigation		X	X	
Equipment		X	X	
Scheduling	X			
Develop a plan to turn large users off in drought situations				
Industrial and commercial efficiency				
Water-efficient processes		X	X	
Cooling equipment efficiency				
Other [specify]				
SUPPLY-SIDE MEASURES				
Water reuse systems				
Not applicable to Sterling				Sterling must return flow to South Platte River
Distribution system efficiency				
Leak repair		X	X	
Removal of phreatrophytes				There are no open channel conveyance systems used for supply or distribution.
Other [specify]				
Temporary transfers from agriculture				
Dry year leasing				
Rotational fallowing				
Water salvage				
Other [specify]				
Source optimization				
Conjunctive use				
System integration with other utilities				
Other [specify]				

[a] To meet the requirements of §37-60-126, C.R.S., measures in shaded rows were considered.

[b] This column was used to indicate the chief reason(s) a listed measure is not given further evaluation (Planning Step 6) in this plan.

Worksheet 5-2: Conservation Programs Identified in the Planning Process

Program [a]	Already Implemented?	Evaluated in this Plan (Step 5)?	Evaluated in this Plan (Step 6)?	Comments [b]
DEMAND-SIDE PROGRAMS				
Education/information dissemination				
Public education		X	X	This is done by educating people through water bill inserts providing both general water conservation techniques and advertising voluntary water audits, rebates, and the showerhead giveaway program.
Water-saving demonstrations		X		This is a high cost item for the City both for installation and maintenance. Public education will be conducted via information dissemination through water bill inserts.
School programs				
Informative and understandable water bill				
Water bill inserts		X	X	
Other [specify]				
Technical Assistance				
Customer water use audits		X	X	
Targeted at large users				
Targeted at large landscapes				
Water conservation expert available				
Other [specify]				
Rate structures & billing systems designed to encourage efficiency				
Volume billing	X			
Conservation (tiered) rate structure	X			
Increased (monthly) billing frequency				
Other [specify]				
Regulations/Ordinances				
Addressing fixtures & appliances				
Standards for fixtures and appliances				
Time of sale upgrades				
Other [specify]				
Addressing landscapes				
Turf restrictions				
Landscape design/layout				
Soil preparation				
Irrigation equipment				
Water waste prohibition				
Other (watering restrictions)	X			
Incentives				
Rebates		X	X	
Give-aways		X	X	
Other [specify]				
SUPPLY-SIDE PROGRAMS				
Distribution system efficiency				
Leak identification		X	X	
Meter source water	X			
Meter service connections	X	X	X	
Meter testing and replacement	X			
Improved water accounting	X	X	X	
Analysis of non-account water	X	X	X	
Other [specify]				

[a] To meet the requirements of §37-60-126, C.R.S., measures in shaded rows were considered.
[b] This column was used to indicate the chief reason(s) a listed measure is not given further evaluation (Planning Step 6) in this plan.

Worksheet 6-1: Analysis of Each Conservation Measure or Group of Measures & Programs

Group 1

Describe conservation measure(s):
Installing water efficient fixtures in area households.

Describe program(s), if applicable:
A give away of 3,500 showerheads rated at 1.5 gpm to replace showerheads rated at 2.5 gpm. Provide $100 rebate for the purchase of water efficient clothes washers. Provide $50 rebate for purchase of irrigation controller. Advertised in monthly water bills via inserts.

Typical measure/program water savings: 16.4 million gal per year
Number of planned installations: n/a
Anticipated life span of the savings 10 years

The measure(s)/program(s) is(are) designed to reduce:

- ☐ Average-day demand
- ☐ Maximum-day demand
- X Both average-day and maximum-day demand

Line	Item	Amount	Amount
A	**COST OF THE MEASURE(S)/PROGRAM(S) [a]**	**Per unit [b]**	**Total cost of the measure/program**
1	Materials	$ -	$ -
2	Labor	-	$ -
3	Rebates or other payments	-	$ 28,774
4	Marketing and advertising		$ 3,250
5	Administration		$ -
6	Consulting or contracting		$ -
7	Other		$ -
8	Total program costs for the life of the measure/program (add lines 1 through 7) [c]		$ 32,024
B	**ESTIMATED SAVINGS**		
9	Number of units to be installed [d]		n/a
10	Estimated annual water savings per unit in gallons [e]		na/
11	Total estimated annual savings for the measure/program in gallons (multiply line 9 by line 10)		16,400,000
12	Expected life span for the savings in years		10
13	Total life span estimated saving for the measure/program in gallons (multiply line 11 by line 12)		164,000,000
C	**ANALYSIS OF COST EFFECTIVENESS**		**Amount**
14	Cost of water saved by the measure in $/gallon (line 8 divided by line 13)		$ 0.000195
15	Simple incremental cost of water supply in $/gallon [f]		$ 0.001750
16	Cost comparison in $/gallon (line 15 less line 14)		$ 0.001555
D	**NET BENEFIT OF CONSERVATION**		**Amount**
17	Estimated value of water saved by the measure base on incremental supply cost (line 13 multiplied by line 15)		$ 287,000
18	Net value of water saved by the measure/program (line 17 less line 8)		$ 254,976

[a] This analysis is used to aid the comparison and selection of measure. Planners will estimate actual effects of conservation on planned capital facilities in Section 8. A separate analysis should be performed for each conservation measure or program, but measures/programs were combined if they jointly produce water savings.

[b] Examples of a unit are a toilet, a retrofit kit, and an audit. A unit estimate may not be appropriate for each measure/program in which case total measure/program water savings and costs were used.

[c] All recurring operation and maintenance costs over the life of the measure/program were considered.

[d] Units can be individual product units (such as toilets) or groups of products (such as household retrofits), as long as the analysis is consistent. Left blank if unit values do no apply.

[e] For example, water savings per retrofit. Leave blank if unit values do not apply.

[f] From Worksheet 3-2, line 11.

Summary of Group 1 Costs

	Description	Number	Cost/ea.	Total Cost	Water Savings (Annual Average)	Water Savings (Peak Day) [7]
Materials						
1	n/a			$ -		
Labor						
1	n/a			$ -		
Rebates or other payments						
1	Showerheads	2,800	$ 7.33	$ 20,524	15,300,000 gal/yr	
2	Washers	55	$ 100	$ 5,500	400,000 gal/yr	
3	Irrigation controllers	55	$ 50	$ 2,750	700,000 gal/yr	5,000 gal/d
				$ 28,774		
Marketing and advertising						
1	Clerical Staff (hours to develop mailers)	20	$ 50	$ 1,000		
2	Mailers (~4,500 bills)	45,000	$ 0.05	$ 2,250		
				$ 3,250		
Administration						
1	n/a			$ -		
Consulting or contracting						
1	n/a			$ -		
Other						
1	n/a			$ -		
TOTAL						
1	**Rebates**			$ 32,024		

Notes:
1) Cost of showerhead based on amconservationgroup.com.
2) Savings based on difference between 2.5 gpm and 1.5 gpm showerhead; 5 minute showers;
3 people per household; 1 shower per day per person.
3) Number of showerheads chosen based on approximately 75% of the total single family residential connections.
4) Number of washers chosen based on 0.4% of the total population
(average for Boulder, El Paso, Albuquerque - A Comparative Study of Urban Water Use Efficiency Across the Southwest.)
5) Average washer water use per year 13,500 gal (400 loads/yr - Energy Star); efficient washer use per year 6,000 gal.
6) Number of irrigation controllers based on same criteria as washers.
Potential savings per residence 8 inches/yr based on 2007 LIRF. Average yard size 2,430 ft2.
7) Peak day savings based on potable system only.

Worksheet 6-1: Analysis of Each Conservation Measure or Group of Measures & Programs

Group 2

Describe conservation measure(s):
Efficient irrigation in City parks.

Describe program(s), if applicable:
Install ET monitors in all City parks. Select an outside cosultant to conduct an irrigation water audit for the City Parks Department.

Typical measure/program water savings: 72.6 million gal per year
Number of planned installations: 16
Anticipated life span of the savings 5 years

The measure(s)/program(s) is(are) designed to reduce:

- ☐ Average-day demand
- ☐ Maximum-day demand
- X Both average-day and maximum-day demand

Line	Item	Amount	Amount
A	**COST OF THE MEASURE(S)/PROGRAM(S) [a]**	**Per unit [b]**	**Total cost of the measure/program**
1	Materials		$ 16,000
2	Labor		$ 4,480
3	Rebates or other payments	-	$ -
4	Marketing and advertising		$ -
5	Administration		$ -
6	Consulting or contracting		$ 12,800
7	Other		$ -
8	Total program costs for the life of the measure/program (add lines 1 through 7) [c]		$ 33,280
B	**ESTIMATED SAVINGS**		
9	Number of units to be installed [d]		16
10	Estimated annual water savings per unit in gallons [e]		0
11	Total estimated annual savings for the measure/program in gallons (multiply line 9 by line 10)		72,600,000
12	Expected life span for the savings in years		5
13	Total life span estimated saving for the measure/program in gallons (multiply line 11 by line 12)		363,000,000
C	**ANALYSIS OF COST EFFECTIVENESS**		**Amount**
14	Cost of water saved by the measure in $/gallon (line 8 divided by line 13)		$ 0.000092
15	Simple incremental cost of water supply in $/gallon [f]		$ 0.001149
16	Cost comparison in $/gallon (line 15 less line 14)		$ 0.001058
D	**NET BENEFIT OF CONSERVATION**		**Amount**
17	Estimated value of water saved by the measure base on incremental supply cost (line 13 multiplied by line 15)		$ 417,232
18	Net value of water saved by the measure/program (line 17 less line 8)		$ 383,952

[a] This analysis is used to aid the comparison and selection of measure. Planners will estimate actual effects of conservation on planned capital facilities in Section 8. A separate analysis should be performed for each conservation measure or program, but measures/programs were combined if they jointly produce water savings.

[b] Examples of a unit are a toilet, a retrofit kit, and an audit. A unit estimate may not be appropriate for each measure/program in which case total measure/program water savings and costs were used.

[c] All recurring operation and maintenance costs over the life of the measure/program were considered.

[d] Units can be individual product units (such as toilets) or groups of products (such as household retrofits), as long as the analysis is consistent. Left blank if unit values do no apply.

[e] For example, water savings per retrofit. Leave blank if unit values do not apply.

[f] From Worksheet 3-2, line 11. The cost indicated here is a weighted cost between potable water and irrigation water. It is assumed that 25% of the savings will be potable and 75% of the savings will be irrigation only.

Summary of Group 2 Costs

	Description	Number	Cost/ea.	Total Cost	Water Savings (Annual Average)	Water Savings (Peak Day) [5]
Materials						
1	ET monitors	16	$ 1,000	$ 16,000	72,600,000 gal/yr	128,000 gpd
				$ 16,000		
Labor						
1	Installation	64	$ 70	$ 4,480		
				$ 4,480		
Rebates or other payments						
1	n/a			$ -		
Marketing and advertising						
1	n/a			$ -		
Administration						
1	n/a			$ -		
Consulting or contracting						
1	Water audit consultant	128	$ 100	$ 12,800		
				$ 12,800		
Other						
1	n/a			$ -		
TOTAL						
1	**ET Monitors and Parks Water Audit**			$ 33,280		

Notes:
1) Cost of ET monitors based on $1,000 per unit with 16 installations in parks around the City (rainbird).
2) Labor cost based on 2 installations per day (8 days/8 hours per day).
3) Consulting or contracting based on 16 consultations at 8 hours each.
4) Estimated 30% savings in parks irrigation realized over a five year period.
5) Peak day savings based on potable system only.

Worksheet 6-1: Analysis of Each Conservation Measure or Group of Measures & Programs

Group 3

Describe conservation measure(s):
Low water-use landscapes at single family residences.

Describe program(s), if applicable:
Implement rebate system for residential xeriscaping. City will provide 50% match up to $1,000 for cost of xeriscaping a portion of residential turf. Advertise with inserts in monthly bills. Advertisement would also include miscellaneous water saving techniques around the household.

Typical measure/program water savings: 0.51 million gal per year
Number of planned installations: 46
Anticipated life span of the savings 10 years

The measure(s)/program(s) is(are) designed to reduce:

- ☐ Average-day demand
- ☐ Maximum-day demand
- X Both average-day and maximum-day demand

Line	Item	Amount	Amount
A	**COST OF THE MEASURE(S)/PROGRAM(S) [a]**	**Per unit [b]**	**Total cost of the measure/program**
1	Materials	$ -	$ -
2	Labor		$ -
3	Rebates or other payments		$ 45,000
4	Marketing and advertising		$ -
5	Administration		$ -
6	Consulting or contracting		$ -
7	Other		$ -
8	Total program costs for the life of the measure/program (add lines 1 through 7) [c]		$ 45,000
B	**ESTIMATED SAVINGS**		
9	Number of units to be installed [d]		46
10	Estimated annual water savings per unit in gallons [e]		0
11	Total estimated annual savings for the measure/program in gallons (multiply line 9 by line 10)		510,000
12	Expected life span for the savings in years		10
13	Total life span estimated saving for the measure/program in gallons (multiply line 11 by line 12)		5,100,000
C	**ANALYSIS OF COST EFFECTIVENESS**		**Amount**
14	Cost of water saved by the measure in $/gallon (line 8 divided by line 13)		$ 0.008824
15	Simple incremental cost of water supply in $/gallon [f]		$ 0.001750
16	Cost comparison in $/gallon (line 15 less line 14)		$ (0.007074)
D	**NET BENEFIT OF CONSERVATION**		**Amount**
17	Estimated value of water saved by the measure base on incremental supply cost (line 13 multiplied by line 15)		$ 8,925
18	Net value of water saved by the measure/program (line 17 less line 8)		$ (36,075)

[a] This analysis is used to aid the comparison and selection of measure. Planners will estimate actual effects of conservation on planned capital facilities in Section 8. A separate analysis should be performed for each conservation measure or program, but measures/programs were combined if they jointly produce water savings.

[b] Examples of a unit are a toilet, a retrofit kit, and an audit. A unit estimate may not be appropriate for each measure/program in which case total measure/program water savings and costs were used.

[c] All recurring operation and maintenance costs over the life of the measure/program were considered.

[d] Units can be individual product units (such as toilets) or groups of products (such as household retrofits), as long as the analysis is consistent. Left blank if unit values do no apply.

[e] For example, water savings per retrofit. Leave blank if unit values do not apply.

[f] From Worksheet 3-2, line 11.

Summary of Group 3 Costs

	Description	Number	Cost/ea.	Total Cost	Water Savings (Annual Average)	Water Savings (Peak Day) [4]
Materials						
1	n/a			$ -		
Labor						
1	n/a			$ -		
Rebates or other payments						
1	Xeriscape rebate	45	$ 1,000	$ 45,000	510,000 gpd	4,000 gpd
				$ 45,000		
Marketing and advertising						
1	already including inserts in rebates section			$ -		
Administration						
1				$ -		
Consulting or contracting						
1	n/a			$ -		
Other						
1	n/a			$ -		
TOTAL						
1	**Xeriscape rebate**			$ 45,000		

Notes:

1) Average turf area per household 2,430 ft^2; Cost based on 30% area xeriscaped at $2.00/$ft^2$; 50% City match.
2) Number of rebates based on 1% of households participating.
3) Administration costs based on 2 hours per install to go over rebate paperwork and issue checks.
4) Peak day savings based on potable system only.

Worksheet 6-1: Analysis of Each Conservation Measure or Group of Measures & Programs

Group 4

Describe conservation measure(s):
Leak detection, increase metering coverage, and water accounting.

Describe program(s), if applicable:
Implement a leak detection program. Complete installation of meters on all government building connections.
Implement a water accounting system to track progress of reducing non-account water and all other conservation measures.

Typical measure/program water savings: 1.5 million gal. per year
Number of planned installations: n/a
Anticipated life span of the savings 10 years

The measure(s)/program(s) is(are) designed to reduce:

- X Average-day demand
- ☐ Maximum-day demand
- ☐ Both average-day and maximum-day demand

Line	Item	Amount	Amount
A	**COST OF THE MEASURE(S)/PROGRAM(S) [a]**	**Per unit [b]**	**Total cost of the measure/program**
1	Materials	-	$ 52,000
2	Labor	-	$ 5,600
3	Rebates or other payments	-	$ -
4	Marketing and advertising		$ -
5	Administration		$ 26,000
6	Consulting or contracting		$ 11,200
7	Other	-	$ -
8	Total program costs for the life of the measure/program (add lines 1 through 7) [c]		$ 94,800
B	**ESTIMATED SAVINGS**		
9	Number of units to be installed [d]		n/a
10	Estimated annual water savings per unit in gallons [e]		n/a
11	Total estimated annual savings for the measure/program in gallons (multiply line 9 by line 10)		1,500,000
12	Expected life span for the savings in years		10
13	Total life span estimated saving for the measure/program in gallons (multiply line 11 by line 12)		15,000,000
C	**ANALYSIS OF COST EFFECTIVENESS**		**Amount**
14	Cost of water saved by the measure in $/gallon (line 8 divided by line 13)		$ 0.006320
15	Simple incremental cost of water supply in $/gallon [f]		$ 0.001750
16	Cost comparison in $/gallon (line 15 less line 14)		$ (0.004570)
D	**NET BENEFIT OF CONSERVATION**		**Amount**
17	Estimated value of water saved by the measure base on incremental supply cost (line 13 multiplied by line 15)		$ 26,250
18	Net value of water saved by the measure/program (line 17 less line 8)		$ (68,550)

[a] This analysis is used to aid the comparison and selection of measure. Planners will estimate actual effects of conservation on planned capital facilities in Section 8. A separate analysis should be performed for each conservation measure or program, but measures/programs were combined if they jointly produce water savings.

[b] Examples of a unit are a toilet, a retrofit kit, and an audit. A unit estimate may not be appropriate for each measure/program in which case total measure/program water savings and costs were used.

[c] All recurring operation and maintenance costs over the life of the measure/program were considered.

[d] Units can be individual product units (such as toilets) or groups of products (such as household retrofits), as long as the analysis is consistent. Left blank if unit values do no apply.

[e] For example, water savings per retrofit. Leave blank if unit values do not apply.

[f] From Worksheet 3-2, line 11.

Summary of Group 4 Costs

	Description	Number	Cost/ea.	Total Cost	Water Savings [3] (Annual Average)	Water Savings [3] (Peak Day)
Materials						
1	Miscellaneous repairs ($5k per year)	10	$ 5,000	$ 50,000	1,500,000 gal/yr	N/A
2	Water meters	10	$ 200	$ 2,000		
				$ 52,000		
Labor						
1	T&D staff (8 hours/meter)	80	$ 70	$ 5,600		
				$ 5,600		
Rebates or other payments						
1	n/a			$ -		
Marketing and advertising						
1	n/a			$ -		
Administration						
1	Water accounting (1 hrs/wk)	520	$ 50	$ 26,000		
				$ 26,000		
Consulting or contracting						
1	Leak detection consultant (16 hours/yr)	160	$ 70	$ 11,200		
				$ 11,200		
Other						
1	n/a			$ -		
TOTAL						
	Reduction in non-account water			$ 94,800		

Notes:
1) Estimated that 38% of non-account water is unmetered buildings, 62% is lost.
2) Goal is to meter all buildings and bring total unaccounted for water down to 10% or below.
3) Water savings presented account for overall savings as a result of reduction in non-account water.

Worksheet 6-1: Analysis of Each Conservation Measure or Group of Measures & Programs

Group 5

Describe conservation measure(s):
Water audit for residential, commercial, industrial, and government users. Rate increase.

Describe program(s), if applicable:
Implement a voluntary water audit program. Information will be made available on the website and in billing inserts.
Increase water rates as a result of the Sterling Water Treatment System Project. Continue to use tiered rate structure.

Typical measure/program water savings: 24.6 million gal. per year
Number of planned installations: n/a
Anticipated life span of the savings 10 years

The measure(s)/program(s) is(are) designed to reduce:

- ☐ Average-day demand
- ☐ Maximum-day demand
- X Both average-day and maximum-day demand

Line	Item	Amount	Amount
A	**COST OF THE MEASURE(S)/PROGRAM(S) [a]**	**Per unit [b]**	**Total cost of the measure/program**
1	Materials	-	$ -
2	Labor	-	$ -
3	Rebates or other payments	-	$ -
4	Marketing and advertising		$ -
5	Administration		$ 20,000
6	Consulting or contracting		$ 160,000
7	Other	-	$ -
8	Total program costs for the life of the measure/program (add lines 1 through 7) [c]		$ 180,000
B	**ESTIMATED SAVINGS**		
9	Number of units to be installed [d]		n/a
10	Estimated annual water savings per unit in gallons [e]		n/a
11	Total estimated annual savings for the measure/program in gallons (multiply line 9 by line 10)		24,600,000
12	Expected life span for the savings in years		10
13	Total life span estimated saving for the measure/program in gallons (multiply line 11 by line 12)		246,000,000
C	**ANALYSIS OF COST EFFECTIVENESS**		**Amount**
14	Cost of water saved by the measure in $/gallon (line 8 divided by line 13)		$ 0.000732
15	Simple incremental cost of water supply in $/gallon [f]		$ 0.001750
16	Cost comparison in $/gallon (line 15 less line 14)		$ 0.001018
D	**NET BENEFIT OF CONSERVATION**		**Amount**
17	Estimated value of water saved by the measure base on incremental supply cost (line 13 multiplied by line 15)		$ 430,500
18	Net value of water saved by the measure/program (line 17 less line 8)		$ 250,500

[a] This analysis is used to aid the comparison and selection of measure. Planners will estimate actual effects of conservation on planned capital facilities in Section 8. A separate analysis should be performed for each conservation measure or program, but measures/programs were combined if they jointly produce water savings.

[b] Examples of a unit are a toilet, a retrofit kit, and an audit. A unit estimate may not be appropriate for each measure/program in which case total measure/program water savings and costs were used.

[c] All recurring operation and maintenance costs over the life of the measure/program were considered.

[d] Units can be individual product units (such as toilets) or groups of products (such as household retrofits), as long as the analysis is consistent. Left blank if unit values do no apply.

[e] For example, water savings per retrofit. Leave blank if unit values do not apply.

[f] From Worksheet 3-2, line 11.

Summary of Group 5 Costs

	Description	Number	Cost/ea.	Total Cost	Water Savings (Annual Average)	Water Savings (Peak Day) [4]
Materials						
1	n/a			$ -		
Labor						
1	n/a			$ -		
Rebates or other payments						
1	n/a			$ -		
Marketing and advertising						
1	already covered in rebate group			$ -		
Administration						
1	Oversee water audits (1 hour/audit)	400	$ 50	$ 20,000		
				$ 20,000		
Consulting or contracting						
1	Water audit consultant	1,600	$ 100	$ 160,000	24,600,000 gal/yr	96.000 gal/d
				$ 160,000		
Other						
1	n/a			$ -		
TOTAL						
	Water Audit			$ 180,000		

Notes:

1) Consulting cost based on 400 water audits at 4 hours each.
   This accounts for approximately 10% of the total number is bills or connections.
2) Savings based on 2% reduction in water use for all user types.
3) Estimated that most residential water savings will be outdoor use, reducing peak demand.
4) Peak day savings based on potable system only.

Worksheet 6-2: Comparison of Benefits and Cost of the Conservation Measures and Programs

Line	Conservation measure/program [a]	Total cost for the measure/ program [b]	Anticipated annual water savings in gallons [c]	Cost of water saved by the measure ($/gallon) [d]	Net benefit of implementing the measure/ program [e]
1	Miscellaneous rebates	$ 32,024	16,400,000	$ 0.000195	$ 254,976
2	ET monitors and parks audit	$ 33,280	72,600,000	$ 0.000092	$ 383,952
3	Xeriscape rebates	$ 45,000	510,000	$ 0.008824	$ (36,075)
4	Non-account reduction program	$ 94,800	1,500,000	$ 0.006320	$ (68,550)
5	Consumer water audits & rate structure	$ 180,000	24,600,000	$ 0.000732	$ 250,500

[a] Combined measure and programs that produce joint conservation savings were treated as one
[b] From Worksheet 6-1, line 8.
[c] From Worksheet 6-1, line 11.
[d] From Worksheet 6-1, line 14.
[e] From Worksheet 6-1, line 18. Note: This estimate of net benefit does not consider societal benefits and

Worksheet 6-3: Selection of Conservation Measures/Programs and Estimate of Water Savings

Line	Measure/Program	Selected	Primary criteria for selecting or rejecting the conservation measure/program for implementation	Estimated reduction in demand for selected measures/programs (gallons per day) [a]	
				Average-day demand	Maximum-day demand
1	Rebate program	x	Ease of implementation and public perception	45,000	5,000
2	ET monitors and parks audit	x	Magnitude of savings and cost effectiveness	199,000	128,000
3	Xeriscape rebates		High consumer cost and cost ineffectiveness	1,400	4,000
4	Non-account reduction program	x	Good management practice, improves accounting capability	4,000	
5	Consumer water audits & rate structure	x	Public perception, water savings across all user categories	67,000	96,000
Total				316,400	233,000

[a] Based on Worksheet 6-1, line 11. Planners will need to convert estimates of annual water savings to estimates of reductions in average-day and maximum-day demand for each measure or group of measures/programs.

Worksheet 7-1: Modified Demand Forecast (Entire System)

Line	Item	Year (2008)	Year (2012)	Year (2022)	20-Year Forecast (2032)
1	Average-day demand with existing conservation [a]	4.76	5.01	5.85	6.57
2	Average-day demand after additionalconservation [b]		4.85	5.39	6.03
3	Reduction in average-day demand (line 1 less line 2)		0.160	0.460	0.540

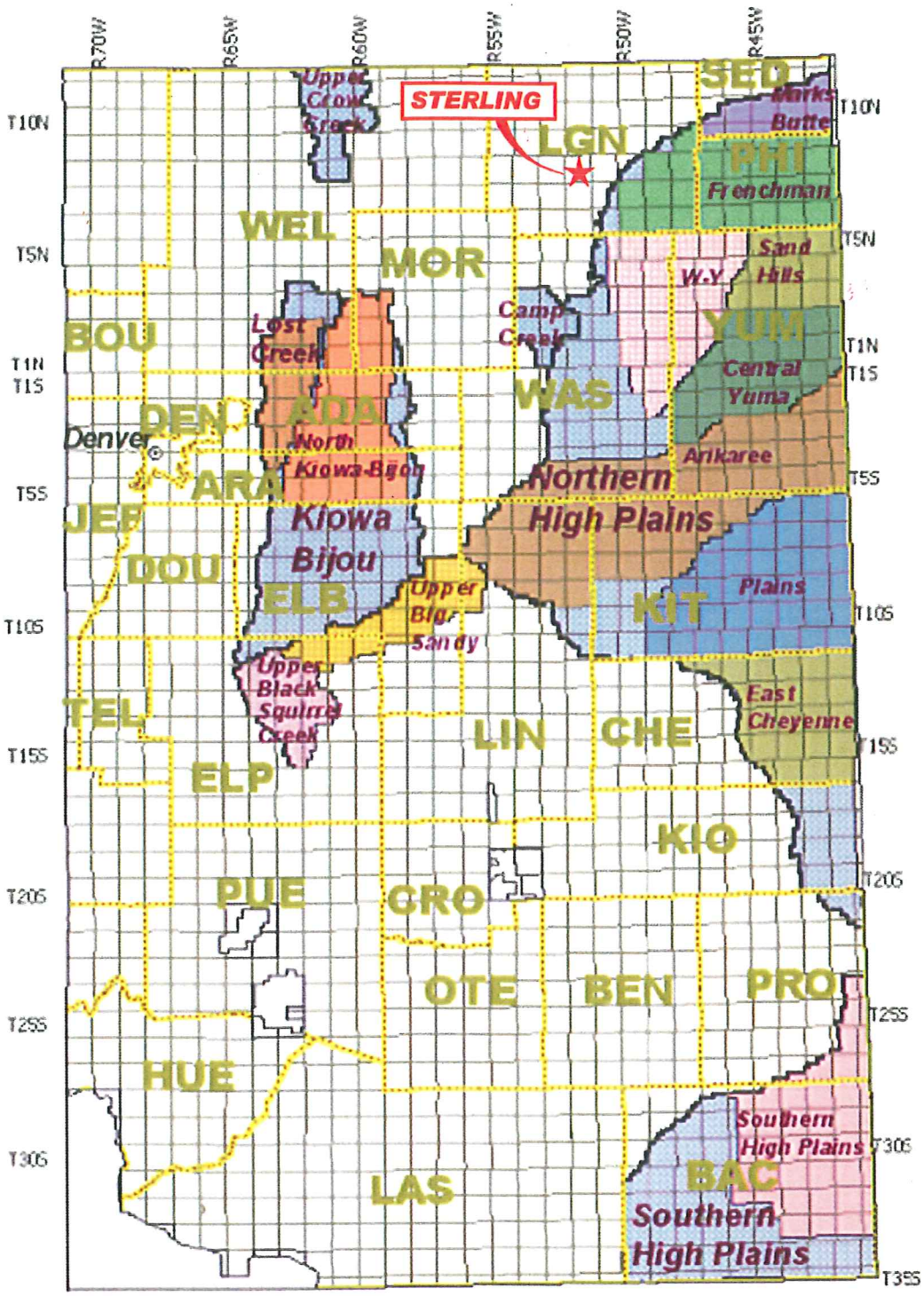
* All units in MGD
[a] From Worksheet 2-1
[b] Based on Worksheet 6-3.

Worksheet 7-1: Modified Demand Forecast (Potable System)

Line	Item	Year (2008)	Year (2012)	Year (2022)	20-Year Forecast (2032)
1	Average-day demand with existing conservation [a]	3.40	3.83	4.54	5.15
2	Average-day demand after additional conservation [b]		3.77	4.30	4.85
3	Reduction in average-day demand (line 1 less line 2)		0.060	0.240	0.300
4	Maximum-day demand with existing conservation [a]	8.00	8.95	10.63	12.04
5	Maximum-day demand after additional conservation [b]		8.77	9.88	11.16
6	Reduction in maximum-day demand (line 4 less line 5)		0.180	0.750	0.880
7	Ratio maximum-day to average-day demand before conservation (line 4 divided by line 1)	2.35	2.34	2.34	2.34
8	Ratio maximum-day to average-day demand after conservation (line 5 divided by line 2)		2.33	2.30	2.30

* All units in MGD
[a] From Worksheet 2-1
[b] Based on Worksheet 6-3.

APPENDIX B



Designated Ground Water Basins and Ground Water Management Districts

County Boundary
Township/Range
Designated Basins
Capital

Management Districts within the Designated Basins
Arikaree
Central Yuma
East Cheyenne
Frenchman
Lost Creek
Marks Butte
North Kiowa Bijou
Plains
Sand Hills
Southern High Plains
Upper Big Sandy
Upper Black Squirrel Creek
W-Y

N
W
E
S

APPENDIX C

STERLING
A Colorado Treasure
www.sterlingcolo.com

June 1, 2009

D. Ryan Walsh
Richard P. Arber Associates
198 Union Boulevard, Suite 200
Lakewood, CO 80228

RE: City of Sterling Water Conservation Plan

Mr. Walsh,

The notice for comments regarding the City of Sterling Water Conservation Plan was published in the Sterling Journal-Advocate newspaper March 24th & 31st and April 21st & 28th of 2009.
I did not receive any comments by phone, mail, email or in person concerning the water conservation plan for the City of Sterling.
Please see the enclosed proof of publication provided by the Sterling Journal-Advocate.

Sincerely,

Barbara Meinders

Barbara Meinders
Administrative Secretary Public Works
City of Sterling

RECEIVED
JUN 0 2 2009
Richard P. Arber Associates, Inc.
DENVER, CO

CITY OF STERLING, CENTENNIAL SQUARE, 421 NORTH 4TH STREET, P. O. BOX 4000, STERLING, COLORADO 80751-0400

CITY HALL	SERVICE CENTER	FIRE	POLICE	RECREATION CENTER	LIBRARY	MUSEUM
(970) 522-9700	(970) 522-2619	(970)522-3823	(970) 522-3512	(970)522-7882	(970) 522-2023	(970) 522-3895
FAX (970)521-0632	FAX (970)521-7141		FAX (970)522-3511		FAX (970)522-2657	FAX (970)521-7135

Proof of Publication

COPY

STATE OF COLORADO,}
}ss.
County of Logan. }

____Julie K. Tonsing_____, being duly sworn, disposes and says:

1. That she is the Business Manager of the Sterling Journal-Advocate, a daily newspaper printed and published in the City of Sterling, County of Logan, and State of Colorado.

2. That the said The Sterling Journal-Advocate is printed and published daily, except Sundays and legal holidays, and that it has a general circulation in the City of Sterling, and County of Logan, and elsewhere.

3. That the said The Sterling Journal-Advocate was established, and has been printed and published in said County, uninterruptedly and continuously, during a period of at least Fifty-two Weeks next prior to the first **__LEGAL – WATER CONSERVATION PLAN__** copy of which is hereunto attached.

4. That the said The Sterling Journal-Advocate is a daily newspaper of general circulation, and that the said daily newspaper is printed and published in whole or in part in said County of Logan, in which said ___NOTICE__ is required by law to be published.

5. That the said The Sterling Journal-Advocate has been admitted to the United State Mails as second class matter under the provisions of the Act of March 3, 1879, or any amendments thereof, and that said newspaper is a daily newspaper duly qualified for publishing legal notice and advertisements within the meaning of an Act of General Assembly of the State of Colorado, approved March 5, 1935, being Chapter 156 of the Session laws of Colorado, 1935, entitled: "An Act relating to legal notices and advertisements," and amending Section 1, Chapter 113 Sessions Laws of Colorado, 1931.

6. That the said annexed ___NOTICE___ was published in the regular and entire editions of The Sterling Journal-Advocate, a duly qualified daily newspaper for that purpose, within the terms of the above named Acts.

7. That the said annexed ___NOTICE___ is a true copy of the original which was regularly published in each of the regular and entire issues of said daily newspaper, a legally qualified paper for that purpose, once each week, on the same day of each week, for ____FOUR____ successive week by _____FOUR____ insertions and that the first publication thereof was in the issue dated __ MARCH 24, 2009___ and the last publication was in the issue date __APRIL 28, 2009.

Julie K. Tonsing
Business Manager

Subscribed and sworn to before me this__1ST OF JUNE, 2009

Dana Jo Stumpff
Notary Public.
My commission expires, DECEMBER 05, 2009

Dana Jo Stumpff
NOTARY PUBLIC, STATE OF COLORADO

NOTICE

The City of Sterling is accepting comments from the public regarding its **Water Conservation Plan.** A copy of the plan can be viewed at the Public Works Department located in City Hall at 421 N. 4th Street, Sterling, CO. Hardcopies can also be obtained from the Public Works Department at this same location. The plan can also be downloaded from the City website at www.sterlingcolo.com.

Please submit all comments regarding this plan by May 21, 2009.

Comments may be sent as follows:

Mail: City of Sterling — Public Works Department
Attention: Barbara Meinders, Administrative Secretary
P.O. Box 4000, Sterling, CO 80751
Email: meinders@sterlingcolo.com
Phone: (970) 522-9700 @ extension #109 during normal business hours.

Published: March 24 & 31 & April 21 & 28, 2009
Sterling Journal-Advocate

APPENDIX D

RESOLUTION NO. 7-4-09

COPY

Series of 2009

A RESOLUTION BEFORE THE CITY OF STERLING, LOGAN COUNTY, COLORADO, ADOPTING THE CITY OF STERLING WATER CONSERVATION PLAN OF MARCH 2009.

Introduced by Councilmember Mayor Jones.

WHEREAS, the State of Colorado Water Conservation Act of 2004 requires that entities that supply more than 2,000 acre-feet of retail water annually for domestic, commercial or industrial use, prepare and submit a Water Conservation Plan to the Colorado Water Conservation Board; and

WHEREAS, the City developed its latest Water Conservation Plan in 1996 under the 1991 State of Colorado Water Conservation Act, and this Water Conservation Plan dated March 2009 provides an updated plan.

NOW, THEREFORE, BE IT RESOLVED BY THE CITY COUNCIL OF THE CITY OF STERLING, COLORADO that the City of Sterling does hereby adopt the City of Sterling Water Conservation Plan dated March 2009 and the City Manager is directed to file said plan with the Water Conservation Board and any and all other appropriate agencies requiring said plan forthwith.

Adopted this 28th day of July, 2009.

Mayor

ATTEST:

City Clerk