WATER CONSERVATION PLAN

CITY OF GREELEY, COLORADO

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EXECUTIVE SUMMARY

Securing safe and sufficient water supplies for future generations of Greeley residents in the face of significant uncertainties such as drought and climate change is a major challenge. Successful stewardship of precious water resources is a benchmark by which future generations will judge the current citizens and water utility staff. This Water Conservation Plan for the City of Greeley has been developed to establish clear goals and to outline programs and measures to meet those goals that will ensure a healthy and sufficient water supply for the future.

Greeley has established a goal of reducing demand by 8.2 percent directly through its conservation program efforts over the period from 2010 to 2030 compared with projected future demand without conservation. The net impact of this program is an estimated cumulative savings of 144 acre feet per year that will yield a total savings of slightly over 3,000 acre feet of water by 2030. An analysis of estimated savings achieved through the current program suggests that this goal is attainable given the current level of conservation effort and may be exceeded.

Greeley has included conservation in overall supply planning for 15 years. Greeley developed its first water conservation plan in 1994. In 1997, Greeley hired a full-time conservation coordinator, who has managed the City's water efficiency efforts for the past 11 years. In that time the program has grown to encompass all customer sectors in the City. In 2007, the City's conservation program budget was $500,000 making it one of the largest programs in Colorado. The conservation program addresses both indoor and outdoor water use through education, ordinances, direct outreach, rebates, and information. The Greeley conservation program implements social marketing as well as traditional marketing in campaigns that include sponsorship of the local NPR radio station, advertisements on buses, bus benches, and cable TV. Consequently, the Greeley program has become one of the most visible and well publicized conservation efforts in Northern Colorado.

The following elements comprise the current Greeley conservation program:

- Rebates and giveaways for fixtures and appliances
- Water wise landscape ordinances, codes, grants, and demonstration sites
- Water efficiency audits
- Water reuse to meet augmentation, non-potable, and return flow obligations
- Water loss and system leakage reduction
- Information and public education
- Water rate structure with full metering
- Regulatory measures
- Conservation results within supply planning
- Active program that evolves to meet customer needs
- Formal conservation plan review
- Non-potable irrigation

This Conservation Plan provides details concerning each of these programs and explains how conservation is a key element of Greeley's overall supply planning. Greeley's Water Conservation Plan complies with Colorado Revised Statute § 37-60-126. An explanation of Greeley's compliance with the statute's requirements is presented on page 36.

INTRODUCTION AND SERVICE AREA CHARACTERISTICS

Securing safe and sufficient water supplies for future generations of Greeley residents in the face of significant uncertainties such as drought and climate change is a major challenge. Successful stewardship of precious water resources is a benchmark by which future generations will judge the current population and water utility staff. This Water Conservation Plan for the City of Greeley establishes clear goals and outlines programs and measures to ensure a healthy and sufficient water supply for the future.

Greeley, originally known as Union Colony, was organized in 1870 by Nathan Meeker, the agriculture editor for Horace Greeley's *New York Tribune*. Meeker dreamed of founding a "utopian community based on temperance, religion, education, agriculture, irrigation, cooperation, and family values."

As of 2007, the City of Greeley is spread over 46 square miles of Weld County, and Greeley is the largest city in the county and is the county seat. The City's water supply system stretches more than 60 miles from the western-most raw water collection and storage facilities to the eastern-most reaches of its finished water distribution system.

Located on Colorado's high plains, Greeley's average annual precipitation is 14 inches per year. In the 21st century, the Greeley area anticipates one of the highest average growth rates on Colorado's Front Range at 2.25 percent, along with more demands on resources and infrastructure. Greeley's 2007 population is estimated to be 91,109. By 2050, demographers predict Greeley will be home to 239,000 people. A sustainable water supply, along with treatment, collection and distribution systems, is of primary importance.

WATER SYSTEM PROFILE

Greeley's water sources include direct river diversions, ownership in the Colorado-Big Thompson (C-BT) and Windy Gap projects, high mountain reservoirs, and rights in several irrigation companies. Kodak, along with three nearby municipalities, Evans, and a portion of Windsor, and Milliken, annually transfer their water rights to Greeley for treatment and delivery. The City also owns and uses several wells for non-potable irrigation.

Water Rights

Greeley draws raw water from four main river basins on both sides of the Continental Divide: the Cache la Poudre (Poudre), Big Thompson, Upper Colorado, and Laramie. This diversity of the supply sources increases the reliability and security of Greeley's system. A map of the Greeley water supply system is shown in Figure 1.

Cache la Poudre River

Greeley owns senior direct flow and storage rights on the Poudre River. The direct flow rights, the cornerstone of Greeley's portfolio, consistently yield 9,000 acre feet for treatment at the Bellvue Filter Plant (Bellvue), one of the City's two water treatment plants. These rights at 6

and 6 ½ priority on the Poudre, allow Greeley to divert water in all but the most extreme dry years.

Other Poudre basin rights include storage rights in five high mountain reservoirs: Barnes Meadow, Peterson, Comanche, Hourglass, and Twin Lakes. The reservoirs capture water at high elevations from some of the Poudre River's tributaries. High mountain storage is ideal because it decreases evaporation, adds options for delivery, and obviates the need for mainstream dams. However, Greeley's high mountain reservoir storage rights are junior and have low yields in drought years.

Milton Seaman Reservoir, on the Poudre River's North Fork, is the City's largest multi-year storage vessel within the Poudre basin. Milton Seaman Reservoir is primarily used as a drought storage vessel and in most years remains relatively full with about 5,000 acre feet of available water supplies.

A majority of Greeley's Poudre River water rights are treatable at Bellvue. However, some of Greeley's Poudre River water rights cannot be physically delivered to Bellvue and are therefore categorized as "untreatable." For example, Greeley's ownership in the Greeley Irrigation Company (GIC" or the "No. 3 Ditch) represents an untreatable supply located in the lower portion of the Poudre basin. These supplies are located too far downstream for treatment and thus are used for non-potable irrigation of Greeley's parks and golf courses. This reduces the amount of treated water used by the City.

Greeley also owns, or is in the process of acquiring, additional storage in the Poudre Basin to store both untreatable and treatable supplies. These storage facilities will provide additional firm yield and operational flexibility. For example, the "Poudre Ponds at Greeley" are lined gravel pits located near the City that reuse, not physically but via river exchange, waste water effluent (effluent). Greeley reuses, by river exchange, all its effluent that is legally available for reuse to meet augmentation, non-potable, and return flow obligations. Full utilization of effluent water is an important element of efficiently utilizing Greeley's total water portfolio.

Colorado River

Greeley also obtains water from two interrelated transmountain diversion projects – the Colorado-Big Thompson (C-BT) and Windy Gap projects. Raw water from these projects can be delivered to either of Greeley's two treatment plants.

The C-BT Project provides supplemental water to its service area in northeastern Colorado. The project boasts 800,000 acre feet of active storage and a relatively senior water right on the Colorado River. Owned by the U.S. Bureau of Reclamation, it is operated by the Northern Colorado Water Conservancy District (NCWCD). With 22,522 units, Greeley is one of the largest municipal holders of C-BT rights.

The Windy Gap Project, was planned and built between 1969 and 1985. Six C-BT stakeholders – Greeley, Loveland, Fort Collins, Longmont, Boulder, and Estes Park – cooperated

to form a municipal subdistrict, which oversees the Project and establishes the assessments for the existing Windy Gap shareholders.

Windy Gap consists of a diversion dam on the Colorado River, pump station, and a pipeline to deliver water to Lake Granby. The C-BT system conveys the water from Lake Granby to Windy Gap customers on the Front Range. The Windy Gap subdistrict has a contract with the U.S. Bureau of Reclamation to allow the C-BT system to transport the water when there is unused capacity. A key impediment to system yield is climate variability. In either a wet or dry year, Windy Gap does not yield. In a dry year, senior rights limit diversions and there may be little water to deliver. In a wet year, the C-BT system is at capacity and has no spare room to store or move Windy Gap water to the East Slope. The Windy Gap Firming Project expects to issue a draft Environmental Impact Statement (EIS) in 2008.

Chimney Hollow, a proposed 90,000 acre-foot East Slope reservoir is the preferred alternative for the Windy Gap Firming Project. Greeley has subscribed to 7,000 acre feet in this reservoir and will pay its proportionate share of the expected $200 million cost.

Big Thompson River

Beginning in the 1960s, Greeley began to acquire shares in three related agricultural water companies: The Seven Lakes Company, The Lake Loveland Company, and the Greeley-Loveland Irrigation Company (collectively the Greeley-Loveland Companies). Greeley has accepted shares/water rights of the Greeley-Loveland Companies for raw water dedication as the City has grown westward over ground historically irrigated by such rights. Additionally, the City purchased numerous Greeley-Loveland Companies Shares in the early 1990s, some of which are still leased back to the original owners for agricultural use. These water rights are relatively junior and do not yield well during droughts. The Greeley-Loveland Companies water rights include the rights to use the ditch company's extensive storage system.

Water supplies from the Big Thompson basin can only be treated at Greeley's Boyd Lake Filter Plant (Boyd). Unlike GIC water, the Greeley-Loveland Companies water rights are treatable. Even so, in order to minimize treatment and transmission costs, and to conserve, the City also uses the water from Greeley-Loveland Companies to meet non-potable irrigation demands. However, for every acre foot of water from this system that Greeley treats at Boyd or delivers downstream into the canals for non-potable use, at least 22 percent of the water is lost due to shrink. In dry years, the shrink losses can exceed 30 percent. In addition to the delivery shrink loss, the City incurs another 11 percent annual loss on any water stored over winter in the reservoirs. Therefore, Greeley works diligently to minimize shrink losses, maximize yields, and limit costly treatment and transmission.

Laramie River

Greeley currently owns some minor ditch rights in the Laramie River Basin, which produce up to 300 acre feet per year and owns 1/3 of the Laramie Poudre Tunnel Company which produces for Greeley an additional 1,100 AF of water from this basin. These water rights are not changed for municipal use, but once so decreed, will be treated at Bellvue and delivered to Greeley.

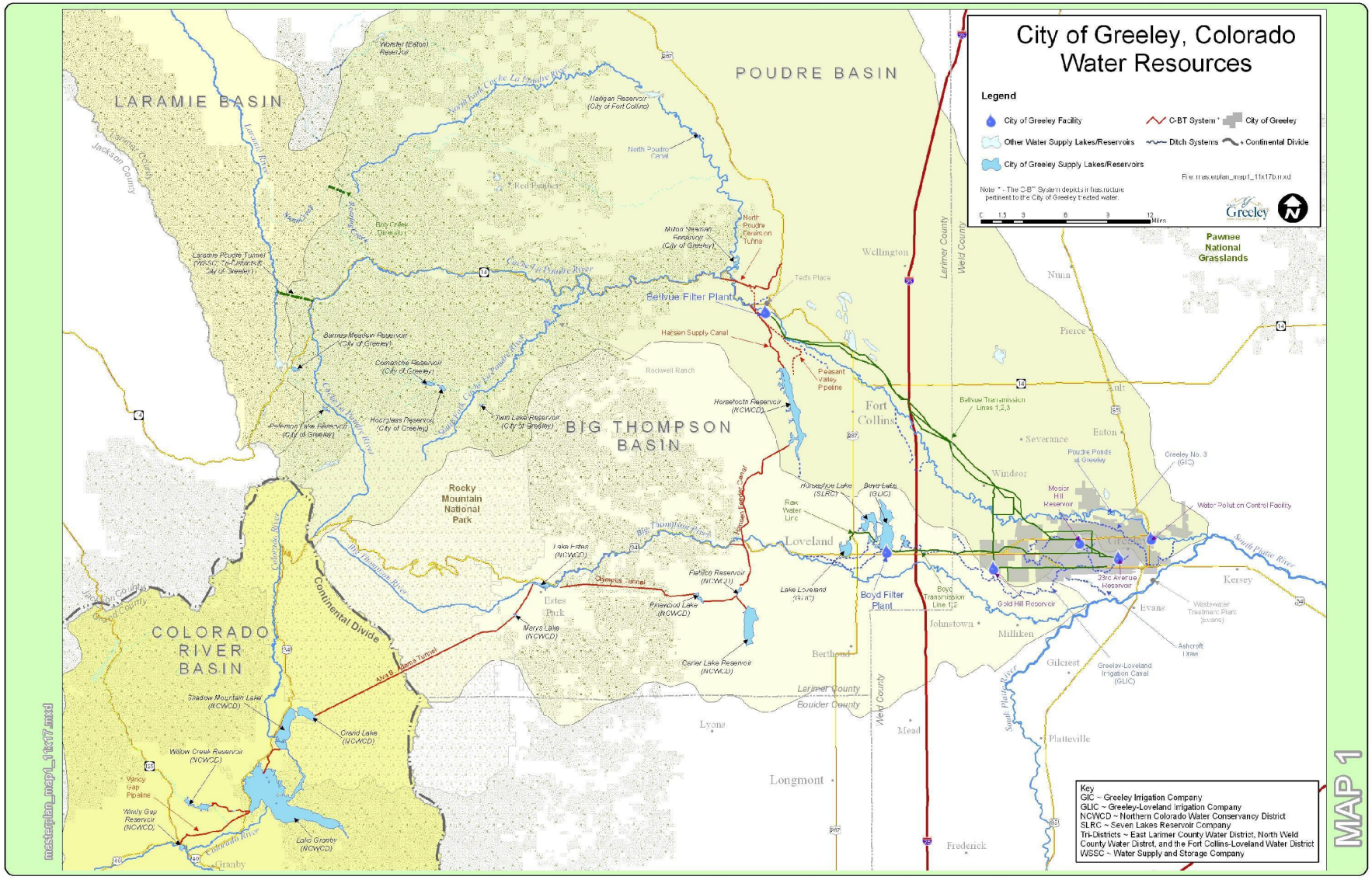

Figure 1: City of Greeley Water System (August 2008)

Drought Definitions and Planning

Greeley uses a 1-in-50 critical drought for water supply planning. The City plans to provide water service through this intensity of drought in part by relying on use restrictions to drop demand 10 percent below the demand predicted by the population and climate conditions.

The 1-in-50 critical drought was defined for the Poudre and Big Thompson Rivers by first developing 50,000 years of synthetic data using a peer-reviewed multivariate stochastic model. The 50,000 years of generated data were then used to determine the average of the worst drought that occurs on the Poudre and Big Thompson Rivers in the 1,000 50-year periods. For comparison, the selected 1-in-50 critical drought for the Poudre River is similar to two events that have been recorded in the 124 year period of record (1884-2007). The design drought, which lasts six years, is slightly worse than the 1950s drought and not quite as severe as the drought that began in 2000.

Greeley Firm Yield

"Firm yield" is the water demand, including return flow obligations that Greeley can meet throughout the six-year design drought. During the drought, there is no extra yield or water in storage for additional demands. To determine Greeley's firm yield, the Greeley water system model was run with a 1-in-50 critical drought (see Drought Definitions and Planning) data set and increasing water demands. The point at which an increasing demand would create a potable water deficit is Greeley's *firm yield*. To meet water demands in drought, Greeley must supplement the annual yield of its water rights with water from storage in the C-BT system, the Greeley and Loveland System, and Milton Seaman, and Barnes Meadows Reservoirs.

Assuming that all of Greeley's existing water supplies have been decreed for municipal use, and all the City's proposed small retiming facilities (gravel pits) have been built, and all supplies are operational, Greeley's potable firm yield is 38,700 acre feet.[1] This is the potable demand that can be met at the tap in the specific hydrologic conditions contained in the 1-in-50 modeled drought scenario.[2] Furthermore, the City anticipates that it can meet an additional 3,500 acre feet of non-potable demand.

Water Treatment

Greeley owns two water treatment plants, Bellvue and Boyd, with a combined treatment capacity of 59 million gallons per day (mgd). Both use conventional filtration and chemical treatment and have been upgraded to meet current regulatory requirements.

Bellvue Filter Plant

The Bellvue Filter Plant is located northwest of Fort Collins and has the historical capacity to treat 21 mgd. The plant consists of raw water settling ponds, rapid mix, flocculation, sedimentation, filtration and disinfection. Treated water flows to Greeley by gravity. Bellvue is

[1] 42,500 acre feet at the plant less system and treatment losses.
[2] The water portfolio described is the "Future Water Account" as described in a Management Brief by N. Koch dated June 12, 2007.

the City's base plant for meeting treated water demands and is operated year-round. Entering the plant, raw water has low turbidity and low hardness.

Over the last ten years, and especially since the 2003 Water Master Plan, Greeley focused its planning on new Poudre Basin supplies. The Bellvue Filter Plant was extensively upgraded as a result of the Poudre River focus. Inlet piping to the raw ponds has been improved and toe drains will be installed toward the end of 2008. The flocculation-sedimentation system has been upgraded with tilted-plate settlers. The filters were rebuilt with new piping, actuators, and controls. A new chemical feed building was constructed. A new clear well and solids thickening and dewatering system were built. Effluent piping and the laboratory were rebuilt. When a third-stage flocculation is added toward the end of 2008, the plant is expected to be rated at 32 mgd. During extensive testing over the last several years, the treatment system meets or exceeds all anticipated federal drinking water regulations.

Bellvue Plant Transmission

The two and three parallel transmission lines from the Bellvue Filter Plant operate by gravity and have a combined capacity of about 26.6 mgd. The first transmission line is predominantly a 27-inch line, which splits into two 20-inch lines at Interstate-25. The second transmission line varies between 38-inch, 30-inch, and 27-inch. A number of customers are served directly from these transmission lines, though Greeley would like to eventually eliminate all such connections.

Greeley is currently building a 60-inch pipeline from Bellvue to Greeley, a distance of over 30 miles. When complete in 2012, the pipe will boost transmission capacity to a total of 70 mgd by gravity.

Boyd Lake Filter Plant

The Boyd Lake Filter Plant is located east of Loveland along the south shore of Boyd Lake reservoir. The plant has a capacity to treat about 38 mgd and is a conventional plant consisting of a raw water settling pond, rapid mix flocculation, sedimentation, filtration, and disinfection. The Boyd Lake Plant is used as a peaking plant to meet summer irrigation demands and is typically operated from April through October. The plant draws water from both Lake Loveland and Boyd Lake which are filled with C-BT and Big Thompson River water via irrigation ditches. The historical water sources for the Boyd Lake Water Filter Plant were irrigation water rights that were typically used from April through October. Raw water quality from Boyd Lake is considered average with low turbidity but moderate hardness. Water must be pumped 18 miles to Greeley via two steel lines of 27 and 34-inch diameter.

Table 1 presents a summary of the Greeley water treatment and delivery system and the current capacity.

Table 1: Greeley Water System Summary

	Capacity	Comments
Raw Water	42,500 acre feet (in 50-year critical drought)	Includes 3,500 acre feet non-potable. Assumes all rights are decreed.
Bellvue Filter Plant	21-mgd peak capacity	Anticipated to be 32-mgd by 2010
Boyd Lake Filter Plant	38-mgd peak capacity	Plant was upgraded and expanded in 2000
Bellvue Transmission	26.6-mgd current capacity	Lines are 50 – 80 years old; new 60" line will add 50-mgd delivery
Boyd Lake Transmission	40-mgd maximum capacity	Lines are 35 – 40 years old; water must be pumped to Greeley

BASELINE WATER USE

Water demand has grown substantially over the past few decades although the rate of growth has slowed considerably in the last few years. In 1975, Greeley's total annual water demand was approximately 15,050 acre feet.[3] By 1990, total annual water production had increased to nearly 22,030 acre feet,[4] an average annual increase of 2.6 percent. This rate of growth in water demand was above Greeley's population growth rate during this period, which was less than two percent per year.

When Greeley's residential metering program was implemented in the early 1990s, growth in per capita water use flattened considerably as customers began to realize the benefits of water conservation. By 2007, total annual water demand for Greeley (excluding treatment and delivery for outside users) was only 25,550 acre feet.[5] This growth rate in water demand of less than one percent annually, even though population growth exceeded 2.4 percent, is a reversal of the previous trend. It appears that between 1990 and 2007, universal metering and other conservation programs dropped water demand by more than 20 percent in Greeley.

Of the total water demand Greeley currently serves, approximately 85 percent is used within Greeley and the remainder is associated with customers located outside of Greeley. In-city treated water use by customer type is shown in Table 2. Residential uses account for approximately 62 percent of total water use within Greeley; the remainder is comprised of commercial, industrial, and park or golf course uses. Fifty-five percent of residential water use goes to outside landscaping. Thus residential use shows a strong seasonal variation, with nearly 75 percent of total City annual use occurring between May and October.

[3] Plant production, not including 1,130 acre feet treated for Kodak, 691 acre feet treated for Evans, or 347 acre feet treated for Windsor.
[4] Plant production, not including 1,323 acre feet treated for Kodak, or 1,384 acre feet treated for Evans.
[5] Plant production plus non-potable, not including Kodak, Windsor, Evans, or Milliken.

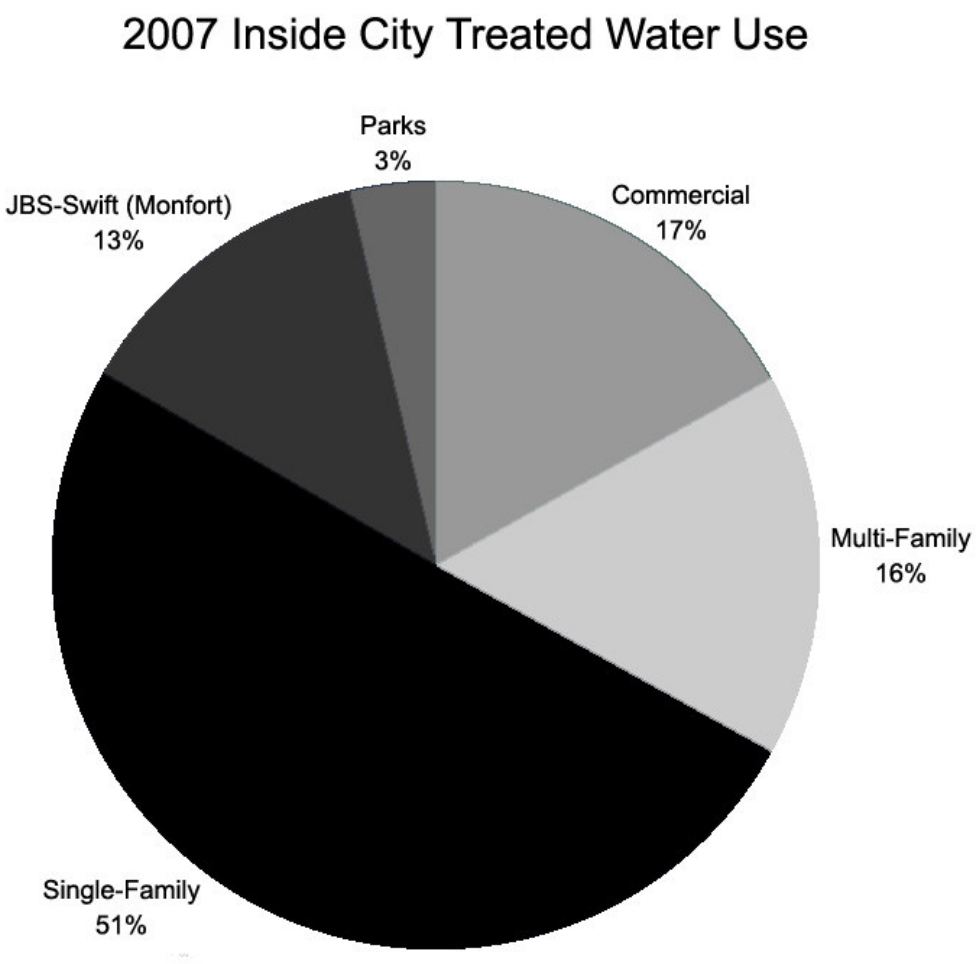

Figure 2: In-City Potable Use by Land use Type

Table 2 shows a breakdown of annual use by customer category for customers within the city limits.

Table 2: Potable water demand breakdown for inside city uses (2007)

Customer	Single Family	Multi-family	Other Residential	ICI*	Total
Total Number of Accounts	20,372	1967	760	1988	25,087
Annual Billed Consumption 2007 (kgal)	3,085,308	990,793	254,972	2,448,686	6,779,759 (20,811 af)
Unit Use Annual (kgal/acct)	151	503	335	1,232	270

*ICI: Industrial, commercial, or institutional

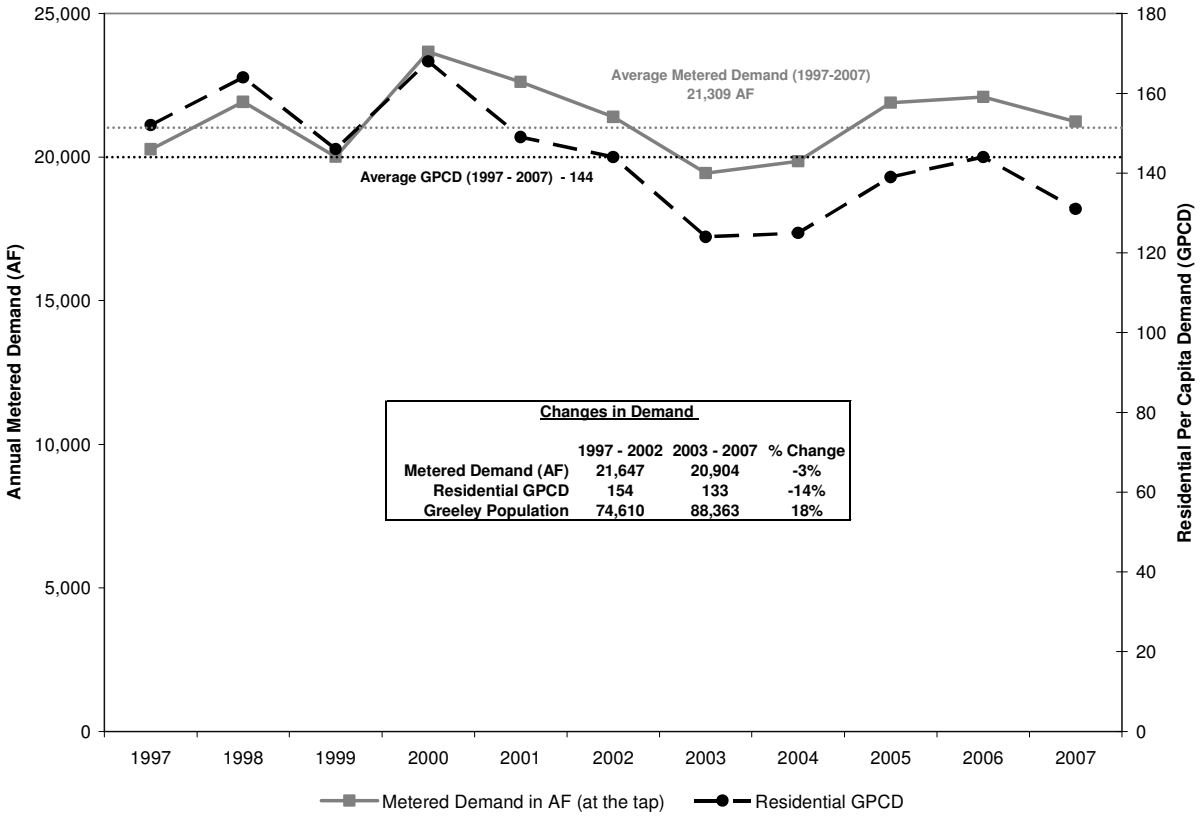

Figure 3: Annual and residential per capita demand in Greeley, 1997 - 2007

Figure 3 shows annual metered demand in Greeley from 1997 – 2007 along with the calculated residential gallons per capita per day (gpcd) for each of these years. This figure shows the impact of the 2002 drought on Greeley's demand and also shows a significant reduction in per capita residential demand, dropping from 154 gpcd in 1997-2002 to 133 gpcd from 2003-2007; a 14 percent reduction[6]. Metered demand is essentially unchanged in ten years in spite of an 18.4 percent increase in population. This indicates that Greeley's water conservation efforts over the past 10 years have had an impact.

[6] Due to variations in precipitation, population densities, and landscaping, Greeley does not compare gpcd to other communities to assess water use, and the effectiveness of its conservation program. Greeley uses gpcd as an internal comparison to demonstrate use reductions.

Table 4 shows projected water demands for Greeley. The focus of the Greeley Water Conservation Program is on in-city customers; hence in-city demand will be the focus of this plan.

Table 3: Projected demands for Greeley 2010 – 2030

Year	Potable Demands at the tap (acre feet)	Potable Demands plus 7% loss (acre feet)	Non potable demands (acre feet)	Total Demand potable + non potable (acre feet)
2010	25,222	27,091	2,346	29,437
2015	27,612	29,658	2,755	32,413
2020	30,502	32,763	3,164	35,927
2025	33,742	36,243	3,573	39,816
2030	37,382	40,153	3,982	44,135

Between 2010 and 2030, Greeley expects 13,000 acre feet of new potable demand (including losses). An additional 1,600 acre foot of new non-potable demand is forecast over the same period.

SEASONAL AND PEAK DAY DEMANDS

The quantity of water a city uses can be described as an annual use, a seasonal use, a daily use, or an hourly use. Historical data was used to predict the ratios among these factors.

- **Annual use** determines water rights needs and the size of reservoirs that provide storage over multi-year periods.
- **Seasonal use** determines storage needed to re-time irrigation water rights yielding in the spring and early summer to match year-round municipal demands.
- **Peak daily use** determines treatment and transmission capacity.
- **Peak hourly use** determines sizes of storage tanks in the distribution system and the pipe sizes in the distribution system. Because the distribution system does not affect the long-term direction of Greeley's water system, hourly use is not considered.
- **Outside Customers**[7] use Greeley treatment and transmission capacity but do not affect the quantity of water the city uses.

Peak Water Use Day

The peak day of water use for each year typically occurs during July in Greeley, for example July 21 in 2008 (51.1 mgd), July 24 in 2007 (50.3 mgd), and July 19 in 2005 (55.7 mgd – the all time maximum). The overall water system, including treatment, transmission, and distribution, must be able to meet the peak day of use. Using the last 20 years of historical data, Greeley's peak day to annual demand ratio is 2.1. The historical peak day as well as the treatment and transmission capacity of the system is shown in Figure 4.

[7] Primarily Kodak, Windsor, Milliken, and Evans.

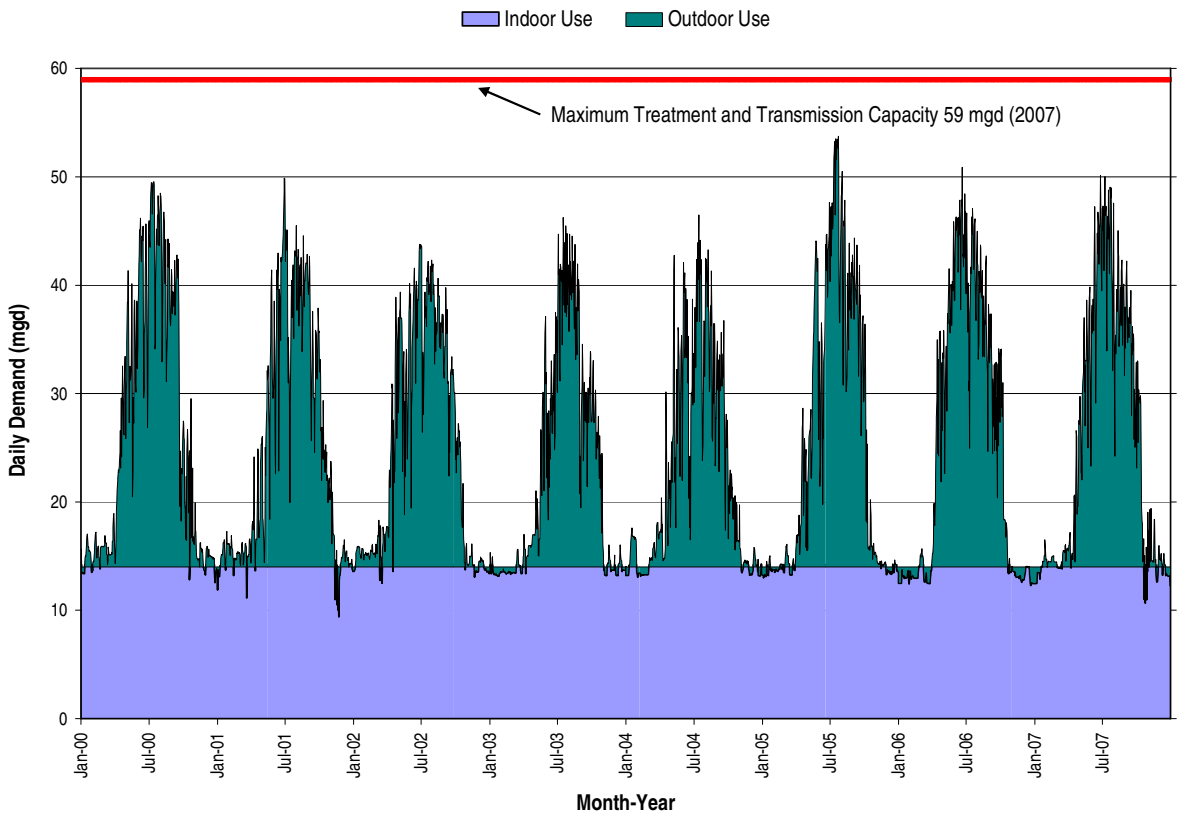

Figure 4: Daily demands and peaks, 2000-2007

System Water Loss

Greeley has an active water loss control, detection, and maintenance program that has held water loss (real and apparent losses) to below six percent in seven of the past ten years. This is a low system loss for a system the size and age of Greeley's and is indicative of the effort the City has made in this area. System losses have nudged upward each year from 2003 to 2007, but are still very low. Nevertheless, Greeley is committed to its water loss control, detection, and maintenance system and will continue to strive to maintain exceptional system efficiency. Figure 5 shows the total metered use, system production, and water loss for the past ten years on a two-axis graph.

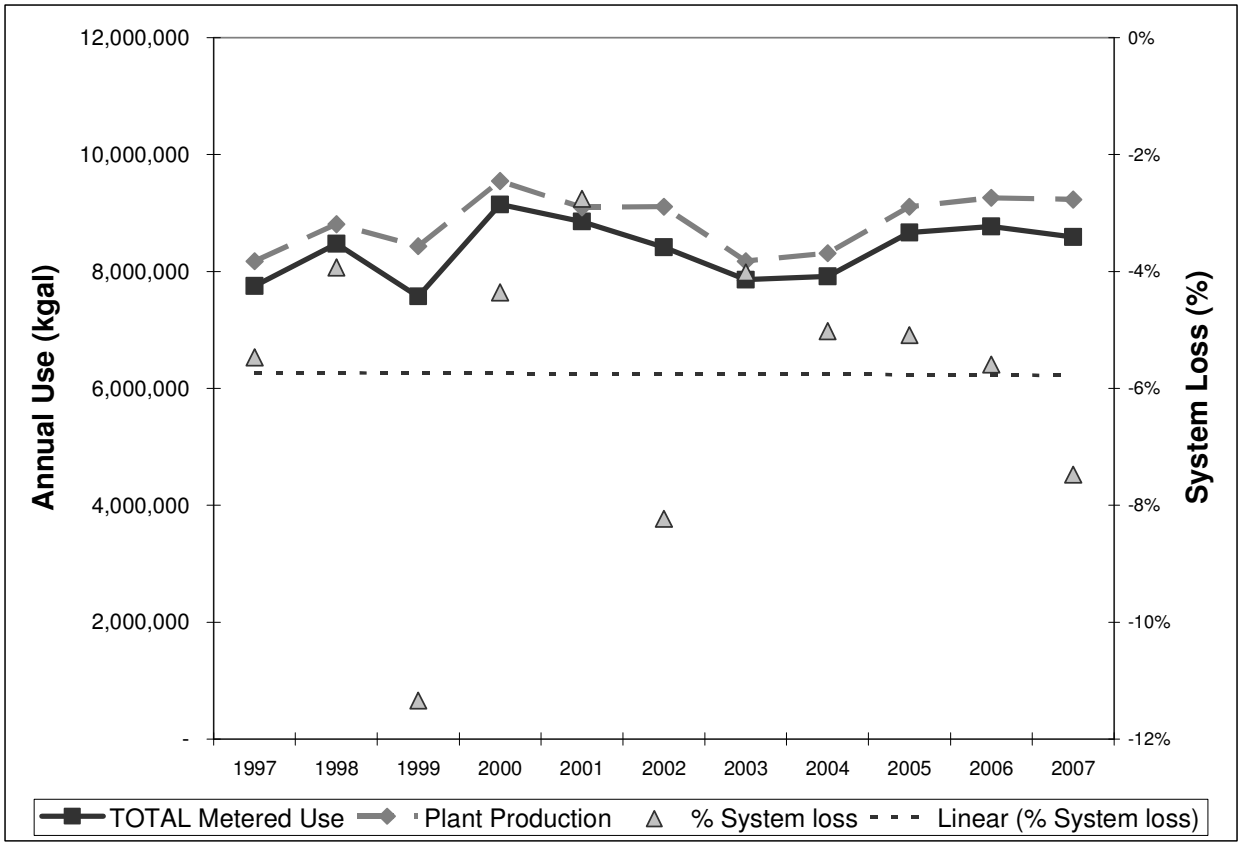

Figure 5: System water loss, 1997 – 2007

WATER RATES, COST, AND PRICING

Billing system and Water Rates

Greeley is currently examining the feasibility of implementing a customized tiered rate (water budget) structure similar to those implemented by the Centennial Water and Sanitation District and the City of Boulder, Colorado. The intent of this new rate structure would be to encourage efficiency and to penalize waste. A simple tiered rate structure such as is common throughout the Front Range would be extremely unfair in Greeley because of the wide variation in lot sizes and Greeley's historic raw water dedication policies. Custom tiered rates ("water budget") that account for the customer's lot size and water dedication are more suitable to Greeley. More information about the on-going water budget study is provided later in this document.

Greeley was one of the first Front Range communities to be fully metered. Currently, Greeley water charges are billed every month using a uniform rate structure. The rate structure is developed annually by a cost-of-service rate model created by Black & Veatch. Customers are metered and pay for the water they use. Each bill is composed of two parts: a fixed minimum charge and an amount of water used charge. Charges depend on customer class and customer location. Inside city fixed charges for 2008 are shown in Table 4.

Table 4: Inside City - Service Charge

Meter Size	Inside City Fixed Minimum Charge
5/8"	$7.80
3/4"	$7.80
1"	$8.10
1-1/2"	$11.50
2"	$12.90
3"	$41.65
4"	$49.10
6”	$62.70
8”	$80.65
10”	$104.35
12”	$135.50

Inside City- Residential

The 2008 variable consumption rate is $2.41 per thousand gallons. The fixed minimum charge is based on meter size as shown in Table 4. For example, if a customer uses 5,000 gallons of water in a one month period and has a 3/4" meter, the bill would be $19.85. The water-use charge is $2.41 per 1000 gallons. A fixed charge of $7.80 is added to the commodity charge of $12.05 for a total of $19.85.

Inside City – Commercial

The 2008 variable consumption rate is $2.36 per thousand gallons. The fixed minimum charge is based on meter size as shown in Table 4.

Outside City- Residential

When Greeley built the transmission mains from Bellvue and Boyd to Greeley, many property owners received water taps in exchange for easements. These accounts are classified as Outside City. City Council has a policy against granting additional water taps outside the City without annexation. The 2008 variable consumption rate is $5.10 per thousand gallons for residential customers located outside of the City limits. The fixed minimum charge is based on meter size as shown in Table 4.

Industrial Rates

The rate for large industrial customers is also set by the cost-of-service rate model and depends primarily on maximum daily and peak hourly demands. JBS-Swift’s 2008 variable consumption rate is $2.18 per thousand gallons.

Commercial and Industrial Surcharges

Commercial and industrial customers dedicate water to the City for service based on their tap sizes and thus acquire an annual allotment of water. When annual usage (based on billing records) exceeds the user’s allotment, a raw water surcharge is assessed. The current surcharge is $6.70 per 1,000 gallons in excess of the annual allotment. The surcharge is based on the market price of C-BT water and it is established annually by the Water and Sewer Board.

Sewer Rates

Greeley sanitary sewer rates are also developed annually by Red Oaks Consulting using the cost-of-service rate model created originally by Black & Veatch. Sewer service charges are billed every month, and appear on the same statement as the water bill. The sewer bill is divided in two parts: a fixed minimum every billing period along with a consumption charge that is based on water usage. The charges depend on customer classification which depends primarily on the strength of the waste to be treated.

Residential Single family

In 2008, the typical single family homeowner will pay a fixed minimum of $9.80 on every sewer bill. The consumption charge is $1.76 per thousand gallons of water used per billing period, but not to exceed the winter quarter consumption. This keeps the summer lawn water use from being charged as sewer flow.

Multi-family

The 2008 rate consists of a fixed minimum of $9.80 per sewer connection, plus $1.76 per thousand gallons for water usage for the billing period, not to exceed the winter quarter water consumption.

Commercial and Industrial

Commercial and Industrial rates depend on the type of customer; (e.g., whether the customer operates a restaurant, car wash, or mortuary etc.) These rates are based on how much and how contaminated the wastewater is for each customer group.

PROPOSED WATER SUPPLY PROJECTS

Windy Gap Firming Project

In 1985, the Windy Gap Project water supply was completed by the Municipal subdistrict of the Northern Colorado Water Conservancy District. The goal of the Windy Gap Project was to deliver an average of 48,000 acre feet of water annually to project participants. However, since 1985, the project has not met such projections due to deficiencies in water delivery and lack of storage. The Windy Gap Firming Project has been proposed to firm all or a portion of the existing participants' Windy Gap needs by obtaining storage and improving the reliability of the Windy Gap water supply. The Subdistrict's preferred alternative for this storage is the 90,000 acre-foot Chimney Hollow Reservoir located southwest of Loveland. Greeley intends to "firm" 44 units of Windy Gap by subscribing to 7,000 acre feet of storage in the proposed reservoir.

Halligan-Seaman Water Management Project

Greeley is participating in the Halligan-Seaman Water Management Project (HSWMP) along with the City of Fort Collins and its partners. The HSWMP involves enlarging two existing reservoirs on the North Fork of the Cache la Poudre River (North Fork). Fort Collins along with three water districts and an agricultural ditch company plan to enlarge Halligan Reservoir from 6,400 acre feet to 40,000 acre feet in 2010. Greeley intends to enlarge Seaman Reservoir from its existing capacity of 5,000 acre feet to 53,000 acre feet. The anticipated construction date for Seaman Reservoir is 2029.

The enlarged pools of both reservoir enlargements will primarily be filled with senior agricultural water, although both the Halligan Participants and Greeley will store some junior water rights on the rare occasion when they are in priority. The senior agricultural water rights that the HSWMP participants own or will acquire for the enlargements have been historically diverted into agricultural ditches just a few river miles below the confluence of the Poudre main stem and the North Fork. Greeley anticipates that the project will increase its annual yield by approximately 10,000 acre feet. The City will make relatively small annual releases from the Seaman enlargement, but the main function of the project is to provide Greeley with critical drought storage.

As both Halligan and Seaman Reservoirs are both located on the North Fork, 16 river miles apart, there may be the opportunity to obtain the additional water supplies needed by the participants and improve environmental flows in the North Forth by coordinated reservoir operations and reallocation of storage. The HSWMP participants are working with local stakeholders and environmental groups to evaluate this opportunity.

The HSWMP participants have requested a permit to construct the reservoir enlargements from the U.S. Army Corps of Engineers (USACE). The USACE is currently conducting all analyses necessary to complete the Environmental Impact Statement and Record of Decision on this project.

Overland Trail Gravel Pits

Greeley and the Tri-Districts (Fort Collins-Loveland, East Larimer County, and North Weld Water Districts) are in a joint venture to purchase, develop, and line several gravel pits along the Poudre River, north of Fort Collins. These pits will be used by Greeley to maximize the utility of existing water rights and especially to meet return flows in that reach of the Poudre. Greeley's 1,800 acre-foot share of the pits is expected to be online by 2022.

REVIEW OF CURRENT POLICIES AND PLANNING INITIATIVES

The following policies and planning initiatives are in place in Greeley.

1. Growth shall pay its own way without unduly affecting existing ratepayers.
2. Greeley will not enter into any additional open-ended outside service contracts.
3. During a severe drought, Greeley shall incrementally increase the severity of water restrictions as drought conditions intensify, considering factors such as water storage within Greeley's system and regional water systems (i.e., C-BT system) Greeley depends on for yield.
4. Greeley will develop non-potable systems which will equal or be less than the cost of potable sources.
5. Greeley will maintain a strong water conservation ethic and will invest in additional cost effective water conservation.
6. Every five years (along with a Master Plan update) Greeley will create a new ten-year gpcd average that will be used to project future water demands. The new average will

include the last five years worth of conservation measures and ensure any savings through conservation are part of Greeley's long term planning.

7. Construction of new treatment and transmission capacity shall begin when peak demands exceed 90 percent of existing capacity.

POPULATION PLANNING PROJECTIONS

A city's growth potential depends on geography, transportation, historical industries, potential industries, and proximity to other entities. Greeley is located in an agricultural area and is surrounded on three sides by rural areas. The area around Greeley that is within service areas of other water providers is relatively small. Additionally, Greeley's Urban Growth Boundary includes extensive undeveloped lands.

Based on historical growth rates, Greeley is not expected to develop all land within its Urban Growth Boundary by 2050. The combination of these factors makes Greeley fairly unique on the Front Range with respect to growth potential. Growth in water demand for the majority of entities on the Front Range is typically limited by adjacent municipalities, other water providers, or un-developable land (such as mountains, federally owned installations, and national forests).

The Greeley City Council-defined Urban Growth Boundary is essentially the only limit to Greeley's growth potential. Therefore, the Greeley Water Department must anticipate long-term implementation of water supplies to 2050 and beyond.

The challenges to unlimited growth potential are:

- It is difficult to project the ultimate water needs for the City.
- A large number of raw water sources must be considered that must be developed many years in advance of the demand.
- A wider variety in the location of potential treatment plants, the size of treatment plants, and the size and location of finished water transmission.

Greeley's 2003 Water Master Plan defined a near-term (2020) water development plan and a long-term (2050) water development strategy. The near-term plan is essentially to maximize existing supplies through such efficiencies as gravel pit storage, reuse exchanges, and conservation, with agricultural water acquisition a follow-on step. The long-term strategy would be to participate in a regional storage project, such as the expansion[8] of Milton Seaman Reservoir. The near-term program is well on the way to completion.

[8] Although Greeley initiated the HSWMP with Fort Collins before 2020, if approved by the USACE, Greeley will not build an enlarged Seaman until after 2020.

EXISTING WATER CONSERVATION PROGRAMS AND MEASURES

Greeley first imposed water restrictions in 1907, requiring residents to alternate watering days and avoid mid-day watering. This same ethic is in place today over 100 years later. Furthermore, in 2003, the City hired ten employees for the irrigation season to patrol, enforce restrictions, and ticket violators in response to the severe drought conditions. Every year since 2003, Greeley has hired a group of seasonal employees to patrol and offer educational opportunities.

The City has included conservation in overall supply planning for 15 years. Greeley developed its first water conservation plan in 1992. In 1997, Greeley hired a full-time conservation coordinator who has managed the City's water efficiency efforts for the past 11 years.

Greeley Conservation Program

Greeley's water conservation program has grown and expanded over the past 11 years to encompass all customer sectors in the City. In 2007, the City's conservation program budget was increased to $500,000 making it one of the largest programs in Colorado. The conservation program addresses both indoor and outdoor water use through education, ordinances, direct outreach, rebates, and information. The Greeley conservation program implements an extensive education, marketing and social marketing campaign that includes sponsorship of the local NPR radio station, advertisements on buses, bus benches, and cable TV. Consequently, the Greeley program has become one of the most visible and well publicized conservation efforts in Northern Colorado.

The following elements comprise the Greeley conservation program:

Lawn Watering Restrictions and Planting Ordinance

Greeley instituted its first lawn watering restrictions in 1907 and imposed fines for violations.[9] At the time, the City's population numbered no more than 8,000 and in a remarkable feat of conservation continuity, those first rules still apply today to over 90,000 citizens. For example, daily lawn watering and watering during the heat of the day is forbidden. Greeley's irrigation restrictions are shown in Table 5.

[9] A 1908 Greeley Tribune article reports "eight or nine prominent Greeley" citizens complained that their fines for sprinkling out of hours should go to the water works fund, not to the Police Magistrate.

Table 5: Greeley mandatory watering restriction schedule, 2008

	Single family residences & duplexes with **even** numbered addresses ending in: **0, 2, 4, 6, 8**	Single family residences & duplexes with **odd** numbered addresses ending in: **1, 3, 5, 7, 9**	**All others:** home owner association common areas, multi-family residences, apartments, businesses, government, non-profit, churches, commercial, industries, and institutions.
January 1 - April 14	No Lawn Watering	No Lawn Watering	No Lawn Watering
April 15 - December 31	Sunday, Tuesday, Thursday *No Watering 12 p.m. to 5 p.m.*	Monday, Wednesday, Saturday *No Watering 12 p.m. to 5 p.m.*	Sunday, Tuesday, Friday *No Watering 12 p.m. to 5 p.m.*

City ordinance establishes the following lawn watering restrictions in Greeley:

- Hand watering of brown spots in a lawn is allowed on any day. Greeley encourages its customers not to hand water their lawns between 10 a.m. and 5 p.m. Hand watering of trees, shrubs, flower and vegetable gardens may be watered at any time by hand, drip irrigation, low volume, bubblers or by weeping-type soaker hoses. Using a watering can or someone holding a hose with a restrictive nozzle is considered watering by hand. Hand watering does not include utilizing a hose with a sprinkler or manually operating an irrigation controller.
- No hosing paved surfaces, including, but not limited to: decks, driveways, patios, and sidewalks.
- Occasional washing/hosing off vinyl siding, washing out roof gutters, washing in preparation for paint or staining is allowed within reason.
- Home car washing is allowed with a restrictive nozzle hose and bucket, and minimal runoff.
- New lawn watering variances are available with proper soil amendment (4 cubic yards per 1,000 square feet of lawn).

When landscaping a new home or planting seed or sod in an established yard, Greeley residents must get a variance to water during restricted periods. Greeley also requires residents to prepare the soil with compost (organic matter) before receiving a variance. Under a 2002 City ordinance, new lawns require proof of adequate compost. The program has the following rules:

- Sod and compost receipts must be provided to the City to verify the installation.
- Four cubic yards of compost must be used for every 1,000 square feet of sod put down.
- The compost must be rototilled and the property owner must provide photos or tiller rental receipts as proof.
- City employees check to verify the new lawn and compost.
- The property owner must post a variance notice when the off-hour irrigation is occurring.

Water Waste Ordinance

An ordinance enacted in 2002 prohibits water waste of any kind in Greeley. Water utility staff members are empowered to enforce this ordinance and issue tickets with inclining fines for repeat violations.

Toilet, Clothes Washer, and Irrigation Efficiency Rebates

The City of Greeley offers rebates for the purchase and installation of ultra low-flow toilets and high efficiency front loading washers.

For toilets, Greeley offers a $50 rebate for any brand new low-flow toilet equal to or less than 1.6 gallons per flush (gpf) and $75 for a high efficiency 1.3 gpf toilet (HET) that replaces a 3.5 gpf or greater toilet (manufactured before 1994). A photo of the destroyed replaced toilet is required as proof that it was not re-installed. Alternatively the customer may take the old toilet to the City's recycling facility where it is destroyed and used for road base. A voucher from the recycling facility serves as proof of destruction.

Greeley offers a rebate of $100 for the purchase of a high efficiency clothes washer. Only washers on the "qualifying list" are eligible for the rebate. The list is regularly updated and is available on the City's web site (http://www.greeleygov.com/Water/Rebates.aspx).

Greeley's rebate programs operate under the following rules:

- Rebates are subject to available funds. Currently $75,000 annually.
- Clothes washers must be on qualifying list.
- For each year's rebate, products must be purchased between January 1 and December 31 of the year the customer requests the rebate. Applications must be submitted before January 7 of the following year.
- The original sales receipt must be attached to the application and include the date of purchase, price, brand name and model number.
- Products must be for use at an address that receives a City of Greeley water bill.
- The owner bears responsibility for installation.
- The City of Greeley reserves the right to inspect and verify the purchase and installation location of any appliance or device for which a rebate is provided.
- The rebate is for a maximum of two toilets per customer.

Greeley also offers matching grants for low water or alternative turf installations. In 2007, the City spent nearly $16,000 for 81,000 square feet of low or alternative turf.

The rebate program began July 2006 and Greeley processed 102 toilet rebates and 244 clothes washer rebates that year. In 2007, Greeley processed 161 toilet rebates and 456 clothes washer rebates. A list of the conservation program rebate efforts during the 2007 budget year is shown in 6.

Table 5: Greeley residential conservation program rebates 2008 (as of publish date)

	Number	Amount of Rebate	Money Rebated
Low Flow Toilets (<1.6gpf)	182	$ 50.00	$ 9,100.00
Ultra Low Flow Toilets (<1.2gpf)	13	$ 75.00	$ 1,125.00
High Efficiency Front Load Washers	384	$ 100.00	$ 38,400.00
Total Indoor appliances/fixtures	579		$ 48,625.00
			$ -
Outdoor Rebates			$ -
Rain /Weather Sensor	4	varies	$ 125.00
Lg Rotors	62	7	$ 434.00
Irrigation Controllers	13	varies	$ 700.00
ET Controller	2	varies	$ 155.00
	0		$ 1,414.00
		Total indoor/outdoor	$50,032.00

Beginning in 2008, Greeley's rebate program expanded to include commercial properties and irrigation products such as rain sensors, irrigation heads, more sophistication sprinkler controllers and Smart (ET) irrigation controllers. Other conservation rebate include toilets and urinals, air cooled ice machines, conductivity controllers (for cooling towers) and front loading washers. To date, Greeley has rebated approximately $30,841.62 to local businesses.

Greeley has also developed a targeted toilet replacement methodology that integrates analysis of water billing records with the Greeley Geographical Information System (GIS). Using GIS it is possible to identify the average age of the housing stock for each census tract in Greeley. By plotting this against the average winter-time water use (a good surrogate for indoor use in Colorado) it is possible to identify areas that have the highest rate of indoor water use and hence are likely candidates for toilet and clothes washer retrofits. Affectionately dubbed the "toilet map," this analysis is an innovative method for targeting customers most likely to benefit from a conservation rebate program. A recent version of the "toilet map" is shown in Figure 6.

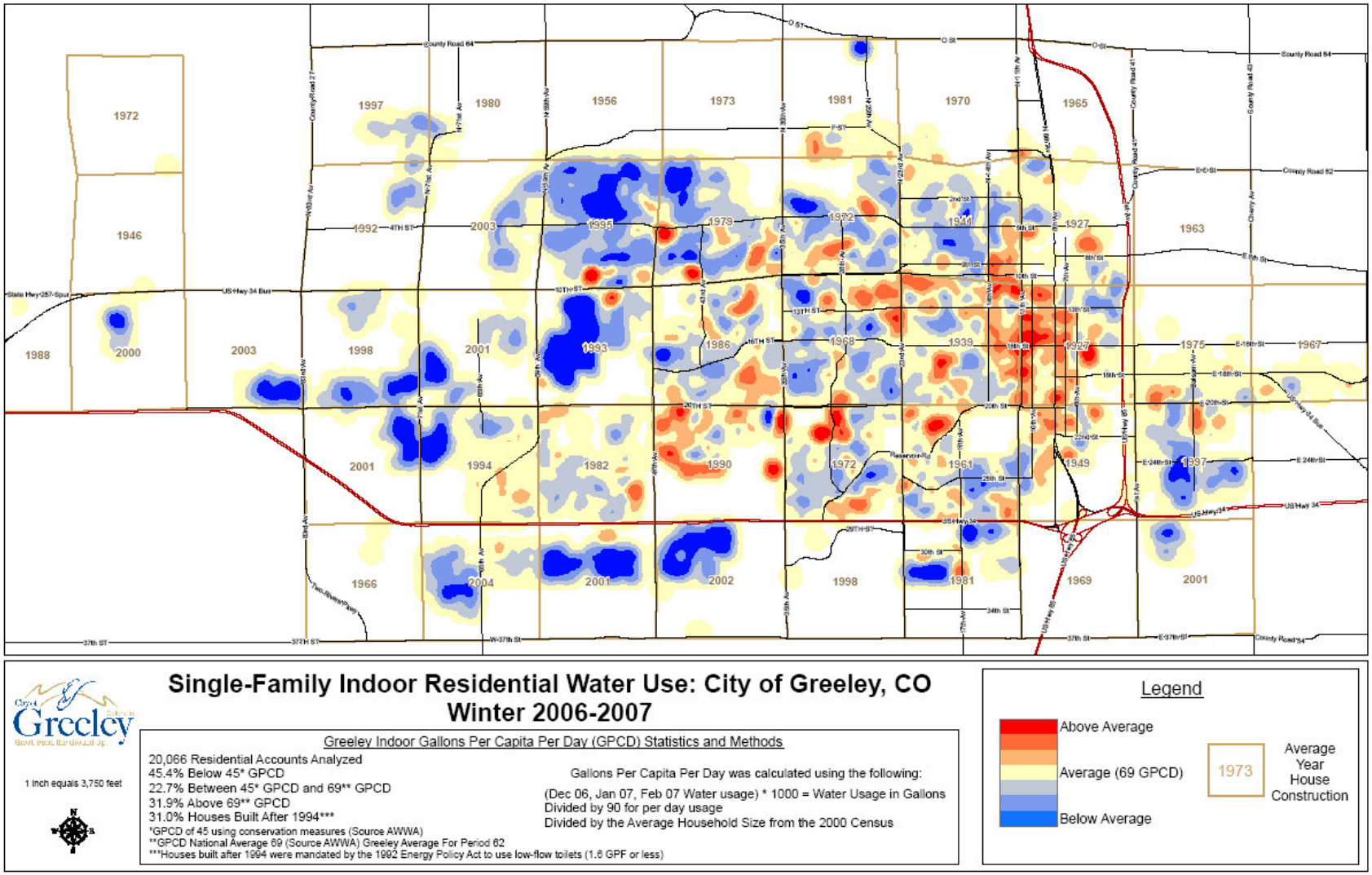

Figure 6: Greeley "toilet map" showing indoor residential water use and average age of housing stock. This diagram is used to target conservation efforts such as toilet and clothes washer rebates and retrofits.

Water Efficiency Audits

Irrigation Audits

The Greeley Water Conservation Program offers free irrigation efficiency audits to customers interested in learning about ways to improve the efficiency and operation of their irrigation systems. Customers can request an appointment for an evaluation from the City. The auditor also supplies the customer with a rain sensor and shows them how to install and use it.

The irrigation auditing program has gradually modified each year since 2001 to meet the changing needs of customers. Demand for irrigation audits exceeded what the conservation program could support. In response to the demand, a full time Conservation Irrigation Specialist was hired in 2007. This staff member now supervises the program and hires and trains the auditors. In 2006, Greeley performed 175 residential irrigation audits and 16 large irrigation commercial audits. In 2007, 143 residential customers received an irrigation audit from the City and 38 commercial customers. In 2008, 249 residential customers were audited and received a rain sensor. Thirty-four larger commercial properties were audited including three parks.

Commercial Indoor Audits

In 2007, a Commercial Auditor was hired to assist commercial and industrial customers with their indoor water consumption. After auditing approximately 160 businesses, Greeley developed its commercial rebate program for these customers based on information learned from the audits.

During the summer of 2008, Greeley contracted with an engineering firm to conduct a water audit of the JBS Swift meat processing facility. This plant is responsible for approximately 13 percent of the total potable water demand in Greeley. The audit revealed significant areas where water conservation can be achieved. If the audit recommendations are implemented it should result in significant water savings.

Education Program

Education is considered an essential element of a good utility-based water conservation program. The City is steadfast in the belief that face to face personal contact is the most effective element of its educational program, and Conservation Program staff strives to be visible in the community, and to meet with as many citizens as possible. Staff spends one-on-one time with customers explaining compost requirements for installation of a new lawn, covering the water saving potential of a sprinkler system tune-up, and answering questions when customers complete paperwork for a washing machine rebate. These are invaluable education opportunities. The conservation staff also sponsors and participates in a broad array of events and educational activities to foster face to face interaction.

In addition, Greeley also offers informational literature, current and comprehensive web pages, an informational phone line, bill stuffers, and conservation brochures and information.

Greeley participates in conservation fairs, the local home and garden show, and children's water festivals, which offer ready-made outreach opportunities. Added to those educational efforts are neighborhood meetings, speaking engagements, discussions with local

civic groups, and classroom visits. Staff members also are involved with professional organizations, such as American Water Works Association (AWWA), Colorado State University Cooperative Extension Master Gardeners, American Water Resources Association (AWRA), Colorado WaterWise Council (CWWC), where they collaborate with others on regional and statewide efforts.

Water Efficiency Product Distribution and Retrofits

The Greeley Water Conservation Program has distributed water conservation kits to residential customers for over ten years. In 2007, Greeley distributed approximately 500 conservation kits to homeowners. A bulk purchase is made every couple of years and the kits are distributed to Greeley water customers and attendees to the above mentioned events for free.

These kits include:

- Dye tablets to check toilets for leaks
- Kitchen aerator
- Bathroom aerator
- Teflon tape
- Showerhead

Greeley also actively retrofits municipal facilities and parks. In 2006, Greeley completed a retrofit of automatic shut-off shower heads at the Greeley Recreation Center. In 2007 both City Hall and the City Hall annex buildings were retrofitted with low flow toilets. Placing these products in a public setting such as the recreation center or City offices provides a showcase for this water conserving technology and the message that the City is doing its part to conserve.

Irrigation Efficiency Improvements and Landscape Water Budgets

The Conservation Program also features efforts to improve irrigation efficiency. In recent years the Conservation Program spent $500,000 to purchase a central irrigation control system for the City of Greeley Parks department. A central irrigation control system computes the efficient water application rate for each park individually and greatly assists with their irrigation management.

Greeley has installed water meters on all parks and golf courses. Furthermore, water budgets based on evapotranspiration demands have been developed for all of these properties and the meters are read weekly during the irrigation season. The consumption data is put into a database and provided to the park managers every week, showing their park's consumption in relation to the water budget. The park managers are not billed for each water use but find the regular feedback on their water budget helpful in maximizing the efficiency of their irrigation system and recreation demands.

Water Loss Control

Greeley has an active water loss control and leak detection program. City staff has a regular leak detection and repair regime that is followed to maintain a tight distribution system. In 2006, City crews repaired 54 water leaks which amount to approximately one leak for every ten miles of pipe in the Greeley system. Greeley's system losses have averaged less than six

percent since 2000. Many utilities consider ten percent system losses to be acceptable, so Greeley is operating a particularly tight system.

Water Budget Pilot Study

The City of Greeley has been actively evaluating the use of an individualized tiered rate (water budget) billing approach over the past seven years. As part of this assessment Greeley has examined the water consumption and billing of over 800 residential meters on a weekly basis. A water budget essentially defines the amount of water each customer needs during a certain time period to be efficient. This amount is calculated based on the user's indoor requirements as well as outdoor requirements. Variables such as average household size, temperature, precipitation, and landscaped area are used in the calculation of the water budget. Household size and landscaped area have proven the most difficult to determine accurately.

The City of Greeley believes a water budget is the best rate structure to promote and encourage the efficient use of water for its customers while discouraging waste. The water budget pilot program is providing feedback to City officials on the best way to implement a water budget. The City of Greeley will incorporate a water budget-based rate structure within the next 2-3 years. Statements of Qualifications are currently being sought by the Water Department to hire a consultant to evaluate feasibility and implementation of a Water Budget.

Reuse

Greeley does reuse effluent, not by costly treatment, but through river exchanges. Greeley is located between the confluence of the South Platte River and the Poudre providing for ample opportunity to conduct complicated and regular river exchanges. With use of up to three wastewater treatment plants, Greeley can conduct extensive exchanges storing effluent for reuse. The stored effluent is later used to meet augmentation, non-potable, and return flow obligations. By reusing effluent Greeley is conserving valuable, treatable supplies.

CONSERVATION PROGRAM AND DEMAND FORECASTS

Based on the analyses in this Conservation Plan, Greeley has established a goal of reducing demand by 8.2 percent from 2010 to 2030 directly through its conservation program. An analysis of estimated savings achieved through the current program, as described below, suggests that this goal is attainable. Indeed the goal may be exceeded, given the current level of conservation effort, particularly if Greeley implements the water budget based rate structure currently being studied.

Table 6 presents an analysis of the estimated water savings achievable through the Greeley Water Conservation Program. Where possible, water savings were measured using data from the Greeley billing system. The net impact of this program is an estimated savings of 144 acre feet per year, every year, which will yield a total savings of over 3,000 acre feet of water by 2030. In most cases, savings were estimated from published research and references listed in the table. The estimates provided in this table are conservatively low and it is possible that Greeley may achieve higher savings in the coming years.

Table 6: Greeley water conservation program matrix, estimated water savings, and source citation

Current Program/Measures	# of Customers Impacted Per Year	Estimated Savings Per Account (kgal/year)	Estimated Total Savings Per Year (ACRE FEET)	Comments	Citation
Mandatory watering restrictions (3 days per week - no watering from noon- 5 p.m.)	ALL	0		Existing program for 100 years. Unprecedented. Key benefits include: reduced peak demand, more regularized demand patterns, useful education tool, keeps water use and efficiency in public eye.	
Soil amendment ordinance	200	16.3	10	Estimate based on discussions with Ruth Quade.	"30 % less water is needed" - A1
Water Waste Ordinance	ALL		10	Estimate based on customer contacts and citations issued.	
ULF toilet rebate ($50)	161	9	4.4	Based on average savings level determined at 95 % confidence level	*Residential End Uses of Water* - AWWA, 1999; *EPA Residential Retrofit Study* - Aquacraft, 2004; *Handbook of Water Use and Conservation*, A. Vickers 2001.
HET toilet rebate ($100)	4	10	0.1	Based on average savings level determined at 95 % confidence level. Note: As more HET models become locally available the numbers will increase. 13 rebates have been processed so far in 2008.	*Residential End Uses of Water* - AWWA, 1999; *EPA Residential Retrofit Study* - Aquacraft, 2004; *Handbook of Water Use and Conservation*, A. Vickers 2001.
Clothes washer rebate ($100)	456	5.5	7.7	Based on average savings level determined at 95 % confidence level and current clothes washer water use data	*EPA Residential Retrofit Study* - Aquacraft, 2004; *Handbook of Water Use and Conservation*, A. Vickers 2001; Consortium for Energy Efficiency
Indoor Commercial Water efficiency audits	225	29.1	20.1	Calculation based on data from Ruth Quade (if they take advantage of retrofits)	
Conservation education program (indoor/outdoor)	MANY/ALL	0.5	23.0	Estimate based historic demand patterns and education program implementation timeline. Assumes 50 % of customers save 500 gallons per year through educational efforts.	*"As We See It -- Education on Water Use Is Essential as Population, Demand Soar",* Fender, Douglas H. Journal AWWA, Vol. 95 Iss. 2, February 2003;*Handbook of Water Use and Conservation*, A. Vickers 2001.
Conservation kit distribution	450	2	2.8	Assumes not all kits are installed and only limited savings achieved.	*Handbook of Water Use and Conservation*, A. Vickers 2001.
Irrigation efficiency audits	300	20	18.4	Engineering estimate	
Water loss control	1	N/A	25	Based on a measured 1 % reduction in system loss between 97-01 and 02-07 (-6% vs. -5%) amounting to a 0.1% reduction per year. Reductions will likely taper off at the -3% to -4% level, but the program effort is probably worthwhile to maintain such a low level of system losses.	Greeley water use data provided by Sean Cronin.

Current Program/Measures	# of Customers Impacted Per Year	Estimated Savings Per Account (kgal/year)	Estimated Total Savings Per Year (ACRE FEET)	Comments	Citation
ESTIMATED ANNUAL SAVINGS FROM CURRENT PROGRAMS AND MEASURES			**121.5**	Does not include significant peak usage reductions resulting from watering restrictions which could be reducing coincident peak day demand by 30 - 40%.	
Natural Replacement					
Residential toilet replacement (1% per year)	140	9	3.9	Assumes 1% of residential customers per year replace toilets. Some apply for the available rebate and some don't.	*Residential End Uses of Water* - AWWA, 1999; *EPA Residential Retrofit Study* - Aquaft, 2004; *Handbook of Water Use and Conservation*, A. Vickers 2001.
Residential CW replacement (3% per year)	450	5.5	7.6	Assumes 3% of residential customers per year replace their washer. Some apply for the available rebate and some don't.	*Residential End Uses of Water* - AWWA, 1999; *EPA Residential Retrofit Study* - Aquacraft, 2004; *Handbook of Water Use and Conservation*, A. Vickers 2001.
CII toilet replacement (1% per year)	250	10	7.7	Assumes 1% of CII customers will replace toilets each year. Water savings estimate is on the low side of scale. Savings are dependent upon usage frequency of the old and new fixture.	*Commercial and Institutional End Uses of Water* - AWWA, 2000; *A Practical Approach to Water Conservation for Commercial and Industrial Facilities,* Mohan Seneviratne, 2007; *Handbook of Water Use and Conservation*, A. Vickers 2001.
CII faucet replacement (1% per year)	250	5	3.8	Assumes 1% of CII customers will replace faucet aerators each year. Water savings estimate is on the low side of scale. Savings are dependent upon usage frequency of the old and new fixture.	*Commercial and Institutional End Uses of Water* - AWWA, 2000; *A Practical Approach to Water Conservation for Commercial and Industrial Facilities,* Mohan Seneviratne, 2007; *Handbook of Water Use and Conservation*, A. Vickers 2001.
ESTIMATED ANNUAL SAVINGS FROM NATURAL REPLACEMENT			**23.0**		
TOTAL ESTIMATED ANNUAL SAVINGS FROM CURRENT PROGRAM AND NATURAL REPLACEMENT			**144.4**	50 ACRE FEET = 0.1% of total annual demand. The amount represents approximately 0.28% of Greeley's total annual demand. The expected range of savings should be + or - 10% of the total (128 - 166 ACRE FEET). When developing these savings into a long-term demand forecast changes in technology and program implementation rates must be considered.	

Figure 7 shows the forecasted demand in Greeley from 2010 – 2030 under baseline conditions and with the anticipated conservation savings resulting in the 8.2 percent reduction by 2030. The net impact of this program is estimated savings of 144 acre feet per year that will yield a total savings of over 3,000 acre feet of water by 2030. At a conservative $7,000 per acre-foot, this saved water represents a $21 million capital benefit to the City.

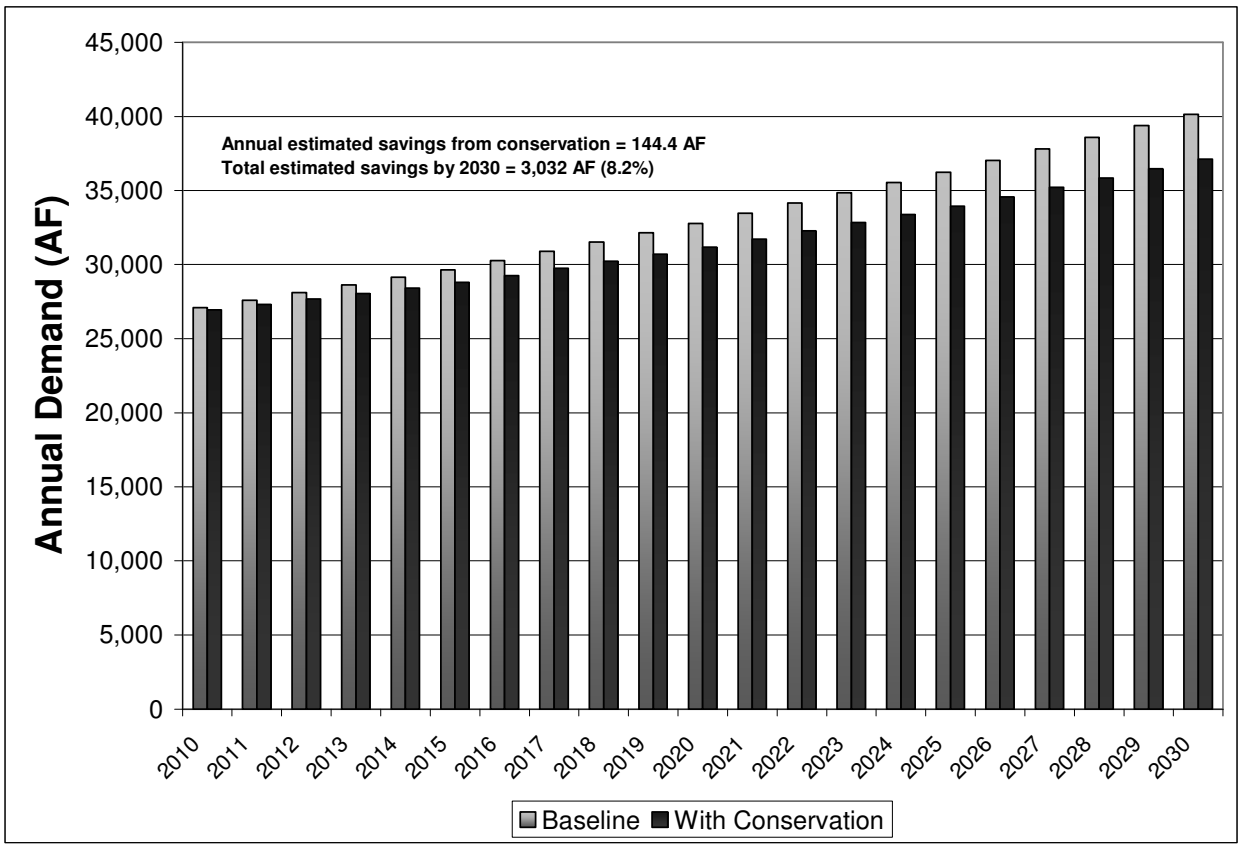

Figure 7: Forecasted water use in Greeley under baseline conditions and with the estimated savings from the conservation program.

IMPLEMENTATION PLAN FOR GREELEY CONSERVATION PROGRAM

Greeley is actively implementing the conservation program described above. The program is not a static program and under the guidance of the Water Conservation Coordinator, the program has evolved to meet the growing needs of the community and water utility. This evolution is demonstrated by the doubling of the annual budget and the three-fold increase in full-time and seasonal employees over the last several years.

Proposed Future Programs

It is anticipated that the program will continue to evolve and change over the next five years, but the financial and human resource commitment from Greeley and the associated water savings are expected to remain the same.

Specifically Greeley intends to add the following programs, analysis and evaluation, over the next five years, to its existing conservation program.

- 25 percent increase to the conservation budget over five years
- Water budget rate structure throughout the City
- Clearer water wise landscaping code language
- Water wise landscape incentives for landlords and foreclosed properties
- Water wise landscape incentives for developers and home owners associations
- Analyze effectiveness of natural replacement of low efficient appliances
- Analyze normalizing gpcd for precipitation and lot size
- Analyze allowing for smaller non-potable irrigation sites
- Evaluation if additional staff is necessary to implement new programs
- Develop low-budget xeric alternatives to zero landscaping
- Water Conservation will work with Community Development on exploring changes in landscape codes, new construction landscape requirements, lot sizes, turf and landscape percentages of total lot size.
- If demonstrated as feasible and cost effective, implement a Water Budget as soon as reasonably possible.
- Initiate various Pilot Projects
- "WaterSense" pilot. Recruit a new subdivision and create incentives to build WaterSense labeled homes as part of the EPA's WaterSense program
    - Investigate retrofits of existing landscaping to water wise landscaping (i.e. Cash for Bluegrass)
    - Pilot project on 11th Avenue between 16th and 20th Street –retrofit 200 LF or ULF Toilets, showerheads and faucet aerators. This area was previously identified as a high per capita use area due to a combination of factors.
    - ET clock pilot: install at least 50 ET clocks on residential and /or commercial properties and evaluate their consumption.
    - Design a system with MP or Rainbird Rotators

Monitoring and Evaluation

The entire suite of current conservation programs are regularly evaluated and judged against annual, seasonal, per customer, and per capita demands. For each program, Greeley will evaluate and monitors the program's progress towards the stated 8.2 percent water savings goal. Additionally, net and gross water savings will be evaluated.

Every five years (along with a Master Plan update) Greeley will create a new 10-year gpcd average that will be used to project future water demands. The new gpcd average will include the last five years worth of conservation measures and ensure that any savings through conservation are part of Greeley's long term planning. Because of the issues (fluctuating weather data) with measuring only by gpcd on a yearly basis, this will not be the only way that savings is quantified. The monitoring and savings will be reported annually on all programs when there is at least a year's consumption data. See Table 7.

Objective and actual conservation results achieved by each component of the plan will be quantitatively monitored and reported to management and the Water Board at least once a year. For example, consumption for those who have received a conservation incentive from the previous year(s) will be monitored and quantified similar to what has been done with the monitoring for the Parks Department.

Program	2008 Use	2009 Use	Difference(gal)	Difference (AF)	% Difference	Cost (staff & materials)	Cost /AF
I. Fixtures and Appliances							
II. Water wise landscaping							
III. Commercial, Industrial Institutional							
IV. Water Reuse systems							
V. Water loss and leakage reduction							
VI. Information and public information							
VII. Water Rate Structure							
VIII. Technical Assistance							
IX. Regulatory Measures							
X. Incentives							

Table 7 Greeley Water Conservation measures and monitored savings for current and previous years. Staff will continue to add programs and data to keep a five year running total of savings.

Updating the Conservation Plan

Greeley will update the conservation plan every five years, along with the Water Master Plan, unless significant changes occur within that time frame warranting an accelerated schedule. As part of this, all demand forecasts will be reevaluated at that time.

Conservation Plan Review Process, Public Participation, and Adoption

On August 20, 2008, the City of Greeley Water and Sewer Board reviewed the plan and made comments, after which the public comment period began. Public comments ended on October 20th.

On August 21, 2008, the Greeley Water Conservation Plan was posted on the City of Greeley website www.greeleygov.com and hard copies were made available to any interested members of the community at City Hall (1000 10th St.) and the Water and Sewer Department at City Hall Annex (1100 10th St.).

Public comments and any proposed changes were presented to the City of Greeley Water and Sewer Board on November 19, 2008. The Greeley Water and Sewer Board adopted the 2008 Water Conservation Plan.

Greeley has submitted its plan to the Colorado Water Conservation Board in November 2008.

COMPLIANCE WITH STATE PLANNING REQUIREMENTS

Colorado Revised Statute § 37-60-126 requires a covered entity to develop, adopt, make publicly available, and implement a water conservation plan that will encourage its domestic, commercial, industrial, and public facility customers to use water more efficiently. Key elements that must be considered in development of the plan are listed as follows:

1. Water-saving measures and programs including: (I) water-efficient fixtures and appliances; (II) water-wise landscapes; (III) water-efficient industrial and commercial water-using processes; (IV) water reuse systems; (V) distribution system leak identification and repair; (VI) information and education; (VII) conservation oriented rate structure; (VIII) technical assistance; (IX) regulatory measures designed to encourage water conservation; (X) incentives to implement water conservation techniques including rebates.
2. Role of conservation in the entity's supply planning.
3. Plan implementation, monitoring, review, and revision.
4. Future review of plan within 5-7 years.
5. Estimated savings from previous conservation efforts as well as estimates from implementation of current plan and new plan.
6. A 60-day minimum public comment period.

The following section of the plan details Greeley's compliance with this statute.

Greeley Compliance

The City of Greeley developed this conservation plan in order to comply with C.R.S. § 37-60-126. Each element of compliance is documented below.

1. **Consideration of specific conservation measures** -

(I) *Fixture and appliances* – Current program includes residential and commercial toilet rebates and clothes washer rebates, sprinkler clocks, rain sensors and sprinkler heads, free water conservation kits and general promotion of water efficient fixtures and appliances.

(II) *Water wise landscape* – Current program includes rebate for controllers and components; Xeriscape Grant program offering matching money for schools and commercial properties; Xeriscape education and demonstration gardens. Proposed revision of landscape codes to incorporate water conserving practices into all new landscaping.

(III) *Commercial, Industrial and Institutional (CII) measures* – Current program includes free audits, rebates for toilets, urinals, and clothes washers; air cooled ice machines, conductivity controllers for cooling towers, etc. hotel and restaurant conservation cards; CII benchmarking effort; See Appendix A for a complete list of commercial rebates.

(IV) *Water reuse systems* – Water from the wastewater plant is used to satisfy augmentation, return flow, and non-potable demands.

(V) *Water loss and system leakage reduction* – Current program includes an active utility water loss and leak detection program and customer's high bills are flagged and leak investigation is implemented. Currently, Greeley is lining the in-town treated water reservoirs to tighten up the system. It is estimated that the rehab and lining of in town treated reservoirs will cut leaks by 98%. Every other year water mains in an older targeted area of town are rehabilitated with a cement mortar lining project as a preventative measure.

(VI) *Information and public education* – Current program includes various public information campaigns with bill stuffers and related informational materials; Xeriscape education; annual youth water festival; classroom presentations; workshops, classes, and presentations to customers, civic groups and anyone who requests a presentation. Large portion of the budget is dedicated to print, radio and other advertising and promotions.

(VII) *Water rate structure* – Current program is a billing system based on the cost of water; water budgeting pilot program is providing feedback to city officials and staff on best way to implement a custom tiered rate (water budget). City is moving forward with research and development of a water-budget based rate structure for implementation as soon as reasonably possible.

(VIII) *Technical assistance* – none was requested for development of this plan.

(IX) *Regulatory measures* – Current program includes watering restrictions, lawn permit ordinance; soil amendment ordinance, water wasting ordinance; landscape ordinances;

(X) *Incentives* – A broad range of incentive and rebate programs are included in the measures described above as well as free products.

2. Role of conservation in Greeley supply planning. Greeley has a $500,000 budget for conservation in 2008. The conservation program is well integrated into overall water supply planning, and anticipated conservation savings are included in future demand projections.

3. Plan implementation, monitoring, review, and revision. Greeley has developed a careful plan implementation program along with monitoring mechanisms and scheduled review and revisions. Details of this effort are described in the preceding section of this document.

4. **Future review of plan within seven years.** The City of Greeley intends to review and update the water conservation every five years. The next scheduled review is scheduled to occur in 2014.

5. **Estimated savings from previous conservation efforts and current plan.** The Greeley water conservation program has accomplished significant demand reductions. Residential per capita use from 1997 to 2001 was 156 gpcd. From 2002 to 2007, gpcd decreased to 133 – a 14.7 percent reduction. Greeley intends to maintain these savings in the coming years. Greeley has established a goal of reducing demand by 8.2 percent directly through its conservation program efforts over the period from 2010 to 2030 compared with projected future demand without conservation.

6. **Public comment period.** The Greeley conservation plan approval process followed the required comment period. The public participation process started August 21, 2008 through presentation of the draft plan to the Greeley Water and Sewer Board. A 60 day comment period ending on October 20, 2008 followed, and was concluded with the adoption of the plan by the Water and Sewer Board on November 19, 2008. A total of three public comments were received.

APPENDIX A

City of Greeley Commercial Water Conservation Rebates

Restaurant Rebates	
Toilet or Urinal (1.6 gpf)	$100
High Efficient Toilets (1.3 gpf)	$200
Connectionless Steamers	$485
Air Cooled Ice Machines	$450
Water Brooms To Replace Hose Sprayers	50% of cost up to $100
Dish Machine Upgrade to High Efficiency	25% of cost up to $400
Refrigeration Condensers from Water Cooled to Air Cooled	20% of cost up to $895
Pre-Rinse Spray Valves	Free per request
Table Tents	Free per request

Laundromat Rebates	
Coin Operated Commercial Washer	$300
Toilet or Urinal (1.6 gpf)	$100

Car Wash Rebates	
Spray Nozzle	$1/each up to $300 per year

Multi-Family Dwelling Rebates	
Toilet or Urinal (1.6 gpf)	$50
Toilet or Urinal (1.6 gpf)	$100 (if 8 or more are replaced at one time)
Faucet Aerators (Bathroom and Kitchen)	Free per request

Hospitality (Hotel/Motel) Rebates	
Toilet or Urinal (1.6 gpf)	$50
Toilet or Urinal (1.6 gpf)	$100 (if 8 or more are replaced at one time)
Clothes Washer	$100
Air Cooled Ice Machines	$450
Water Brooms To Replace Hose Sprayers	50% of cost up to $100

Outdoor/Landscape Rebates	
Irrigation Controller (12 and higher station)	$100
ET Controller (2 -6 stations)	$50
ET Controller (7 -12 stations)	$100
ET Controller (13+ stations)	$150
Rain Sensor	$5
Wireless Rain Sensor	$25
Rain \ Freeze Sensor	$50
Weather Station	$100
Sprinkler Head (Rotor)	$10/per head
Products must be on the qualifying list.	

Commercial and Industrial Rebates	
Cooling Tower Meters Installed	$50 (should be replaced every 5 years)
Cooling Tower Conductivity Controller Installed	$900

APPENDIX B

XERISCAPE GRANT CRITERIA

FOR
PUBLIC AREAS

City of Greeley Water Conservation Program
Water & Sewer Department
1100 10th Street
Suite 300
Greeley CO 80631

EVALUATION CRITERIA FOR XERISCAPE GARDENS

Per: Water Conservation Technical Report, 1994, Chapter 5, Page 18

Purpose: Under this measure, the City will provide funding to support efforts by the City Parks and Recreation Department, local universities, churches, schools, homeowners associations, businesses or others to develop demonstration gardens using Xeric landscaping techniques. These gardens will provide an educational resource for all water users and will provide examples to coincide with recommended guidelines for voluntary low water use landscaping alternatives. This measure will be merged with the new Landscape Guidelines measure.
Listed below are the guidelines to receive funding and support to develop Xeric Demonstration Gardens.

I. Implementation Plan: The City requires that each proposal be accompanied by an Implementation Plan. The plan should include the following items.

A. Funding

1. Sources and amounts. Include monetary sources and in kind services and donations. In kind services must be logged including person, date, time & task.
2. Total anticipated expenditures.
3. Five year estimate of maintenance costs.

Each proposal must be accompanied by or have included within the proposal a description of who will provide the maintenance and for what period of time.

4. The City will require in writing a guarantee from each proposal that all funds have been secured for the phase of the project the City's committed to before the City will release its share of funding.

B. Project Schedule

Pre-design, design, and construction (schedule through project completion)

C. Who will be performing the various phases of the project.

D. Where the work will be performed.

II. Each Xeriscape shall contain the following Seven Principals of Xeriscape **(A-G)**:

A. **A Good Design** - considering slopes, soils, drainage and limited turf areas. The design will need to be pre-approved by the Water Conservation Committee.

B. **Soil Improvement** - the addition of organic material to improve soil and a soil analysis. Minimum soil amendment is 4-6 cubic yards per 1000 square foot of area.

C. **Reduction of turf areas**, use of alternatives turfs or ground covers or removal of turf.

D. **Mulch areas** - the use of mulches to cover soil, and conserve water. Landscape fabric may be used to help reduce weeds. No plastic is allowed. Mulch should be organic and rock used sparingly or as accent rather than the primary mulch. NO more than 25% of the mulch may be rock.

E. **Efficient Irrigation**. The irrigation systems must be zoned according to water needs (very low, low, moderate, and high). Drip irrigation shall be used when possible and new irrigation methods can be demonstrated. Irrigation cannot over spray on buildings, sidewalks or other hard, non-permeable surfaces.

F. **Low Water demand plants** shall be used. Use of various trees, shrubs, ground covers, ornamental grasses and flowers will make the garden more appealing.

G. **Maintenance** - each plot should be a low maintenance design and be maintained to an acceptable level throughout the seasons and especially during the peak growing season when visibility is high. Proper maintenance includes but is not limited to weeding, fertilizing, pruning, dividing of plants, replanting lost specimens, and replacing mulches.

Other Requirements:

H. A minimum of two water zones is required.

I. A walkway for viewing, enjoying and educating the public if one doesn't already exist.

J. Educational and informative signs for plants, turf varieties, irrigation, water zones, and goals.

K. Demonstration of a 30-80% water savings.

L. Eye appealing plants and a creative design.

III. The Xeriscape must be easily visible and accessible by the public during daylight hours. The City can not consider private homes for this Xeriscape Grant but will consider Home Owner's Associations and Multi-Family complexes where public access is possible.

IV. Each proposal will be considered by the City on its own merit.

3. The City encourages partnerships, joint ventures or expert advice from local nurseries.
4. The maximum amount of money that can be requested for the initial project is $1,500.00. Money can be requested in subsequent years for expanding or upgrading the demonstration garden and interested parties will be required to submit an additional application addressing Grant Criteria.

The City's role:

1. To offer technical advice
5. To review the Xeriscape Design.
6. To provide the Grant money in two or more increments.

The City can not:

7. Design the demonstration garden.
8. Install the demonstration garden.
9. Maintain the demonstration garden.

GREELEY PUBLIC XERISCAPE GRANT AGREEMENT

Name of Project: _____

By accepting the grant money, I (we) agree to:

1. Provide a sign explaining the purpose of the garden and giving the City of Greeley Water and Sewer Department credit.
2. Provide signs that identify the plant either by name or by number with a corresponding master map or pamphlet identifying the plants.
3. Provide for maintenance during subsequent years and keep it in top condition during the growing season.
4. Allow public viewing during daylight hours.
5. Comply with all other Grant Criteria.
6. Will use the money for planning and installing the Xeriscape Demonstration Garden.
7. Will secure goods and services that equals or exceeds request for grant money.

The City will provide and install a sign for the street designating your site as a Public Xeriscape Garden when the project is finished.

Failure to comply with any of the above may result in either relinquishing the grant money or removal of the sign or both.

I also agree to complete the garden in a timely manner in accordance with the time schedule.

_____DATE:_____

Signature

_____DATE:_____

Signature

Please sign both copies of the agreement and send one copy to the address below along with completed grant and request for money.

City of Greeley Water and Sewer
Attention: Ruth Quade
1100 10th Street, Third Floor
Greeley CO 80631-3810