

# Cheyenne Public Utilities

## Conservation Ordinance

The City of Cheyenne Board of Public Utilities (BOPU) provides water and wastewater services for the City of Cheyenne, Wyoming. Cheyenne BOPU serves a population of approximately 66,550. As of the 2000 Census, the median household income in Cheyenne was \$38,856, which is higher than the statewide median of \$37,892.<sup>1</sup>

### UTILITY DEMOGRAPHICS

Cheyenne BOPU supplies water to the City of Cheyenne, South Cheyenne, the F.E. Warren Air Force Base (Warren AFB), and some county users. The total service area is 40 square miles. As of April 2005, the BOPU had 21,525 connections, 91.9% of which were residential. Of their total connections, 18,597 were single family residential, 1,192 were multifamily residential, 1,565 were commercial, 26 were industrial, and 147 were for city services. Cheyenne BOPU has a storage capacity of 39,420 acre-feet. As of 2004, the average residential water use was 76 gallons per capita per day (gpcd), and total utility water use was 141 gpcd.

**CONSERVATION ORDINANCE**

**Affected Customers:** **All**

**Customers Analyzed:** **ICI, City Services, Residential, Warren AFB**

**Ordinance Effective Date:** **March 2003**

### UTILITY RATE STRUCTURE AND PRICES

In July 2004, Cheyenne BOPU adopted an increasing block rate structure in order to encourage water conservation. Customers are charged a monthly service fee of \$4.00 for 5/8" and 3/4" meters in addition to a variable charge:

Usage	Price	
	Inside City	Outside City
≤ 6,000 gallons	\$2.76/1,000 gal	\$4.14/1,000 gal
6,001 – 24,000 gallons	\$3.45/1,000 gal	\$5.18/1,000 gal
24,001 – 42,000 gallons	\$4.31/1,000 gal	\$6.47/1,000 gal
≥ 42,001 gallons	\$5.39/1,000 gal	\$8.09/1,000 gal

### CURRENT CAPACITY AND WATER SOURCES

The BOPU's sources of water include the Little Snake/Douglas Creek System, which supplies approximately 12,000 acre-feet per year, Crow Creek, which provides 3,500 acre-feet per year, and four well fields that provide approximately 4,000 acre-feet per year. Surface water resources are stored in five reservoirs; they are Rob Roy, Lake Owen, North Crow, Granite Springs, and Crystal.<sup>2</sup>

### FUTURE PLANS TO MEET DEMAND

The population of Cheyenne BOPU's service area is growing at an annual rate of 1%. The BOPU plans to meet future demands by expanding water sources, expanding facilities, through water reuse, and through water conservation.

<sup>1</sup> US Census Bureau. QuickFacts.

<sup>2</sup> City of Cheyenne Board of Public Utilities.

## ORDINANCE - DESCRIPTION

Cheyenne BOPU adopted a Short-term Drought-based Water Restrictions Ordinance in March 2003 as a response to the continuation of drought conditions that impacted Cheyenne's water supply. The ordinance was to be in effect for one year. The goal of the restrictions was to reduce the amount of water supplied during the 2003 calendar year by 25-35% or about 5,400 acre-feet. The ordinance was primarily aimed at reducing outdoor water use.

### OTHER CHEYENNE CONSERVATION PROGRAMS

Leak Detection Service, *ongoing*  
Surcharge fees, *March 2003-February 2004*  
March 2003 - February 2004,  
a \$0.80/1,000 gallons surcharge.  
Conservation Rates, *May 2004-present*  
Public Education, *May 2003-present*

The ordinance set forth measures that aimed to reduce water use through time-of-day and day-of-week restrictions on lawn irrigation, water conservation and prevention of water waste, including limitations to reduce over-watering and prevent inefficient watering. The restrictions specified watering schedules for residential customers, and required special use permits for watering golf courses, athletic fields, parks and greenways, large turf areas, and cemeteries. Commercial restrictions included restaurants serving water by request only, and lodging establishments offering guests staying more than one night the option of not changing linen, towels, etc. Areas maintained by the City (City Services) were given an annual water budget, and were also asked to save 5% more water than other customer classes.

The program also implemented a surcharge of \$0.80 per 1,000 gallons to the variable water rate during a Level 3 drought. In addition, violators of water restrictions were penalized with a warning on the first violation, a fine of \$300 for a second violation, and \$500 for third and subsequent violations. The utility switched from a flat rate structure to an increasing block rate structure in May 2004.

In November 2004, modifications were made to the ordinance and it was adopted for permanent use as the City's Wise Water Use Plan.<sup>3</sup>

Also, 2004 was a wet and cool year, with frequent rain events much of the summer. Many of Cheyenne's customers do not have automated irrigation systems. As a result, a greater proportion of the reduction in 2004 water use was likely due to the weather than in other years.

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## METHODOLOGY

*Please see the General Methodology for the specific procedures and techniques used for all ECoBA analyses..*

The methodology for this analysis is different from most of the cases in the study because no control group was available for comparison. This is because the conservation ordinance affected all of the utility's customers. Instead of using a control group, the water savings were calculated solely from the difference in pre- and post-measure water use of the customer classes analyzed. The pre-measure and post-

<sup>3</sup> BOPU website. "Wise Water Use Plan."

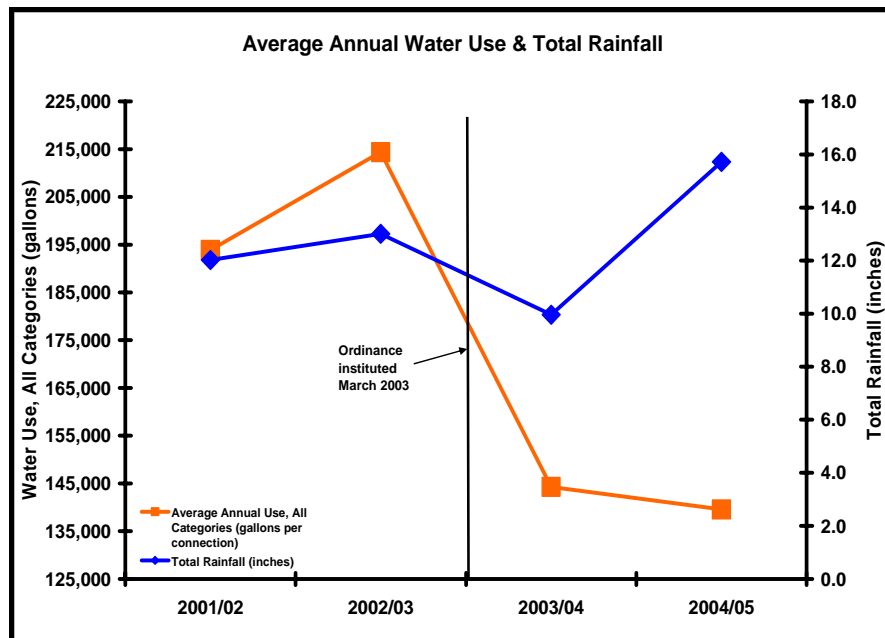
measure time periods were two years each, May 2001 through April 2003 and May 2003 through April 2005. The average yearly water savings from the two years after the implementation of the conservation ordinance was extrapolated for ten years, the assumed lifespan of the ordinance.

The customer classes analyzed were institutional, commercial, and industrial (ICI), city services, residential, and the Warren AFB. The water savings were calculated for each customer class and the total of the four classes. The cost benefit analysis was performed on the total of the four classes. The utility's other customer classes were not included in the analysis because they had primarily indoor water use or they had a combination of residential and ICI connections (i.e., South Cheyenne).

All quantified costs and benefits have been discounted to the first year of the analysis (2003) and inflated to 2004 dollars. The discount rate used in this analysis was 4.2%. The CPI values used in this analysis were the 2004 value of 188.9 and the 2003 value of 184.0.

It was not possible to follow the individual customers of the utility at the time of implementation of the ordinance. Instead, the number of connections for each customer class was used as a proxy. The number of connections varied by month. There were an average of 1,626 ICI connections, 155

City Services connections, 18,301 residential connections, and 18 Warren AFB, for an average of 20,100 connections total.



In addition to data collected to estimate water savings and perform cost benefit analysis, historical weather data was collected for additional information. Two gauges of weather were gathered; mean annual temperature and total annual rainfall. This data was collected from the National Climatic Data Center, data file Local Climatological Data, Edited.

## ASSUMPTIONS

*Please see the General Assumptions for the specific conditions and rules underlying all ECoBA analyses.*

In calculating the average number of connections over the ten year period of analysis, it was assumed that the annual growth in

connections was equal to the average annual growth between 2001 and 2005.

The price of water used in calculating the benefits from water savings was \$3.32, the average between the commercial rate, \$3.18, and the residential rate at the tier where the residential customers' water use fell (tier 2), \$3.45.

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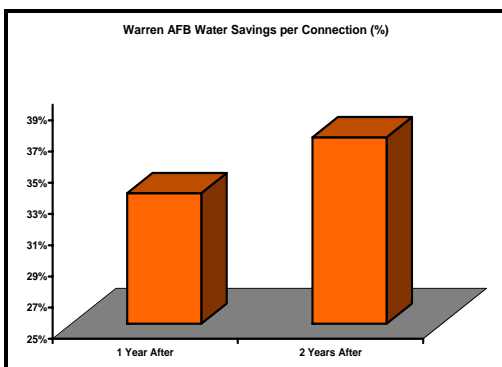
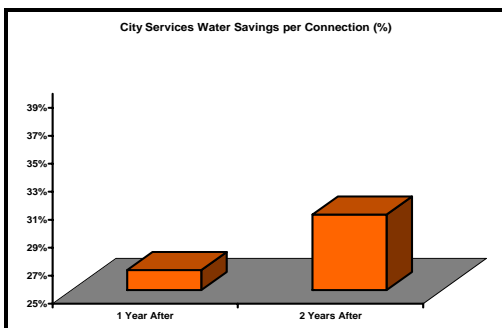
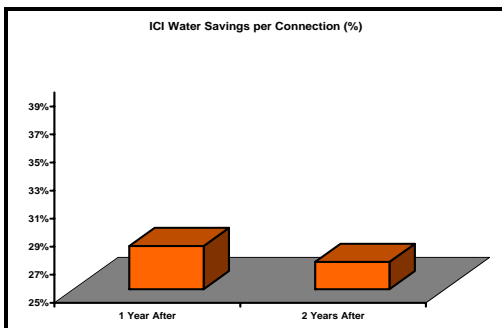
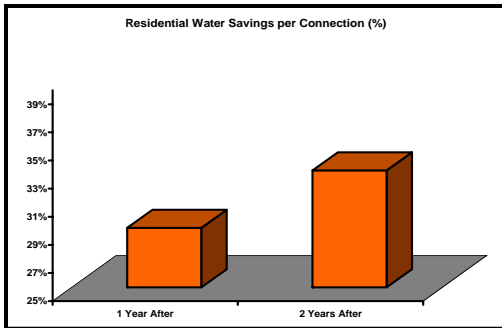
## RESULTS - WATER SAVINGS

For **residential customers**, during the first year after the ordinance, water savings amounted to 653,075,618 gallons, or 35,685 gppy (29.2% of pre-measure water use). The second year after, water savings amounted to 744,458,221 gallons, or 40,678 gppy (33.3% of pre-measure water use). The average savings per year was 698,766,920 gallons (2,144 AF), or 38,181 gppy (31.3% of pre-measure water use). **The total water savings over the ten year assumed lifespan of the ordinance was 6,987,669,197 gallons (21,444 AF), or 381,813 gallons per participant.**

For **ICI customers**, during the first year after the ordinance, water savings amounted to 267,043,739 gallons, or 164,245 gppy (28.1% of pre-measure water use). The second year after, water savings amounted to 256,201,943 gallons, or 157,577 gppy (26.9% of pre-measure water use). The average savings per year was 261,622,841 gallons (802.9 AF), or 160,911 gppy (27.5% of pre-measure water use). The total water savings over the ten year assumed lifespan of the ordinance was 2,616,228,410 gallons (8,028.9 AF), or 1,609,107 gallons per participant.

For **city services customers**, during the first year after the ordinance, water savings amounted to 114,158,367 gallons, or 737,331 gppy (26.4% of pre-measure water use). The second year after, water savings amounted to 131,313,741 gallons, or 848,135 gppy (30.4% of pre-measure water use). The average savings per year was 122,736,054 gallons (376.7 AF), or 792,733 gppy (28.4% of pre-measure water use). The total water savings over the ten year assumed lifespan of the ordinance was 1,227,360,543 gallons (3,767 AF), or 7,927,334 gallons per participant.

For **Warren AFB customers**, during the first year after the ordinance, water savings amounted to 176,519,133 gallons, or 9,780,206 gppy (33.4% of pre-measure water use). The second year after, water



savings amounted to 195,490,442 gallons, or 10,831,329 gppy (37.0% of pre-measure water use). The average savings per year was 186,004,788 gallons (570.8 AF), or 10,305,767 gppy (35.2% of pre-measure water use). The total water savings over the ten year assumed lifespan of the ordinance was 1,860,047,875 gallons (5,708.3 AF), or 103,057,674 gallons per participant.

For all customers analyzed, during the first year after the ordinance, water savings amounted to 1,203,073,321 gallons, or 59,854 gppy (29.3% of pre-measure water use). The second year after, water savings amounted to 1,297,701,899 gallons, or 64,562 gppy (31.6% of pre-measure water use). The average savings per year was 1,250,387,610 gallons (3,837.3 AF), or 62,208 gppy (30.5% of pre-measure water use). **The total water savings over the ten year assumed lifespan of the ordinance was 12,503,876,101 gallons (38,372.9 AF), or 622,082 gallons per participant.**

### RESULTS -- COST BENEFIT ANALYSIS

*Costs and benefits listed below represent the entire lifespan of the program (ten years).*

- ◆ The cost to the utility was \$89,288 (\$4 per participant). This includes the cost of capital expenditures, \$34,979 (\$1 per participant), and operation and maintenance costs, \$54,309 (\$3 per participant).
- ◆ The benefit to the utility was \$0.
- ◆ The cost to the participants was \$2,458 (\$0.12 per participant). This includes the cost of ordinance violation fines, \$2,458.
- ◆ The benefit to participants was \$34,219,471 (\$1,702 per participant). This includes water bill savings, \$34,219,471.

Quantified Costs and Benefits							
Utility				Participants			
Costs		Benefits		Costs		Benefits	
Capital Expenditures	\$34,979	Not Quantified		Fines	\$2,458	Water Bill Savings	\$34,219,471
Operation & Maintenance	\$54,309			Total	\$2,669	Total	\$34,219,471
Total	\$89,288						

#### UTILITY PERSPECTIVE

Results of cost benefit analysis show a net benefit (net present value) of -\$89,288 from the utility perspective. This is a net benefit of -\$4 per participant. The quantified costs to the utility were greater than the quantified benefits to the utility. **The cost per acre-foot of water saved from the utility perspective was \$2.**

#### PARTICIPANT PERSPECTIVE

Results of cost benefit analysis show a net benefit (net present value) of \$34,217,013 from the participant perspective. This is a net benefit of \$1,702 per participant. The quantified costs to the participants were less than the quantified benefits to the participants. **The cost per acre-foot of water saved from the participant perspective was \$0.06.**

### **OVERALL PERSPECTIVE**

Results of cost benefit analysis show a net benefit (net present value) of \$34,127,725 from an overall perspective. This is a net benefit of \$1,697 per participant. The quantified costs to the participants and utility were less than the quantified benefits to the participants and utility. **The cost per acre-foot of water saved from an overall perspective was \$2.**

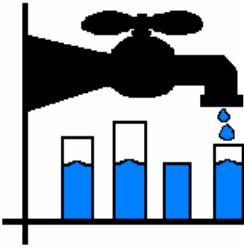
### **UNQUANTIFIED COSTS AND BENEFITS**

#### **Costs**

- The customers' time spent maintaining compliance with ordinance.

#### **Benefits**

- Financial savings on sewer bill for participants.
- Environmental benefits of reduced use of water.
- Increased public awareness about water conservation.
- Replenishing reservoirs to full capacity.
- Reinforces need to conserve water and desirability of conserving.
- Delays capital improvement projects.
- Avoided construction of new facilities.
- Water saved for future municipal use.
- Provided drought recovery.
- Extended capacity of the water supply system.



# Cheyenne Public Utilities

## Conservation Ordinance

### Results of Cost Benefit Analysis-Lifespan (10 Years)

	UTILITY	PARTICIPANT	OVERALL
<i><u>Present Value Costs</u></i>			
Costs to Utility	89,288	NA	89,288
Costs to Participants	NA	2,458	2,458
Costs to Others	NA	NA	0
<b>Total Costs</b>	<b>\$89,288</b>	<b>\$2,458</b>	<b>\$91,746</b>
<i><u>Present Value Benefits</u></i>			
<b>Total Water Savings</b>	<b>38,372.94AF</b>	<b>38,372.94AF</b>	<b>38,372.94 AF</b>
Benefits to Utility	0	NA	0
Benefits to Participants	NA	34,219,471	34,219,471
Benefits to Others	NA	NA	0
<b>Total Benefits</b>	<b>\$0</b>	<b>\$34,219,471</b>	<b>\$34,219,471</b>
<i><u>Cost Benefit Calculations</u></i>			
<b>Net Present Value (NPV)</b> (Total Benefits - Total Costs)	<b>-\$89,288</b>	<b>\$34,217,013</b>	<b>\$34,127,725</b>
<b>Cost Effectiveness Analysis (CEA)</b> (Total Costs ÷ Total Water Savings)	<b>\$2 /AF</b>	<b>\$0.06 /AF</b>	<b>\$2 /AF</b>

