

# Thornton Water Res. Div.

## Showerhead Exchange Program

The City of Thornton Water Resources Division (TWRD) is located in Thornton, Colorado, approximately 10 miles north of downtown Denver. As of March 31, 2005, the population served by TWRD was 127,832, where 111,002 reside inside the city and 16,830 reside outside the city. Median household income was \$54,445 as of the 2000 census, which was higher than the statewide average of \$47,203.<sup>1</sup>

### UTILITY DEMOGRAPHICS

As of May 2005, TWRD maintained 34,259 connections of which 94.3% were residential. Of their total connections, 30,377 were single family residential, 1,937 were multifamily residential, 628 were ICI, and 1,317 were irrigation accounts, including city parks. In addition to providing water to individual retail customers, TWRD provides 2.0 million gallons per day (mgd) of treated water to the City of Westminster. TWRD's total service area is 19 square miles. As of 2004, average customer water use in gallons per capita per day (gpcd) was 142 for all customers and 129 for residential customers.

### SHOWERHEAD EXCHANGE

<b>Eligible Customers:</b>	<b>SF</b>
<b>Customers Analyzed:</b>	<b>SF</b>
<b>Program Years:</b>	<b>2003 – present</b>
<b>Years Analyzed:</b>	<b>2003</b>

### UTILITY RATE STRUCTURE AND PRICES

As of 2004, the domestic inside-city monthly service charge is \$2.46 for a 5/8 x 3/4 inch meter and the outside-city charge is \$3.69 per month. TWRD has an increasing block rate structure. The four-tier structure categorizes rates by determining how much a customer uses relative to their Average Winter Consumption (AWC) and their Monthly Outdoor Allowance (MOA)

Usage	Price	
	INSIDE CITY	OUTSIDE CITY
0 gallons - AWC	\$3.00/1,000g	\$4.50/1,000g
> AWC, up to AWC + MOA	\$3.00/1,000g	\$4.50/1,000g
> AWC + MOA, up to AWC + 2xMOA	\$4.50/1,000g	\$6.75/1,000g
> AWC + 2xMOA	\$9.00/1,000g	\$13.50/1,000g

### CURRENT CAPACITY AND WATER SOURCES

Currently, the capacity of existing raw water storage from reservoirs is 26,594 acre-feet. Their treated water storage capacity is 27 mgd. TWRD has two water treatment plants that have a combined capacity of 65 mgd. TWRD's primary water sources are Clear Creek and the South Platte River.

### FUTURE PLANS TO MEET DEMAND

The City of Thornton's growth rate has decreased from 5.0% in 2002 to 3.8% in 2004. The city's plans to meet future demand through a number of different actions. They plan to continue use of current

<sup>1</sup> U.S. Census Bureau, American FactFinder.

capacity and sources, implement a planned surface water supply project from the Cache la Poudre River basin, expand storage and treatment facilities, continue conservation efforts, purchase and exchange additional water rights, and develop water reuse projects.

### **SHOWERHEAD EXCHANGE - DESCRIPTION**

On May 17, 2003, the Showerhead Exchange Program began, which offers Niagara 2.0 gallon per minute (gpm) showerheads to single family customers whose homes were built before 1994. Customers are allowed to exchange up to two showerheads. The program is advertised in billing inserts, on TWRD's website, on television ads, at festivals, and in TWRD's quarterly magazine.

**OTHER THORNTON CONSERVATION PROGRAMS**  
**Toilet Rebates, May 1, 2003 - present**  
**Washing Machine Rebates, May 1, 2003-present**  
**Tiered Conservation Rates, effective May 15, 2003**  
**Public Education, May 2002-present**  
**Water Conservation Ordinances, various start dates**

During the time of the showerhead exchange program, especially from 2002 to 2004, the area was experiencing a drought and there was ongoing water conservation campaigns to mitigate the effects of the drought. However, a major

snowstorm in March 2003 improved TWRD's water supply situation. Another important measure taking place during the period of the showerhead exchange program was the utility-wide transition from a flat rate structure to a conservation rate structure in May 2003.

### **METHODOLOGY**

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

The analysis includes only single family households that received showerheads between May 17 and December 31, 2003. The water savings were calculated and a cost benefit analysis was performed for this time period. Results refer to this time period, not to the ongoing program. The lifespan of the showerheads, which is used as the period of analysis, was assumed to be five years.

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 3.6%. The CPI values that were used in this analysis were the 2004 value of 188.9 and the 2003 value of 184.0.

Since two complete years of pre- and post-measure water use could not be acquired for this analysis, water use data for the participants was acquired from 18 months before the program and 18 months after the program for all households that were residing there for that full period. The pre-measure period includes January 2002 to June 2003, and the post-measure period includes January 2004 to June 2005.

The population studied for this analysis was comprised of all participants who received showerheads between May 17 and December 31, 2003. There were 127 usable participants out of 322 total participants during the period under analysis.

All TWRD single family households, including the participants, were used as the control group. The average annual pre-measure water use of the participants (103,894 gallons) was lower than that of the control group (107,839 gallons). The number of control group connections varied by month, from a minimum of 20,148 to a maximum of 24,532.

## ASSUMPTIONS

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

The 2003 CPI value, 184.0, and the 2004 CPI value, 188.9, were used in this analysis.

Participants who participated in any other conservation program during the period of analysis were not included in the study.

Participants who had two or more consecutive months of no water use were not included in the study.

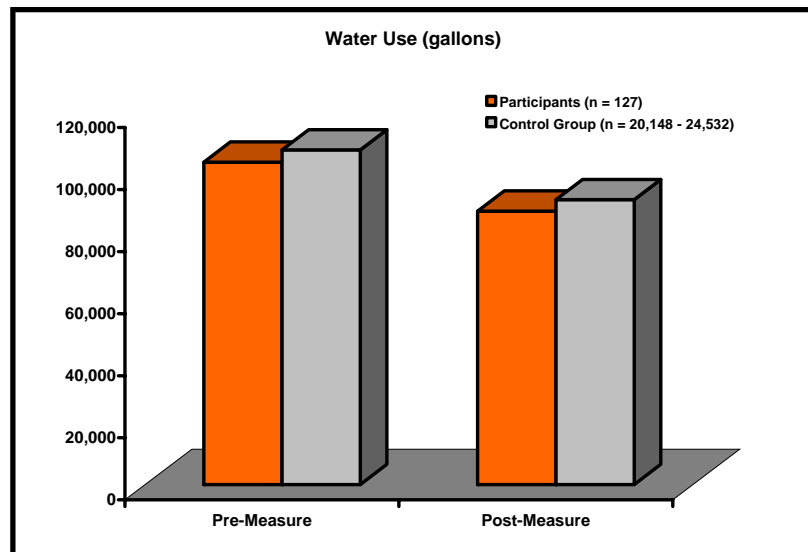
Any participants that had 11 to 13 months of usage per year were included in the study.

The control group consisted of all single family residential connections, including participants.

The percentage of showerhead exchange program participants who lived inside the city was 95%. However, it was assumed that 100% of participants lived inside the city, thus Inside-City rates apply for all cost benefit analysis calculations.

Since all participants were assumed to reside inside the city, Outside-City connections were not included in the control group.

It was assumed that average participant water use falls into tier 1 or 2 of the increasing block rate structure implemented in 2003.



## RESULTS - WATER SAVINGS

During the 18 months after participating in the showerhead program, water savings amounted to 64,248 gallons or 506 gallons per participant (0.3% of pre-measure water use). The average annual water savings was 42,832 gallons, or 337 gallons per participant per year (gppy) (0.3% of pre-measure water use). **The total water savings over the five year assumed lifespan was 214,158 gallons (0.66 AF), or 1,686 gallons per participant.**

During the 18 months before participating in the showerhead program, the participant group's water use was, on average, 96.3% of the control group's use. During the 18 months after, the participant group's water use was 95.9% of the control group's use, on average. The participant group's water use decreased by 15.2%, whereas the control group's use decreased by 14.9%. **The resulting overall water savings attributed to this program was 0.3%.**

## RESULTS - COST BENEFIT ANALYSIS

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

- ◆ The quantified cost to the utility was \$1,546 (\$12 per participant). This cost includes advertising, \$91 (\$1 per participant), devices, \$532 (\$4 per participant), and labor, \$922 (\$7 per participant).
- ◆ The quantified benefit to the utility was \$0.
- ◆ The quantified cost to the participants was \$0.
- ◆ The quantified benefit to the participants was \$594 (\$5 per participant), which includes water bill savings.

Quantified Costs and Benefits					
Utility			Participants		
Costs		Benefits	Costs	Benefits	
Advertising	\$91	Not Quantified	Not Quantified	Water Bill Savings	\$594
Devices	\$532				
Labor	\$922				
Total	\$1,546			Total	\$594

### UTILITY PERSPECTIVE

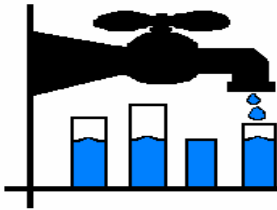
Results of cost benefit analysis show a net benefit (net present value) of -\$1,546 from the utility perspective over the five year assumed lifespan of the devices. This is a net benefit of -\$12 per participant. The quantified costs to the utility were greater than the quantified benefits to the utility. **The cost per acre-foot of water saved from the utility perspective was \$2,352.**

### PARTICIPANT PERSPECTIVE

Results of cost benefit analysis show a net benefit (net present value) of \$594 from the perspective of the participant. This is a net benefit of \$5 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.**

### OVERALL PERSPECTIVE

Results of cost benefit analysis show a net benefit (net present value) of -\$952 from an overall perspective. This is a net benefit of -\$7 per participant. The quantified costs to the participants and utility were greater than the quantified benefits to the participants and utility. **The cost per acre-foot of water saved from the overall perspective was \$2,352.**



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<b>Results of Cost Benefit Analysis-Lifespan (5 Years)</b>			
	UTILITY	PARTICIPANT	OVERALL
<b><u>Present Value Costs</u></b>			
Costs to Utility	1,546	NA	1,546
Costs to Participants	NA	0	0
Costs to Others	NA	NA	0
<b>Total Costs</b>	<b>\$1,546</b>	<b>\$0</b>	<b>\$1,546</b>
<b><u>Present Value Benefits</u></b>			
Total Water Savings	0.66 AF	0.66 AF	0.66 AF
Benefits to Utility	0	NA	0
Benefits to Participants	NA	594	594
Benefits to Others	NA	NA	0
<b>Total Benefits</b>	<b>\$0</b>	<b>\$594</b>	<b>\$594</b>
<b><u>Cost Benefit Calculations</u></b>			
<b>Net Present Value (NPV)</b> (Total Benefits - Total Costs)	<b>-\$1,546</b>	<b>\$594</b>	<b>-\$952</b>
<b>Cost Effectiveness Analysis (CEA)</b> (Total Costs ÷ Total Water Savings)	<b>\$2,352 /AF</b>	<b>\$0 /AF</b>	<b>\$2,352 /AF</b>

### UNQUANTIFIED COSTS AND BENEFITS

#### Costs

- Disposal of old devices.

#### Benefits

- Financial savings on sewer bills for participants.
- Avoided cost of acquisition and distribution of water saved.
- Reduced energy bills for participants.
- Environmental benefits of reduced use of water.
- Increased public awareness about water conservation.
- Reinforces need to conserve water and desirability of conserving.
- Improved public relations for the utility.

