A Review of the City of Santa Fe Water Conservation Rebate Program

Executive Summary and Recommendations:

The purposes of this review are to compile a record of the City of Santa Fe[1] water conservation rebate programs, analyze how effective the rebate programs have been in meeting the needs of both the City and the customer, and provide recommendations that might be used in the development of future rebate programs.

Rebates are one of several strategies that the City uses to encourage water conservation and reduce both total annual and peak seasonal water demand. Other programs include outreach, tiered water rates, regulations, water use restrictions and building codes. Water demand is also affected by cultural, social, economic and climatic factors. This review focuses on City rebate programs, and does not attempt to evaluate the influence of other City programs or external factors in reducing water demand.

Santa Fe's Comprehensive Water Conservation Ordinance (Ord. #1997-17, §2) provides the City the means to reduce per capita water demands by requiring its citizens and businesses to comply with prescribed water conservation regulations and by establishing financial incentives for water conservation. The ordinance also states that reduction in water use reduces peak summer demands thereby reducing short and long-term system costs. Water conservation rebates are one of the strategies adopted under the Water Conservation Ordinance, and rebates have been a part of the City's water conservation program since 2003 (Ord. #2003-29, §2).

Part 1 presents a history of the City's water conservation rebate programs, Parts 2 – 6 discuss the effectiveness of these programs, and Part 7 provides recommendations for future programs. The appendices contain a glossary, chronological details and a list of relevant ordinances and resolutions, details on current rebates, supplementary data tables and a bibliography.

One measure of the effectiveness of a rebate program is the amount of water savings that results from the installation of water-saving devices. In this document, device-specific factors (water savings rates or WSRs) were used to estimate device-specific and total water savings. WSRs are calculated factors that are used to predict the potential savings of each device, assuming that the device is installed and operated as designed. The water saving rates used in this review are from City documents. They are useful because they (1) provide a consistent basis for comparing water-saving devices, and (2) isolate the rebate program from other factors that affect water demand. Although they are useful, water savings rates are only estimates of potential water savings, and are not measured or actual water savings.

To summarize the rebate programs, through 2013, Santa Fe has awarded more than 8,500 rebates for water saving devices. Eighty percent were awarded to single-family residential accounts, and twenty percent to commercial accounts. No rebates were awarded to multi-family accounts.

Estimated potential annual water savings is 130 acre-feet, or 1,300 acre-feet over the projected 10-year useful life of the devices. The annual water savings can be compared to Santa Fe's annual water demand of about 10,000 acre-feet per year, indicating a reduction in annual demand of about 1.3 percent as a result of rebates. Though commercial connections make up about 30 percent of total connections, commercial rebates account for less than 15 percent the total water savings through the rebate program. Outdoor rebates account for about 2.5 percent of total water savings.

Rebate expenditures total almost $1.7 million. Dividing total expenditures by the total estimated water savings of 1,300 acre-feet results in a cost of $1,300 per acre-foot of water saved by rebates, which is less than the City's $1,670 per acre-foot cost of water production.

From the City's point of view, rebates should provide water savings at reasonable cost, perhaps less than the cost of producing an equivalent amount of water. For the customer, a rebate should reduce the net

[1] Hereafter referred to as Santa Fe or the City

purchase cost, and the water-saving device should provide ongoing utility cost savings and should not be too difficult or expensive to install.

This document uses simple payback to evaluate the economics of rebates. Payback is different for the City than for the customer. City payback depends on the rebate, the water savings rate, and the cost of water production. Customer payback depends on the net device cost (price minus rebate), the water savings rate, and the value of water and sewer savings.

Commercial and residential customers may be motivated by both economic and non-economic factors to reduce water consumption. Economic factors include net cost and customer payback. Non-economic factors include the effort required to install the device and the level and duration of City promotional activities.

For commercial customers, it appears that a combination of low net cost and short payback encourages rebate acceptance. For residential customers, a combination of active promotion, low net cost and short payback encourages rebate acceptance. For example, the highly promoted 2010 clothes washer rebate with a low net cost and short payback resulted in a large number of rebates (782 in 2010). In comparison, from 2004 to 2009, when clothes washer rebates were less heavily promoted and had a higher net cost and longer payback, rebates were awarded at a rate of about 400 per year, as detailed in Part 2 – 6 and the associated appendices.

With some notable exceptions, the City has set rebate amounts based on its internal economic considerations — generally the estimated lifetime water savings of the device in acre-feet times the City cost of water in dollars per acre-foot. For the customer, the economic interests associated with water-saving devices are different from those of the City, and those interests have historically not been a factor in the City's approach to determining rebate amounts.

Significant recommendations resulting from this review are as follows:

- Rebate programs combined with education and promotion should remain a significant component of an overall water conservation effort.
- Rebates should be available and promoted to include all customer classifications and water uses.
- Rebate programs need a constant, predictable funding source.
- Rebate programs should be ongoing; rebate amounts, water savings rates and education programs should be evaluated and adjusted on an ongoing basis.
- Mechanisms for modifying the program, particularly rebate amounts, should not be excessively difficult.
- Payback periods for both the City and the customer should be considered in determining rebate amounts. Excessively long payback periods for either should be avoided.
- Rebate amounts should be sufficient to provide an economic incentive to the customer.
- Heavy promotion of specific device rebates, coupled with rebates sufficient to provide an economic incentive, generates more rebates.
- Promotion efforts to commercial accounts should be focused on lifetime cost of water savings; whereas, promotion to residents should be focused on both economic and non-economic factors.

This review is a starting point for further investigations. Suggestions for further investigations are found in Part 7, Conclusions.

Overview

For the City of Santa Fe, both total annual water system production (acre-feet) and water use rate (gallons per capita per day) have declined by about 10 percent since 2003. During this time, the City has had a variety of water conservation rebate programs, and the City has awarded thousands of rebates to water utility customers. Although rising water prices, extended drought, increased public awareness, poor economic conditions and other factors have contributed to declining water consumption, the City's rebates programs have also been a factor. This review is an attempt to compile information about the rebate programs and investigate how well the programs have worked.

The purposes of this review are to:

1. compile a record of Santa Fe's water conservation rebate programs,

2. investigate how effective the rebate programs have been in meeting the needs of the City and the customer, and

3. provide recommendations that might be used in the development of future rebate programs.

This review is based primarily on information from the City of Santa Fe Annual Water Reports for the years of 2009 through 2012,[2] with some historical information taken from portions of the Water Conservation and Drought Management Plan.[3] The annual reports include data back to 2004, and these data sets are the primary basis for this paper. Data from these reports and other sources has been assembled into spreadsheets. A portion of the data in the spreadsheets is included in tables in the body of the report and the appendices.

The report is divided into seven parts as follows:

Part 1: Program History, Distribution by Population and Sector, Current Rebates, Summary Details, and Seasonal Use and Outdoor Rebates. This part includes a history and description of the rebate programs and a table of current rebate amounts. It also includes details on the number of rebates awarded and the distribution among the residential and commercial sectors, the amount of the rebates as the rebate programs have changed through time, a table of the water savings rates and projected water savings for each device, and a discussion of seasonal use.

Part 2. City Economic Factors. This part addresses economic factors relating to the rebate program from the perspective of the City. It provides information on the total amounts that the City has awarded to customers based on the number of rebates and the amount provided for each rebate as indicated in Part 1. It includes a table that provides an estimate of the potential water savings as a result of the rebate programs, which results in economic savings to the City because this water will not have to be produced. Based on these savings, this section provides an estimate of the time in years that will be required for the City to recoup its investment in the rebates, and an estimate of the payback period to the City by device type.

Part 3. Customer Economic Factors. Beginning with a tabulation of the price of the devices, this part investigates potential water savings and economic benefits from the perspective of the customer. It discusses the net cost of devices, the value of water and sewer savings, and the customer payback periods.

Part 4. Balanced Rebates. This part evaluates the equilibrium between payback periods for the City and the customer. This balanced rebate approach could be used as a tool to evaluate rebate amounts in the future.

[2] http://www.santafenm.gov/how_much_water_do_we_use_reports_and_studies
[3] http://savewatersantafe.com/wp-content/uploads/2013/05/CitySF-Water-Conservation-and-Drought-Mangement-Plan-2010.pdf

Part 5. Non-economic Factors. This part provides information on the degree of difficulty for the customer to install water saving devices, and on the level of promotion of the rebates, described as the duration of the rebate program and the number of promotional activities.

Part 6. Relationship of the Number of Rebates to Customer Factors. This part relates the number of rebates to the customer factors described in the previous parts.

Part 7. Conclusions, Recommendations and Further Investigations. Parts 1 – 6 present the data, and Part 7 contains general conclusions and suggestions for further investigations.

Part 1: Program History, Distribution by Population and Sector, Current Rebates, Summary Details, and Seasonal Use and Outdoor Rebates

Part 1 summarizes the rebate programs. It includes:

- a brief history of the rebate programs,
- a discussion relating the number of rebates relative to population and to the number of water service connections, and indicating the distribution of rebates by commercial or residential connection,[4]
- a table of current rebates, and
- details and tables showing the year-by-year number of rebates and history of rebate amounts.

Program History

In September 2003 Santa Fe provided a rain barrel rebate to single-family residential City water customers, and in November initiated residential rebates for high-efficiency clothes washers and hot water recirculators.

From 2004 through 2009, the City provided rebates for rain barrels, high-efficiency clothes washers, hot water recirculators, and a small number of commercial devices. In 2009, the City added rebates for outdoor devices such as rain and moisture sensors, evapotranspiration irrigation controllers, and pressure reducing valves, although no rebates were awarded for these devices. During this period, almost 4,500 rebates were awarded.

The rebate program was modified in 2010. The City provided commercial rebates for high-efficiency toilets, water-free urinals, high-efficiency clothes washers, and commercial process efficiency improvements. The City initiated rebates for residential high-efficiency toilets, and discontinued rebates for hot water recirculators. Rebates were made available for rain barrels and cisterns. The City provided a high-efficiency clothes washer rebate that was augmented by a State rebate. Almost 2,000 rebates were awarded during 2010.

The current rebate program began in May 2011. It requires applicants to be water customers of the City of Santa Fe Water Division. Rebates are for the exchange of existing devices to more efficient technologies, and do not apply to purchases for new homes or new construction and development.

The program is funded by a Conservation Program Charge (SFCC 1987, Chapter 25, Exhibit B, Rate Schedule 10). For a single-family residential service with a 5/8 or 3/4 inch meter, the charge is $4.00 per year. Charges are greater for multi-family and commercial services.

The rebate program provides rebates for the same devices as the previous program, but at slightly different amounts. To the end of 2013, the program has awarded more than 2,400 rebates for devices including commercial high-efficiency toilets, water-free urinals, high-efficiency clothes washers, low-flow toilets, rain barrels, cisterns, and rain sensors.

Details on the current rebate program are included in Appendix IV. A detailed historical summary and a list of relevant City resolutions and ordinances can be found in the appendices.

[4] Water service connections are classified as single-family residential, multi-family residential, commercial, or others, which includes fire service, irrigation, and potable water fill stations. The term “residential” refers to single or multi-family residential accounts, mixed-use communities, home offices and businesses operated out of the home. The largest number of rebates has been to single-family residential accounts. No rebates have been awarded to multi-family residential accounts. The term “commercial” refers to commercial, industrial and institutional accounts. The majority of commercial rebates has been to lodging facilities (hotels/motels).

Number of Rebates Relative to Population and Connections, and Distribution by Sector

This section summarizes the overall distribution of rebate awards.

One measure of rebate distribution that may be useful for comparison to rebate programs of other cities is the number of rebates awarded relative to the population. Another potentially useful measure is the number of rebates relative to the number of connections.

Table 1 provides information on the number of rebates relative to both population and connections. It also separates the rebates by commercial and residential sector and separates single-family residential connections from multi-family residential and other connections. The information regarding distribution of rebates by sector may be useful in directing future rebate amounts or promotional efforts to specific customer classifications.

According to U.S. Census data for the City of Santa Fe, as of July 1, 2012, Santa Fe had a population of approximately 69,200. For the purposes of this paper, population is estimated to be 69,500 at the end of 2012, and 70,000 at the end 2013.

At the end of 2012, there had been a total of 7,959 rebates, and at the close of 2013, the total had reached 8,864. There were approximately 55,000 water utility connections, distributed among single-family residential, multi-family residential, and commercial and other accounts. Relative to the number of connections, the City has achieved over 20 percent penetration in single-family residential accounts, no penetration in multi-family residential accounts, and less than 10 percent penetration in commercial and other accounts.

Table 1
Rebate Distribution

	2012	2013
Population	69,500	70,000 est[a]
Total Rebates	7,959	8,864
• Residential (Single-family) Rebates to end of year	6,558	7,101
• Commercial Rebates to end of year	1,401	1,763
Total Connections	54,900[b]	55,300[c]
• Single-family Residential (approximate)	30,200[d]	30,400[d]
• Multi-family Residential (approximate)	8,200[d]	8,300[d]
• Commercial and Other (approximate)	16,500[d]	16,600[d]
Total Rebates as percent of Population	11.5%	12.7%
Total Rebates as percent of Total Connections	14.5%	15.4%
• Residential Rebates, percent of Single-family Residential Connections	21.8%[e]	22.6%[e]
• Commercial Rebates, percent of Commercial Connections	8.3%	9.9%

[a]Population from U.S. Census Bureau, Population Division. Annual Estimates of the Resident Population: April 1, 2010 to July 1, 2012. Found at http://factfinder2.census.gov/faces/nav/jsf/pages/index.xhtml. (Community Facts/Santa Fe city, New Mexico/Annual Population Estimates). End of year (2012 and 2013) population estimated at approximately 0.8% annual growth rate.
[b]From City Water Division data.
[c]Connections estimated at 0.79 times population from City Water Division data.
[d]Commercial, single-family residential and multi-family residential approximations are from City Water Division records indicating that connections are distributed at 30%, 55% and 15% respectively among the categories.
[e]No rebates have been awarded to multi-family residential accounts.

History of Number of Rebates Awarded and Rebate Amounts

This section provides additional details on the rebate programs, with emphasis on the annual distribution of number rebates and on the changes in rebate amounts in dollars. Table 2 summarizes the discussion, and Figure 1 shows the number of rebates by year. A table of number of rebates by device and year is included in Appendix V.

The first City of Santa Fe Water Conservation rebates went into effect in September 2003. A single-family residential water customer was eligible for one $30 rebate for the purchase of a rain barrel. In November 2003, the City made rebates available for high-efficiency clothes washers and hot water recirculators. A residential water customer was eligible for one $100 rebate for the purchase of either a hot water recirculator or a high-efficiency clothes washer. From 2004 to 2009, 2,462 high-efficiency clothes washer, 1,711 rain barrel and 265 hot water recirculator rebates were awarded. During this same time, the City awarded commercial rebates for six air cooled ice machines and one commercial dishwasher. In 2009, the City initiated outdoor rebates for rain and moisture sensors, evapotranspiration irrigation controllers, pressure reducing valves, and other outdoor devices. No outdoor rebates were awarded during 2009 or 2010.

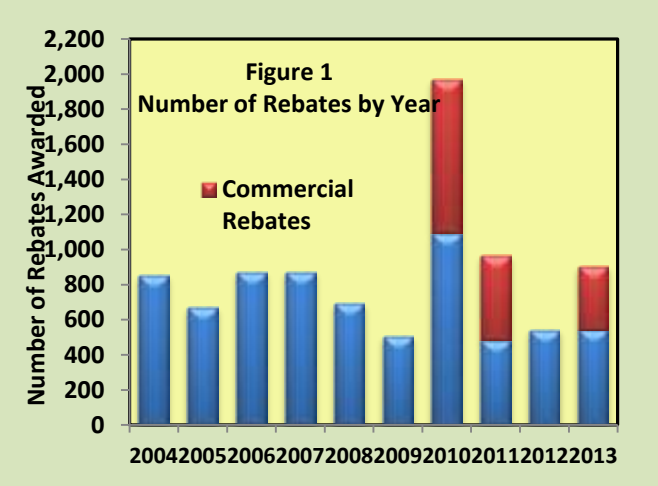
Table 2
Summary of Number of Rebates

Rebate	2004-2009	2010	2011-2013	Total
Commercial Pre-rinse Sprayer	30	NA	NA	30
Commercial HET, Flushometer	NA	197	2	199
Commercial HET, Tank not Hotel/Motel	NA	192	20	212
Commercial HET, Hotel/Motel	NA	459	822	1,281
Water-Free Urinal	NA	24	5	29
Commercial HE Clothes Washer	NA	4	0	4
Air-Cooled Ice Machine	6	NA	NA	6
Commercial Dishwasher	1	NA	NA	1
Commercial Process Efficiency	NA	1	0	1
Hot Water Recirculator	265	NA	NA	265
Residential HE Toilet	NA	236	695	931
Residential Clothes Washer	2,462	NA	NA	2,462
Residential HE Clothes Washer	NA	817	772	1,589
Rain Barrel, Unspecified	1,711	NA	NA	1,711
Rain Barrel, 50-299 gallon	NA	39	95	134
Cistern	NA	2	6	8
Rain Sensor	0	0	1	1
Other Outdoor Devices	0	0	0	0
Total	4,477	1,971	2,418	8,864
Commercial Total	37	877	849	1,763
Residential Total	4,438	1,094	1,569	7,101

The rebate program was updated in 2010. The City provided rebates for commercial high-efficiency toilets of three types: flushometer valve, tank-type installed in locations other than lodging facilities, and tank-type installed in lodging facilities (hotels/motels). Some 848 rebates were awarded for commercial high-efficiency toilets. Commercial rebates were also awarded for water-free urinals (24), the exchange of front-loader or the replacement of top-loader clothes washers (4), and for commercial process efficiency improvements (1).

In 2010, the City rebate for the replacement of a top-loading clothes washer with a high-efficiency clothes washer was $480. For a portion of the year, the State of New Mexico, using funding from the American Recovery and Reinvestment Act, provided an additional $200 clothes washer rebate.[5] A total of 817 residential clothes washing machine rebates were awarded, an all-time high. The City also awarded rebates for residential high-efficiency (1.28 gallons-per-flush) toilets (236) and discontinued rebates for residential hot water recirculators. Rebates were awarded for rain barrels (39), and cisterns (2). The State clothes washer rebate program was discontinued before the end of the year, and the City rebate program ran out of funds in August.

[5] http://www.emnrd.State.nm.us/ecmd/documents/ProgramDescription.pdf



The most recent year, 2013 had more rebates (362) than 2012 due to installations of commercial high-efficiency hotel/motel toilet rebates by two or three lodging facilities; 361 in 2013 compared to no hotel/motel toilet rebates in 2012.

By the end of 2013, a total of 1,763 commercial rebates had been awarded. Almost all were for high-efficiency toilets, and three-quarters were at hotels and motels. Almost all have been awarded since the beginning of 2010.

Rebate amounts are proposed by the Water Conservation Office and adopted by City Ordinance. Rebate amounts have changed as the rebate programs have changed. Table 3 lists the changes over time for both commercial and residential rebates.

To summarize the distribution of rebates, at the close of 2013, a total of 7,101 residential and 1,763 commercial rebates had been awarded. No rebates had been awarded to multi-family residential accounts. Clothes washers accounted for more than half of the total residential rebates. The greatest number of rebates was awarded in 2010, largely due to top loader clothes washer replacements. Of the 1,854 outdoor rebates, less than 10 were not rain barrels.

The current rebate program, which began on May 1, 2011, reinstated rebates for the same devices as in 2010, but at slightly different amounts. Under this program (2011 to the end of 2013), 844 rebates have been awarded for commercial high-efficiency toilets and 5 for water-free urinals.

Residential rebates have been awarded for high-efficiency toilets (695), high efficiency clothes washers (772), rain barrels (95), cisterns (6) and rain sensors (1). The City is currently accepting rebate applications for rain barrels and cisterns, but not for the other outdoor devices that had been available for rebate under the previous program.

Table 3
Historical Rebate Amounts (Dollars)

Rebate	2004-2009	2010	2011-2013
Commercial HE Toilet, Flushometer	NA	504	500
Commercial HE Toilet, Tank Type not in Hotel/Motel	NA	504	250
Commercial HE Toilet, Tank Type in Hotel/Motel	NA	504	125
Water-Free Urinal	NA	630	500
Commercial HE Clothes Washer, Top Loader replacement	NA	480	350
Commercial HE Clothes Washer, Front Loader exchange	NA	180	150
Air-Cooled Ice Machine	400	NA	NA
Commercial Dishwasher	400	NA	NA
Commercial Process Efficiency	NA	874	b
Commercial Pre-Rinse Spray	25	NA	NA
Hot Water Recirculator	100	NA	NA
Residential HE Toilet	NA	175	175
Residential Clothes Washer, Unspecified	100	NA	NA
Residential HE Clothes Washer, Top Loader replacement	NA	480[c]	350
Residential HE Clothes Washer, Front Loader exchange	NA	180	150
Rain Barrel, Unspecified	30	NA	NA
Rain Barrel, 50-99 gallon	NA	12	12
Rain Barrel, 100-199 gallon	NA	25	25
Rain Barrel, 200-299 gallon	NA	50	50
Water Harvesting (Cistern), per gallon	0	0.25	0.25
Rain Sensor	0	40	40[d]
Moisture Sensor	0	75	75[d]
Evapotranspiration Controller	0	300-750	300-750[d]
Press Reducing Valve	0	120-525	120-525[d]
Other Outdoor Devices	0	2-5	2-5[d]

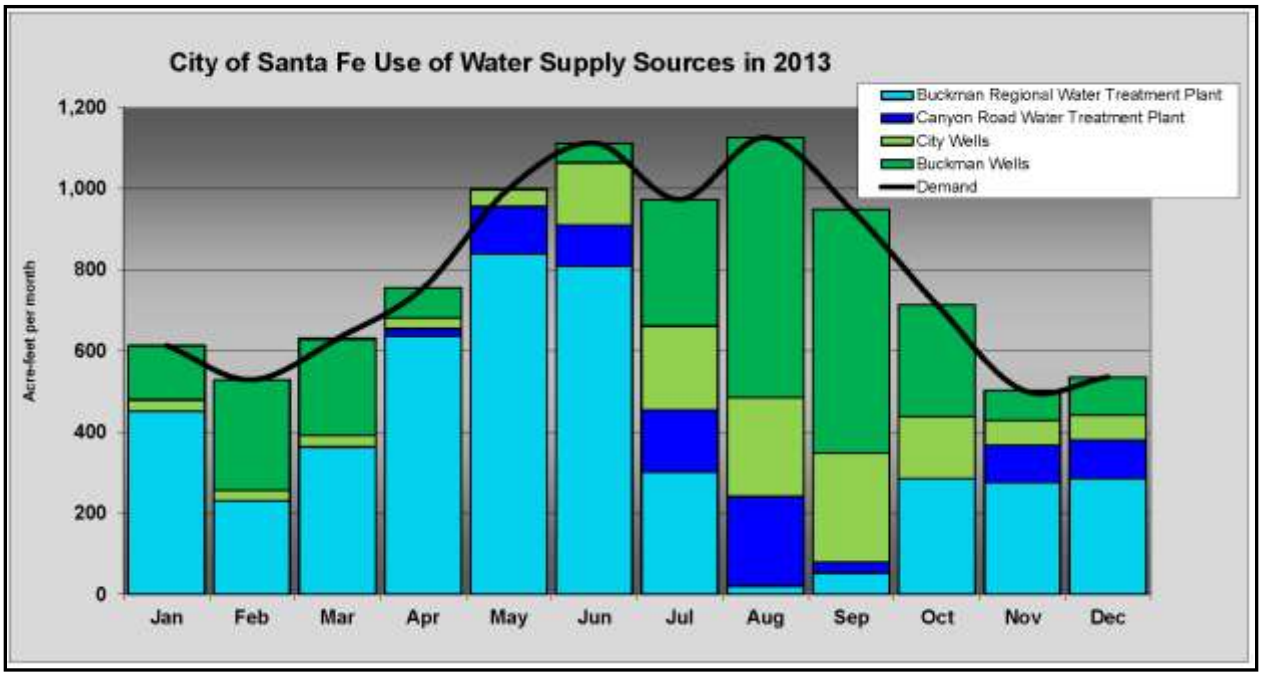
[a]NA indicates that rebates were not available [b]Installation-specific amount
[c]Does not includes the $200 rebate from the State of New Mexico
[d]Rebates for these devices were not available in 2013

Seasonal Use and Outdoor Rebates

According to the City (*Where Does Our Drinking Water Come From?*),[6] water use varies through the year as indicated in Figure 2.

The figure illustrates that City water demand in 2013 ranged from less than 600 acre-feet in some of the winter months to more than 1,000 acre-feet in summer months. The pattern of water use is also documented in the *City of Santa Fe Long-Range Water Supply Plan* Appendix F-6.[7]

Figure 2



A 2010 article[8] in *Choices* magazine contains the following paragraph:

> "Irrigating the urban residential landscape usually accounts for 40-70% of household water use. Additionally, residential landscapes receive 30-40% more water than typically required by the common types of plants and grass. Estimates of potential water savings range from 35-75% of current per capita water use based on a typical home with a traditional bluegrass type landscape. Improvements in the efficiency of landscape irrigation could yield significant water savings and is properly the focus of municipal water conservation programs."

High summer demand is partly due to summer landscape irrigation, outdoor water conservation programs, in addition to reducing overall water consumption, might also reduce peak demand and help to conserve water resources.

This concludes Part 1 on the history and distribution of rebates and usefulness of rebate in reducing peak summer demand. The next part is a discussion of factors that relate to the effectiveness of rebate programs to both the City and the customer.

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[6] http://www.santafenm.gov/where_does_our_drinking_water_come_from

[7] http://www.santafenm.gov/document_center/document/781

[8] *Water-Conserving Attitudes and Landscape Choices in New Mexico*, Hurd, Brian H., in Choices, Volume 25, Issue 3, 3rd Quarter 2010. Found January 2014 at http://www.choicesmagazine.org/magazine/article.php?article=146 and at http://ageconsearch.umn.edu/bitstream/95759/2/Water-Conserving.pdf.

Part 2: City Economic Factors

Part 2 considers, from the perspective of the City, factors relating to the economics and water savings of rebates.

Part 2 includes:

- information on the total City rebate expenditures, based on the number of rebates and the amount provided for each rebate as indicated in Part 1,
- a discussion and table showing water savings rates, and a table that relates the amount of the rebate to the amount of water saved for the life of the device,
- a table that provides an estimate of the potential savings as a result of the rebate programs,
- a calculation of the City payback for overall rebate program, and
- a calculation of the City payback by device.

City Rebate Expenditures

Table 4 lists the total amounts in dollars that the City has rebated to customers, based on the number of rebates and the rebate amount in dollars. The table does not include State rebate expenditures.

Table 4
Rebate Program Expenditures

Year	Commercial Rebates	Residential Rebates	Expenditure in Dollars
2004	0	43,930	43,390
2005	0	47,080	47,080
2006	900	58,790	59,590
2007	2,650	61,540	63,540
2008	0	62,390	62,390
2009	0	50,300	50,300
2010	444,706	428,015	872,721
2011	64,375	130,498	194,873
2012	1,500	130,925	132,425
2013	45,375	113,139	158,514
Total	**559,506**	**1,126,607**	**1,685,363**

City expenditures for rebates from 2004-2013 total almost $1,700,000, approximately two-thirds for residential and one-third for commercial rebates. Most of the expenditures have been from 2010 to the present, with more than half in 2010.

The next section discusses water saving rates.

Water Savings Rates

For the devices or technologies that are available for a rebate, the City has calculated the annual water savings rate (WSR) as indicated in the 2012 Annual Report.[9] These numbers are used by the City to predict how much water will be saved each year as a result of the installation of a water-saving device. Water savings rates are shown in Table 5.

> The water savings rate is the potential amount of water that the City estimates that a water saving device will save in a year. The City generally expresses the WSR in acre-feet per year. The value of the WSR depends on the savings of each device and on the frequency of its use. In part, rebate amounts have changed as the WSR has been adjusted.

For example, for a high efficiency (1.28 gallons per flush) toilet, the City estimates that the toilet uses 0.4 gallons of water per flush less than a low-flow toilet. Using typical household data — 5.1 flushes per day per person and 2.3 persons per household (11.7 flushes per household per day), the water savings resulting from changing a low-flow toilet to a high efficiency toilet is 1,713 gallons per year, or 0.0053 acre-feet per year (afy). The water savings rate is 0.0053 acre-feet per year.

As another example, the water savings rate for a high-efficiency toilet in a hotel/motel is only 0.0022 acre-feet per year, less than the rate for a residential toilet because of the lower frequency of use (4.8 flushes per day) compared to 11.7 per day for a household toilet.

Most devices have a manufacturer's recommended useful life of 10 years, although air-cooled ice machines and commercial dishwashers and spray nozzles have a 5-year useful life. The WSR and the useful life can be used to estimate the projected lifetime water savings from the device. Both the WSR and useful life are estimates, and the actual annual and lifetime savings may be different than the estimates.

Table 5
Water Savings Rates

Device	Water Savings Rate (acre-feet per year)
Commercial HE Toilet, Flushometer	0.0336
Commercial HE Toilet, Tank Type not in Hotel/Motel	0.0168
Commercial HE Toilet, Tank Type in Hotel/Motel	0.0022
Water-Free Urinal	0.0420
Air-Cooled Ice Machine	0.67
Commercial Dishwasher	1.15
Commercial Process Efficiency	0.45
Commercial Pre-Sprayer	0.1590
Hot Water Recirculator	0.0215
Residential HE Toilet	0.0053
Residential Clothes Washer, Unspecified	0.0250
HE Clothes Washer, Top Loader replacement	0.0233[a]
HE Clothes Washer, Front Loader exchange	0.0088[b]
Rain Barrel, Unspecified	0.0015
Rain Barrel, 50-99 gallon	0.0008
Rain Barrel, 100-199 gallon	0.0015
Rain Barrel, 200-299 gallon	0.0031
Cistern (per gallon capacity)	0.000015
Other Outdoor Devices	Not Calculated

[a]Both commercial and residential
[b]Both commercial and residential

[9] http://www.santafenm.gov/document_center/document/767

Table 6
Rebate Cost per acre-foot of Water Saved per Device

Device	Water Savings Rate acre-feet per year	Useful Life yrs	Lifetime Water Savings acre-feet	Rebate $	Cost $ per acre-foot
Commercial HE Toilet, Flushometer	0.0336	10	0.336	500	1,488
Commercial HE Toilet, Tank Type not in Hotel/Motel	0.0168	10	0.168	250	1,488
Commercial HE Toilet, Tank Type in Hotel/Motel	0.0022	10	0.022	125	5,682
Water-Free Urinal	0.0420	10	0.42	500	1,190
HE Clothes Washer, Top Loader replacement	0.0233	10	0.233	350	1,502
HE Clothes Washer, Front Loader exchange	0.0088	10	0.088	150	1,705
Residential HE Toilet	0.0053	10	0.053	175	3,302
Rain Barrel, 50-99 gallon	0.0008	10	0.008	12	1,500
Rain Barrel, 100-199 gallon	0.0015	10	0.015	25	1,667
Rain Barrel, 200-299 gallon	0.0031	10	0.031	50	1,613
Cistern	0.000015 per gallon	10	0.00015 per gallon	0.25 per gallon	1,667

The cost of the rebate to save an acre foot of water can be calculated by dividing the rebate amount by the lifetime water savings.

$$\boldsymbol{Cost, \$/af = \frac{Rebate, \$}{Lifetime\ Water\ Savings, af}}$$

For the current rebates the cost to save an acre-foot of water is shown in Table 6. Costs range from almost $5,700 for a high-efficiency toilet in a hotel/motel to about $1,200 for a water-free urinal.

Table 6 also illustrates how the City calculates rebate amounts. The starting point is a City cost to produce an acre-foot of water of about $1,670 per acre-foot. (See discussion in a subsequent section). This amount is multiplied by the water-saving rate in acre-feet per year and then by the useful life in years, as indicated in the following formula:

$$\boldsymbol{\left(Production\ Cost, \frac{\$}{af}\right)\left(WSR, \frac{af}{yr}\right)(Usefful\ Life, yr) = Rebate\ \$}$$

For example, for a high-efficiency clothes washer front loader exchange, the rebate amount in dollars is calculated as:

$$\boldsymbol{\left(1,670\ \frac{\$}{af}\right)\left(0.0088 \frac{af}{yr}\right)(\ 10\ yr) = \$146.96}$$

which was rounded to $150.00.

For all but three of the devices listed in Table 6, the rebate amounts determined by this calculation are within 15 percent of the current City rebate amounts. The exceptions are the hotel/motel commercial high-efficiency toilet, the water-free urinal, and the residential high-efficiency toilet. Presumably the rebate amounts for these devices were chosen on a basis other than City cost per acre foot of saved water.

Potential Water Savings

The preceding information can be used to evaluate the water savings per device and potential rebate program water savings if the rebated devices are installed and are operated for the estimated useful life. This information is summarized in Table 7.

The first column lists the devices — the first nine rows for commercial devices and the remainder for residential devices. Column 2 is the estimated useful life in years.

The values in the columns for the years 2004 – 2013 are, for each device, the product of the number of rebates times the water savings rates from Table 6. The units are acre-feet per year.

The column labeled “Sum 2004-2012” is the sum of the entries to the left, with units of acre-feet per year. If all devices had 10-year useful lives, total savings would be a little more than 130 acre-feet

The column labeled “Potential Savings, af” is the product of the estimated annual water savings times the useful life. This value is the total potential water savings in acre-feet for the life of the device.

For the estimated useful life of the devices, almost 174 acre-feet of water (sum of Commercial Potential Water Savings) will be potentially saved by commercial devices, and almost 1,104 acre-feet (sum of Residential Potential Water Savings) by residential devices already installed. This amounts to a total of almost 1,280 acre-feet of total potential water savings, with economic savings to the City due to the equivalent amount of water that will not have to be produced. Dividing the direct cost of $1,685,000 by the total of 1,280 acre feet of water savings equates to a cost of about $1,320 per acre-foot of water saved.

Table 7
Estimated Water Savings of Installed Devices 2004-2013

Device	Useful Life, Years	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	Sum 2004 – 2012, afy	Potential Savings, af
Flushometer Valve High Efficiency Toilet	10							6.62	0.07			6.69	66.86
Tank Type High Efficiency Toilet	10							3.23	0.22	0.10	0.02	3.56	35.62
Hotel/Motel High Efficiency Toilet	10							1.01	1.01		0.79	2.82	28.18
Water Free Urinal	10							1.01	0.21			1.22	12.18
HE Clothes Washer replacement for top loader	10							0.05				0.05	0.47
HE Clothes Washer exchange for front loader	10							0.02				0.02	0.18
Commercial Process Efficiency	10							0.45				0.45	4.50
Air Cooled Ice Machine	5			0.67	3.35							4.02	20.10
Commercial Dishwasher	5			1.15								1.15	5.75
Commercial Pre-Rinse Sprayer	5			.64	4.13							4.77	23.85
Hot Water Recirculator	10	1.29	0.99	0.71	1.05	0.73	0.92					5.70	56.98
Residential High Efficiency Toilet	10							1.25	0.92	1.35	1.42	4.93	49.34
Residential Clothes Washer	10	5.43	8.50	10.85	11.40	13.90	11.50					61.55	615.5
HE Clothes Washer replacement for top loader	10							18.22	6.20	5.31	4.01	33.74	337.38
HE Clothes Washer exchange for front loader	10							0.31	0.31	0.36	0.26	1.241	12.41
Rain Barrel	10	0.81	0.43	0.60	0.55	0.17						2.57	25.67
Rain Barrel 50-99 g	10							0.01	0.003	0.01	0.05	0.08	0.78
Rain Barrel 100-199 g	10							0.01	0.003	0.005	0.003	0.02	0.18
Rain Barrel 200-299 g	10							0.06	0.006	0.003	0.01	0.07	0.74
Water Harvesting (number)	10												
• Water Harvesting	10							0.23	0.09	0.01	0.05	0.38	3.77
Rain Sensor	10												
Moisture Sensor	10												
Evapotranspiration Controller	10												
Pressure Reducing Valve	10												
Other Outdoor Devices	10												
Commercial		0.00	0.00	2.46	7.48	0.00	0.00	12.38	1.51	0.10	0.81		197.68
Residential		7.53	9.89	12.16	13.01	14.80	12.42	20.09	7.53	7.05	5.80		1,102.75
Total		**7.53**	**9.89**	**13.98**	**16.36**	**14.80**	**12.42**	**32.46**	**9.04**	**7.15**	**6.61**		**1,300.43**

Rebate Program Payback

The *City of Santa Fe Long-Range Water Supply Plan*[10] Appendix Table I-1 provides an estimate of capital and operating and maintenance (O&M) costs for water production. The sum of costs for 2013 (O&M existing sources, capital cost, and O&M new sources) is about $16,300,000. Overall water demand for 2012 is reported in *Santa Fe Trends 2013*[11] to be 9,777 acre-feet. Dividing the cost by the water demand results in an average cost for water production of $1,670 per acre-foot.

Simple payback can be calculated by dividing the amount of the expenditure ($1,685,000) by the annual return (dollars per year). The annual return is the annual savings rate (128 af per year) times the water production cost ($1,670 per acre-foot).

$$\boldsymbol{City\ Payback, yrs} = \frac{\boldsymbol{Total\ Expenditures\ for\ Rebates, \$}}{(\boldsymbol{Water\ Savings\ Rate\ , af\ per\ yr})(\boldsymbol{Water\ Production\ Cost, \$\ per\ af})}$$

$$\boldsymbol{City\ Payback, yrs} = \frac{\boldsymbol{\$1,685,000}}{(\boldsymbol{128\ af\ per\ year})(\boldsymbol{\$1,670\ per\ af})} = \boldsymbol{7.9\ years}$$

The above formula can be rearranged as below. The ratio of total expenditures for rebates divided by total water savings is the overall cost of $1,320 per acre foot saved that was calculated in the previous section. Multiplying that ratio by the 10-year useful life and dividing by the production cost gives the same 7.9 year result.

$$\boldsymbol{Payback\ Period, yrs} = \frac{(\boldsymbol{Total\ Expenditures\ for\ Rebates, \$})}{(\boldsymbol{Total\ Water\ Savings\ , af})} \quad \frac{(\boldsymbol{Useful\ Life, yrs})}{(\boldsymbol{Water\ Production\ Cost, \$\ per\ af})}$$

$$\boldsymbol{City\ Payback\ Period, yrs} = \frac{(\boldsymbol{\$1,685,000})}{(\boldsymbol{1280\ af}\ )} \quad \frac{(\boldsymbol{10\ yrs})}{(\boldsymbol{\$1,670\ per\ af})} = \boldsymbol{7.9\ years}$$

Equivalently, annual savings from water not produced are 128 acre-feet per year times the water production cost of $1,670 per acre-foot, or $213,760 per year. Dividing this by the total expenditures for rebates of $1,685,000 results in 12.69 percent of the expenditure recovered each year, or 0.1269 expressed as a fraction. The inverse of this results in a calculated 7.9 year payout.

[10] http://www.santafenm.gov/document_center/document/781
[11] http://www.santafenm.gov/community_profile

City Payback by Device

Although a saving for the customer, rebates are an expense for the City. Similar to the first method used in the prior section (Rebate Program Payback) to calculate the overall payback period for the rebate program, simple payback for the City for each device can be calculated. City paybacks are indicated in Table 8.

$$\boldsymbol{City\ Payback, yrs} = \frac{\boldsymbol{Rebate\ Amount, \$}}{(\boldsymbol{Water\ Savings\ Rate\ , af\ per\ yr})(\boldsymbol{City\ Water\ Production\ Cost, \$\ per\ af})}$$

For example, for a high-efficiency front load clothes washer exchange,

$$\boldsymbol{City\ Payback, yrs} = \frac{\boldsymbol{\$150}}{(\boldsymbol{0.0088\ , af\ per\ yr})(\boldsymbol{1,670, \$\ per\ af})} = \boldsymbol{10.2\ years}$$

Table 8
City Payback by Device

Device	Rebate $	Water Savings Rate afy	Payback Period Years
Flushometer Valve HE Toilet	500	0.0336	8.9
Tank Type HE Toilet	250	0.0168	8.9
Hotel/Motel HE Toilet	125	0.0022	34.0
Water Free Urinal	500	0.0420	7.1
Commercial Process Efficiency	874	0.4500	1.2
Air Cooled Ice Machine	400	0.6700	0.4
Dishwasher	400	1.1500	0.2
Hot Water Recirculator	100	0.0215	2.8
HE Toilet	175	0.0053	19.8
Washing Machine	100	0.0250	2.4
HE Clothes Washer replacement for top loader	350	0.0233	9.0
HE Clothes Washer exchange for front loader	150	0.0088	10.2
Rain Barrel	30	0.0015	12.0
Rain Barrel 50-99 gal	12	0.0008	9.0
Rain Barrel 100-199 gal	25	0.0015	10.0
Rain Barrel 200-299 gal	50	0.0031	9.7
Cistern	0.25 per gallon	0.000015 per gallon	10.0

City payback is directly related to the City Rebate cost per acre-foot for each device indicated in Table 6. Dividing Payback [R / (WSR)*(City Water Cost)] by Rebate Cost [R / (WSR)*(Useful Life)] reduces to [Useful Life / City Water Cost]. That is, Payback = Rebate Cost per acre-foot for the specific device (from Table 6) * (Useful Life of the specific device) / (City Water Cost). For devices with a 10-year useful life, the factor (Useful Life for the specific device) / (City Water Cost) equals 0.006. In that case, payback for each device is simply Rebate Cost per acre-foot (which incorporates water savings rate and rebate amount) from Table 6 times 0.006.

To summarize, higher rebate amounts in dollars result in longer City paybacks. Longer paybacks mean that it takes longer for the City to recoup its rebate investment through water savings. Shorter paybacks are better for the City as they result in faster recovery of rebate expenditures. For example, the 34-year payback for a hotel/motel high-efficiency toilet could be reduced to 17 years by reducing the rebate amount by one half.

Part 3: Customer Economic Factors

Part 3 considers economic factors relating to rebates from the perspective of the customer. Non-economic factors are considered in another section. Beginning with a tabulation of the price of the devices, this part investigates potential water savings and economic benefits. It discusses the net cost of devices, the value of water and sewer savings, and the customer payback periods.

This part includes:

- information on the purchase price of devices available for rebates,
- an estimate of the value to the customer of water and sewer savings, and
- a calculation of the customer payback by device.

Customer Purchase Price

To calculate customer payback, it is necessary to estimate the net cost of the device (purchase price minus rebate), the water savings factor, and the value of water and sewer savings. The following sections discuss these factors, beginning with this section on purchase price. The rebate amounts shown in earlier tables can be subtracted from the purchase price to estimate the net cost.

Table 9 provides information on estimated purchase price. Prices were generated through Internet searches for the specific devices, finding a range of prices and then calculating the low, high and median price. This results in a device price for 2013 that may not reflect past price but is used for consistent comparison. Prices vary widely, and an aggressive shopper might find lower prices than the ones indicated. Also, the prices are not sale prices, which could also lower the cost of the device. There is no requirement in the City program that the device be purchased locally, and the local taxes (currently 8.1875 percent) are not included in the prices shown in the table.

Table 9
Estimated Purchase Price of Appliance or Device
(Dollars)

Device	Low	High	Median
HE Toilet - Flushometer Valve	279	487	383
HE Toilet - Tank Type	135	1,500	300
Water-Free Urinal	300	1,200	600
Commercial Clothes Washer - top loader	750	1,085	765
Commercial Clothes Washer - front loader	1,375	1,700	1,485
Air Cooled Ice Machine	1,800	4,700	2,150
Commercial Dishwasher	2,800	24,000	5,700
Commercial Pre-Rinse Sprayer	72	441	291
Hot Water Recirculator	80	210	170
High-Efficiency Toilet	100	1,500	190[a]
Clothes Washing Machine	630	1,400	760
HE Clothes Washer - top loader	700	810	720
HE Clothes Washer - front loader	630	1,400	760
Rain Barrel 50-99 gal	120	385	175
Rain Barrel 100-199 gal	300	510	405
Rain Barrel 200-299 gal	500	750	700
Cistern ($ per gallon)	0.55	2.62	1.22
Rain Sensor	15	60	20
Moisture Sensor	30	400	200
ET Controllers	320	1,500	500
Irrigation Pressure Reducing Spray Head	5	25	10
Irrigation Pressure Reducing Valve	50	70	50

[a] Median price adjusted from $250 to $190 based on conversations with City personnel indicating the lower price is more common in customer

Value of Water and Sewer Savings

This section discusses water and sewer savings.

Beginning in March 2009, City water rates have increased 8.2 percent per year for the last five years. As indicated in Table 10, for single and multi-family residential accounts and commercial accounts with meters up to 3/4 inch, the current base volume charge (marginal rate) is $6.06 per 1000 gallons. During the May – August irrigation season, the rate is $6.06 per 1000 gallons for the first 10,000 gallons, and $21.72 per 1,000 gallons thereafter. For the remainder of the year, the base rate is $6.06 per 1,000 gallons for the first 7,000 gallons, and $21.72 per 1000 gallons thereafter. The water rate structure is somewhat different for commercial accounts with meters one inch and larger.[12]

Table 10
Santa Fe Volume Water Rates

Account Type	Meter Size, inches	September – April	May – August
Residential	All	$6.06/1,000 for the first 7,000 gallons $21.72/1,000 gallons thereafter	$6.06/1,000 for the first 10,000 gallons $21.72/1,000 gallons thereafter
Commercial	5/8 and 3/4	$6.06/1000 for the first 7,000 gallons $21.72/1000 gallons thereafter	$6.06/1000 for the first 10,000 gallons $21.72/1000 gallons thereafter
Commercial	1 and larger	Other commercial rates apply	Other commercial rates apply

The marginal rate of $6.06 per 1000 gallons is consistent with the City's cost of water production. That is, $6.06 per 1000 gallons is $1,975 per acre-foot, which is slightly more than the City's average cost of water production of $1,670 per acre foot.

However, for the customer, the $6.06 per 1,000 gallons marginal cost of water is not the total cost. The residential sewer charge is also based on water consumption, at $3.58 per 1,000 gallons.[13] Both of these are taxed at 5 percent. Therefore, the total cost to the customer, based on water consumption, is $10.12 per 1,000 gallons of water.

This equates to a cost of $3,300 per acre foot of water, making the economics of water saving different for the customer than for the City. The economics are also different if water consumption is greater than the base levels of 7,000 (May through August) or 10,000 gallons (remainder of the year). For consumption greater than base levels, total marginal cost to the customer comes to $26.57 per 1,000 gallons of water, or almost $8,700 per acre foot of water.

[12] http://www.santafenm.gov/water_division
[13] http://www.santafenm.gov/sewer_rates_and_application

Customer Payback

Customer payback can be calculated with the information presented in the previous sections on purchase price and rebate amounts, water savings rates and water and sewer savings value.

For the customer, the payback for each rebate can be calculated as

$$\boldsymbol{Customer\ Payback, yrs} = \frac{\boldsymbol{Price - Rebate, \$}}{(\boldsymbol{Water\ Savings\ Rate\ , af\ per\ yr})(\boldsymbol{Value\ of\ Water\ and\ Sewer\ Savings, \$\ per\ af})}$$

The net cost (price minus rebate) and water savings rate are device-specific, and the value of water and savings is either $3,300 or $8,700 per acre-foot, depending on whether the customer is paying the base or the high water rate.

Customer paybacks by device are listed in Table 11.

Table 11
Customer Paybacks by Device

Device	Median Price $	Rebate $	Water Factor, afy	Payback years @ $3,300 per af	Payback years @ $8,700 per af
HE Toilet, Flushometer Valve	383	500	0.0336	-1.1	-0.4
HE Toilet, Tank Type	300	250	0.0168	0.9	0.3
HE Toilet, Tank Type, Hotel/Motel	300	125	0.0022	24.1	9.1
Water-Free Urinal	600	500	0.0420	0.7	0.3
Commercial HE Clothes Washer, top loader replacement	765	350	0.0233	5.4	2.0
Commercial HE Clothes Washer, front loader exchange	1,485	150	0.0088	46.0	17.4
Air-Cooled Ice Machine	2,150	400	0.6700	0.9	0.3
Commercial Dishwasher	5,700	400	1.1500	1.4	0.5
Hot Water Recirculator	170	100	0.0215	1.0	0.4
Residential HE Toilet, Tank Type	190	175	0.0053	0.9	0.3
Residential Clothes Washer	760	100	0.0250	8.0	3.0
Residential HE Clothes Washer, top loader replacement	720	350[a]	0.0233	4.8[a]	1.8[a]
Residential HE Clothes Washer, front loader exchange	760	150	0.0088	21.0	8.0
Rain Barrel	325	30	0.0015	59.6	22.6
Rain Barrel 50-99 gal	175	12	0.0008	61.7	23.4
Rain Barrel 100-199 gal	405	25	0.0015	76.8	29.1
Rain Barrel 200-299 gal	700	50	0.0031	63.5	24.1
Cistern	1.22 per gallon	0.25 per gallon	0.000015 per gallon	19.6	7.4

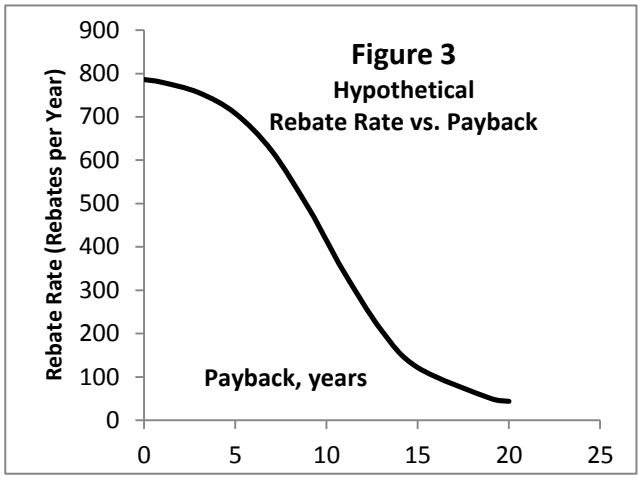
[a]In 2010, combined rebate (City and State) was $680, and payback was less than one year.

Customer paybacks range from less than one year to more than 76 years. Payback periods at the base water rate are 2.6 times longer than paybacks at the higher water and sewer rate. As indicated in the table, larger rebates relative to device cost result in shorter customer paybacks.

Relationship of Rebate Rate to Customer Payback

There may be a relationship between rebate acceptance rate (number of rebates awarded per year) and payback; that is, customers might be more likely to take advantage of rebates with short paybacks, and less likely for those with long paybacks.

One possible relationship, depicted in Figure 3, might have three ranges – a upper range, one with a maximum rebate acceptance rate regardless of payback; a middle range where the rebate rates decreases as the payback gets longer; and a lower range where the rebate rate is constant no matter how poor the payback.

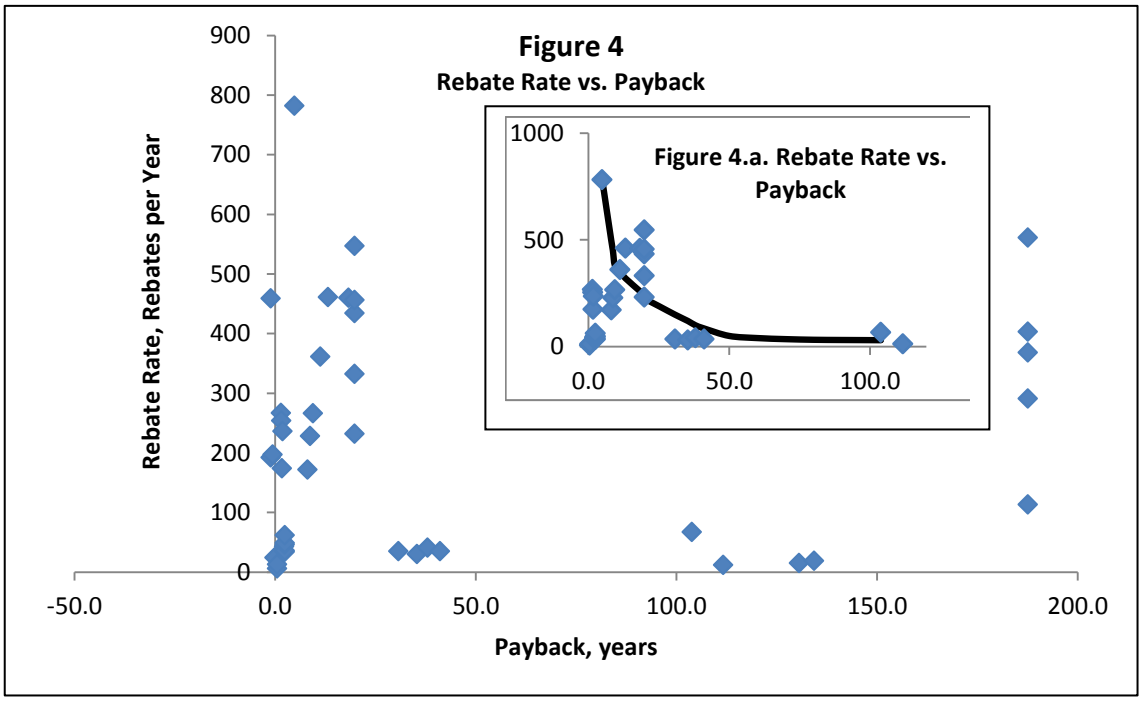


The data for the evaluation for this relationship is complicated for several reasons. In some instances (a specific rebate and year) there were very few rebates awarded, making those data points of little value for developing a relationship. Also, payback is different for large users (commercial or otherwise) than for many residential customers because the water saving rate depends on the marginal cost of water, which is different for high-volume users. Also, payback has changed as both the marginal cost of water and the water savings rates have changed. Some of these complications are apparent by inspection of the summary spreadsheet found in Appendix 6. Nevertheless, Table 12 was developed after removing the rows from Appendix VI with five or fewer rebates. It is based on the volume (marginal) cost of water only.

Table 12
Device-specific Rebate and Year, Payback, and Rebate Rate

Device	Payback yrs	Number of Rebates	Device	Payback yrs	Number of Rebates
Comm Flushometer Valve HE Toilet 2010	-0.6	197	Res Clothes Washer 2008	19.8	556
Comm Tank Type HE Toilet 2010	-1.1	192	Res Clothes Washer 2009	18.3	460
Comm Tank Type HE Toilet 2011	0.5	13	Res Top Load CW Replacement 2010	4.8	782
Comm Tank Type HE Toilet 2012	0.5	6	Res Top Load CW Replacement 2011	9.4	266
Comm Tank Type HE Toilet 2013	0.5	1	Res Top Load CW Replacement 2012	8.7	228
Comm Hotel/Motel HE Toilet 2010	-1.1	459	Res Top Load CW Replacement 2013	8.1	172
Comm Hotel/Motel HE Toilet 2011	13.2	461	Res Front Load CW Replacement 2010	30.7	35
Comm Hotel/Motel HE Toilet 2013	11.2	361	Res Front Load CW Replacement 2011	41.1	35
Comm Water-Free Urinal 2010	-0.1	24	Res Front Load CW Replacement 2012	38.0	41
Comm Water-Free Urinal 2011	-.01	5	Res Front Load CW Replacement 2013	35.3	30
Res Hot Water Circulator 2004	2.4	60	Res Rain Barrel 2004	187.6	541
Res Hot Water Circulator 2005	2.4	46	Res Rain Barrel 2005	187.6	286
Res Hot Water Circulator 2006	2.4	33	Res Rain Barrel 2006	187.6	403
Res Hot Water Circulator 2007	2.4	49	Res Rain Barrel 2007	187.6	368
Res Hot Water Circulator 2008	2.4	34	Res Rain Barrel 2008	187.6	113
Res Hot Water Circulator 2009	2.3	43	Res Rain Barrel 50-99 g 2010	130.5	15
Res HE Toilet 2010	1.8	236	Res Rain Barrel 50-99 g 2011	130.5	4
Res HE Toilet 2011	1.7	174	Res Rain Barrel 50-99 g 2012	111.7	12
Res HE Toilet 2012	1.6	254	Res Rain Barrel 50-99 g 2013	103.9	67
Res HE Toilet 2013	1.4	267	Res Rain Barrel 200-299 g 2010	134.3	19
Res Clothes Washer 2004	19.8	217			
Res Clothes Washer 2005	19.8	339			
Res Clothes Washer 2006	19.8	434			
Res Clothes Washer 2007	19.8	456			

The data is plotted in Figure 4 below:



At first glance, Figure 4 appears to have little in common with Figure 3. At the far right are the 2004 to 2008 residential rain barrel rebates (188 year payback) and other rain barrel rebates with paybacks greater than 100 years. It appears that rain barrel rebate acceptance rate (number of rebates per year) is independent of payback. Rain barrels are popular in Santa Fe and rebates may not affect demand for this device.

Looking only at the portion of the graph with paybacks less than 100 years (Inset, Figure 4.a.), there may be some resemblance to Figure 3. There may be a maximum rate of rebates, based on short payback, perhaps in the range of 800 rebates per year, as was the case for 2010 residential top loading clothes washer replacements. However, other factors besides or in addition to payback may have influenced the high rebate rate. In the less than 50 year payback range, the higher rebate rates (>300 per year) were residential clothes washers and commercial high-efficiency toilets with paybacks less than 20 years. For rebate rates from 100 to 300 per year, paybacks ranged from less than zero to 20 years for toilets and clothes washers. For rebate rates less than 100 per year, paybacks ranged from less than zero to more than 40 years for a range of devices including residential hot water recirculators.

The overall conclusion is that although there may be a relationship between payback and rebate acceptance, factors other than economic ones (at least economic ones as measured by payback) influence rebate acceptance.

Part 4: Balanced Rebates

Part 4 introduces the concept of a balanced rebate; that is, a rebate that has the same payback period for both the City and the customer. The balanced rebate might be useful as a tool for setting rebate amounts.

As shown in the sections on City and customer payback, the rebate paybacks for the City are different than those for a customer. That is, larger rebates result in longer paybacks for the City and shorter paybacks for the customer. At some rebate amount, the City and customer paybacks are the same. The rebate that results in this payback is referred to in this document as the "balanced rebate." The balanced rebate can be calculated as indicated below.

Using the following equations for payback periods:

$$City\ Payback\ Period, yrs = \frac{Rebate\ Amount, \$}{(Water\ Savings\ Rate\ , af\ per\ yr)(City\ Water\ Production\ Cost, \$\ per\ af)}$$

$$Customer\ Payback\ Period, yrs = \frac{Price - Rebate, \$}{(Water\ Savings\ Rate\ , af\ per\ yr)(Water\ \&\ Sewer\ Savings, \$\ per\ af)}$$

And the following definitions:

R = balanced rebate
P = device purchase price
WSR = water savings rate
Ci = City water production cost
Cu = customer value of water and sewer savings
F = Cu / Ci, the ratio of Customer Value to City Cost

Setting the paybacks equal, canceling WSR and rearranging:

$$\frac{R}{WSR\ x\ Ci} = \frac{P - R}{(WSR\ x\ Cu)}$$

$$RCu = (P - R)Ci$$
$$RCu = PCi - RCi$$
$$RCi + RCu = PCi$$
$$R(Ci + Cu) = PCi$$

$$R = P\left(\frac{Ci}{Ci + Cu}\right)$$

That is:

Defining F to be the ratio of Customer Value to City cost

$F = Cu / Ci$ then $Cu = FCi$ and

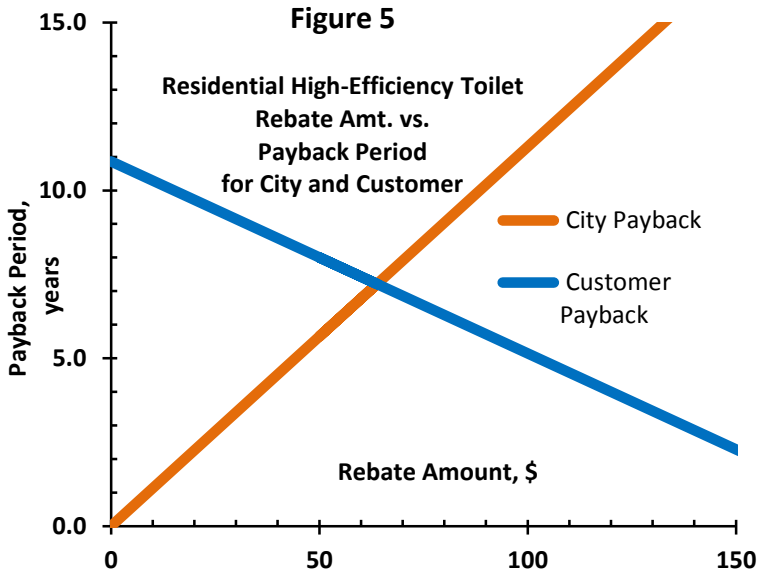
$$R = \frac{PCi}{Ci + Cu} \quad , \quad R = \frac{PCi}{Ci + FCi}$$

$$R = \frac{PCi}{Ci(1 + F)} \qquad R = P\left(\frac{1}{1 + F}\right)$$

The balanced rebate depends on the price and on the ratio of Customer Value to City Cost.

$$\boldsymbol{Balanced\ Rebate}, \$ = \boldsymbol{Price}, \$\left(\frac{\boldsymbol{City\ Cost}, \$}{\boldsymbol{City\ Cost}, \$ + \boldsymbol{Cutomer\ Value}, \$}\right)$$

With F defined as the ratio of Customer Value to City Cost, and expecting that the City does not want to sell water below production cost, Cu = Ci. This results in an upper limit of F of one, and an upper limit of (1/F+1) of one-half. Therefore, the largest rebate is one-half of the prices of the device. At the values of $3,300 Customer Value and $1,670 City Cost, F = 1.98 and the value of [1 / (F+1)] is 0.336. That is, the balanced rebate is about one-third of the price. At the values of $8,700 Customer Value and $1,670 City Cost, F= 5.21 and the value of [1 / (F+1)] is 0.161, making the balanced rebate about one-sixth of the price.



As illustrated in Figure 5, at a median price for a high-efficiency residential toilet of $190, the balanced rebate is $64. Payout periods for both the City and the customer are 7.2 years.

Table 13 provides the rebate amount in dollars and payback period in years of the balanced rebate (columns 4 and 5), compared to the current rebate and City and customer payback periods.

Column 2 shows Water Savings Rate. It is included as an indication of the effectiveness of the device in saving water, and is used in the payback calculations. The data suggest that devices with low water savings rates (perhaps less than 0.0015 acre-feet per year) may not be good expenditures for either the City or the customer.

Column 3 is the price of the device, which is used in calculation of the Balanced Rebate. As indicated above, at the values of $1,670 City Cost and $3,300 Customer Value, the Balanced Rebate is 0.336 times Price, with a payback that is the same for both the City and the customer. The last two columns (6 and 7) show the current rebate amount and the payback to the City and to the customer at the current rebate.

Table 13
Balanced Rebates

Device	Water Savings Rate, afy	Price $	Balanced Rebate (.336 x Price) $	Payback at Balanced Rebate yrs	Rebate $	City Payback at Rebate yrs	Customer Payback at Rebate yrs
Commercial							
HE Toilet - Flushometer Valve	0.0336	383	129	2.3	500	8.9	-1.1
HE Toilet -Tank Type	0.0168	300	101	3.6	250	8.9	0.9
HE Toilet -Tank Type, Hotel/Motel	0.0022	300	101	27.4	125	34.0	24.1
Water-Free Urinal	0.0420	600	202	2.9	500	7.1	0.7
Commercial Clothes Washer - top loader replacement	0.0233	765	257	6.6	350	9.0	5.4
Commercial Clothes Washer - front loader exchange	0.0088	1,485	499	34.0	150	10.2	46.0
Air Cooled Ice Machine	0.6700	2,150	722	0.6	400	0.4	0.9
Dishwashers	1.1500	5,700	1,915	1.0	400	0.2	1.4
Residential							
Hot Water Recirculator	0.0215	170	57	1.6	100	2.8	1.4
HE Toilet	0.0053	190	64	7.2	175	19.8	0.9
Washing Machine	0.0250	760	255	6.1	100	2.4	8.0
HE Clothes Washer replacement for top loader	0.0233	720	242	6.2	350	9.0	4.8
HE Clothes Washer exchange for front loader	0.0088	760	255	17.4	150	10.2	21.0
Rain Barrel	0.0015	325	109	43.6	30	12.0	59.6
Rain Barrel 50-99 gal	0.0008	175	59	44.0	12	9.0	61.7
Rain Barrel 100-199 gal	0.0015	405	136	54.3	25	10.0	76.8
Rain Barrel 200-299 gal	0.0031	700	235	45.4	50	9.7	63.5
Cistern	0.000015 per gal	1.22 per gal	0.41 per gal	16.4	0.25 per gal	10	19.6

The table indicates that the only residential balanced rebate with a payback less than five years is the one for hot water recirculators. The hot water recirculator rebate was discontinued in 2011. The water savings factor attributed to “washing machines” was unusually high (0.0250 acre-feet per year) and even with that factor the balanced rebate had a payback of 6.1 years. Rain barrels have balanced paybacks greater than 40 years due to low water savings factors.

Using the hot water recirculator as an example, the balanced rebate of $57 provides an acceptable payback of 1.6 years to both the city and the customer. However, the actual rebate was $100, which provides a 2.8-year payback to the City and a 1.4-year payback to the customer.

Besides balanced rebates, payback periods may also be useful as guidelines when setting rebate amounts. This is because rebates (whatever the amount) with excessive payback periods may not be in the economic interest of either the City or the customer. Rebates with long payback periods might be considered, but perhaps based on non-economic factors. For example, rebates for hotel/motel high-efficiency toilets, with a payback approaching 30 years, are not a good economic decision for either the City or the customer; however, they may be desirable for other reasons.

Part 5. Non-economic Factors

Part 5 discusses non-economic factors that may affect customer acceptance of a specific rebate. Factors include information on the degree of difficulty for the customer to install water saving devices and on the level of promotion of the rebates.

Installation Effort

Installation effort is different for different devices. For example, for a hot water recirculator, installation may require the services of a plumber; whereas for a clothes washer, the vendor may not only deliver and install the washer, but may also take away the old unit, sometimes at an additional charge. Table 14 below ranks the installation effort from low to high for both commercial and residential devices, with low being easy to do.[14] This table will be used in a subsequent section to relate this variable to rebate acceptance.

Table 14
Estimated Installation Effort of Rebated Devices

Commercial Devices	Ranking*
HE Toilet - Flushometer Valve	4
HE Toilet - Tank Type	3
Water-Free Urinal	4
Clothes Washer - Replacement for top loader	2-4
Clothes Washer - Exchange for front loading washer	2-4
Air Cooled Ice Machine	3-5
Dishwasher	4-5
Residential Devices	
Hot Water Recirculator	4-5
High-Efficiency Toilet	2
Clothes Washing Machine	1
HE Clothes Washer replacement for top loader	1
HE Clothes Washer exchange for front loading washer	1
Rain Barrel 50-99 gal	2
Rain Barrel 100-199 gal	2
Rain Barrel 200-299 gal	2
Cistern (Water Harvesting)	5
Rain Sensor	2
Moisture Sensor	1-2
ET Controllers	4
Irrigation Pressure Reducing Spray Head	3-4
Irrigation Pressure Reducing Valve	3

1 – Requires little to no effort
2 – Some effort required, but typically doable by someone with mechanical skills
3 – Requires expertise and potentially specialized tools
4 – Requires contractor or licensed professional, no permit or building modifications
5 – Contractor required and may require building modification and/or permit

[14]Rankings assume purchaser is a normal homeowner or business and not a contractor/installer. Rankings are from meetings with City of Santa Fe Water Division personnel. Does not include commercial pre-rinse sprayer

Duration and Extent of Rebate Promotion by Device

Other factors may affect the success of a rebate program. One is the length of time the rebate was available and another is the number of ways the rebate was promoted, such as advertising and word of mouth.

The marketing avenues used by the City include: websites, brochures (single or multiple, displayed in city display stands and stores), newspapers and other periodicals, theater, television, water bill inserts, radio shows, press releases, bus ads, published articles and vendor-purchased advertisements. The number of years and number of ways promoted are listed in Table 15 for use in subsequent sections.

Table 15
Promotion of Rebate Devices

Commercial Devices	Years of Program	How Promoted*
HE Toilet - Flushometer Valve	2010 – Present	1,2,3,4,5,6,9,10,11,12,13,14
HE Toilet - Tank Type	2010 – Present	1,2,3,4,5,6,9,10,11,13,14
Water-Free Urinal	2010 – Present	1,2,3,4,5,6,9,10,11,12,13,14
Clothes Washer - Replacement for top loader	2010 – Present	1,2,3,4,5,6,9,10,11,12,13,14
Clothes Washer - Exchange for front loading washer	2010 – Present	1,2,3,4,5,6,9,10,11,12,13,14
Air Cooled Ice Machine	2006 and 2007	2,14
Dishwashers	2006 and 2007	None
Pre-Rinse Sprayer	2006 and 2007	None
Residential Devices		
Hot Water Recirculators	2004 – 2009	2,14
High-Efficiency Toilets	2010 – Present	1,2,3,4,5,6,9,10,11,13,14
Clothes Washing Machines	2004 – 2009	1,3,4,5,6,9,10,11,12,13,14
HE Clothes Washer replacement for top loader	2010 – Present	1,2,3,4,5,6,9,10,11,13,14
HE Clothes Washer exchange for front loading washer	2010 – Present	1,2,3,4,5,6,9,10,11,13,14
Rain Barrel 50-99 gal	2010 – Present	1,2,3,4,5,6,9,10,11,13
Rain Barrel 100-199 gal	2010 – Present	1,2,3,4,5,6,9,10,11,13
Rain Barrel 200-299 gal	2010 – Present	1,2,3,4,5,6,9,10,11,13
Cisterns	2010 – Present	1,2,3,4,5,6,9,10,11,13
Rain Sensor	Aug 2009 – Sept 2012	1,3,4,5,9,10
Moisture Sensor	Aug 2009 – Sept 2012	1,3,4,5,9,10
ET Controllers	Aug 2009 – Sept 2012	1,3,4,5,9,10
Irrigation Pressure Reducing Spray Head	Aug 2009 – Sept 2012	1,3,4,5,9,10
Irrigation Pressure Reducing Valve	Aug 2009 – Sept 2012	1,3,4,5,9,10

The table above was based on meetings with City personnel[i]. Revised numbers were provided post interviews. Promotional vehicles include:

1. Water Conservation Website
2. City Website
3. Brochures
4. City Display Stands
5. Vendor Display Stands
6. Print Media
7. Theater Advertising
8. Television Advertising
9. Water Bill Inserts
10. Radio Advertising
11. Press Releases
12. Vendor-purchased Advertising
13. Byline Article
14. Media Coverage

Table 16 lists the total number of months a rebate was available (the duration) and the total number of ways it was promoted. In simply providing a sum of the number of the ways promoted, the implicit assumption is that each type of promotion is equally effective, which may not be the case.

In 2013, the City launched a new website which may make it easier to find rebates and the related rebate forms. This may affect future rebates but is not considered in this analysis.

Table 16
Rebate Duration and Number of Ways Promoted

Commercial Devices	Months of Rebate	Total Number of Ways Promoted
HE Toilet - Flushometer Valve	48	12
HE Toilet - Tank Type	48	11
Water-Free Urinal	48	12
Clothes Washer - Replacement for top loader	48	12
Clothes Washer - Exchange for front loading washer	48	12
Air Cooled Ice Machine	12	2
Dishwashers	12	0[a]
Pre-Rinse Sprayer	24	0[a]
Residential Devices		
Hot Water Recirculators	72	2
High-Efficiency Toilets	48	11
Clothes Washing Machines	72	11
HE Clothes Washer replacement for top loader	48	12
HE Clothes Washer exchange for front loading washer	48	12
Rain Barrel 50-99 gal	48	10
Rain Barrel 100-199 gal	48	10
Rain Barrel 200-299 gal	48	10
Cisterns	48	10
Rain Sensor	38	6
Moisture Sensor	38	6
ET Controllers	38	6
Irrigation Pressure Reducing Spray Head	38	6
Irrigation Pressure Reducing Valve	38	6

[a]No record of promotional activities, although the City was likely approached by a customer for these rebates.

Part 6. Relationship between the Number of Rebates and Customer Factors

Part 6 relates the number of rebates to the customer factors of price, rebate amount, net cost, payback, installation effort, and promotional effort described in the previous sections.

Number of Rebates Related to Price of Device and Rebate Amount

Table 17 summarizes the number of rebates awarded, the rebate amount and the median price of a device.

Table 17
Relationship of Device Price and Rebate Amount
To Number of Rebates Awarded

Device	Median Price $	Rebate Amount[a] $	Net Cost $	No. of Rebates Awarded
HE Toilet - Flushometer Valve	383	500 (504, 2004-2009)	(117)	199
HE Toilet - Tank Type	300	250 (504, 2004-2009)	50	212
HE Toilet - Tank Type (Hotel/Motel)	300	125 (504, 2004-2009)	175	1281
Water-Free Urinal	600	500 (630, 2004-2009)	100	29
Clothes Washer - Replacement for top loader	765	350 (480, 2004-2009)	415	2
Clothes Washer - Exchange for front loader	1,485	150 (180, 2004-2009)	1335	2
Air Cooled Ice Machine	2,150	400 (2004 to 2009)	1750	6
Dishwashers	5,700	400 (2004 to 2009)	5300	1
Pre-Rinse Sprayer	300	25	275	30
Hot Water Recirculators	170	100 (2004 to 2009)	70	270
High-Efficiency Toilets	190	175	15	931
Clothes Washing Machines	760	100 (2004 to 2009)	660	2,461
HE Clothes Washer replacement for top loader	720	350 (480[b] in 2010)	370 (+240)	1,448
HE Clothes Washer exchange for front loader	760	150 (180 in 2010)	610	141
Rain Barrel	325	30	295	1,736
Rain Barrel 50-99 gal	175	12	163	98
Rain Barrel 100-199 gal	405	25	380	12
Rain Barrel 200-299 gal	700	50	650	24
Cisterns	1.22/gallon	0.25/gallon	0.97/gallon	8
Rain Sensor	20	40	(20)	2
Moisture Sensor	200	75	125	0
ET Controllers	500	300-750	200 (250)	0
Irrigation Pressure Reducing Valve[c]	50	120	(70)	0
Irrigation Pressure Reducing Spray Head	10	5	5	0

[a] 2013 rebate amount unless Stated otherwise
[b] In 2010, the State of New Mexico rebate program added $200 to this rebate amount.
[c] 3/4”

In the commercial device category, 1,721 rebates were awarded for high-efficiency toilets (flushometer valve and tank-type) and water-free urinals. Rebates for these devices covered more than 40 percent of the cost of the device. For clothes washers, dishwashers, and air-cooled ice machines, only 11 commercial rebates were awarded. For these devices, the rebate covered only 10-50 percent of the cost of the device.

Therefore, the relationship between price and rebate may affect the success of the commercial rebate program, at least to some degree. For most commercial devices, there appears to be a correlation between price of the device, the rebate amount and the number of rebates granted. However, this correlation does not explain the number of rebates awarded to Hotels/Motels for high-efficiency toilets, for which the rebate covered only 42 percent of the price. Here the large number of rebates may be attributed to the water saved and the resulting operating cost savings to the commercial customer.

In the residential rebate category, rebates for hot water recirculators and high-efficiency toilets were more than one-half of the cost of the devices and more than 1,200 rebates were awarded. In 2010, rebates for top loader replacements ranged from 45 percent to more than 90 percent of the cost (with the additional $200 State rebate), and more than 1,400 rebates awarded. In the case of clothes washer rebates, over 51 percent of these rebates were awarded in 2010.

Total rebates for front loader exchanges were about 20 percent of the cost, and only 141 rebates were awarded. Besides the relatively small rebate amount, it may be that front loader machines are operating satisfactorily and do not need to be replaced. Rebates for rain barrels (50-299) were about 10 percent or less of the cost of the rain barrel and 134 were awarded.

From 2004-2009, the rebate for clothes washing machines was less than 15 percent of the price of the machine and yet almost 2,500 rebates were awarded. Here, the price/rebate relationship does not account for the number of rebates granted. The high number of these rebates awarded during this period may not be due to the cost/rebate relationship, but other factors such as advertising efforts or promotion by vendors.

In looking at the number of rebates for all outdoor devices other than rain barrels in the years 2009-2011, only two rebates were granted. This occurred despite the rebate amount being greater than the median cost of the device.

In conclusion, shown in 2010 with the addition of the $200 State rebate, increasing rebates relative to the cost of the appliance drives residential behavior. However, as seen with other rebates there must be other factors at play because price alone is not a sole predictor of rebate success.

Number of Rebates Related to Payback

Table 18 below relates the payback to the number of rebates awarded.

Table 18
Relationship of Customer Payback
To Number of Rebates Awarded

Device	Payback years @ $3,300 af	Payback years @ $8,700 af	Number of Rebates
Commercial			
HE Toilet, Flushometer Valve	-1.1	-0.4	199
HE Toilet, Tank Type	0.9	0.3	212
HE Toilet, Tank Type, Hotel/Motel	24.1	9.1	1,281
Water-Free Urinal	0.7	0.3	29
Commercial HE Clothes Washer, top loader replacement	5.4	2.0	2
Commercial HE Clothes Washer, front loader exchange	46.0	17.4	2
Air-Cooled Ice Machine	0.9	0.3	6
Commercial Dishwasher	1.4	0.5	1
Residential			
Hot Water Recirculator	1.0	0.4	270
Residential HE Toilet, Tank Type	0.9	0.3	931
Residential Clothes Washer	8.0	3.0	2,461
Residential HE Clothes Washer, top loader replacement	4.8	1.8	1,448
Residential HE Clothes Washer, front loader exchange	21.0	8.0	141
Rain Barrel	59.6	22.6	1,736
Rain Barrel 50-99 gal	61.7	23.4	98
Rain Barrel 100-199 gal	76.8	29.1	12
Rain Barrel 200-299 gal	63.5	24.1	24
Cistern	19.6	7.4	8

For commercial rebates, the high-efficiency Flushometer has a short payback period for the customer and received the largest number of rebates. Commercial tank type toilets had a large number of rebates and a short payback period. Hotel/Motel tank types had a significant number of rebates awarded despite the payback period being much longer than other payback periods. Interestingly, the air-cooled ice machines, commercial dishwaters, and waterless urinals had short customer payback periods but only a few rebates were awarded.

For residential rebates, there is a correlation between short customer payback periods and greater number of rebates, with the exception of clothes washers in the first rebate program in 2004. Rain barrel programs with long payback periods for the customer have not been as successful as the other current programs.

In conclusion, excluding hotel/motel rebate awards, there seems to be a relationship between customer payback and the number of rebates granted.

Number of Rebates Related to Installation Effort

Table 19 below relates the installation effort for the device with the number of rebates awarded.

Table 19
Relationship of Installation Effort
To Number of Rebates Awarded

Commercial Devices	Ranking	No. of Rebates Awarded
HE Toilet - Flushometer Valve	4	199
HE Toilet - Tank Type	3	212
HE Toilet - Tank Type Hotel/Motel	3-4	1,281
Water-Free Urinal	4	29
Clothes Washer - Replacement for top loader	2-4	2
Clothes Washer - Exchange for front loading washer	2-4	2
Air Cooled Ice Machine	3-5	6
Dishwashers	4-5	1
Residential Devices		
Hot Water Recirculators	4-5	270
High-Efficiency Toilets	2	931
Clothes Washing Machines	1	2,461
HE Clothes Washer replacement for top loader	1	1,448
HE Clothes Washer exchange for front loading washer	1	141
Rain Barrel	2	1,736
Rain Barrel 50-99 gal	2	98
Rain Barrel 100-199 gal	2	12
Rain Barrel 200-299 gal	2	24
Cistern	5	8
Rain Sensor	2	2
Moisture Sensor	1-2	0
ET Controllers	4	0
Irrigation Pressure Reducing Spray Head	3-4	0
Irrigation Pressure Reducing Valve	3	0

[a]These rankings assume purchaser was a normal homeowner or business and not a contractor. Rankings for this analysis came from meetings with City of Santa Fe Water Division personnel. Does not include commercial pre-rinse sprayer device as this rebate information was provided after the conclusion of the interviews.

For commercial devices, there is no apparent correlation between effort and number of rebates awarded. For residential devices, with the exception of hot water recirculators, there is no apparent correlation between effort and number of rebates.

Number of Rebates Related to Promotional Effort

Promotion effectiveness is a combination of length of promotion and the number of ways a device is promoted. The Promotional Factor is determined by multiplying the duration of the rebate program in months with the total number of ways promoted. For this analysis, it is assumed that all promotional vehicles are equal.

Table 20 relates the duration of the rebate program and the number of ways promoted with the number of rebates awarded.

Table 20
Relationship of Rebate Duration and Ways Promoted
to Number of Rebates Awarded

Commercial Devices	Rebate Duration in Months	Total Number of Ways Promoted	Promotional Factor	Number of Rebates Awarded
HE Toilet - Flushometer Valve	48	12	576	199
HE Toilet - Tank Type	48	11	528	212
HE Toilet - Tank Type Hotel/Motel	48	11	528	1,281
Water-Free Urinal	48	12	576	29
Clothes Washer - Replacement for top loader	48	12	576	2
Clothes Washer - Exchange for front loading washer	48	12	576	2
Air Cooled Ice Machine	12	2	24	6
Dishwashers	12	0[a]	0	1
Residential Devices				
Hot Water Recirculators	72	2	24	270
High-Efficiency Toilets	48	11	528	931
Clothes Washing Machines	72	11	792	2,461
HE Clothes Washer replacement for top loader	48	12	576	1,488
HE Clothes Washer exchange for front loading washer	48	12	336	141
Rain Barrel 50-99 gal	48	10	336	98
Rain Barrel 100-199 gal	48	10	336	12
Rain Barrel 200-299 gal	48	10	336	24
Cisterns	48	10	336	8
Rain Sensor	38	6	228	2
Moisture Sensor	38	6	228	0
ET Controllers	38	6	228	0
Irrigation Pressure Reducing Spray Head	38	6	228	0
Irrigation Pressure Reducing Valve	38	6	228	0

[a] No record of promotional activities

The clothes washing machines had the highest promotional factor at 792 and the highest number of rebates awarded. Rain Sensors, Moisture Sensors, ET Controllers, Irrigation Pressure Reducing Spray Heads and Irrigation Pressure Reducing Valves were all part of the same Outdoor Irrigation Rebate

program. According to City personnel, the low number of rebates was related to lack of general awareness and difficulties of rolling out the program.[15]

Part 7. Conclusions, Recommendations and Further Investigations

Conclusions about water savings are based on water savings rates supplied by the City of Santa Fe. These rates assume that the water conservation device was installed and operated as designed per manufacturer specifications.

1. Historical record (2003 – 2013)

The historical record of the rebate program is provided throughout this document and summarized in multiple tables. Baseline data was provided by the City.

Highlights of the historical record of the rebate program:

- Santa Fe's rebate program began in 2003, with indoor and outdoor rebates available to both residential and commercial customers, with modifications over time and continues.
- More than 8,500 rebates have been awarded through 2013.
- At the end of 2013, total rebate expenditures (amounts refunded to customers) were almost $1,700,000, divided between commercial rebates of almost $600,000, and residential rebates of about $1,100,000.
- The rebate program has saved more than 1,280 acre-feet of water.
- Total rebates awarded to date as a percentage of population is more than 12 percent, with commercial rebates as a percentage of connections being almost 10 percent, and residential as a percentage of connections being more than 22 percent.
- The number of rebates awarded per year have ranged from a low of about 500 to more than 2,000.
- For commercial customers, the highest number of rebates was for high-efficiency toilets.
- For residential customers, the highest number of rebates was for clothes washers.
- For outdoor devices, the highest number of rebates was for the 2004-2009 rain barrel rebate program.
- Rebate amounts have changed over the period, and have ranged from a low of $2 to a high of $900.
- In 2010, the State of New Mexico provided a $200 rebate for high-efficiency washing machines in addition to the City rebate, and greatest number of rebates were awarded in 2010.
- Water savings rates (WSR) and the City cost of water are used by the City as a basis for rebate amounts.
- Determining an accurate cost of producing water is critical to determining rebate amounts.
- Rebate amounts for commercial high-efficiency toilets (not hotel/motel) and residential high efficiency toilets are about two to three times the City water cost.
- Potential water savings in 2010 (32.46 acre-feet) was the largest of any year, representing almost 25 percent of total. This was the result of the combined State and City rebates for clothes washers. The increased interest in rebates as a result of the combined rebates may have encouraged other rebates.
- Although commercial connections are about 30 percent of total connections, commercial water savings from rebates have totaled less than 15 percent of overall water savings.
- Outdoor rebates account for only 2.5 percent of the overall water saved through the rebate program.

[15] Discussion with Daniel Ransom, the City Water Conservation Manager at the time of this program. Does not include commercial pre-rinse sprayer device as this rebate information was provided after the conclusion of the interviews.

Table 21 summarizes key aspects of Santa Fe's rebate program since inception.

Table 21
Historical Rebate Summary

	Water Saving Rate afy	Median Cost $	Total # Rebates	2004 – 2009 Rebate $	2010 Rebate $	2011-2013 Rebate $	Install Effort	Market Awareness (# of ways promoted)	Approx. Duration Period Months
HE Toilet, Flushometer Valve	0.0336	383	199		504	500	4	12	48
HE Toilet, Tank Type	0.0168	300	211		504	250	3	11	48
HE Toilet, Tank Type Hotel/Motel	0.0022	300	1181		504	125	3-4	11	48
Water-Free Urinal	0.0420	600	29		630	500	4	12	48
Commercial HE Clothes Washer, top loader replacement	0.0233	765	2		480	350	2-4	12	48
Commercial HE Clothes Washer, front loader exchange	0.0088	1,485	2		180	150	2-4	12	48
Air-Cooled Ice Machine	0.6700	2,150	6	400			3-5	24	12
Commercial Dishwasher	1.1500	5,700	1	400			4-5	0*	12
Commercial Process Efficiency	0.4500		1		874			0*	0*
Commercial Pre-Rise Sprayer	NC	300	30	25					24
Hot Water Recirculator	0.0215	170	270	100			4-5	24	72*
Residential HE Toilet	0.0053	190	811		175	175	2	11	48
Residential Clothes Washer	0.0250	760	2461	100			1	11	72
Residential HE Clothes Washer, top loader replacement	0.0233	720	1388		480 (730)	350	1	12	48
Residential HE Clothes Washer, front loader exchange	0.0088	760	125		180	150	2	12	48
Rain Barrel	0/0015	325	1736	30			2	10	48
Rain Barrel 50-99 g	0.0008	175	38		12	12	2	10	48
Rain Barrel 100-199 g	0.0015	405	10		25	25	2	10	48
Rain Barrel 200-299 g	0.0031	700	23		50	50	2	10	48
Cistern (Water Harvesting)	0.000015	1.22 / gal	5		0.25 / gal	0.25 / gal	5	10	48
Rain Sensor	NC	20	2		40	40	2	6	38
Moisture Sensor	NC	200	0		75	75	1-2	6	38
ET Controller	NC	500	0		300 - 750	300 - 750	4	6	38
Irrigation Pressure Reducing Valve	NC	50	0		120 - 525	120 - 525	3-4	6	38
Irrigation Pressure Spray Head	NC	10	0				3	6	38

* No record of promotional activities. Does not include commercial pre-rinse sprayer device as this rebate information was provided after the conclusion of the interviews.

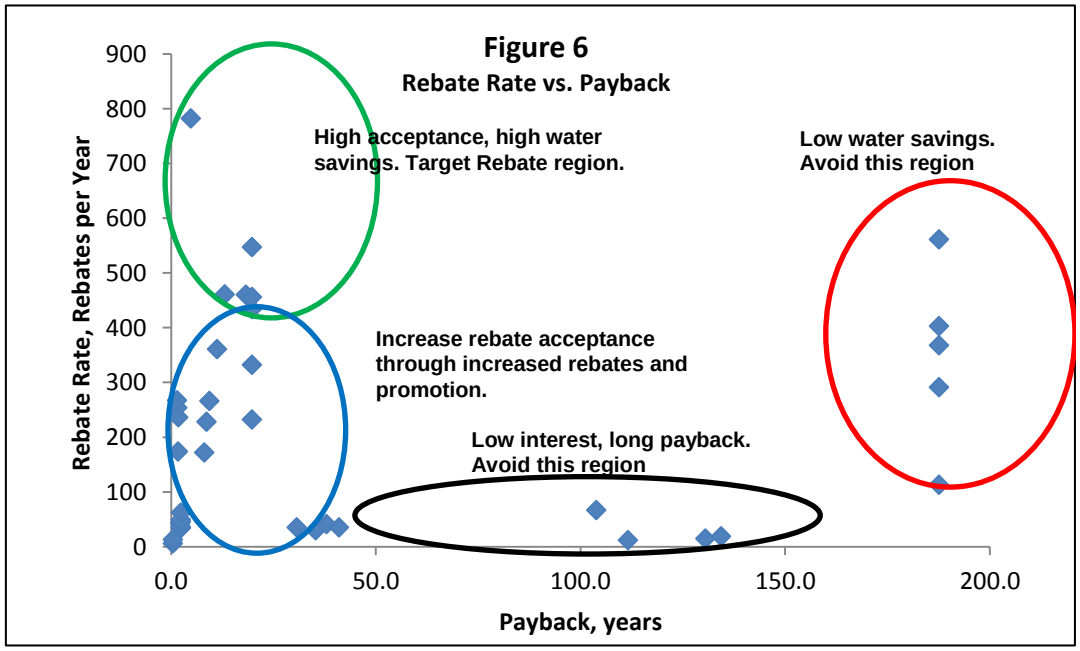
2. The effectiveness of the rebate programs.

- The overall City payback period is almost eight years, and for each device, ranges from less than one year to more than 34 years.
- The economic interests of the customer influence the acceptance of rebates.
- Reduced water consumption results in customer savings in monthly water, sewer, and taxes. At base water rates, customer cost is $10.12 per 1,000 gallons of water, and 2.6 times this at the high water rate.
- For each device, customer payback period depends on the net device cost (price minus rebate), the water savings rate, and the value of water and sewer savings. Except for the water savings rate, these factors are different for the customer than for the City.
- Customer payback periods range from less than one year to more than 75 years at the base water rate. Paybacks are about one third of these values at the high water rate.
- Non-economic factors may affect acceptance of rebates.
- For commercial customers, the net cost does not explain the number of rebates.
- For commercial customers, it appears that a combination of low net cost and short payback period better explains the number of rebates.
- Tank-type toilets for hotels/motels are not explained by either low net cost or short payback. In discussions with the City, this seems to be explained by a large number of installations by a few establishments.
- For residential customers, the net cost may help explain the number of rebates. For example, for a high efficiency clothes washer, there is a correlation between net cost and number of rebates awarded. In 2010, the year the State also awarded rebates for these devices, 782 rebates were awarded. In the years 2004 to 2009, only 2,461, or a rate of about 400 per year, were awarded, and at a higher net cost.
- The net cost does not correlate with any of the outdoor rebates instituted in 2009. This must be explained by other factors.
- For residential rebates, larger numbers of rebates are associated with low net cost and short paybacks.
- For residential customers, low numbers of rebates are associated with high net cost and low paybacks.
- For residential customers, very few rebates were awarded for devices that had paybacks of more than 20 years with the exception of rain barrels.
- Those that do not fit this pattern have had rebates available for longer periods of time.
- Rebates for hot water recirculators were in place only from 2004 to 2009 and were not highly promoted but 270 were awarded.
- For commercial establishments, there is no apparent correlation between installation effort and number of rebates.
- For residential devices, with the exception of hot water recirculators, there seems to be some positive relationship between rebates and low installation effort.
- For residential devices, low promotional factors result in low numbers of rebates.
- For residential devices, the rebates that had the higher promotional factors had the highest number of rebates.
- For commercial devices, the relationship between promotional factors and the number of rebates is less clear.

- Based on the City water demand pattern, the Brian Hurd study published in Choice Magazine[16], and the number of outdoor rebates, outdoor water savings may be useful in reducing peak demand.
- Factors such as device price, installation effort and duration and extent of promotion may influence customer acceptance of rebates.
- Excessively long payback periods for either the City or the customer may not be effective.

3. Recommendations

The Santa Fe rebate program has been in place for more than a decade. Changes have been made to the list of devices, the customer classifications that can take advantage of rebates and the dollar amounts of the rebates. The current mechanism for modifying the rebate program is through City of Santa Fe City Council approval (i.e., city ordinance/resolution changes). This is a time-consuming process. A better approach may be to conduct an annual review of the prior year's results, the overall program objectives, expenditures and targets for the coming year.



- As shown in Figure 6, rebates that have a payback in excess of 50-years are not effective for the City or the customer.
- For commercial rebates, the ongoing, long-term operating cost savings may be an effective promotional message.
- Tentatively, it might be concluded that the most successful rebates for residential customers are at least one-half the cost of the device.
- It appears that current rebate amounts have been based largely on the value of City water savings, however, the value to the customer is also worth considering. The value to the City and the customer are both conveniently measured by the payback period.
- A balanced rebate, one that balances payback periods for both the City and the customer may be a useful tool.
- Rebates dollars need to be large enough to create demand.

[16] *Water-Conserving Attitudes and Landscape Choices in New Mexico*, Hurd, Brian H., in Choices, Volume 25, Issue 3, 3rd Quarter 2010. Found January 2014 at http://www.choicesmagazine.org/magazine/article.php?article=146 and at http://ageconsearch.umn.edu/bitstream/95759/2/Water-Conserving.pdf.

The cost of a rebate program includes administrative and staff expenses as well as costs for processing rebate applications and advertising. Rebate programs are form-based systems that require the customer reporting and the water conservation staff to verification. Verification can require a few minutes to many hours including a site visit in some cases. The barrier to customers and the work requirement for staff are not investigated in this analysis, but do potentially impact the success of a program. If they were taken into account, administrative costs would increase the cost of the rebate program and extend the payoff periods for the City.

4. Further Investigations

Water conservation cannot be entirely evaluated independently of other factors. Other factors also will affect water usage. Some of these are water rates, droughts, regulations, increased public awareness and economic conditions. This analysis is a starting point. Further investigations could include the following:

- Customer survey post installation to verify actual usage of the device rebated.
- Comparative analysis for the market penetration of specific devices by market sector.
- Tracking of hours to process rebates and inclusion of these costs in the overall costs to the City.
- Survey of sample market to better understand awareness versus promotional efforts.
- Better comparative data of the different types of promotion (e.g., city ads versus vendor ads).
- Investigation into the need for a constant source of rebate program funding.
- Investigation of income level and rebate award recipients to determine if low-income individuals are taking advantage of rebate programs

Acknowledgements

This report would not have been possible without the commitment to water conservation by the City of Santa Fe and its current and past administrations and elected officials. This commitment includes the published documentation and records that are maintained as part of the rebate program.

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Although a number of people of contributed to this report, any errors or omissions are entirely the responsibility of the authors.

Appendix I

Glossary

Balanced rebate – A rebate that attempts to balance the payback to both the Water Utility and the Customer.

Commercial process efficiency – A proposed water reduction improvement based on a City audit to a specific customer.

Cost of device (gross) – The total cost of the rebated device, without taxes.

Cost of device (net) – The cost of the device, excluding taxes, and minus the rebated amount.

Evapotranspiration (ET) irrigation controllers – A type of irrigation controller that adjusts the watering schedule automatically based on current climate conditions and plant watering needs.

GPCD - Is a standard measure of the annual per capita (per person) water use expressed in Gallons per Person per Day. It is typically total production of water divided by population of a given area.

High-efficiency toilets – The City of Santa Fe awards rebates based on EPA WaterSense standards for appliances, including toilets. A High-Efficiency toilet must meet current EPA High-Efficiency toilet standards. These standards change over time, reducing water use whereas newer toilets are brought to market (i.e. old toilets used to use 3+ gallons a flush (gpf), where new ones will use 1.28 gpf.

Hot water recirculator – A circulation pump added to the hot and cold water line that tries to keep hot water almost instant at the device. These devices save water by reducing the amount of cold water that typically goes down the drain prior to hot water being available. They use electricity and consequently water. To reduce water consumption these units can be equipped with timer or on/off switch to limit the time the pump is running; thereby saving water and electricity.

Payback period – The amount of time, typically expressed in years, it takes to recover the amount of money spent through ongoing savings.

Peak daily water consumption – A typical measure of a Water Utility to express maximum water produced for a given day. Generally it is expressed in either gallons or acre feet.

Pressure reducing valves – These are plumbing and irrigation valves designed to reduce incoming water pressure. Reducing incoming pressure saves water by reducing flow rate through the water lines. Generally domestic water pressure should be 60 – 80 PSI, where irrigation lines typically need no more than 20 – 30 PSI.

Water savings rate – This is a measure of how much water a specific device saves.

Water utility connection – This is customer of a City water utility that has a meter. It is a different measure than households (e.g. multiple households can have one meter) and a different measure than population. It is generally used in calculating household water use.

Appendix II

Chronology of Rebate Programs

As previously mentioned, Santa Fe has a long history of water conservation programs and rebates have figured in their programs since almost the very beginning. The City has done a good job of tracking and publishing the results of their water conservation efforts. The programs were changed or retired and replaced with a new one targeting new appliances or changing the dollars involved, but a rebate program has been in place every year since they were started in 2004. Provided below is a summary of the programs they have been in place over the years.

2002, 2002 Annual Water Budget Requirements (adopted by Resolution 2002-55 and revised by Resolution 2003-106). All new construction served by the City water utility was required to implement stringent water conservation requirements and offset new demand through retrofitting high-use toilets, typically 3.5 or 5 gallons per flush (gpf) with low flush toilets (1.6 gpf) or by purchasing pre-1907 Middle Rio Grande surface water rights.

The City purchased 75 gallon rain barrels for distribution; 1,000 customers were able to purchase one rain barrel each for $35, a significant savings from the actual cost of $74.95. This program only lasted a few months before the supply of rain barrels was exhausted.

2003 The City established the Water Budget Program, also known as the Toilet Retrofit Program, was created to track the number of toilet retrofits and accumulated water savings. Water credits were awarded to entities that have retrofitted toilets but have not designated the water credits to a future project.

2004 The first rebate program was introduced and it included hot water recirculators ($100), washing machines ($100) and rain barrels ($30). This program resulted in water savings of 67.26 acre/feet between 2004 and 2009, when this specific program ended.

2005 The Water Rights Transfer Program ordinance modified the offset requirements for new development. The City code changed to require offsets with Middle Rio Grande surface water rights, transferred to the City, instead of toilet retrofits for commercial developments greater than 5 acre-feet and residential developments greater than 10 acre-feet.

2009 A 1998 analysis "Water Use in Santa Fe"[17] was updated to include additional customer sectors. These sectors (e.g. single-family, apartment, office, medical, religious, schools, parks) are used in creating development water budgets.

Water Demand Offset Requirements ordinance replaced the Annual Water Budget Requirements (Toilet Retrofit Program). Outstanding toilet retrofit credits were moved into the Water Bank as they are being redeemed. Components of this new code include:

- The development of a Water Budget and a Building Permit Requirement: Applicants are required to offset demand through dedication of water conservation credits or transferred water rights.
- City's Water Budget: Water managers are required to prepare annual accounting of current and projected supply and demand, and allocate water made available by water rights purchases, leases, and conservation measures to meet priorities, including affordable housing.
- City Water Bank: A water bank was established to account for water credits derived from conservation programs and water rights transfers to offset future demand. Some of the credits are available for purchase by developers or for allocation to City priorities.

[17] The report, Water Use in Santa Fe (2009), is available on the City's website at: www.santafenm.gov/document_center/document/793

- Conservation Credit Programs: credits generated by water conservation rebates and water conservation contracts.
- Water Rights Transfer Program: requires that new commercial development greater than 5 acre-feet and residential development greater than 10 acre-feet acquire and transfer water rights to City before obtaining building permit.

2009/55 authorizes the adoption of water conservation programs including rebates for outdoor water saving devices (Resolution 2009-55 modifies Section 25-2.11 SFCC 1987). This program provides rebates on Rain Sensors ($40), Moisture Sensors ($40), ET Controllers (1-6 $300, 7-9 $375, 10-12 $450, 13-18 $575, 19-24 $750), Pressure Reducing Valves (3/4" $120, 1" $150, 1 ½" $400, 2" $525), Pressure Regulating Spray Nozzles ($2), Precision Spray Nozzle ($3), Pressure Regulating Spray Head ($5), and Matched Precipitation Spray Rotors ($5).

2010 A new rebate program was instituted for which credits would now go into the Water Bank instead of the Water Budget Program. Rebates were offered for high-efficiency toilets (HET) ($175/residential, $504/ commercial), water free urinals ($630), high-efficiency clothes washers ($480), rain barrels ($12-$50 depending on size) and water harvesting systems ($0.25/gallon), and for commercial process efficiency, resulting in 32.4626 acre/feet of conservation credits delivered to the Water Bank.

Note: The 2009 and 2010 rebate programs were funded in part with a grant from the American Recovery and Reinvestment Act of 2009. The program ended in July 2010 due to depletion of funds.

2011 Beginning May 1, 2011, rebates were reinstated for high-efficiency toilets (HET) ($175/ residential, $125, $250, or $500/commercial depending on type), water free urinals ($500), high-efficiency clothes washers ($150 or $350 depending on type), rain barrels ($12-$50 depending on size) and water harvesting systems ($0.25/ gallon), and for commercial process efficiency, resulting in 9.0402 acre-feet of conservation credits delivered to the Water Bank.

2012 Rebates for the same products and at the same values as 2011 were continued in 2012, resulting in 7.1504 acre-feet of conservation credits delivered to the Water Bank.

2013 Rebates for the same products and at the same values as 2011 were continued in 2012, resulting in 6.6061 acre-feet of conservation credits delivered to the Water Bank.

Appendix III

Partial List of Santa Fe Water Conservation Ordinances and Resolutions

1. Ordinance 1996 -16 Establishes Emergency Water Regulations
2. Ordinance 1996-20 Amends 1996-16
3. Ordinance 1996-30 Amends Stage 2 Implementation Plan of Emergency Water Regulations
4. Ordinance 1996-35 Amends Stage 2 Implementation Plan
5. Ordinance 1997-17 Comprehensive Water Conservation Ordinance
6. Ordinance 2000-30 Amends 1996-20 with surcharges, restrictions and fines
7. Ordinance 2002-17 Amends Stage 2 and Stage 3 Implementation plans
8. Resolution 2002-25 Establishes the Santa Fe Water Conservation Committee
9. Ordinance 2002-26 Added Stage 5, ordinance rescinded July 10th
10. Ordinance 2002-55 Establishes requirement for developers to bring water offsets
11. Ordinance 2002-106 Amends 2002-55
12. Ordinance 2003-12 Amends Irrigation restrictions on parks, schools and athletic fields
13. Ordinance 2006-53 Amends Emergency Water Regulations changing to Orange and Red
14. Ordinance 2008-50 Discontinues Rainwater Harvesting Rebate Program
15. Resolution 2009-55 Establishes Outdoor Irrigation Rebate Program
16. Ordinance 2010-17 Adopts Landscape Irrigation Design Standard as guidelines
17. Ordinance 2010-78 Broadens the rebate program to Home Owner Associations under certain conditions
18. Ordinance 2011-37 Landscape ordinance, passed and is part of Land Use Code 14-8.8
19. Ordinance 2011-38 Amends to Authorize Suspension of Santa Fe River Target Flows
20. Ordinance 2013-27 Amends code to provide rebates to commercial accounts to lower their water consumption
21. Resolution 2013-52 A Resolution in support of “A Water Conservation Campaign Focusing on Voluntary Outdoor Irrigation”
22. City of Santa Fe Plant List – Referenced in the Land Use code and maintained by the Parks Department

Appendix IV

Current Santa Fe Rebates

	Rebate for (Device or Technology)	C, R, Or Both[a]	Rebate Amount $
Indoor	High-Efficiency Clothes Washer		
	• Top-Load Machine[b]	Both	350
	• Front-Load Machine[c]	Both	150
	High-Efficiency Toilet (HET)		
	• Residential	R	175
	• Commercial Hotel/Motel	C	125
	• Commercial Tank-Type	C	250
	• Commercial Flushometer	C	500
	Water-Free Urinal	Both	500
	Commercial Process Efficiency	C	Site-specific
Outdoor	Rainwater Harvesting		
	• Rain Barrel 50-99 gallon	Both	12
	• Rain Barrel 100-199 gallon	Both	25
	• Rain Barrel 200-299 gallon	Both	50
	• Cistern	Both	0.25 per gallon

[a]Rebates available to commercial accounts (C), residential accounts (R), or both.
[b]Replacement of top loading washer with a higher-efficiency washer
[c] Replacement of a front loading washer with a higher-efficiency washer

Rebate applicants must be water customers of the City of Santa Fe Water Division. Rebates are for the exchange of existing devices to more efficient technologies, and do not apply to purchases for new homes or new construction and development.

1. All appliances and fixtures must be purchased after May 1, 2011
2. Applicants must be a City of Santa Fe Water customer with an account in their name at the service address where the appliance or fixture is installed and at time of purchase.
3. Only original receipt(s) will be accepted. Applications submitted with photocopy receipt(s) will be denied.

The City expanded the Rebate program to include Home Owner Associations and Condo Boards (special terms and conditions apply).

General guidance on rebates is at http://savewatersantafe.com/rebates/.

Links to rebate application forms:

High-Efficiency Clothes Washer
http://savewatersantafe.com/wp-content/uploads/2012/10/clothes_washer_application_2013.pdf

High-Efficiency Toilet
http://savewatersantafe.com/wp-content/uploads/2012/10/het_application_2013.pdf

Water Free Urinal
http://savewatersantafe.com/wp-content/uploads/2012/10/urinal_application_2013.pdf

Rainwater Harvesting
http://savewatersantafe.com/wp-content/uploads/2012/10/water_harvesting_application_2013.pdf

Appendix V

Number of Rebates by Device and Year

Rebate / Year →	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	Total
Commercial HE Toilet, Flushometer	NA	NA	NA	NA	NA	NA	197	2	0	0	199
Commercial HE Toilet, Tank Type not in Hotel/Motel	NA	NA	NA	NA	NA	NA	192	13	6	1	212
Commercial HE Toilet, Tank Type in Hotel/Motel	NA	NA	NA	NA	NA	NA	459	461	0	361	1281
Water-Free Urinal	NA	NA	NA	NA	NA	NA	24	5	0	0	29
Commercial HE Clothes Washer, Top Loader replacement	NA	NA	NA	NA	NA	NA	2	0	0	0	2
Commercial HE Clothes Washer, Front Loader exchange	NA	NA	NA	NA	NA	NA	2	0	0	0	2
Air-Cooled Ice Machine	0	0	1	5	NA	NA	0	0	0	0	6
Commercial Dishwasher	0	0	1	0	NA	NA	0	0	0	0	1
Commercial Process Efficiency	NA	NA	NA	NA	NA	NA	1	0	0	0	1
Commercial Pre-Rinse Sprayer	NA	NA	4	26	NA	NA	NA	NA	NA	NA	30
Hot Water Recirculator	60	46	33	49	34	43	NA	NA	NA	NA	265
Residential HE Toilet	NA	NA	NA	NA	NA	NA	236	174	254	267	931
Residential Clothes Washer, Unspecified	217	339	434	456	556	460	NA	NA	NA	NA	2,462
Residential HE Clothes Washer, Top Loader replacement	NA	NA	NA	NA	NA	NA	782	266	228	172	1,448
Residential HE Clothes Washer, Front Loader exchange	NA	NA	NA	NA	NA	NA	35	35	41	30	141
Rain Barrel, Unspecified	541	286	403	368	113	0	NA	NA	NA	NA	1,711
Rain Barrel, 50-99 gallon	NA	NA	NA	NA	NA	NA	15	4	12	67	98
Rain Barrel, 100-199 gallon	NA	NA	NA	NA	NA	NA	5	2	3	2	12
Rain Barrel, 200-299 gallon	NA	NA	NA	NA	NA	NA	19	2	1	2	24
Water Harvesting (Cistern)	NA	NA	NA	NA	NA	NA	2	2	1	3	8
Rain Sensor	NA	NA	NA	NA	NA	NA	0	0	1	NA	1
Moisture Sensor	NA	NA	NA	NA	NA	NA	0	0	0	NA	0
Evapotranspiration Controller	NA	NA	NA	NA	NA	NA	0	0	0	NA	0
Press Reducing Valve	NA	NA	NA	NA	NA	NA	0	0	0	NA	0
Other Outdoor Devices	NA	NA	NA	NA	NA	NA	0	0	0	NA	0
Commercial Total	0	0	6	31	0	0	877	481	6	362	1,763
Residential Total	818	671	870	873	703	503	1094	485	541	543	6,869
Annual Total	**818**	**671**	**876**	**904**	**703**	**503**	**1971**	**966**	**547**	**905**	**8,864**

*NA indicates that rebates were not available

Appendix VI

Summary Table

No.	Device	Year	Low Water Cost $/1000 gal	High Water Cost $/1000 gal	Low Water Cost $/af	High Water Cost $/af	WSR afy	Median Price $	Rebate $	Net Cost $	Payback yrs	Promo Duration mos	Promo Ways	Promo Factor	Difficulty	Number Rebates
1	Commercial Low-flow Pre-Rinse Sprayer	2006	4.09	19.09	1,333	6,220	0.1590	300	25	275	0.28	12				4
2	Commercial Low-flow Pre-Rinse Sprayer	2007	4.09	19.09	1,333	6,220	0.1590	300	25	275	0.28	12				26
3	Commercial Flushometer Valve High Efficiency Toilet	2010	4.79	17.14	1,561	5,585	0.0336	383	504	-121	-0.64	12	12	144	4	197
4	Commercial Flushometer Valve High Efficiency Toilet	2011	5.18	18.55	1,688	6,045	0.0336	383	500	-117	-0.58	24	12	288	4	2
5	Commercial Flushometer Valve High Efficiency Toilet	2012	5.60	20.07	1,825	6,540	0.0336	383	500	-117	-0.53	36	12	432	4	0
6	Commercial Flushometer Valve High Efficiency Toilet	2013	6.02	21.72	1,962	7,077	0.0336	383	500	-117	-0.49	48	12	576	4	0
7	Commercial Tank Type High Efficiency Toilet	2010	4.79	17.14	1,561	5,585	0.0336	300	504	-204	-1.09	12	11	132	3	192
8	Commercial Tank Type High Efficiency Toilet	2011	5.18	18.55	1,688	6,045	0.0168	300	250	50	0.49	24	11	264	3	13
9	Commercial Tank Type High Efficiency Toilet	2012	5.60	20.07	1,825	6,540	0.0168	300	250	50	0.46	36	11	396	3	6
10	Commercial Tank Type High Efficiency Toilet	2013	6.02	21.72	1,962	7,077	0.0168	300	250	50	0.42	48	11	528	3	1
11	Commercial Hotel/Motel High Efficiency Toilet	2010	4.79	17.14	1,561	5,585	0.0336	300	504	-204	-1.09	12	11	132	3	459
12	Commercial Hotel/Motel High Efficiency Toilet	2011	5.18	18.55	1,688	6,045	0.0022	300	125	175	13.16	24	11	264	3	461
13	Commercial Hotel/Motel High Efficiency Toilet	2012	5.60	20.07	1,825	6,540	0.0022	300	125	175	12.16	36	11	396	3	0
14	Commercial Hotel/Motel High Efficiency Toilet	2013	6.02	21.72	1,962	7,077	0.0022	300	125	175	11.24	48	11	528	3	361
15	Commercial Water-Free Urinal	2010	4.79	17.14	1,561	5,585	0.0420	600	630	-30	-0.13	12	12	144	4	24
16	Commercial Water-Free Urinal	2011	5.18	18.55	1,688	6,045	0.0420	600	500	100	0.39	24	12	288	4	5
17	Commercial Water-Free Urinal	2012	5.60	20.07	1,825	6,540	0.0420	600	500	100	0.36	36	12	432	4	0
18	Commercial Water-Free Urinal	2013	6.02	21.72	1,962	7,077	0.0420	600	500	100	0.34	48	12	576	4	0
19	Commercial Top Load Clothes Washer Replacement	2010	4.79	17.14	1,561	5,585	0.0233	765	480	285	2.19	12	12	144	3	2
20	Commercial Top Load Clothes Washer Replacement	2011	5.18	18.55	1,688	6,045	0.0233	765	350	415	2.95	24	12	288	3	0
21	Commercial Top Load Clothes Washer Replacement	2012	5.60	20.07	1,825	6,540	0.0233	765	350	415	2.72	36	12	432	3	0
22	Commercial Top Load Clothes Washer Replacement	2013	6.02	21.72	1,962	7,077	0.0233	765	350	415	2.52	48	12	576	3	0
23	Commercial Front Load Clothes Washer Replacement	2010	4.79	17.14	1,561	5,585	0.0121	1,485	180	1,305	19.31	12	12	144	3	2
24	Commercial Front Load Clothes Washer Replacement	2011	5.18	18.55	1,688	6,045	0.0088	1,485	150	1,335	25.10	24	12	288	3	0
25	Commercial Front Load Clothes Washer Replacement	2012	5.60	20.07	1,825	6,540	0.0088	1,485	150	1,335	23.20	36	12	432	3	0
26	Commercial Front Load Clothes Washer Replacement	2013	6.02	21.72	1,962	7,077	0.0088	1,485	150	1,335	21.43	48	12	576	3	0
27	Commercial Process Efficiency	2010	4.79	17.14	1,561	5,585	0.4500		874			12	12	144		1
28	Commercial Air Cooled Ice Machine	2006	4.09	19.09	1,333	6,220	0.6700	2,150	400	1,750	0.42	12	0	0	4	1
29	Commercial Air Cooled Ice Machine	2007	4.09	19.09	1,333	6,220	0.6700	2,150	400	1,750	0.42	24	0	0	4	5
30	Commercial Dishwasher	2006	4.09	19.09	1,333	6,220	1.1500	5,700	400	5,300	0.74	12	0	0	4.5	1
31	Commercial Dishwasher	2007	4.09	19.09	1,333	6,220	1.1500	5,700	400	5,300	0.74	24	0	0	4.5	0
32	Residential Hot Water Circulator	2004	4.09	19.09	1,333	6,220	0.0215	170	100	70	2.44	12	0	0	4.5	60
33	Residential Hot Water Circulator	2005	4.09	19.09	1,333	6,220	0.0215	170	100	70	2.44	24	0	0	4.5	46
34	Residential Hot Water Circulator	2006	4.09	19.09	1,333	6,220	0.0215	170	100	70	2.44	36	0	0	4.5	33
35	Residential Hot Water Circulator	2007	4.09	19.09	1,333	6,220	0.0215	170	100	70	2.44	48	0	0	4.5	49
36	Residential Hot Water Circulator	2008	4.09	19.09	1,333	6,220	0.0215	170	100	70	2.44	60	0	0	4.5	34
37	Residential Hot Water Circulator	2009	4.43	15.84	1,444	5,161	0.0215	170	100	70	2.26	72	0	0	4.5	43
38	Residential High Efficiency Toilet	2010	4.79	17.14	1,561	5,585	0.0053	190	175	15	1.81	12	11	132	2	236
39	Residential High Efficiency Toilet	2011	5.18	18.55	1,688	6,045	0.0053	190	175	15	1.68	24	11	264	2	174
40	Residential High Efficiency Toilet	2012	5.60	20.07	1,825	6,540	0.0053	190	175	15	1.55	36	11	396	2	254
41	Residential High Efficiency Toilet	2013	6.02	21.72	1,962	7,077	0.0053	190	175	15	1.44	48	11	528	2	267
42	Residential Clothes Washer	2004	4.09	19.09	1,333	6,220	0.0250	760	100	660	19.81	12	11	132	1	217
43	Residential Clothes Washer	2005	4.09	19.09	1,333	6,220	0.0250	760	100	660	19.81	24	11	264	1	339
44	Residential Clothes Washer	2006	4.09	19.09	1,333	6,220	0.0250	760	100	660	19.81	36	11	396	1	434
45	Residential Clothes Washer	2007	4.09	19.09	1,333	6,220	0.0250	760	100	660	19.81	48	11	528	1	456
46	Residential Clothes Washer	2008	4.09	19.09	1,333	6,220	0.0250	760	100	660	19.81	60	11	660	1	556
47	Residential Clothes Washer	2009	4.43	15.84	1,444	5,161	0.0250	760	100	660	18.29	72	11	792	1	460
48	Residential Top Load Clothes Washer Replacement	2010	4.79	17.14	1,561	5,585	0.0319	720	480	240	4.82	12	12	144	1	782
49	Residential Top Load Clothes Washer Replacement	2011	5.18	18.55	1,688	6,045	0.0233	720	350	370	9.41	24	12	288	1	266
50	Residential Top Load Clothes Washer Replacement	2012	5.60	20.07	1,825	6,540	0.0233	720	350	370	8.70	36	12	432	1	228
51	Residential Top Load Clothes Washer Replacement	2013	6.02	21.72	1,962	7,077	0.0233	720	350	370	8.10	48	12	576	1	172
52	Residential Front Load Clothes Washer Replacement	2010	4.79	17.14	1,561	5,585	0.0121	760	180	580	30.71	12	12	144	1	35
53	Residential Front Load Clothes Washer Replacement	2011	5.18	18.55	1,688	6,045	0.0088	760	150	610	41.07	24	12	288	1	35
54	Residential Front Load Clothes Washer Replacement	2012	5.60	20.07	1,825	6,540	0.0088	760	150	610	37.99	36	12	432	1	41
55	Residential Front Load Clothes Washer Replacement	2013	6.02	21.72	1,962	7,077	0.0088	760	150	610	35.34	48	12	576	1	30

No.	Device	Year	Low Water Cost $/1000 gal	High Water Cost $/1000 gal	Low Water Cost $/af	High Water Cost $/af	WSR afy	Median Price $	Rebate $	Net Cost $	Payback yrs	Promo Duration mos	Promo Ways	Promo Factor	Difficulty	Number Rebates
56	Residential Rain Barrel	2004	4.09	19.09	1,333	6,220	0.0015	405	30	375	187.59	12	12	144	2	541
57	Residential Rain Barrel	2005	4.09	19.09	1,333	6,220	0.0015	405	30	375	187.59	24	12	288	2	286
58	Residential Rain Barrel	2006	4.09	19.09	1,333	6,220	0.0015	405	30	375	187.59	36	12	432	2	403
59	Residential Rain Barrel	2007	4.09	19.09	1,333	6,220	0.0015	405	30	375	187.59	48	12	576	2	368
60	Residential Rain Barrel	2008	4.09	19.09	1,333	6,220	0.0015	405	30	375	187.59	60	12	720	2	113
61	Residential Rain Barrel	2009	4.43	15.84	1,444	5,161	0.0015	405	30	375	173.19	72	12	864	2	0
62	Residential Rain Barrel 50-99 g	2010	4.79	17.14	1,561	5,585	0.0008	175	12	163	130.54	12	7	84	2	15
63	Residential Rain Barrel 50-99 g	2011	5.18	18.55	1,688	6,045	0.0008	175	12	163	120.71	24	7	168	2	4
64	Residential Rain Barrel 50-99 g	2012	5.60	20.07	1,825	6,540	0.0008	175	12	163	111.66	36	7	252	2	12
65	Residential Rain Barrel 50-99 g	2013	6.02	21.72	1,962	7,077	0.0008	175	12	163	103.87	48	7	336	2	67
66	Residential Rain Barrel 100-199 g	2010	4.79	17.14	1,561	5,585	0.0015	405	25	380	162.31	12	7	84	2	5
67	Residential Rain Barrel 100-199 g	2011	5.18	18.55	1,688	6,045	0.0015	405	25	380	150.09	24	7	168	2	2
68	Residential Rain Barrel 100-199 g	2012	5.60	20.07	1,825	6,540	0.0015	405	25	380	138.83	36	7	252	2	3
69	Residential Rain Barrel 100-199 g	2013	6.02	21.72	1,962	7,077	0.0015	405	25	380	129.15	48	7	336	2	2
70	Residential Rain Barrel 200-299 g	2010	4.79	17.14	1,561	5,585	0.0031	700	50	650	134.34	12	7	84	2	19
71	Residential Rain Barrel 200-299 g	2011	5.18	18.55	1,688	6,045	0.0031	700	50	650	124.22	24	7	168	2	2
72	Residential Rain Barrel 200-299 g	2012	5.60	20.07	1,825	6,540	0.0031	700	50	650	114.91	36	7	252	2	1
73	Residential Rain Barrel 200-299 g	2013	6.02	21.72	1,962	7,077	0.0031	700	50	650	106.89	48	7	336	2	2
74	Residential Water Harvesting	2010	4.79	17.14	1,561	5,585	0.000015	1.22	0.25	0.97	41.43	12	7	84	5	2
75	Residential Water Harvesting	2011	5.18	18.55	1,688	6,045	0.000015	1.22	0.25	0.97	38.31	24	7	168	5	2
76	Residential Water Harvesting	2012	5.60	20.07	1,825	6,540	0.000015	1.22	0.25	0.97	35.44	36	7	252	5	1
77	Residential Water Harvesting	2013	6.02	21.72	1,962	7,077	0.000015	1.22	0.25	0.97	32.97	48	7	336	5	3
78	Residential Rain Sensor	2010	4.79	17.14	1,561	5,585		20	40	-20		2	6	12	2	0
79	Residential Rain Sensor	2011	5.18	18.55	1,688	6,045		20	40	-20		14	6	84	2	0
80	Residential Rain Sensor	2012	5.60	20.07	1,825	6,540		20	40	-20		26	6	156	2	1
81	Residential Rain Sensor	2013	6.02	21.72	1,962	7,077		20	40	-20		38	6	228	2	0
	Total															**8,864**

[a]Payback for commercial rebates calculated at high water cost, for residential rebates at low water cost.
[b]Water cost is volume water cost only, and does not include sewer cost and tax.

Appendix VII

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