VENETA WATER CONSERVATION PROGRAM

June 2010

RARE Resource Assistance for Rural Environments

Veneta
Water Conservation Program

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INTRODUCTION – WHY CONSERVATION?

Western Oregon is known for its abundance of annual precipitation and Veneta is no exception -- receiving nearly 50 inches of precipitation annually. This begs the question: why is there a need for water conservation in Veneta? Essentially, the combination of local geology and rapid population growth within the past decade heighten the need for conservation. What follows is a brief discussion of the City's water system and water demand.

> The City's population increased nearly **81%** from 2000-2010.

WATER SYSTEM OVERVIEW

A full description of Veneta's water system is provided in the adopted Water Master Plan (May 2009). A brief synopsis is provided below to provide context.

Supply Sources

The City operates five (5) groundwater wells within the water system service area. The wells produce water year round and serve as the City's sole water supply source. Wells 4, 9, 10, 11 and 12 have an existing combined production capacity of nearly 1.7 million gallons per day (mgd). Veneta's water system also contains three (3) reservoirs with a total combined storage capacity of approximately 3.5 million gallons (*City of Veneta, Water System Master Plan, 2009*).

On the basis of the geologic, hydrologic, and physiographic conditions, Veneta is divided into two major areas: the lower flatter topography that is transitional to the shoreline area of Fern Ridge Reservoir and an upland area of steeper topography, e.g., Bolton Hill. Older alluvial deposits underlie the lowland. These deposits contain the most productive aquifers. In this area, the alluvial deposits are semiconfined to unconfined in nature and discharge to rivers or local streams. The consolidated rocks, i.e., siltstone, sandstone, etc., that compromise the bulk of the upland areas, and underlie the alluvial deposits, generally yield small to moderate quantities of water to wells, are generally confined and are generally not hydraulically connected to the alluvial aquifers (*City of Veneta Source Water Assessment Report, 2000*).

> The City operates 5 groundwater wells that have an existing combined production capacity of nearly 1.7 million gallons per day.

Groundwater currently serves as the drinking water source for the City of Veneta as well as adjacent rural properties. With the overlying silty and clay soils in conjunction with sandstone bedrock, the aquifer has a limited ability to provide water. Some localized alluvial deposits provide a modest yield, but overall, the geology of the area is not conducive to water production both in terms of quantity and quality.

Veneta's water rights consist of two certificates and one groundwater permit for a total permitted production rate of 1.52 mgd (Wells 4, 9, 10 and 11). The City has been issued a limited license for Well 12 (LL1219). The City has been issued a limited license for an unnamed well for 0.30 mgd. Oregon Water Rights Department (ORWD) issued a letter to the City on January 8, 2010,

in which the Department has determined that Well 12 and any new wells within one mile of the Long Tom River and the Fern Ridge Reservoir will have the potential for substantial interference and therefore surface water availability must be considered. Surface water rights are not available for these two water bodies. On the basis of the potential for interference, the Department is therefore proposing to limit all future municipal well development within one mile of surface waters (*Preliminary Engineering Report: Water Supply From Eugene Water & Electric Board, 2010*).

Distribution System

The water distribution system is composed of various pipe types in sizes up to 16 inches in diameter. The total length of piping in the service area is approximately 29 miles. The pipe types include asbestos cement, cast iron, ductile iron, PVC and copper. The majority of the piping in the system is asbestos cement piping. The City's distribution system is fairly tight with an estimated system leakage of less than 5% which is exceptional (*City of Veneta, Water System Master Plan, 2009*). Oregon's standard for unaccounted-for water is 10-15% -- suppliers should strive for 15%, but if it is determined that 15% can be readily achieved, then the supplier should seek to attain an objective of 10% when feasible (*Survey of State Agency Water Loss Reporting Practices, 2002*).

Historical Water Usage

The term "water demand" refers to all of the water requirements of the system including domestic, commercial, municipal, institutional and industrial. Demands are discussed in terms of gallons per unit of time such as gallons per day (gpd), mgd or gallons per minute (gpm). Demands are also related to per capita use as gallons per capita per day (gpcd). The City maintains daily water production records at its supply wells and treatment facilities which have been evaluated to estimate water demands. Historically, average daily demand within the City has been approximately 0.4 to 0.7 mgd and per capita consumption has ranged from approximately 120 to 170 gpcd. Recent maximum daily usage has been as high as approximately 1.7 mgd, with a maximum day demand (MDD) per capita consumption range of approximately 320 to 460 gpcd (*City of Veneta, Water System Master Plan, 2009*).

Historically, average daily demand within the City has been approximately 0.4 to 0.7 million gallons per day (mgd). Recent maximum daily usage has been as high as approximately 1.7 mgd.

WATER DEMAND

Water Demand Projections

Estimates of future water demands were developed from the City's present per capita water usage and population forecasts from City planning data. For the purposes of the Water System Master Plan (2009), estimated average daily water usage is assumed to be approximately 165 gpcd. As conservation plays an increasing role in water usage patterns, it is anticipated that City's average daily per capita usage can ultimately be reduced to and maintained at 150 gpcd.

For the purposes of this study, current maximum daily per capita usage is estimated at approximately 375 gpcd. Due to City's proximity to the Eugene Metro Area, we expect that

changes in water demand due to conservation will influence the City's water needs in the long term. It is anticipated that the City's maximum daily per capita use can ultimately be reduced to and maintained at approximately 350 gpcd, even in drought years (*City of Veneta, Water System Master Plan, 2009*).

Figure 1 summarizes projected water demand in the coming years and illustrates the need for water conservation. Within the circled area are the intersecting of Maximum Day Demand (usage) and the current (2009) groundwater well production capacity (supply). As illustrated in Figure 1, essentially, peak day water usage is now exceeding supply capacity, thus there is a need for water conservation. However, it should be noted that the data used in the graph are figures from 2008. Since that time the economic downtown has been responsible for a slow to no growth rate for 2009-2010. The City has also made equipment changes at several well sites that may slightly increase maximum production.

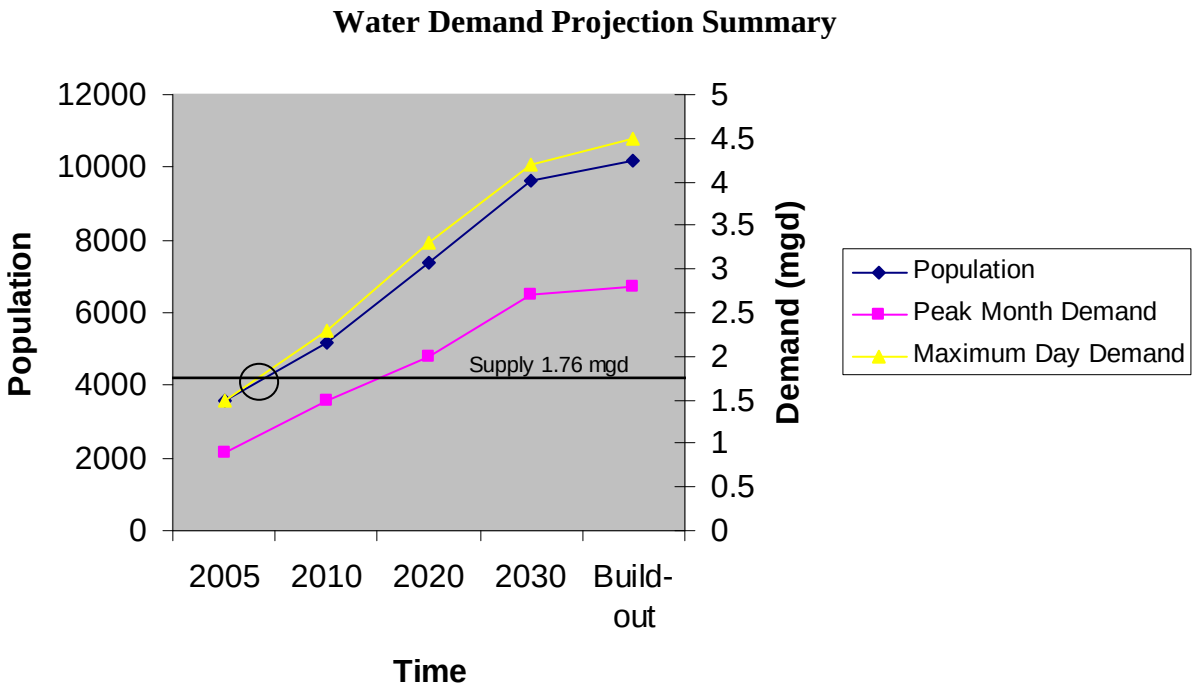


Figure 1: Conservation is much needed with population, peak month demand, and maximum daily demand all exceeding water supply in the near future.

The City's water distribution system is fairly tight with an estimated system leakage of less than 5% which is far better than Oregon's standard for unaccounted-for water; therefore system leakage is not exceedingly relevant in regards to the City's water supply issue. Essentially, the two issues are: the water system's production capacity versus the City's projected water demand and; the City's difficulty in finding additional water supplies.

In general, groundwater is diffucult to find in the Veneta area in sufficient quantity and quality to meet the City's water demands. As shown in Figure 1 above, the projected maximum day demand currently exceeds the total suppy capacity of 1.76 mgd. It is assumed that the supply capacity should be equal to or greater than the maximum day demand. That said, to meet water

demands, the City is exercising its options in search of additional water supply sources but is limited as far as water rights are concerned. Because water demand is exceeding water supply and additional water sources are hard to obtain, water conservation is becoming increasingly important. Water conservation is not a long-term solution but is expected to reduce water usage thereby addressing the water demand side of the equation, buying the City time while further water supply options are explored.

GOALS OF THE PROGRAM

The goal of the City of Veneta's Water Conservation Program is to reduce peak monthly per capita usage by 5% over the program's lifespan of five years (a reduction of 1% each year).

YEAR 1 GOALS:

- Completely implement online water billing and payment
- Implement a residential seasonal block rate structure
- Include water billing rate structure information on water bills
- Make semimonthly contacts regarding conservation information & tips to residential users during peak season
- Create a water conservation webpage on the City's website
- Partner with the local schools
- Publish articles periodically regarding conservation in the City newsletter
- Offer fifty $100 toilet rebates (retrofitting non-ultra-low-flow toilets with high efficiency toilets)
- Issue proactive letters to top 5% residential water consumers during peak season
- Distribute toilet leak detection tablets to all residential units twice a year
- Distribute lawn watering gauges to top 5-10% residential water consumers during peak season
- City to lead by example: plan to Xeriscape a portion of City Hall's lawn
- City to lead by example: purchase and install Smart Controllers at public facilities

Subsequent yearly goals:
Subsequent yearly goals will vary and depend upon the success of the program's first year goals. A few strategies will be carried on throughout the entire life of the program such as toilet rebates, bill inserts, and proactive letters. New strategies may be adopted in subsequent years and some will come to fruition over time such as partnering with the schools and constructing the Xeriscape pilot project both in the program's second year. Depending upon the success of Smart Controllers, subsequent years may include Smart Controller rebates. Goals specific to the coming years will be fine-tuned and fully established before yearly implementation. Refer to the Schedule of Implementation on page 16 for a general forecast.

> The City's Water Conservation Program is a five-year program, incremental in nature, and has a primary goal to reduce peak monthly per capita usage by 5% over five years.

The percent reduction goal will be evaluated at the end of five years; however, non-numeric goals will be evaluated annually.

The primary goal of the program is to reduce peak water demands on the water supply system. Summer landscape irrigation creates the peak demand that more than doubles water consumption through the summer months. Single family residences are the largest consumptive user group.

Conservation components that reduce excessive outdoor irrigation use during summer (peak) months will provide for the largest and most effective returns in realizing goals and long-term benefits of water conservation to the City. Effective as well are components aimed at reducing toilet consumption as toilets are the number one water consuming fixture in the house, accounting for 27% of indoor water use. The combination of these components will reduce water usage year round.

TARGETS OF CONSERVATION

The City's 1500 residential water accounts are responsible for nearly 85% of total water consumption (Figure 2). When reviewing a snapshot of total water usage by month, usage among commercial users is generally constant throughout the year. Residential usage on the other hand, more than doubles during peak season (June through September).

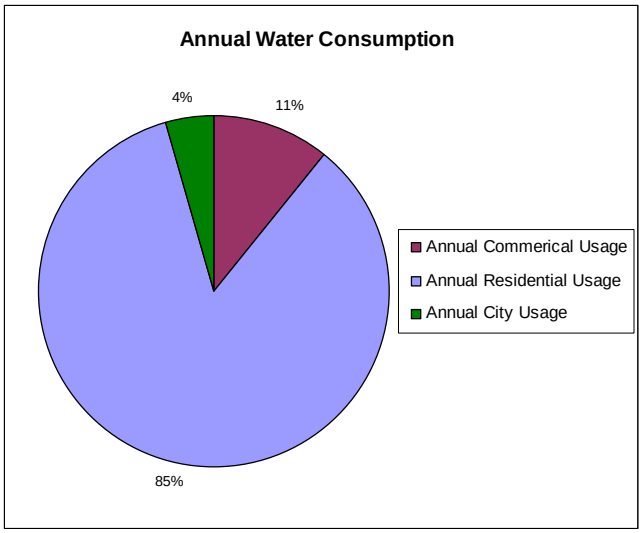


Figure 2: Residential users account for 85% of total water consumed in Veneta.

Veneta receives about 49 inches of annual precipitation a year, only roughly 10% of which occurs during peak season (*Western Regional Climate Center*). Research shows that on average 80-90% of outdoor residential water usage is for lawn watering (*City of Veneta Water Management & Conservation Plan, 2003*). These two facts together explain why residential water usage more than doubles during peak season.

The average household uses approximately five thousand gallons a month for in-home (non-irrigation) use during the winter months. During peak season, irrigation more than doubles this amount, peaking in July with an average of almost fourteen thousand gallons. A substantial number of residential users consume far more than the average of fourteen thousand gallons a month during peak months. Residential users consuming more than the average fourteen-fifteen thousand gallons a month represent 34% of users, but account for nearly 60% of total residential consumption during peak months. Users consuming over thirty thousand gallons a month (peak) represent only 6% of users, but account for nearly 20% of residential consumption during peak months (*City of Veneta Water Rate Report, 2008*).

Thirty-four percent of users account for 60% of total residential consumption during peak months.

Six percent of users account for nearly 20% of residential consumption during peak months.

Summer landscape irrigation creates the peak demand that more than doubles water consumption during peak season. Single family residences are the largest consumptive user group. Conservation components that reduce excessive outdoor irrigation use during summer (peak) months will provide for the largest and most cost effective returns in realizing goals and long-term benefits of water conservation for the City.

APPLICABILITY OF TOOLS WITHIN THE VENETA CONTEXT

Conservation tools best suited to addressing Veneta's goals are ones that address peak season demand on the water system and irrigation demands in particular. Moreover, tools aimed at residential users as these users consume nearly 85% of total water consumption; will provide the most benefit (*City of Veneta's Water Rate Report 2008*).

Figure 3 depicts that Veneta receives about 49 inches of precipitation a year, however during peak season (June-September) the City receives less than 5 inches of precipitation (*Western Regional Climate Center*).

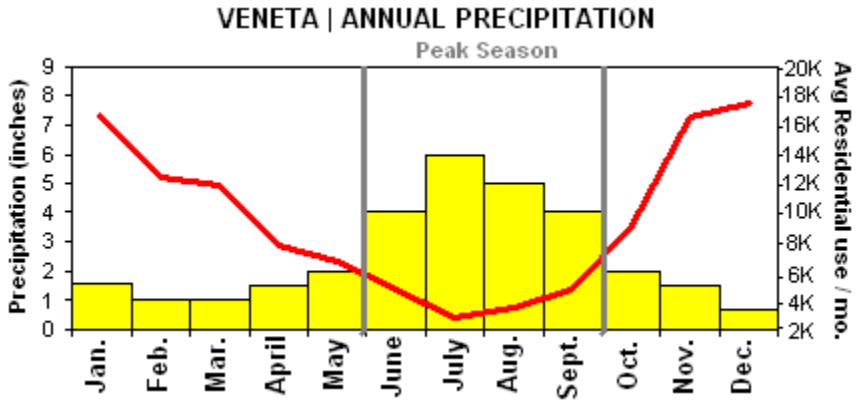


Figure 3: Veneta receives about 49 inches of precipitation a year with less than 5 inches falling during peak season when average residential water use is at its highest.

Within the region, outdoor water use accounts for about 41% of the total residential water usage, and research shows that on average 80-90% of outdoor residential water usage is for lawn watering (*City of Veneta Water Management & Conservation Plan, 2003*).

The most effective tools will be those that help curb residential outdoor water use during peak season.

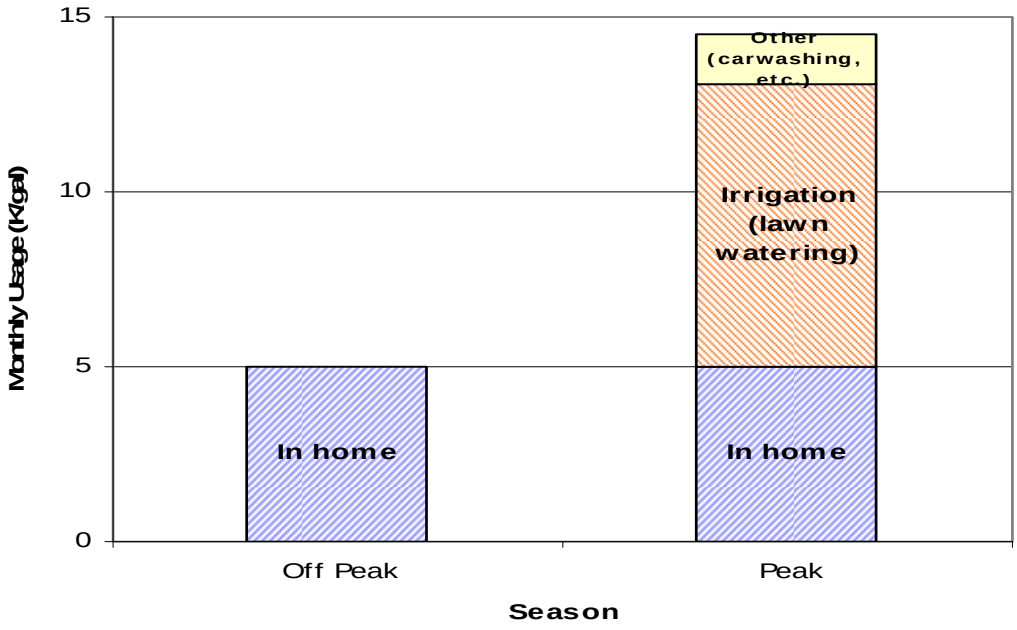


Figure 4: Peak season average water use more than doubles off peak seasonal use with an additional 10K/gal for outdoor use. About 85% of all outdoor use is for lawn watering.

RECOMMENDATIONS

After conducting research on water conservation programs using both a wide variety of academic literature and reviewing various water conservation programs from other cities, information was gathered, synthesized, and utilized in making informed decisions about recommendations for the City of Veneta's water conservation program. Not all conservation measures found effective in reducing water consumption were applicable to Veneta; therefore measures were applied in context to Veneta's water conservation goals.

The proposed budget amount for the first year of the City's water conservation program equates to $4.56 per capita, comparable in per capita cost to the program of Fort Collins, Colorado and Stockton, California, as shown in Table 1, along with the budget numbers of other water conservation programs. The water conservation programs of Fort Collins and Stockton are more broad-based and designed to reduce demand in most customer sectors whereas Veneta's focus is more geared toward single family residences in reducing peak season usage. Veneta's per capita cost is aggressive; however we believe it is warranted because of Veneta's situation.

City	Per capita*	Exp/yr
Austin, TX	$8.97	$6,810,301.00
Denver, CO	$8.76	$11,400,000.00
Aurora, CO	$7.87	$2,510,905.00
Vancouver, WA	$5.71	$1,200,000.00
Fort Collins, CO	$5.01	$647,125.00
Veneta, OR	**$4.56**	**$22,800.00**
Stockton, CA	$3.75	$1,088,355.00
Eugene, OR (EWEB)	$3.68	$416,571.00
Bend, OR	$3.02	$160,000.00
Lake Oswego, OR	$2.78	$100,000.00
Colorado Springs, CO	$2.02	$841,470.00
Tualatin Valley Water Dist.	$2.00	$400,000.00
Springfield, OR (SUB)	$1.70	$33,000.00
Portland, OR	$1.29	$1,110,447.00
Tigard, OR	$0.66	$30,900.00

* Per capita is based on service population

Table 1: Per capita costs vary among cities. There doesn't seem to be any solid conclusion to be drawn from the numbers, however, there are a number of factors that could influence the amount of money spent on water conservation.

What follows are the City of Veneta's Water Conservation Program recommendations. Recommendations are broken below in four distinct sections: codes, rebates/incentives, pilot projects, and media and education. Finally, the budget numbers associated with respective recommendations are provided on separate worksheets.

CODES

Section 5.12(6)(b), of the Veneta Land Development Ordinance regarding plant selection states: "A combination of deciduous and evergreen trees, shrubs, and ground covers shall be used for all planted areas, the selection of which shall be based on local climate, soil, exposure, water availability, and drainage conditions. Applicants are encouraged to select native plants which are drought tolerant to reduce the demand on the City's water supply."

♦ <u>Recommendation:</u> *For the sake of water conservation, it is recommended that applicants should be required to select native plants which are drought tolerant to reduce the demand on the City's water supply.*

Section 5.12(6)(d), of the Veneta Land Development Ordinance regarding soil requirements states: "When new vegetation (including sod) is planted, topsoil shall be added and/or soils amended or aerated as necessary, to allow for healthy plant growth. Compaction of the planting area shall be minimized whenever practical and compacted soils shall be amended and/or aerated as necessary prior to planting."

Figure 5: Xeriscaping involves landscaping with native, water-efficient plants, ultimately reducing the need for supplemental irrigation.

♦ <u>Recommendation:</u> *It is recommended that the City implement a minimum topsoil requirement. Without adequate or proper soil composition, the soil is unable to retain moisture efficiently, resulting in overwatering.*

Section 5.12(6)(g), of the Veneta Land Development Ordinance regarding non-plant ground covers states: "Bark dust, chips, aggregate, or other non-plant ground covers may be used, but shall cover no more than 25 percent of the area to be landscaped and shall be confined to areas underneath plants. Non-plant ground covers cannot be substitute for ground cover plants."

♦ <u>Recommendation:</u> *To encourage water conservation measures such as Xeriscaping, it is recommended that the percentage of area landscaped with non-plant ground covers be increased from the current maximum of 25 percent. In addition, it is recommended that non-plant ground covers not be entirely confined to areas underneath plants.*

After completion of the Water Conservation Program's second or third year when the City has had the opportunity to conduct a lengthy demonstration of Smart Irrigation controllers (refer to page 15 for a comprehensive description of Smart Irrigation controllers) and depending upon the effectiveness of the Smart controllers to significantly reduce water use, the City may look to establish a code requiring all new development to include Smart Irrigation controllers in their landscaping.

REBATES / INCENTIVES

Toilet Rebates

Toilets are the number one water consuming fixture accounting for about 27% of all indoor water use. Approximately 45% of Veneta's residential units connected to water were built before 1993; therefore retrofitting toilets presents significant opportunity for savings. The table on the following page provides potential water savings by retrofitting toilets in Veneta. It should be noted that this is the maximum potential savings -- if all non-ultra-low-flow toilets (non-ULFTs) were retrofitted with the new conservation standard high efficiency toilets (HETs).*

Total # of residential units connected to water	# of residential units connected to water built prior to 1993	Gallons per unit per day used for flushing	Gallons per unit per day used for flushing after retrofitting	Potential savings (gallons) per day	Reduction in peak day demand
1500	675	37800[1]	13986[2]	23814	~1-2%[3]

*Basis for calculations were derived from numbers taken from the Veneta Water System Master Plan (May 2009) and the Veneta Water Management & Conservation Plan (2003).
[1] 675 multiplied by 2.8 (avg. household size in Veneta) = 1890, 1890 multiplied by 20 (typical non-low-flow toilet domestic use is about 20 gallons per person per day) = 37800 gallons/day.
[2] 63% (high efficiency toilets reduce toilet consumption by about 63%) of 37800 = 13986.
[3] 23814 divided by 2100000 gallons/day (peak day demand in 2009) = ~1%, 459 gallons per capita per day (peak day demand in 2009) divided by 23814 = ~2%

After reviewing toilet rebate programs from other water conservation programs, typical rebate amounts were around $100. In order to establish a rebate amount for Veneta, an avoided cost analysis was employed. Avoided costs are essentially the incremental savings associated with *not* having to produce additional units of water or water service while meeting demand requirements.

To meet the water demand to 2030 (twenty years out), the water production (supply) cost per gallon was calculated by calculating the total yearly demand and associated operations and maintenance costs along with the total capital cost, which equated to $0.004858 (average between the low and high cost scenarios) per gallon. By retrofitting non-ULFTs with HETs, by 2030, 109,135 gallons of water would be saved. The twenty-year water savings was then multiplied by the supply cost per gallon, which equated to a $530.21 (average between the low and high cost scenarios) savings per retrofit over twenty years.

> Over the next 20 years, it will cost the City approximately $0.004858 to produce each gallon of water.

The results of the avoided cost analysis conclude that providing a $100 rebate to customers to retrofit their non-ULFT would be cost-effective for both the customer and the City. As shown in the table below, retrofitting a toilet equates to a savings of $8.74 per person per year, and $24.47 per household per year. It's important to emphasize that such a rebate is intended to benefit both the customer and the City.

Customer Toilet Retrofit Savings

Toilet flush volume (gallons/flush)	Flushes per person per day[1]	Gallons used per year	Cost per gallon[2]	Toilet cost per person per year	Retrofit savings: per person per year	Retrofit savings: household per year[3]
1.28 (HET)	5	2336	$0.00215	$5.02	$8.74	$24.47
3.5 (non-ULFT)	5	6388	$0.00215	$13.76		

[1] Each person flushes the toilet approximately five times daily according to National estimates.
[2] Cost per gallon is based on average household usage.
[3] The average household size in Veneta is 2.8 according to the 2000 Census.

To retrofit one non-ULFT per 675 (number of residential units connected to water and built before 1993) residential units and assuming a 100% rebate participation rate, a $100 toilet rebate program would cost the City $67,500 over the span of five years ($13,500 a year).

♦ <u>*Recommendation:*</u> *It is recommended that the City budget $5,000 (50 rebates) for the toilet rebate program for fiscal year 2010-2011.*

Toilet leak detection tablets

According to the Environmental Protection Agency, about 20% of toilets leak and a leaky toilet can increase water usage by 200 gallons a day. Toilet leak detection tablets are little tablets that are placed in the toilet's tank, and after waiting a few minutes, if the dye ends up in the toilet bowl it indicates that the toilet has a leak. Here is the logic behind toilet leak detection tablets: assuming by using the tablets, a customer detects a leak, the customer will then go buy the part needed to fix the leak. A leaky toilet can waste up to 73,000 gallons a year. Assuming that the life of the new part is five years, by repairing the leak, 365,000 gallons can be saved over five years for each leaky toilet. This equates to a $1,773 avoided cost five-year savings per toilet. It is recommended that the City mail toilet leak detection tablets to water users twice a year. This would be about 2,800 tablet mailings costing the City approximately $1,800 a year. This would certainly be a worthwhile investment.

FACT: A leaky toilet can waste up to 73,000 gallons a year; that's enough to fill four in-ground swimming pools! -*EPA*

Lawn watering gauges

It is commonly cited that lawns in the Pacific Northwest only require about an inch of water a week, including rain, in temperature below 85 degrees. Temperatures above 85 require 1 ½ inches of water a week. Most people tend to over-water their lawns having the misconception that lawns need to be watered thoroughly and daily during times of dry, hot weather. Because research has shown that on average 80-90% of outdoor residential water usage is for lawn watering, an effective conservation measure is to educate residential users on proper lawn watering techniques. In doing so, the City will distribute lawn watering gauges to the top 5-10% residential users.

The lawn watering gauge is a gauge that is staked into the ground and has a water measuring capacity of 1 ½ inches. To avoid unnecessary lawn watering, the gauge should be placed in a well exposed part of the lawn (to allow the gauge to collect irrigation water). Generally speaking, soils in the Veneta area absorb and release water slowly, therefore it is recommended to allow at least one day between watering days to allow air into the soil, ultimately preventing runoff. For proper lawn watering, the 1-1 ½" weekly recommendation should be broken down and administered in watering intervals of two or three times over the course of the week, rather than fulfilling the recommendation in one application. For example: if you water your lawn 1" during the week, you should water a half inch two days a week, or 1/3 of an inch three days a week.

A lawn water gauge instruction sheet and lawn watering conservation techniques will accompany gauge distribution. Proper use of the lawn watering gauge has the potential to significantly reduce over-watering and thus greatly conserve water during peak season.

Rate Structure Review

Increasing Block Rate

The increasing block rate is the most effective means at encouraging efficient water use and is currently employed by the City of Veneta (*Western Resource Advocates, 2006*). The design of block rate structures is critical to set the appropriate price signals to the customers. Usually 3 to 4 tiers are adequate for an effective residential rate design. Percentage increases between tiers can vary, with 25% or more, and 50% between the last two tiers (*State of Minnesota Conservation Rate Structures, 2008*) – some are increased at greater than 50% (*Conservation Oriented Rate Structures, Alliance for Water Efficiency*). The first tier provides minimal water usage for a typical household at the minimum reasonable price with an effective rate design having more than half of residential customers exceeding the first tier when the new rate structure is first implemented, and at least 30% of customers using water in the 3rd tier and 10% of customers using water in the 4th tier (at least during seasonal peak demand). It's important to note that if price increases within the tiers are too small, resulting in price insensitivity, the increasing block rate structure will be ineffective in promoting efficient water use (*Conservation Oriented Rate Structures, Alliance for Water Efficiency*). The City of Veneta's residential increasing block rate structure is provided below:

> Price insensitivity can occur if price increases within tiers are too small, making an increasing block rate structure ineffective in promoting efficient water use. *–Alliance for Water Efficiency*

Current Residential Rates (As of January 1, 2010)

		% increase in cost	**% users (during peak month)**
Base Rate	$9.54		
Tier 1: 0-5000 gal	$2.08*	-	17%
Tier 2: 5001-15000 gal	$2.47	18.75%	49%
Tier 3: > 15000 gal	$2.97	20.25%	34%

* Cost per thousand gallons

Other water conservation efforts such as educational outreach must accompany increasing block rate structures as rate structures alone are not sufficient to encourage conservation. Moreover, water price elasticity (the responsiveness of consumers to changes in water rates) is estimated to be very low, and even lower than what has been suggested in previous research (*Effectiveness of Residential Water Conservation Price and Nonprice Programs, 1997*).

Inequity Issue

One drawback of the increased block rate structure is the issue of inequity. Essentially the increased block rate structure charges residential customers with a higher consumption level a higher rate for water. For example, imagine household A is a family of five and household B is a family of three, and both households have identical water consumption rates per person. Utilizing the increased block rate structure, household A would pay a higher rate for water consumption simply because they're using more water, even though each person is using the same amount as each person in household B, making the increased block rate inequitable. However, it's noted in the City of Veneta's 2008 Water Rate Report that given the City's difficulty in meeting peak demand, these [increasing block rate] inequities are tolerable if the rate structure produces significant conservation benefits.

Budget Impacts

The increasing block rate structure has the potential to impact the budget by causing revenue instability. Essentially, if effective, an increasing block rate structure can cause consumers to reduce their consumption and thereby reduce the water department's revenue – a short term affect to the budget. Conversely, without such a conservation measure, the budget could be affected long term because the City would potentially look to spend more money to obtain new water supplies to meet consumer demands. However, an increasing block rate structure is unlikely to impact the City of Veneta's budget because as stated in the 2008 Veneta Water Rate Report, the City derives the vast majority of its water revenues from the base rate because all users with an active account pay the base rate regardless of usage.

The City derives the vast majority of its water revenues from the base rate which provides for revenue stability regardless of water consumption.

Another effective form of the increasing block rate is the water budget rate structure. The water budget rate structure can maximize efficiency when the block volumes are individually customized to the specific water needs of each customer. Each customer is assigned a monthly allotment of water based on a number of factors such as the customer's lot size, building occupancy, etc. This may be an effective form of the increasing block rate structure aimed at reducing inequity issues. However, the drawback to this type of rate structure is that it's expensive to administer and is staff intensive because for each customer, a rate with tailored allocations would have to be developed.

Rate Structure Recommendation

It is recommended that the following information be considered during the City of Veneta's next water rates update study. Because water demand is primarily an issue only during peak season, it is recommended that the City implement a seasonal block rate structure. A seasonal rate structure would be the same as the increasing block rate structure but with a steeper increase in tiered pricing during peak season (Figure 6). Because a seasonal structure is only seasonal, customers may not be able to adjust to the increased price over time, thus making conservation efforts more attractive to customers and therefore more effective. This rate structure would be effective during peak season (June-September) when the City receives about 10% of its annual precipitation.

Incorporating suggestions from the rate structure design literature, the proposed residential seasonal rate structure shown in Table 2 depicts larger, more appropriate price increases between tiers, and a fourth tier is added to better account for top consumers. It's important to note that water use by consumers in the latter two tiers is primarily irrigation use. Thirty-four percent of Veneta's residential users consume over 15,000 gallons a month, accounting for nearly 60% of total residential consumption during peak months (*City of Veneta's Water Rate Report 2008*).

Base Rate	\$9.54	**% increase in cost from previous tier**	**% users (during peak month)**
Tier 1: 0-5000 gal	\$2.08	-	17%
Tier 2: 5001-15000 gal	\$2.60	25%	49%
Tier 3: 15001-26000 gal	\$3.90	50%	23%
Tier 4: > 26000 gal	\$5.85	50%	11%

Table 2: Proposed Seasonal Block Rate

Bearing in mind that the vast majority of water revenues come from the base rate, this provides an opportunity to tinker with the increasing block rate structure without having too much of an impact on the budget. Moreover, an increase in rates is unlikely to have an impact on the budget and therefore rates should have the primary objective to encourage conservation. If there is a desire to have monthly bills more influenced by the volumetric portion (tiers), then perhaps the base rate price could be reduced and tiered rates increased. Such a strategy could further incentivize conservation. Finally, a portion of revenue collected from the tiered rates can then go toward funding water conservation efforts such as education.

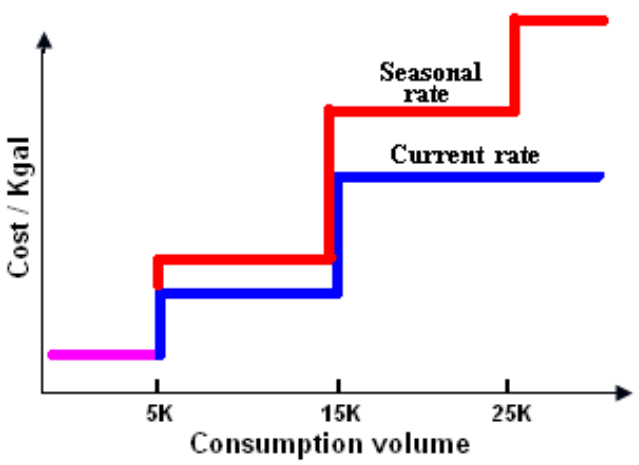


Figure 6: A seasonal increasing block rate structure would have the same basic structure as the City's current rate structure but with a fourth tier added along with an increase in cost among tiers.

A table of monthly water bill amounts is provided in the table below. The table compares bill amounts along with the bill increase percentage between Veneta's current increasing block rate structure and the proposed season block rate structure. In addition, the table displays the expected reduction in water use in response to the increase in tiered rates based upon the fact that elasticity studies have shown an average reduction in water use of 1 to 3 percent for every 10 percent increase in the average monthly water bill (*Principles of Water Rates, Fees, and Charges (M1 Manual), American Water Works Association, 2000*).

Monthly usage (gal)	(Current rate) Monthly Bill Amount	(Seasonal rate) Monthly Bill Amount	Difference	Expected reduction in water use
8,000	$ 27.35	$ 27.74	+ 1.43%	
14,000	$ 42.17	$ 43.34	+ 2.77%	
16,000	$ 47.61	$ 49.84	+ 4.68%	~0.5 - 1.5%
25,000	$ 74.34	$ 84.94	+ 14.26%	~1.5 - 4.5%
32,000	$ 95.13	$ 123.94	+ 30.29%	~3 - 9%

Table 3: Monthly bill comparison between current rate structure and proposed seasonal rate

As can be seen in Table 3 on the previous page, for the average peak season user (14-15 Kgal/month), the monthly bill increase is modest. However, the top consumers' (the City's target audience) monthly bill increases 15-30%, an amount more commensurate with their impact on the system.

♦ *<u>Recommendation:</u> Because water demand is primarily an issue only during peak season, it is recommended that the City implement a seasonal block rate structure.*

Water Bill Information
Currently, the City's water bills do not contain information about the current water rate structure. It should be transparent that customers are being charged higher rates for higher use. If customers are aware of how the rate structure works, they may be more inclined to be mindful of their consumption.

Combining efforts such as implementing a seasonal rate during peak season and making rate charges transparent to customers should result in reduced consumption, especially during peak season when conservation is needed the most.

♦ *<u>Recommendation:</u> It is recommended that water rate information be presented on monthly bills as a way to encourage conservation efforts.*

PILOT PROJECTS

Smart Controllers
An innovative and potentially promising irrigation tool is the Smart Controller (pictured in Figure 7) – also referred to as evapotranspiration (ET) controllers, weather-based irrigation controllers, smart sprinkler controllers, and smart irrigation controllers. This innovative irrigation controller utilizes weather conditions, current and historic ET, solar radiation, soil moisture levels, and other relevant factors to adapt water applications to meet that actual needs of plants. By implementing Smart Controller irrigation technology, research studies over the past eight years have measured statistically significant water savings and runoff reduction (*American Water Works Association Journal, 2010*). The Smart Controller is most effective among high water users. In context to the water conservation goals of Veneta, the Smart Controller appears to be a very attractive conservation tool. This is because the average Veneta resident's water usage more than doubles during peak season. Furthermore, residential users consuming over 30,000 gallons a month (peak) represent only 6% of users, but account for almost 20% of residential consumption during peak months (*City of Veneta's Water Rate Report, 2008*).

Figure 7: Smart controllers are an innovative and effective irrigation tool that utilizes weather conditions to meet the actual needs of plants.

In the first year of the City's water conservation program, it is recommended that the City purchase four Smart Controllers for use on public facilities. The City will lead by example for the first year of the program. Assuming that the Smart Controllers show a savings in water usage among the four public facilities, the program's second year would involve City staff paying visits to the top 1% residential water users. "Utilities seeking cost-effective demand reductions should focus their efforts on identifying sites that stand the best chance of reducing demands through installation of a smart controller"

> As of 2008, the City of Portland was operating Smart Irrigation Controllers at 8 sites in Portland. During the first two summers of the pilot project, participants decreased their irrigation use by an average of 22 percentage points. Portland's summertime climate is very similar to that of Veneta. –*City of Portland Water Conservation Program*

(*American Water Works Association Journal, 2010*). Staff would perform audits of these residents' irrigation systems. After completing an audit, if it is concluded that there is potential for water savings, then the City can provide a free Smart Controller and install it free of charge. For those with installed Smart Controllers, water savings are expected to be significant. If water savings materialize, the program's third year would involve providing rebates for Smart Controllers to medium-to-high end water users.

♦ *Recommendation: In the first year of the City's water conservation program, it is recommended that the City purchase four Smart Controllers for use on public facilities.*

Xeriscaping City Hall

As a way for the City to lead by example, it is recommended that the City Xeriscape a portion of City Hall's lawn as a way to demonstrate and promote water-efficient landscaping in an effort to reduce water consumption during the irrigation season. The designated plot would be located on City Hall's southwestern portion of lawn (refer to Figure 8). The plot has an approximate dimension size of 750 square feet. Essentially the lawn would be completely removed and replaced with a mix of native plants that are water-efficient and a groundcover of mulch. Financial savings would accompany a reduction in City Hall's water consumption. The location would provide exposure to the public, ultimately leading to public awareness. The site may include signage educating readers about the purpose and principles of Xeriscaping. Additional signage may include names of local nursery plant donors. This project would demonstrate the City's role in leading by example in promoting water-efficient landscaping.

Figure 8: The polygon outlines the proposed area of City Hall's lawn to be Xeriscaped.

♦ *Recommendation: It is recommended that the City Xeriscape a portion of City Hall's lawn as a way to demonstrate and promote water-efficient landscaping in an effort to reduce water consumption.*

MEDIA AND EDUCATION

Mailing contacts

According to the 2008 Veneta Water Rate Report, residential users consuming over 30,000 gallons a month (peak) represent only 6% of users, but account for almost 20% of residential consumption during peak months. This is a very small percentage of users who account for nearly 1/5 of residential consumption during peak months! That said, it is recommended that the City mail proactive letters to the top 5% of consumers annually, advising them of their significantly larger consumptive pattern relative to their user group. Moreover, this letter can provide tips on leak

detection and conservation. This is an inexpensive conservation measure costing the City around $35 for one round of mailing.

♦ *<u>Recommendation:</u> It is recommended that the City mail proactive letters to the top 5% of residential users annually.*

Bill inserts
Bill inserts are another relatively inexpensive conservation measure that is highly recommended. It would cost the City an additional $45 a month to print conservation information the backside of the monthly water bills. It is highly recommended that the bill inserts display the water billing rate structure, making it transparent that customers are charged a higher rate for higher use. Conservation tips should be included on the bill insert as well.

> "Surprisingly, most consumers have almost no knowledge of their water source, supply capacity and/or availability […] The goal of a public education program is to cultivate an awareness of limitations on water resources and to develop a conservation ethic concerning water consumption." *–City of Newport, OR Water Management & Conservation Plan*

Water conservation webpage
It is recommended that on the City's website, a link be available to a water conservation webpage. In addition, the same link would be available on the City's online billing webpage. The water conservation webpage would include content such as conservation tips, water use facts, a water use calculator, information about rebates, the City's pilot project, etc.

City Newsletter
With the City's new newsletter, it is recommended that articles about water conservation be published periodically, and more frequently during peak season.

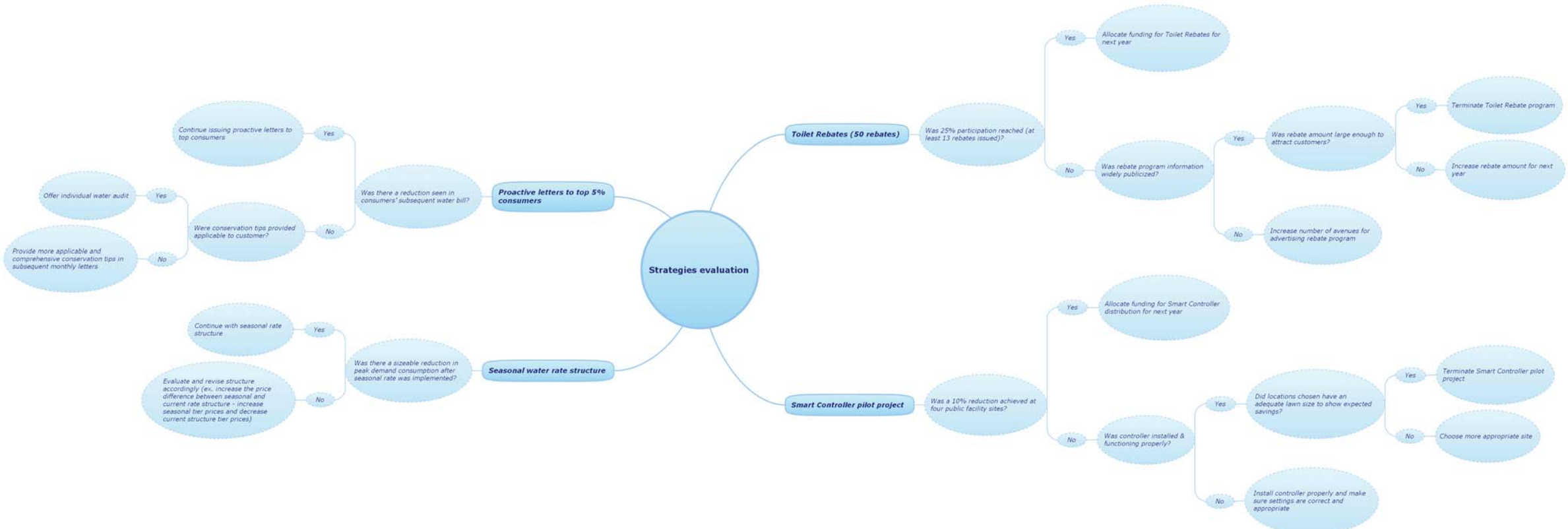
Partnering with the schools
It is recommended that the City partner with the local schools as an effective way for educational outreach. Water conservation education activities such as coloring and calendar contests, classroom presentations, and videos can be very effective in getting the word out about conservation to young residents. After learning about water conservation at school, children come home to share their newly learned knowledge with their parents. Such knowledge shared at home may have an impact on household water use behavior.

SCHEDULE OF IMPLEMENTATION

Year 1 FY 2010-11	**Year 2** FY 2011-12	**Year 3** FY 2012-13	**Year 4** FY 2013-14	**Year 5** FY 2014-15
•**Pilot Project** (planning phase)	•**Pilot Project** (construction phase)	•**Toilet Rebates**	•**Toilet Rebates**	•**Toilet Rebates**
•**Toilet Rebates** (50 rebates)	•**Toilet Rebates**	•**Smart Controller Rebates**	•**Smart Controller Rebates**	•**Smart Controller Rebates**
•**Smart Controllers** (purchase & installation at four public facilities)	•**Smart Controllers** (distributing & installing free controllers to top 1% residential water users)	•**Toilet Leak Detection Tablets** (2x year mailings to residential users)	•**Bill inserts**	•**Bill inserts**
•**Toilet Leak Detection Tablets** (2x year mailings to residential users)	•**Toilet Leak Detection Tablets** (2x year mailings to residential users)	•**Bill inserts**	•**Proactive letters**	•**Proactive letters**
•**Bill inserts**	•**Bill inserts**	•**Proactive letters**	•**Education activities in schools**	•**Education activities in schools**
•**Proactive letters**	•**Proactive letters**	•**Education activities in schools**	•**Lawn watering gauges**	•**Lawn watering gauges**
•**Create water conservation webpage**	•**Partner with schools & provide educational activities**	•**Establish new code that requires all new development to include Smart Irrigation controllers**		
•**Lawn watering gauges**	•**Lawn watering gauges**	•**Lawn watering gauges**		
•**Revise water billing rate structure**				

Conceptual Diagram of Program Evaluation

This is a conceptual diagram of the water conservation program evaluation. The purpose of the evaluation is to measure the success of each measurable conservation strategy. The flow chart helps guide the evaluation of each strategy and ultimately facilitates the action needed to be taken in developing the following year's strategies.



Proposed Water Conservation Program Budget: FY 10-11

$100 Toilet Rebates:	1 toilet per RU 675	(Assumes 100% participation) Total cost to replace 675 toilets $67,500	Cost per year $13,500	**Cost for FY 10-11 (50 rebates)** **$5,000**	**Total annual water savings (gal)** 272,838	**Avoided cost (gal. converted to cost)** $26,500	**# of years to recoup component cost** 0.19
Smart Controllers	Cost per controller $200-$500	4 controllers: public facilities		**Cost for FY 10-11 (4 controllers)** **$2,000**	80,500	$391	5.12
Mailing Contacts		Bill inserts, conservation info, proactive letters (75-80 letters), etc.		**Cost for FY 10-11** **$1,000**		Not quantifiable	
Educational outreach		Distribution of conservation materials to schools: brochures, bookmarks, videos, art contest, etc.		**Cost for FY 10-11** **$1,000**		Not quantifiable	
Promo Items	Mailings 2800	Toilet leak detection tablets $0.20 ea. [conservationmart.com]	Postage $0.44	**Cost for FY 10-11** **$1,800**	73,000	$355	5.07
Pilot Project	construction phase of xeriscaping			**Cost for FY 10-11** **$2,000**	1122	$5.45	367
Staff: RARE intern	$20,000	50% of time devoted to water conservation		**Cost for FY 10-11** **$10,000**		**Grand total avoided cost: $27,251**	

Grand total:
$22,800

Per capita cost: $4.56

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