

**Appendix 5-1 –
Avoided Cost of Supply Technical Memorandum**

Everett Comprehensive Water Plan Technical Memorandum



Date: July 7, 2006

Subject: Avoided Cost Associated with Conserved Water

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Introduction

When water is saved through conservation actions, certain costs associated with the water and wastewater systems are avoided. This can include operational costs such as pumping drinking water and wastewater and capital costs associated with capacity of facilities. Collectively these are termed “avoided costs.” Avoided costs are financial savings that help to offset the cost of conservation actions.

In developing the conservation program for Everett’s 2006 Comprehensive Water Plan (CWP), information was gathered on avoided costs. This technical memorandum summarizes the information gathered and the results of the avoided cost analysis. The results will be used in defining the cost-effectiveness of water conservation measures. Conservation measures whose cost per unit is below the avoided cost will be deemed cost effective.

Results

Table 1 displays the results of the avoided cost analysis. Explanation of the various components shown in Table 1 is provided in the following section of this Technical Memorandum.

The total avoided cost is \$0.35/ccf. This value is appropriate for comparison with conservation actions that yield both water supply and wastewater reductions. This applies to most indoor water conservation actions.

For outdoor water conservation actions, the wastewater avoided costs are not considered. Subtracting all of the wastewater components (operations and capital) and allocating the environmental component only to water supply elements yields an avoided cost of \$0.21/ccf. This value should be used for comparison with outdoor water conservation actions that do not affect wastewater flows.

Table 1. Summary of Avoided Costs from Water Conservation

Item	Description	Relation to Conservation	Avoided Cost (\$/CCF)
<i>Water System Operations</i>			
Regional WFP Chemicals	Treatment process chemicals	Direct	\$0.02
Regional WFP Energy	Energy use at WFP. Less estimate of costs for heating/lighting.	Direct	\$0.01
Local Distr. Pumping	Energy for pumping water in local distribution systems	Direct	\$0.08
Local re-chlorination	Chemical additions to maintain Cl residual in wholesale cust. systems	Unknown	\$0.00
Subtotal			\$0.11
<i>Wastewater System Operations</i>			
Regional WPCF Chemicals	Wastewater treatment process chemicals. Cost based on loading, not volume.	None	\$0.00
Regional WPCF Energy	Energy use at WPCF Less estimate of costs for heating/lighting.	Direct	\$0.05
Local lift station pumping	Energy for pumping wastewater at local lift stations	Direct	\$0.02
Subtotal			\$0.07
<i>Water System Capital Facilities</i>			
WFP Improvements - Everett	Phase II Improvements from 2002 WFP Facilities Plan	Direct	\$0.02
Transmission Pipelines - Everett	Improvements not tied to capacity needs.	None	\$0.00
Local pump stations - Everett	No capacity improvements until after 2025	None	\$0.00
Local storage tanks - Everett	No capacity improvements until after 2025	None	\$0.00
Local water mains - Everett	Main sizing is dictated by fire flow requirements, which conservation does not impact.	None	\$0.00
Local improvements - wholesale	Extrapolation from wholesale customer Water System Plans	Direct	\$0.06
Lake Chaplain Reservoir	None identified. Capacity not constrained.	None	\$0.00
Jackson Project Reservoir	None identified. Capacity not constrained.	None	\$0.00
Subtotal			\$0.08
<i>Wastewater System Capital Facilities</i>			
WPCF Improvements	Capacity driven by stormwater and I/I, not base sewage flows	None	\$0.00
Conveyance line to outfall	Capacity driven by stormwater and I/I, not base sewage flows	None	\$0.00
Local collection pipes - Everett	N. End capacity driven by stormwater. S. end projects not needed until 2020s.	Minimal	\$0.01
Local lift stations - Everett	N. End capacity driven by stormwater. S. end projects not needed until 2020s.	Minimal	\$0.005
Collection pipes - other systems	Extrapolation from figure for Everett wastewater service area	Partial	\$0.03
Lift stations - other systems	Extrapolation from figure for Everett wastewater service area	Partial	\$0.02
Subtotal			\$0.07
<i>Environmental Benefits</i>			
Estimated Avoided Cost Factor	Assumption: 10% of all other avoided costs	Direct	\$0.03
Subtotal			\$0.03
Total Avoided Cost			\$0.35

Avoided Cost Components

The major categories of avoided cost are operations costs and capital costs. These two categories can occur on both the water supply side and the wastewater side, wherever a reduction in water use yields cost savings for the utility system.

Avoided Costs of Operations

For the water supply system, the following operational costs were considered:

- Chemical use at the Water Filtration Plant (WFP)
- Energy use at the WFP (not including heating/lighting, assumed to be 10 percent of costs)
- Energy use for local pump stations throughout Everett Water Service Area (EWSA).

For the wastewater system, operational costs that were considered included:

- Chemical use at the Water Pollution Control Facility (WPCF). Based on City staff input, this was deemed to be negligible because chemical use is based on pollutant loading, rather than water volume. Since drinking water has minimal loading, reduced flows of drinking water down customer drains does not reduce chemical needs at the WPCF.
- Energy use at the WPCF (not including heating/lighting, assumed to be 10 percent of costs), extrapolated to regional cost based on proportion of EWSA population served by Everett's WPCF.
- Energy for pumping wastewater at local lift stations.

Data on each of these operational costs was provided by Everett staff.

Avoided Costs of Capital Projects

Capital costs considered in relation to the water supply system were:

- **Capacity-related improvements at the WFP at Lake Chaplain.** These costs are identified as "Phase 2" costs in the 2002 Water Filtration Plant Facilities Plan.
- **Improvements to the transmission lines from Lake Chaplain to the drinking water service area.** Improvements identified at this stage of the water system plan process are not tied to capacity needs. Therefore, these costs are not considered further.
- **Pump stations and storage facilities in Everett.** Analysis for the CWP Capital Improvement Program (CIP) indicates that Everett's storage capacity and pump station capacity for its retail service area are adequate to meet needs through the end of the 20-year planning period. Since there is no opportunity in this time frame to postpone or avoid costs of these facilities, these costs are not considered further.
- **Local water mains in Everett.** Sizing and scheduling of water distribution mains are based on requirements for both fire flow and peak hour demands. When fire flow is the

main factor, conservation does not offer opportunities to defer or reduce costs. Some savings may be achievable when peak hour demand is the main factor. At the time this memorandum was prepared, data from the hydraulic modeling task was not available to permit identification of these cases. Therefore, the avoided cost does not include these projects.

- **Local pump stations, storage, facilities and transmission mains outside Everett's retail service area.** CIPs from water system plans prepared by seven of Everett's largest wholesale customers were reviewed. Costs for transmission lines, pump stations and reservoirs were extracted. Where CIP tables clearly indicated costs were due to factors other than capacity limitations, these costs were excluded. Based on these seven systems, costs were extrapolated to represent all wholesale systems served by Everett.
- **Source reservoirs.** No capacity-related improvements were identified with respect to Lake Chaplain or Spada Lake. Therefore, no avoided cost is included for these facilities.

Capital costs considered in relation to wastewater are listed below. Everett's wastewater system serves approximately 30 percent of the regional population that is served by the water system. Therefore, avoided costs estimated for Everett's water system were extrapolated to yield avoided cost on the wastewater side for the entire water service area.

- **Everett WPCF.** No capacity related improvements were identified. Everett staff involved in wastewater system planning reported that capacity needs are driven by large flows associated with stormwater and infiltration/inflow. Actual wastewater generated by the community is a small percentage of total flow, so a reduction of wastewater by 5 to 15 percent would have minimal impact on capacity improvements.
- **Conveyance Line from Everett WPCF to outfall.** Same conditions as for WPCF.
- **Everett wastewater collection pipes.** Everett staff reported that the North End system receives stormwater, leading to similar conditions as for the WPCF. The South End has separated piping, so that wastewater flows have a greater impact on capacity needs. However, most piping projects for the South End are not needed until after 2020. These projects were not analyzed in detail. To reflect a small component for these projects, a value of \$0.01/ccf was used in the avoided cost analysis.
- **Everett lift stations.** Same conditions as Everett collection pipes. To reflect a small component for these projects, a value of \$0.005/ccf was assumed.
- **Other communities' wastewater collection pipes.** This value was extrapolated from the Everett value based on the percentage of the regional water service population that is also served by Everett's wastewater system.
- **Other communities' lift stations.** This was also extrapolated from the Everett value based on the percentage of the regional water service area population served by Everett's wastewater system.

Avoided Costs Associated with Environmental Benefits

The avoided cost of capital projects and operations and maintenance discussed above relate solely to costs saved by the water and wastewater utilities and their ratepayers in the region. There are additional environmental benefits associated with reduced need for raw water from the Sultan River system. This analysis did not attempt to develop a detailed breakdown of environmental benefits and their economic value. However, an assumption was made that these benefits have a value of at least ten percent of the avoided costs related to capital projects and operations. Therefore, the avoided cost includes a line item incorporating this assumption.

Calculations

In order to achieve a single measure of avoided cost, operational and capital costs must be expressed in common units and summed. This section describes how operational and capital costs are both calculated in terms of dollars per unit of water saved. Units are dollars per hundred cubic feet (\$/ccf). Data used for these calculations are shown in Attachment A.

Calculation of Avoided Costs from Operations

The expression of operational costs in terms of dollars per unit of water saved is relatively simple. The operational costs listed earlier are generally linear, in that a reduction in the volume of water produced yields a corresponding reduction in cost. Total costs were estimated on an annual basis based on data available from 2005. The total quantity of water produced in the same year was obtained from Everett's water system records. Annual cost was divided by annual production, yielding a cost in dollars per ccf. Since the cost function for these operational components is approximately linear, each unit of water saved through conservation will yield the same value in cost savings.

For local operational costs, such as energy costs associated with local pump stations, it was assumed that the avoided cost for the Everett system was the same as the avoided cost for wholesale customer systems. This assumption is realistic, given that energy costs, terrain, and other factors that could affect the operational costs considered are similar throughout the regional water service area.

Calculation of Avoided Cost from Capital Projects

The following procedure was followed to convert capital costs into avoided costs in order to compare them with the costs of conservation actions. Data on upcoming capital projects, including the cost and the construction year, were gathered from CIPs. The cost estimates were prepared in various years from 2002 to 2006. All project costs were updated to reflect 2006 dollars using the construction cost index from the publication *Engineering News Record*.

Specific analysis of the capacity needs at Everett's WFP showed that reducing demand by 5 percent would allow projects to be deferred by approximately one year. Reducing demand by 10 percent would allow deferral by three years. Reducing demand by 15 percent would allow deferral by five years. These findings were assumed to be similar for all other capital projects, both in Everett and the wholesale customer service areas.

The present value was calculated for each project cost based on the construction year scheduled. A discount rate of 4 percent was used. Effects of inflation are not included in this discount rate, since project costs were expressed in 2006 dollars. Present values were then recalculated under scenarios where all projects were deferred by either one year, three years, or five years. The difference between the present value as originally scheduled and the present value of deferred projects was considered to be the cost savings attributable to the conservation program.

The quantity of water saved is needed to calculate unit costs in dollars per ccf. The quantity of water saved was calculated to be either five, ten, or fifteen percent of total peak season potable water demand in all years from 2006 to 2025. In each year, peak season demand was assumed to be 50 percent of annual demand. Peak season demands were used because the unit cost of conservation actions is also expressed as a peak season unit cost.

Additional capital cost savings could be achieved if capital facilities are either downsized or completely eliminated due to reduced demand for water. Based on review of available CIPs and discussion with Everett staff, no opportunities for downsizing or avoidance were identified. These opportunities could exist for specific capital projects but are not included in the avoided costs shown here.

Attachment A

Table A-1. Calculation of Operational Avoided Costs

Water Supply System	Regional Service Area		Direct Service Area	
	2005	2005 \$/CCF	2005	2005 \$/CCF
Annual Production (in MGD)	50.9	N/A	9.02	N/A
Annual Production (CCF)	24,834,247	N/A	4,401,345	N/A
Annual Chemical Costs (\$27/MG)	\$501,620	\$0.02	\$88,901	\$0.02
Annual Energy Costs--Plant (\$)	\$252,180	\$0.01	\$44,694	\$0.01
Annual Pumping Costs	\$1,892,186	\$0.08	\$335,350	\$0.08
Waste Water System				
Annual Production (in MGD)	57.4	N/A	16.8	N/A
Annual Production (CCF)	27,990,227	N/A	8,196,765	N/A
Annual Chemical Costs (\$)	\$117,161	\$0.00	\$34,310	\$0.00
Annual Energy Costs--Plant (\$)	\$1,359,172	\$0.05	\$398,025	\$0.05
Annual Energy Costs--Pumping (Lift Stations)	\$524,921	\$0.02	\$153,720	\$0.02

Table A-2. Present Value Calculations - Capital Projects, Wholesale Customer Water Supply Projects (\$000s)

Project	Year	Deferred 1 year	Deferred 3 years	Deferred 5 years	Orig. Cost Estimate	Cost 2006 \$s	Present Value (PV)	PV if deferred 1 yr.	PV if deferred 3 yrs.	PV if deferred 5 yrs	Savings for 1 yr. deferral	Savings 3 yr. deferral	Savings 5 yr. deferral
Pump Station	2009	2010	2012	2014	2,100	2,100	1,867	1,795	1,660	1,534	72	207	332
Transmission Main	2011	2012	2014	2016	900	900	740	711	658	608	28	82	132
Transmission Main	2015	2016	2018	2020	400	461	324	312	288	266	12	36	58
Transmission Main	2015	2016	2018	2020	400	461	324	312	288	266	12	36	58
Transmission Main	2015	2016	2018	2020	100	115	81	78	72	67	3	9	14
Reservoir	2010	2011	2013	2015	3,400	3,804	3,251	3,126	2,891	2,672	125	361	579
Transmission Main	2008	2009	2011	2013	800	824	762	733	677	626	29	85	136
Reservoir	2009	2010	2012	2014	1,600	1,648	1,465	1,409	1,303	1,204	56	163	261
Reservoir	2018	2019	2021	2023	2,300	2,369	1,480	1,423	1,316	1,216	57	164	264
Pump Station	2010	2011	2013	2015	100	112	96	92	85	79	4	11	17
Reservoir	2013	2014	2016	2018	3,800	4,251	3,231	3,106	2,872	2,655	124	359	575
Reservoir	2009	2010	2012	2014	2,300	2,573	2,288	2,200	2,034	1,880	88	254	407
Total PV of local plans							15,908	15,296	14,142	13,075	612	1,766	2,833
Savings Extrapolated to All Wholesale Customers											Savings for 1 yr. deferral	Savings 3 yr. deferral	Savings 5 yr. deferral
											857	2,472	3,966
<p>Systems Reviewed: CIPs from seven utilities representing 72% of Everett's wholesale water demand in 2011. (Alderwood 2002, Mukilteo 2006, Monroe 2005, Lynnwood 2005, Marysville 2002, Edmonds 2002, Snohomish PUD 2002) (Dates represent year of original project estimates, based on the respective CIP Tables) Projects counted: Reservoirs, transmission mains and pump stations (excluding projects that were clearly rehabilitation and not capacity-related) Interest Rate: 4.0% ENR CCI (Seattle) for 2006: 8,455 Current Year 2006 Wholesale Demand/Seven Systems Demand: 1.4</p>													

Table A-3. Present Value Calculations - Capital Projects at Everett Water Filter Plant (\$000s)

Project	Year	Deferred 1 year	Deferred 3 years	Deferred 5 years	Orig. Cost Estimate	Cost 2006 \$s	Present Value (PV)	PV if deferred 1 yr.	PV if deferred 3 yrs.	PV if deferred 5 yrs	Savings for 1 yr. deferral	Savings 3 yr. deferral	Savings 5 yr. deferral
WFP Phase II ⁽¹⁾	2016	2017	2019	2021	7,000	7,831	5,291	5,087	4,703	4,348	203	587	942
⁽¹⁾ Phase 2 represents capacity-driven improvements from 2002 WFP Facilities Plan.													

Table A-4. Cost Adjustment Factors for Capital Projects

ENR CCI (Seattle)		Inflation Multiplier
Jun-00	7,150.92	1.18
Jun-01	7,329.03	1.15
Jun-02	7,557.73	1.12
Jun-03	7,645.56	1.11
Jun-04	7,993.50	1.06
Jun-05	8,208.45	1.03
Jun-06	8,455.31	1.00

Table A-5. Conversion to Peak Season Avoided Cost in \$/ccf

A. Wholesale Customer Local Costs	B. Water Filtration Plant
1 year deferral with 5% water savings.	1 year deferral with 5% water savings.
water savings (ccf) 17,635,309	water savings (ccf) 17,635,309
Cost Savings (\$) \$856,599	Cost Savings (\$) \$203,484
Avoided cost (\$/ccf) \$0.05	Avoided cost (\$/ccf) \$0.01
3 year deferral with 10% water savings	3 year deferral with 10% water savings
water savings (ccf) 35,270,618	water savings (ccf) 35,270,618
Cost Savings (\$) \$2,472,225	Cost Savings (\$) \$587,273
Avoided cost (\$/ccf) \$0.07	Avoided cost (\$/ccf) \$0.02
5 year deferral with 15% water savings	5 year deferral with 15% water savings
water savings (ccf) 52,905,927	water savings (ccf) 52,905,927
Cost Savings (\$) \$3,965,962	Cost Savings (\$) \$942,108
Avoided cost (\$/ccf) \$0.07	Avoided cost (\$/ccf) \$0.02
1/4 is attributable to WFP projects: round to \$0.02	
3/4 is attributable to local projects: round to \$0.03	

Table A-6. Water Quantity for Avoided Cost Calculations

Year	Retail & Wholesale ADD w/Tulalip Stream Augm. (ADD in mgd)	Tulalip Stream Aug.	Retail & Wholesale Demand w/o Tulalip Stream Augm.	Conversion to Annual gallons	Conversion to annual CCF
2006	58.2	0.0	58.2	21,233,435,135	28,383,151
2007	59.5	0.0	59.5	21,717,345,818	29,030,004
2008	60.8	0.0	60.8	22,203,175,977	29,679,423
2009	62.2	0.0	62.2	22,690,367,985	30,330,662
2010	63.4	0.0	63.4	23,154,327,774	30,950,846
2011	64.8	2.0	62.8	22,936,720,293	30,659,966
2012	68.4	2.0	66.4	24,222,810,945	32,379,108
2013	69.8	2.0	67.8	24,733,253,000	33,061,426
2014	71.2	2.0	69.2	25,243,445,747	33,743,411
2015	72.6	2.0	70.6	25,754,120,580	34,426,040
2016	76.6	3.6	73.0	26,654,618,969	35,629,754
2017	79.7	5.2	74.5	27,179,193,977	36,330,964
2018	82.7	6.8	75.9	27,704,591,944	37,033,274
2019	86.3	8.4	77.9	28,443,890,658	38,021,509
2020	89.4	10.0	79.4	28,976,014,757	38,732,809
2021	91.0	10.0	81.0	29,561,763,394	39,515,791
2022	93.4	10.0	83.4	30,435,789,081	40,684,119
2023	95.0	10.0	85.0	31,029,310,685	41,477,491
2024	96.6	10.0	86.6	31,624,493,416	42,273,083
2025	98.3	10.0	88.3	32,220,313,725	43,069,528
Total 20-year demand					705,412,356
Peak season 20-yr. demand (ccf) (assumes 1/2 of all demand occurs in peak season)					352,706,178

**Appendix 5-2 –
Conservation Measures Analysis
Technical Memorandum**

Everett Comprehensive Water Plan

Technical Memorandum



Date: A complete Technical Memorandum was originally provided on June 16, 2006. Appendices A and B were updated on August 23, 2006. The main body of this Technical Memorandum was not updated at that time.

Subject: Conservation Measures Cost Effectiveness

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1.0 Introduction

The purpose of this Technical Memorandum is to provide results of the measure cost effectiveness analysis performed for the Water Conservation Chapter of Everett's Comprehensive Water Plan (CWP) update. The analysis was performed using a spreadsheet model developed previously by HDR. This technical memorandum also explains the model's methodology. The activity presented in this Technical Memorandum was performed under Task 6.0 of the CWP process.

Appendix A contains printouts from the model which show the results in terms of water savings, costs, and cost effectiveness. This information is provided for both the six year and 20 year planning periods. Appendix B provides detailed definitions for each measure analyzed by the model, including the assumptions behind the primary savings calculation.

The methodology for determining water savings and costs is generally the same for all conservation measures. The basic method is to compile community demographic and fixture information; apply assumptions for customer participation rates for each conservation measure; calculate the savings achieved by shifting to more efficient hardware or behavior; and calculate the costs for those shifts.

This process is performed in the model's four main worksheets: 1) Demographics and Fixture Assumptions; 2) Participation; 3) Savings; and 4) Costs. Each of these worksheets is described in detail in subsequent sections of this technical memorandum and the results are summarized in the next section.

There are three main sources for the information provided in this memo: 1) demographic data developed under Task 5 of the CWP process; 2) review of Everett's current conservation programs; and 3) estimates based on professional knowledge of national and regional information on conservation measures.

Acronyms used in this memo include the following:

- ccf Hundred cubic feet
- gpm Gallons per minute
- gpf Gallons per flush
- gpl Gallons per load (laundry)
- HH Households
- ICI Industrial, commercial, and institutional
- MF Multifamily
- SF Single family

2.0 Summary Results

Table 1 presents a summary of the analysis of conservation measures, including participants, savings, and direct costs for the six year planning period ending in 2011. The remainder of this technical memorandum explains the methodology used to generate these numbers. Table 2 presents the same summary information for the 20 year planning period ending in 2025.

Table 1 – Measure Analysis Summary Results (6 Year Planning Period)

		Participants		Savings		Direct Costs	
		W/ Free Riders (affects cost)	W/o Free Riders (affects savings)	Peak Season GPD at Full Implementation (w/o free riders)	CCF Over Measure Life (w/o free riders)	Total Cost Over Plan Period	Cost per CCF Saved During Peak Season Over Measure Life (w/o savings free riders)
Conservation Measure							
Single Family	Toilets - 1.6 gpf ultra low flow toilets (ULFT)	13,619	6,810	221,334	377,964	\$2,349,278	\$18.60
	Toilets - 1.0 gpf high efficiency toilets (HET)	14,519	14,519	235,208	2,868,963	\$3,339,370	\$3.48
	Toilets - leak detection	36,297	36,297	289,481	988,670	\$105,988	\$0.32
	Showerheads - 2.0 gpm	58,632	58,632	171,559	1,255,560	\$351,792	\$0.84
	Faucet aerators bathroom - 1.0 gpm	65,970	65,970	316,656	2,317,460	\$164,925	\$0.21
	Faucet aerators kitchen - 2.2 gpm	0	0	0	0	\$0	N/A
	Hot Water - on demand recirculating systems	2,904	2,904	29,040	212,530	\$435,600	\$6.13
	Clotheswashers - residential capacity (in unit)	25,215	22,694	331,332	2,101,554	\$2,521,500	\$3.59
	Outdoor Irrigation Kits	24,739	24,739	235,605	268,956	\$321,607	\$1.20
Multifamily	Toilets - 1.6 gpf ultra low flow toilets (ULFT)	7,106	5,330	154,570	263,953	\$959,310	\$10.87
	Toilets - 1.0 gpf high efficiency toilets (HET)	8,159	8,159	118,317	1,443,176	\$1,468,620	\$3.04
	Toilets - leak detection	20,398	20,398	145,343	496,392	\$9,247	\$0.06
	Showerheads - 2.0 gpm	39,355	39,355	147,581	1,080,079	\$177,098	\$0.49
	Faucet aerators bathroom - 1.0 gpm	37,339	37,339	190,429	1,393,662	\$56,009	\$0.12
	Faucet aerators kitchen - 2.2 gpm	6,414	3,207	15,156	7,395	\$6,414	\$2.59
	Clotheswashers - residential capacity (in unit)	4,292	3,863	50,219	318,526	\$429,200	\$4.03
	Clotheswashers - residential capacity (in common area)	4,292	3,863	50,219	318,526	\$85,840	\$0.81
	Outdoor Irrigation Kits	778	778	14,908	17,018	\$10,114	\$0.59
Commercial	Toilets - 1.6 gpf ultra low flow toilets (ULFT)	1,012	759	208,347	355,785	\$607,200	\$5.11
	Toilets - 1.0 gpf high efficiency toilets (HET)	108	108	17,496	213,409	\$86,400	\$1.21
	Toilets - leak detection	252	252	12,928	44,152	\$4,876	\$0.33
	Urinals - 1.0 gpf	623	467	37,827	46,140	\$140,175	\$9.09
	Urinals - 0.5 gpf	1,084	1,084	29,268	285,599	\$243,900	\$2.55
	Faucet aerators bathroom - 0.5 gpm	584	438	63,565	31,014	\$2,336	\$0.23
	Clotheswashers - commercial capacity (in laundromat)	5	5	6,720	42,623	\$15,000	\$1.05

Indoor Audit	259	259	61,767	301,363	\$77,700	\$0.77
Outdoor Audit	271	271	19,098	31,146	\$135,500	\$4.35
Irrigation Systems - school audits only	11	11	4,971	8,107	\$8,250	\$1.02
Irrigation Systems - school audits and financial assist.	28	28	31,072	50,672	\$66,500	\$1.31

Table 2 – Measure Analysis Summary Results (20 Year Planning Period)

		Participants		Savings		Direct Costs	
		W/ Free Riders (affects cost)	W/o Free Riders (affects savings)	Peak Season GPD at Full Implementation (w/o free riders)	CCF Over Measure Life (w/o free riders)	Total Cost Over Plan Period	Cost per CCF Saved During Peak Season Over Measure Life (w/o savings free riders)
Conservation Measure							
Single Family	Toilets - 1.6 gpf ultra low flow toilets (ULFT)	13,619	6,810	221,334	377,964	\$2,349,278	\$18.60
	Toilets - 1.0 gpf high efficiency toilets (HET)	19,885	19,885	312,222	3,808,346	\$4,573,550	\$3.59
	Toilets - leak detection	49,713	49,713	396,478	3,514,154	\$218,121	\$0.19
	Showerheads - 2.0 gpm	89,232	89,232	281,081	3,103,401	\$807,708	\$0.78
	Faucet aerators bathroom - 1.0 gpm	92,802	92,802	466,425	5,344,769	\$363,262	\$0.20
	Faucet aerators kitchen - 2.2 gpm	0	0	0	0	\$0	N/A
	Hot Water - on demand recirculating systems	3,977	3,977	39,770	468,167	\$959,550	\$6.13
	Clotheswashers - residential capacity (in unit)	37,289	33,560	489,976	5,281,215	\$6,336,643	\$3.59
	Outdoor Irrigation Kits	34,801	34,801	291,855	903,188	\$1,226,447	\$1.36
Multifamily	Toilets - 1.6 gpf ultra low flow toilets (ULFT)	7,106	5,330	154,570	263,953	\$959,310	\$10.87
	Toilets - 1.0 gpf high efficiency toilets (HET)	10,768	10,768	150,752	1,838,808	\$1,938,240	\$3.15
	Toilets - leak detection	26,920	26,920	191,814	1,727,248	\$17,491	\$0.03
	Showerheads - 2.0 gpm	52,749	52,749	189,896	2,289,831	\$391,101	\$0.51
	Faucet aerators bathroom - 1.0 gpm	50,384	50,384	256,958	3,041,945	\$122,250	\$0.12
	Faucet aerators kitchen - 2.2 gpm	6,414	3,207	15,156	7,395	\$6,414	\$2.59
	Clotheswashers - residential capacity (in unit)	6,493	5,844	75,972	812,064	\$1,094,221	\$4.03
	Clotheswashers - residential capacity (in common area)	6,493	5,844	75,972	812,064	\$218,844	\$0.81
	Outdoor Irrigation Kits	1,050	1,050	19,365	58,686	\$36,238	\$0.62
Commercial	Toilets - 1.6 gpf ultra low flow toilets (ULFT)	1,012	759	208,347	355,785	\$607,200	\$5.11
	Toilets - 1.0 gpf high efficiency toilets (HET)	141	141	22,208	270,880	\$112,800	\$1.25
	Toilets - leak detection	273	273	14,005	137,975	\$11,648	\$0.25
	Urinals - 1.0 gpf	623	467	37,827	46,140	\$140,175	\$9.09
	Urinals - 0.5 gpf	1,409	1,409	38,043	371,226	\$317,025	\$2.55
	Faucet aerators bathroom - 0.5 gpm	584	438	63,565	31,014	\$2,336	\$0.23
	Clotheswashers - commercial capacity (in laundromat)	7	6	8,064	94,380	\$38,750	\$1.23
	Indoor Audit	299	299	81,027	723,547	\$148,940	\$0.62

Outdoor Audit	352	352	25,082	74,837	\$292,019	\$3.90
Irrigation Systems - school audits only	11	11	4,971	16,215	\$16,500	\$1.02
Irrigation Systems - school audits and financial assist.	28	28	31,072	101,343	\$133,000	\$1.31

3.0 Demographics & Fixture Assumptions Worksheet

The Demographics and Fixtures Assumptions worksheet, which is part of Appendix A, includes demographic data and fixture assumptions that are used in the Participation worksheet to calculate the number of customers anticipated to participate in each conservation measure.

Demographic data is a key element of the analysis. The main demographic categories used in the analysis were single family households, multifamily households, and employment. Sources for this data include demographic data from Task 5 of the CWP process and from the U.S. Census. Demographic inputs are shown in Table 3. This represents the entire retail and wholesale water service area, incorporating current and future wholesale customers.

Table 3 - Demographic Inputs for Retail and Wholesale Service Area

Category	2006	2011	2025
Single-family Households	132,500	145,189	198,853
Multifamily Households	69,132	81,590	107,680
Employment	221,495	243,804	316,956

Source: Table 10 of Technical Memorandum: "Demographic Data for Demand Forecasting, Everett Comprehensive Water System Plan." March 13, 2006.

Fixture-related assumptions include the percent of customers who have certain water-using fixtures (e.g., toilets, urinals, irrigation systems) and the remaining life for code-related fixtures. These inputs are based on professional knowledge.

4.0 Participation Worksheet

The Participation worksheet, which is part of Appendix A, contains participation assumptions and calculates the number of participants for each measure.

If specific data were unavailable, the following guidelines were employed when determining the percentages for the "Not Already Implemented", "Not Implemented Naturally", and "Participation Rate" fields:

- 90% signifies very high
- 75% signifies high
- 50% signifies moderate
- 25% signifies low
- 10% signifies very low

Total household or business participation for each conservation measure was determined by beginning with the number of eligible households or businesses, reducing that to the target households or businesses, and reducing that to the participating number. Additionally, a follow through rate is applied to certain measures. Definitions of these terms are important:

- **Eligible:** Households or businesses that have the appropriate fixture or behavior for the measure. For example, those with a toilet.

- **Target:** Eligible households or businesses that have not already implemented the measure. For example, those households with a toilet that do not already have an efficient 1.6 gpf model.
- **Participating:** Target households or businesses estimated to take the first, and in many cases only, step in implementing the measure during the planning period. For example, those with a toilet that do not already have an efficient 1.6 gpf model, and who are estimated to purchase an efficient 1.6 gpf model due to the conservation program. It should be noted that participation rates can increase or decrease the value of implementing measures. For example, while waterless urinals save more water per flush than low volume urinals, the participation rate for waterless urinals is usually much lower than for low volume urinals, thus making the overall savings for waterless urinals lower than for low volume urinals.
- **Follow Through Rate:** The percent of participating households or businesses that follow through on any associated steps for the measure. For example, a household that installs an efficient showerhead given away by the utility.

The concept of free-ridership reduces the participation number further. Free-riders are customers who implement a measure, even without encouragement from the utility's conservation program. For example, they are households that were planning to replace a toilet anyway, and simply take the utility money because it is available. The important point is that the utility money does not motivate the customer to implement the measure. Therefore, the utility is spending money on savings that would occur anyway. This is generally considered an unavoidable problem in water conservation programs.

The analysis incorporates the concept of free-ridership, since this results in the true cost effectiveness of conservation. Incorporating the concept means excluding the savings from free-riders, while including their costs. However, participation and savings numbers including free-riders are also provided because they can be useful for other purposes such as demand forecasting, budgeting, and comparing with other utilities that do not incorporate free-ridership.

A similar issue is plumbing code savings. Certain conservation measures may duplicate water savings that would occur eventually due to the plumbing code. While investing in "code-related" measures spends money on actions that will occur eventually without that expenditure, it has the positive effect of accelerating savings. For example, the utility could wait until the customer naturally replaces a showerhead, or it can accelerate the savings by offering free, efficient showerheads.

The following measures bring hardware up to code:

- Toilets - 1.6 gpf ultra low flow toilets ULFT (for SF, MF, and ICI)
- Urinals - 1.0 gpf (for ICI)
- Faucet aerators bathroom - 0.5 gpm (for ICI)
- Faucet aerators kitchen - 2.2 gpm (for SF and MF)

In the model, measures that bring hardware up to code requirements are handled differently than non-code measures in several ways. First, only existing customers are targeted, because new customers will already have hardware meeting code requirements. Second, savings are counted only for the remaining life of the hardware, which may be shorter than the planning period. This is done to take credit only for the years that a measure accelerates code savings. Third, the measure is implemented only once, even if the measure's life is shorter than the

planning period, because when the hardware expires, only code-meeting replacements are available.

It is important to understand the full interplay between code savings and the model analysis. For code related measures, the plumbing code has the potential to affect existing customers who have not already upgraded to code fixtures. This is represented by Column 7 "Not Already Implemented" on the Participation worksheet. For example, 41 percent of existing single family households do not have 1.6 gpf toilets. That 41 percent can be split into the following five groups:

1. **Do not upgrade to code.** This group has no savings or costs and is therefore not represented in the model.
2. **Upgrade to code due to the conservation program, take rebate/equipment.** These are the "code accelerators" and the model claims both savings and costs.
3. **Upgrade to code due to the conservation program, do not take rebate/equipment (e.g., never turn in rebate form).** This group is not represented in the model. Technically, the utility could claim these savings; however, this number is difficult to estimate and a conservative approach is to assume this number is zero.
4. **Upgrade to code, naturally, take rebate/equipment.** These are the "free-riders" and the model claims the costs, but not the savings. This is appropriate to show the cost effectiveness of the conservation program. However, if the utility wants to know how much savings it can expect, regardless of what can be attributed to the conservation program, the model provides this number as well.
5. **Upgrade to code, naturally, do not take rebate/equipment.** This group is part of the traditional "code savings" and is intentionally excluded from the modeled savings because it is not associated with the conservation program.

Key results from the Participation worksheet are generated as follows (using single-family clotheswashers, from the six year planning period, as an example):

- **Participating Households (25,215 with free riders and 22,694 without free riders):** These numbers are important since they are key factors in calculating water savings and costs. The number of existing target households (89,438) is calculated by starting with the number of existing SF households (132,500) and multiplying it by the eligibility rate (90% since 90% of existing SF households have clotheswashers) and by the percent of existing customers that have not already implemented the measure (75%). Similarly, the number of future target households (11,420) is calculated by starting with the number of new SF households added during the planning period (12,689) and multiplying it by the eligibility rate (100% since 100% of new SF households are anticipated to have clotheswashers) and by the percent of new customers that do not naturally implemented the measure (90%). The number of total target households (100,858) is calculated by adding the existing (89,438) and new (11,420) target households. The number of participating households with free-riders (25,215) is calculated by multiplying the total target households (100,858) by the participation rate (25%). The number of participating households without free riders (22,694) is calculated by reducing the number of participating households with free riders (25,215) by the free-ridership (10%).

5.0 Savings Worksheet

The Savings worksheet, which is part of Appendix A, contains savings assumptions and calculates the total savings.

Water savings were estimated by determining the unit savings of the conservation measure compared with previous hardware or behaviors, and then using participation results to calculate total savings.

Key results from the Savings worksheet are generated as follows (using single-family clotheswashers, from the six year planning period, as an example):

- Savings – Peak Season Gallons Per Day (at full implementation; without free riders) (331,332 gpd):** This calculation is the gallons saved per household per year (5,329) multiplied by the number of participating households without free riders from the participation worksheet (22,694) and divided by 365 days. This measure is not a peaking measure. For peaking measures, such as those related to irrigation, the number would be divided by 122 days instead. It is important to note this number represents savings at full implementation, which occurs at the end of year 6 since it is assumed measures are evenly phased in over six years.

Note that for the 20 year planning period analysis, it is assumed all existing customers as well as new customers from year 2 to year 6 are evenly phased in over the first six years, and the remaining new customers are evenly phased in over years 7 to 20.

- Savings – CCF Over Measure Life (without free riders) (2,101,554 ccf):** This number is important since it is used later when calculating the cost per ccf of saved water. This number is comprised of three components. The first component is for the time period when the measure is being phased in over the first six years of the planning period. Those savings are calculated by evenly accumulating the annual gallons saved per year at full implementation without free riders (120,936,326) over the six years (i.e. 1/6 of the savings the first year + 2/6 of the savings the second year, etc). The second component is for the time period when the measure is fully phased in. This will be at least until the end of the planning period, however it may extend further due to the measure lifespan and the assumption that customers and the utility re-opt until the end of the planning period. The third component is for the time period when the equipment installed in years 2-6 of the planning period are phased out. Those savings are the same as the first part, minus one full year of implementation. The three savings components are summed (1,572,172,238) and then converted to ccf by dividing by 748.1.

Note that there are two methods for calculating the savings over the measure life, depending on the measure characteristics. The example above is used for non-code related measures. The other method is used when the measure brings a fixture up to code and therefore only claims savings for the code-accelerating time period. In those cases, the formula phases in the gallons per year at full implementation evenly through the average lifetime remaining for the pre-code fixtures.

6.0 Costs Worksheet

The Costs worksheet, which is part of Appendix A, contains cost assumptions and calculates total costs.

Costs are estimated by determining the unit cost of each conservation measure, and then using demographic and participation data to calculate costs of implementation.

It should be noted that only direct costs are included in this analysis. This includes rebates, costs of hardware, and labor cost for audits. Indirect costs such as utility staff time, marketing, and distribution are not included in this analysis since they depend on how a conservation program is designed. Both direct and indirect costs are ultimately borne by customers through rates. Some measures require additional costs to be borne directly by customers. All measures where the utility pays a rebate implies the customer will pay the remaining cost of the fixture and any installation costs. For example, single family clotheswashers involve a \$100 rebate paid by the utility, but that cost does not include the remaining cost of the clotheswasher and any installation costs paid by the customer.

Key results from the Costs worksheet are generated as follows (using single-family clotheswashers, from the six year planning period, as an example):

- **Total Cost over Plan Period (\$2,521,500):** This number is important since it is the amount of money the utility will have to spend in order to achieve the savings from the measure. It is derived by starting with the number of participating single family households with free riders (25,215 – note using the number with free riders is necessary since the costs for these customers must be budgeted) and multiplying by the cost per clotheswasher (\$100) and by the number of clotheswashers per SF household (1.0) and by the number of times the measure must be implemented over the planning period (1.0) in order to retain savings.
- **Cost per CCF Saved During Peak Season Over Measure Life (\$3.59):** This number is important since it is used to compare measure cost-effectiveness between measures and against the utility's avoided cost of supply. It is derived by starting with the total cost over the plan period (\$2,521,500) and dividing it by the result of the following: the CCF saved over the measure life without free riders (2,101,554) divided by the peaking factor, which is the number of days the measure is in effect (365) divided by the number of days in the peak season (122)..

7.0 Next Steps

After the City of Everett reviews these results, HDR will work with Everett staff to determine which measures are most appropriate to include in the City's conservation program. That determination will reflect the goals of the conservation program, which is a subtask led by Everett staff, and the avoided cost of supply analysis, currently underway by HDR.

Appendix A

Modeling Analysis

City of Everett - Comprehensive Water Plan - Conservation Measures Analysis Demographics & Fixture Assumptions - 6 Yr Planning Period

Demographics						
1	2	3		4		5
#	Parameter	First Plan Yr	Last Plan Yr	Change Between First & Last Plan Yr		
1	Year	2006	2011	6		
2	Single Family Households (SF HH)	132,500	145,189	12,689		
3	Multifamily (MF) Accounts	11,522	13,598	2,076		
4	HHs per MF account	6	6	0		
5	Multifamily Households (MF HH)	69,132	81,590	12,458		
6	Industrial, Commercial, Institutional (ICI) Acct	4,922	5,418	496		
7	Persons Per SF HH	2.8	2.8	0		
8	Persons Per MF HH	2.5	2.5	0		
9	Employees Per ICI Account	45	45	0		
10	Employees	221,495	243,804	22,309		
Footnotes:						
a. Provided by client.						
b. HDR March 14, 2006 demographics technical memorandum, Table 10.						
c. Used 2006 Everett retail ratio of 18,395 MF HH (from HDR March 14, 2006 demographics technical memorandum, Table 10) divided by 3,090 MF accounts (from HDR March 16, 2006 demand technical memorandum, Table 1).						
d. Applied "HHs per MF account" ratio to MF HHs.						
e. 2000 U.S. Census data for area approximating Everett's retail and wholesale service area.						
f. Used 2006 Everett retail ratio of 90,995 employees (from HDR March 14, 2006 demographics technical memorandum, Table 10) divided by 2,003 ICI accounts (from HDR March 16, 2006 demand technical memorandum, Table 1).						
g. Applied "employees per ICI account" ratio to employees.						
h. Calculation.						
i. Calculation.						

Shaded cells contain data and assumptions entered specifically for client.

Fixture Assumptions							
6	7	8	9	10	11	12	13
Percent of HH/Businesses With The Following Fixtures:	Eligible SF HH		Eligible MF HH		Eligible ICI Acct.		Avg Life Remaining for Code Fixtures ^k
	Existing	New	Existing	New	Existing	New	
Toilet - Tank Style	100%	100%	100%	100%	20%	20%	6
Toilet - Flushometer Style	0%	0%	0%	0%	80%	80%	6
Toilet - Tank Style w/ Leaks	25%	12%	25%	12%	10%	5%	N/A
Urinal	0%	0%	0%	0%	80%	80%	4
Showerhead	100%	100%	100%	100%	N/A	N/A	1
Faucet - Bathroom	100%	100%	100%	100%	100%	100%	1
Faucet - Kitchen	100%	100%	100%	100%	N/A	N/A	1
Clotheswasher - Residential capacity (in unit)	90%	100%	25%	45%	N/A	N/A	N/A
Clotheswasher - Residential capacity (in common area)	N/A	N/A	25%	45%	N/A	N/A	N/A
Clotheswasher - Commercial capacity (at laundromat)	N/A	N/A	N/A	N/A	0.5%	0.5%	N/A
School Irrigation Systems	N/A	N/A	N/A	N/A	2.5%	0%	N/A
Long Wait Times for Hot Water	20%	20%	N/A	N/A	N/A	N/A	N/A
Manual Irrigation	75%	75%	25%	25%	N/A	N/A	N/A
Irrigate Facility	N/A	N/A	N/A	N/A	50%	50%	N/A
Facility Not Fully Efficient	N/A	N/A	N/A	N/A	50%	50%	N/A
Sources for data in the table include estimates based on professional knowledge, client input, and sources as indicated below:							
j. Calculation. Opposite of the percent of customers with tank style toilets.							
k. Based on fixture lifespan and time elapsed since code went into effect.							
l. For MF, these are the households that have a clotheswasher in their unit.							
m. For MF, these are the households that access a clotheswasher in a common laundry area.							
n. Estimated based on number of schools in Everett school district and population in Everett compared to population in wholesale areas.							

**City of Everett - Comprehensive Water Plan - Conservation Measures Analysis
Participation - 6 Yr Planning Period**

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
Conservation Measure	Target Audience	Existing (E) or New (N) Customers ^a	Free Riders ^b	Participation											
				Existing SF/MF/ICI			New SF/MF/ICI			Total SF/MF/ICI					
				Eligible ^c	Not Already Implemented ^d	Target ^e	Eligible ^e	Not Implemented Naturally ^d	Target ^e	Target ^h	Participation Rate ^d	Participating		Follow Through Rate	
												W/ free riders ⁱ (affects cost)	W/out free riders ^j (affects savings)		
Single Family	Toilets - 1.6 gpf ultra low flow toilets (ULFT)	SF HH pre-code models	E	50%	100%	41%	54,475	100%	0%	0	54,475	25%	13,619	6,810	n/a
	Toilets - 1.0 gpf high efficiency toilets (HET)	SF HH all models	EN	0%	100%	100%	132,500	100%	100%	12,689	145,189	10%	14,519	14,519	n/a
	Toilets - leak detection ^k	SF HH all models	EN	0%	100%	100%	132,500	100%	100%	12,689	145,189	25%	36,297	36,297	n/a
	Showerheads - 2.0 gpm	SF HH > 2.0 gpm	EN	0%	100%	79%	104,574	100%	100%	12,689	117,263	50%	58,632	58,632	75%
	Faucet aerators bathroom - 1.0 gpm	SF HH all models	EN	0%	100%	90%	119,250	100%	100%	12,689	131,939	50%	65,970	65,970	75%
	Faucet aerators kitchen - 2.2 gpm	SF HH pre-code models	E	50%	100%	0%	0	100%	0%	0	0	75%	0	0	75%
	Hot Water - on demand recirculating systems	SF HH with long wait times	EN	0%	20%	100%	26,500	20%	100%	2,538	29,038	10%	2,904	2,904	n/a
	Clotheswashers - residential capacity (in unit)	SF HH less efficient models	EN	10%	90%	75%	89,438	100%	90%	11,420	100,858	25%	25,215	22,694	n/a
	Outdoor Irrigation Kits	SF HH w/ manual irrigation	EN	0%	75%	90%	89,438	75%	100%	9,517	98,955	25%	24,739	24,739	75%
Multifamily	Toilets - 1.6 gpf ultra low flow toilets (ULFT)	MF HH pre-code models	E	25%	100%	41%	28,423	100%	0%	0	28,423	25%	7,106	5,330	n/a
	Toilets - 1.0 gpf high efficiency toilets (HET)	MF HH all models	EN	0%	100%	100%	69,132	100%	100%	12,458	81,590	10%	8,159	8,159	n/a
	Toilets - leak detection ^k	MF HH all models	EN	0%	100%	100%	69,132	100%	100%	12,458	81,590	25%	20,398	20,398	n/a
	Showerheads - 2.0 gpm	MF HH all models	EN	0%	100%	96%	66,251	100%	100%	12,458	78,709	50%	39,355	39,355	75%
	Faucet aerators bathroom - 1.0 gpm	MF HH all models	EN	0%	100%	90%	62,219	100%	100%	12,458	74,677	50%	37,339	37,339	75%
	Faucet aerators kitchen - 2.2 gpm	MF HH pre-code models	E	50%	100%	12%	8,552	100%	0%	0	8,552	75%	6,414	3,207	75%
	Clotheswashers - residential capacity (in unit)	MF HH using in unit	EN	10%	25%	75%	12,962	45%	75%	4,205	17,167	25%	4,292	3,863	n/a
	Clotheswashers - residential capacity (in common area)	MF HH using in common area	EN	10%	25%	75%	12,962	45%	75%	4,205	17,167	25%	4,292	3,863	n/a
	Outdoor Irrigation Kits	MF accounts w/ manual irrigation	EN	0%	25%	90%	2,592	25%	100%	519	3,111	25%	778	778	75%
Commercial	Toilets - 1.6 gpf ultra low flow toilets (ULFT)	ICI accts pre-code models	E	25%	100%	41%	2,024	100%	0%	0	2,024	50%	1,012	759	n/a
	Toilets - 1.0 gpf high efficiency toilets (HET)	ICI accts tank models	EN	0%	20%	100%	984	20%	100%	99	1,083	10%	108	108	n/a
	Toilets - leak detection ^k	ICI accts tank models	EN	0%	20%	100%	984	5%	100%	25	1,009	25%	252	252	n/a
	Urinals - 1.0 gpf	ICI accts pre-code models	E	25%	80%	32%	1,245	80%	0%	0	1,245	50%	623	467	n/a
	Urinals - 0.5 gpf	ICI accts all models	EN	0%	80%	100%	3,938	80%	100%	397	4,335	25%	1,084	1,084	n/a
	Faucet aerators bathroom - 0.5 gpm	ICI accts pre-code models	E	25%	100%	16%	778	100%	0%	0	778	75%	584	438	75%
	Clotheswashers - commercial capacity (in laundromat)	ICI accts less efficient models	EN	10%	0.5%	75%	18	0.5%	75%	2	20	25%	5	5	n/a
	Indoor Audit	ICI accts not fully efficient	EN	0%	100%	50%	2,461	100%	25%	124	2,585	10%	259	259	n/a
	Outdoor Audit	ICI accts that irrigate	EN	0%	50%	100%	2,461	50%	100%	248	2,709	10%	271	271	n/a
	Irrigation Systems - school audits only	ICI school accounts	E	0%	2.5%	90%	111	0%	100%	0	111	10%	11	11	n/a
	Irrigation Systems - school audits and financial assist.	ICI school accounts	E	0%	2.5%	90%	111	0%	100%	0	111	25%	28	28	50%

Key definitions:
 Eligible: HH/businesses that have the appropriate fixture/behavior for the measure (e.g., have a shower, clotheswasher, or irrigation system).
 Target: Eligible hh/businesses that have not already implemented the measure (e.g., do not already have efficient models).
 Participating: Target hh/businesses that take the first, and in many cases only, step in implementing the measure (e.g., take a free efficient showerhead, purchase an efficient clotheswasher, accept an irrigation audit).
 Follow Through: Participating hh/business that follow through on any associated steps for the measure (e.g., install the showerhead or implement the majority of audit recommendations).

Footnotes:
 a. Whether the measure affects existing or new customers.
 b. Customers who will implement the measure even without the conservation program. Therefore, the utility spends money that does not gain them additional water savings. Source is estimates based on professional knowledge.
 c. Linked to Demographic & Fixtures worksheet.
 d. Estimates based on professional knowledge.
 e. Calculation.
 f. Estimates based on professional knowledge. Note that for measures targeting only pre-code models, this number represents the percent not already at code and is based on natural replacement rates.
 g.-j. Calculations.
 k. See measure definitions for explanation of how this measure has unique treatments for participation, savings and costs related to fact that only a portion of toilets leak, but measure must be marketed to all toilets.

**City of Everett - Comprehensive Water Plan - Conservation Measures Analysis
Savings - 6 Yr Planning Period**

1	2	3	4	5	6	7	8	9	10	10	12	13	14	15	16	17	18	19	20	21	
Conservation Measure		Savings																			
		gal. per capita or employee per day ^a	gal. per hh or business per day ^b	gal. per hh or business per year ^c	Gallons Per Year (at full implementation)		Season	Days in Effect	Annual GPD (at full implementation)		Peak Season GPD (at full implementation)		Gallons Over Plan Period		CCF Over Plan Period		Gallons Over Measure Life		CCF Over Measure Life		
					w/ free riders ^d	w/o free riders ^e			w/ free riders ^f	w/o free riders ^g	w/ free riders ^h	w/o free riders ⁱ	w/ free riders ^j	w/o free riders ^k	w/ free riders ^l	w/o free riders ^m	w/ free riders ⁿ	w/o free riders ^o			
Single Family	Toilets - 1.6 gpf ultra low flow toilets (ULFT) ^f	11.6	32.5	11,863	161,562,197	80,787,030	Full Yr	365	442,636	221,334	442,636	221,334	565,467,690	282,754,605	755,872	377,964	565,467,690	282,754,605	755,872	377,964	
	Toilets - 1.0 gpf high efficiency toilets (HET)	5.8	16.2	5,913	85,850,847	85,850,847	Full Yr	365	235,208	235,208	235,208	235,208	300,477,965	300,477,965	401,655	401,655	2,146,271,175	2,146,271,175	2,868,963	2,868,963	
	Toilets - leak detection ^p	11.4	31.9	11,644	105,660,567	105,660,567	Full Yr	365	289,481	289,481	289,481	289,481	369,811,985	369,811,985	494,335	494,335	739,623,969	739,623,969	988,670	988,670	
	Showerheads - 2.0 gpm	1.4	3.9	1,424	62,618,976	62,618,976	Full Yr	365	171,559	171,559	171,559	171,559	219,166,416	219,166,416	292,964	292,964	939,284,640	939,284,640	1,255,560	1,255,560	
	Faucet aerators bathroom - 1.0 gpm	2.3	6.4	2,336	115,579,440	115,579,440	Full Yr	365	316,656	316,656	316,656	316,656	404,528,040	404,528,040	540,741	540,741	1,733,691,600	1,733,691,600	2,317,460	2,317,460	
	Faucet aerators kitchen - 2.2 gpm	2.5	7.0	2,555	0	0	Full Yr	365	0	0	0	0	0	0	0	0	0	0	0	0	0
	Hot Water - on demand recirculating systems	n/a	10.0	3,650	10,599,600	10,599,600	Full Yr	365	29,040	29,040	29,040	29,040	37,098,600	37,098,600	49,590	49,590	158,994,000	158,994,000	212,530	212,530	
Clotheswashers - residential capacity (in unit)	5.2	14.6	5,329	134,370,735	120,936,326	Full Yr	365	368,139	331,332	368,139	331,332	470,297,573	423,277,141	628,656	565,803	1,746,819,555	1,572,172,238	2,335,008	2,101,554		
Outdoor Irrigation Kits	n/a	n/a	n/a	57,487,500	57,487,500	Peak	122	157,500	157,500	471,209	471,209	201,206,250	201,206,250	268,956	268,956	402,412,500	402,412,500	537,913	537,913		
Multifamily	Toilets - 1.6 gpf ultra low flow toilets (ULFT)	11.6	29.0	10,585	75,217,010	56,418,050	Full Yr	365	206,074	154,570	206,074	154,570	263,259,535	197,463,175	351,904	263,953	263,259,535	197,463,175	351,904	263,953	
	Toilets - 1.0 gpf high efficiency toilets (HET)	5.8	14.5	5,293	43,185,587	43,185,587	Full Yr	365	118,317	118,317	118,317	118,317	151,149,555	151,149,555	202,045	202,045	1,079,639,675	1,079,639,675	1,443,176	1,443,176	
	Toilets - leak detection ^p	11.4	28.5	10,403	53,050,099	53,050,099	Full Yr	365	145,343	145,343	145,343	145,343	185,675,345	185,675,345	248,196	248,196	371,350,690	371,350,690	496,392	496,392	
	Showerheads - 2.0 gpm	2.0	5.0	1,825	53,867,156	53,867,156	Full Yr	365	147,581	147,581	147,581	147,581	188,535,047	188,535,047	252,019	252,019	808,007,344	808,007,344	1,080,079	1,080,079	
	Faucet aerators bathroom - 1.0 gpm	2.7	6.8	2,482	69,506,549	69,506,549	Full Yr	365	190,429	190,429	190,429	190,429	243,272,920	243,272,920	325,188	325,188	1,042,598,228	1,042,598,228	1,393,662	1,393,662	
	Faucet aerators kitchen - 2.2 gpm	2.5	6.3	2,300	11,064,150	5,532,075	Full Yr	365	30,313	15,156	30,313	15,156	11,064,150	5,532,075	14,790	7,395	11,064,150	5,532,075	14,790	7,395	
	Clotheswashers - residential capacity (in unit)	5.2	13.0	4,745	20,365,540	18,329,935	Full Yr	365	55,796	50,219	55,796	50,219	71,279,390	64,154,773	95,281	85,757	264,752,020	238,289,155	353,899	318,526	
Clotheswashers - residential capacity (in common area)	5.2	13.0	4,745	20,365,540	18,329,935	Full Yr	365	55,796	50,219	55,796	50,219	71,279,390	64,154,773	95,281	85,757	264,752,020	238,289,155	353,899	318,526		
Outdoor Irrigation Kits	n/a	n/a	n/a	3,637,500	3,637,500	Peak	122	9,966	9,966	29,816	29,816	12,731,250	12,731,250	17,018	17,018	25,462,500	25,462,500	34,036	34,036		
Commercial	Toilets - 1.6 gpf ultra low flow toilets (ULFT)	6.1	274.5	100,193	101,395,316	76,046,487	Full Yr	365	277,795	208,347	277,795	208,347	354,883,606	266,162,705	474,380	355,785	354,883,606	266,162,705	474,380	355,785	
	Toilets - 1.0 gpf high efficiency toilets (HET)	3.6	162.0	59,130	6,386,040	6,386,040	Full Yr	365	17,496	17,496	17,496	17,496	22,351,140	22,351,140	29,877	29,877	159,651,000	159,651,000	213,409	213,409	
	Toilets - leak detection ^p	11.4	513.0	187,245	4,718,574	4,718,574	Full Yr	365	12,928	12,928	12,928	12,928	16,515,009	16,515,009	22,076	22,076	33,030,018	33,030,018	44,152	44,152	
	Urinals - 1.0 gpf	1.8	81.0	29,565	18,418,995	13,806,855	Full Yr	365	50,463	37,827	50,463	37,827	46,047,488	34,517,138	61,553	46,140	46,047,488	34,517,138	61,553	46,140	
	Urinals - 0.5 gpf	0.6	27.0	9,855	10,682,820	10,682,820	Full Yr	365	29,268	29,268	29,268	29,268	37,389,870	37,389,870	49,980	49,980	213,656,400	213,656,400	285,599	285,599	
	Faucet aerators bathroom - 0.5 gpm	4.3	193.5	70,628	30,935,064	23,201,298	Full Yr	365	84,754	63,565	84,754	63,565	30,935,064	23,201,298	41,352	31,014	30,935,064	23,201,298	41,352	31,014	
	Clotheswashers - commercial capacity (in laundromat)	n/a	1344.0	490,560	2,452,800	2,452,800	Full Yr	365	6,720	6,720	6,720	6,720	8,584,800	8,584,800	11,475	11,475	31,886,400	31,886,400	42,623	42,623	
	Indoor Audit	n/a	n/a	n/a	33,817,500	33,817,500	Full Yr	365	92,651	92,651	92,651	92,651	118,361,250	118,361,250	158,216	158,216	338,175,000	338,175,000	452,045	452,045	
	Outdoor Audit	n/a	n/a	n/a	4,660,000	4,660,000	Peak	122	12,767	12,767	38,197	38,197	16,310,000	16,310,000	21,802	21,802	46,600,000	46,600,000	62,291	62,291	
	Irrigation Systems - school audits only	n/a	n/a	n/a	1,213,036	1,213,036	Peak	122	3,323	3,323	9,943	9,943	4,245,625	4,245,625	5,675	5,675	12,130,358	12,130,358	16,215	16,215	
Irrigation Systems - school audits and financial assist	n/a	n/a	n/a	4,548,884	4,548,884	Peak	122	12,463	12,463	37,286	37,286	15,921,095	15,921,095	21,282	21,282	45,488,843	45,488,843	60,806	60,806		

Footnotes:
a. Sources are estimates based on professional knowledge, including the Handbook of Water Use and Conservation by Amy Vickers. Calculations used by modelers are provided in a more user friendly format elsewhere as part of the measure definitions.
b.-o. Calculations.
p. See measure definitions for explanation of how this measure has unique treatments for participation, savings and costs related to fact that only a portion of toilets leak, but measure must be marketed all toilets.
q. 1.6 gpf ULFT toilets save more "gallons per capita or employee per day" compared to 1.0 gpf HET toilets since ULFT target only pre-code (very inefficient) toilets.
r. 1.0 gpf urinals save more "gallons per capita or employee per day" compared to 0.5 gpf urinals since 1.0 models target only pre-code (very inefficient) urinals.

**City of Everett - Comprehensive Water Plan - Conservation Measures Analysis
Direct Costs^a - 6 Yr Planning Period**

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	
Direct Costs																
Conservation Measure	Cost Per Fixture ^b	Measure Per Participating HH or Business ^b	Cost Per HH or Business ^c	Lifespan ^b	Weighted Avg Times Implemented in Planning Period ^d	Total Cost Over Plan Period ^e	Cost per CCF Saved During Entire Year Over Plan Period		Cost per CCF Saved During Entire Year Over Measure Life		Cost per CCF Saved During Peak Season Over Plan Period		Cost per CCF Saved During Peak Season Over Measure Life			
							w/ savings free riders ^f	w/o savings free riders ^g	w/ savings free riders ^h	w/o savings free riders ⁱ	w savings free riders ^j	w/o savings free riders ^j	w savings free riders ^j	w/o savings free riders ^j		
Single Family	Toilets - 1.6 gpf ultra low flow toilets (ULFT)	\$75.00	2.3	\$172.50	25	1.0	\$2,349,278	\$3.11	\$6.22	\$3.11	\$6.22	\$9.30	\$18.60	\$9.30	\$18.60	
	Toilets - 1.0 gpf high efficiency toilets (HET)	\$100.00	2.3	\$230.00	25	1.0	\$3,339,370	\$8.31	\$8.31	\$1.16	\$1.16	\$24.87	\$24.87	\$3.48	\$3.48	
	Toilets - leak detection ^l	\$0.10	2.3	\$0.23	7.5	1.0	\$105,988	\$0.21	\$0.21	\$0.11	\$0.11	\$0.64	\$0.64	\$0.32	\$0.32	
	Showerheads - 2.0 gpm	\$3.00	2.0	\$6.00	15	1.0	\$351,792	\$1.20	\$1.20	\$0.28	\$0.28	\$3.59	\$3.59	\$0.84	\$0.84	
	Faucet aerators bathroom - 1.0 gpm	\$1.00	2.5	\$2.50	15	1.0	\$164,925	\$0.30	\$0.30	\$0.07	\$0.07	\$0.91	\$0.91	\$0.21	\$0.21	
	Faucet aerators kitchen - 2.2 gpm	\$1.00	1.0	\$1.00	15	1.0	\$0	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
	Hot Water - on demand recirculating systems	\$150.00	1.0	\$150.00	15	1.0	\$435,600	\$8.78	\$8.78	\$2.05	\$2.05	\$26.28	\$26.28	\$6.13	\$6.13	
	Clotheswashers - residential capacity (in unit)	\$100.00	1.0	\$100.00	13	1.0	\$2,521,500	\$4.01	\$4.46	\$1.08	\$1.20	\$12.00	\$13.33	\$3.23	\$3.59	
	Outdoor Irrigation Kits	\$13.00	1.0	\$13.00	7	1.0	\$321,607	\$1.20	\$1.20	\$0.60	\$0.60	\$1.20	\$1.20	\$0.60	\$0.60	
Multifamily	Toilets - 1.6 gpf ultra low flow toilets (ULFT)	\$75.00	1.8	\$135.00	25	1.0	\$959,310	\$2.73	\$3.63	\$2.73	\$3.63	\$8.16	\$10.87	\$8.16	\$10.87	
	Toilets - 1.0 gpf high efficiency toilets (HET)	\$100.00	1.8	\$180.00	25	1.0	\$1,468,620	\$7.27	\$7.27	\$1.02	\$1.02	\$21.75	\$21.75	\$3.04	\$3.04	
	Toilets - leak detection ^l	\$0.10	1.8	\$0.18	7.5	1.0	\$9,247	\$0.04	\$0.04	\$0.02	\$0.02	\$0.11	\$0.11	\$0.06	\$0.06	
	Showerheads - 2.0 gpm	\$3.00	1.5	\$4.50	15	1.0	\$177,098	\$0.70	\$0.70	\$0.16	\$0.16	\$2.10	\$2.10	\$0.49	\$0.49	
	Faucet aerators bathroom - 1.0 gpm	\$1.00	1.5	\$1.50	15	1.0	\$56,009	\$0.17	\$0.17	\$0.04	\$0.04	\$0.52	\$0.52	\$0.12	\$0.12	
	Faucet aerators kitchen - 2.2 gpm	\$1.00	1.0	\$1.00	15	1.0	\$6,414	\$0.43	\$0.87	\$0.43	\$0.87	\$1.30	\$2.59	\$1.30	\$2.59	
	Clotheswashers - residential capacity (in unit)	\$100.00	1.0	\$100.00	13	1.0	\$429,200	\$4.50	\$5.00	\$1.21	\$1.35	\$13.48	\$14.97	\$3.63	\$4.03	
	Clotheswashers - residential capacity (in common area)	\$100.00	0.2	\$20.00	13	1.0	\$85,840	\$0.90	\$1.00	\$0.24	\$0.27	\$2.70	\$2.99	\$0.73	\$0.81	
	Outdoor Irrigation Kits	\$13.00	1.0	\$13.00	7	1.0	\$10,114	\$0.59	\$0.59	\$0.30	\$0.30	\$0.59	\$0.59	\$0.30	\$0.30	
Commercial	Toilets - 1.6 gpf ultra low flow toilets (ULFT)	\$150.00	4.0	\$600.00	25	1.0	\$607,200	\$1.28	\$1.71	\$1.28	\$1.71	\$3.83	\$5.11	\$3.83	\$5.11	
	Toilets - 1.0 gpf high efficiency toilets (HET)	\$200.00	4.0	\$800.00	25	1.0	\$86,400	\$2.89	\$2.89	\$0.40	\$0.40	\$8.65	\$8.65	\$1.21	\$1.21	
	Toilets - leak detection ^l	\$0.10	4.0	\$0.40	7.5	1.0	\$4,876	\$0.22	\$0.22	\$0.11	\$0.11	\$0.66	\$0.66	\$0.33	\$0.33	
	Urinals - 1.0 gpf	\$150.00	1.5	\$225.00	20	1.0	\$140,175	\$2.28	\$3.04	\$2.28	\$3.04	\$6.81	\$9.09	\$6.81	\$9.09	
	Urinals - 0.5 gpf	\$150.00	1.5	\$225.00	20	1.0	\$243,900	\$4.88	\$4.88	\$0.85	\$0.85	\$14.60	\$14.60	\$2.55	\$2.55	
	Faucet aerators bathroom - 0.5 gpm	\$1.00	4.0	\$4.00	15	1.0	\$2,336	\$0.06	\$0.08	\$0.06	\$0.08	\$0.17	\$0.23	\$0.17	\$0.23	
	Clotheswashers - commercial capacity (in laundromat)	\$250.00	12.0	\$3,000.00	13	1.0	\$15,000	\$1.31	\$1.31	\$0.35	\$0.35	\$3.91	\$3.91	\$1.05	\$1.05	
	Indoor Audit	\$300.00	1.0	\$300.00	10	1.0	\$77,700	\$0.49	\$0.49	\$0.17	\$0.17	\$1.47	\$1.47	\$0.51	\$0.51	
	Outdoor Audit	\$500.00	1.0	\$500.00	10	1.0	\$135,500	\$6.22	\$6.22	\$2.18	\$2.18	\$6.22	\$6.22	\$2.18	\$2.18	
	Irrigation Systems - school audits only	\$750.00	1.0	\$750.00	10	1.0	\$8,250	\$1.45	\$1.45	\$0.51	\$0.51	\$1.45	\$1.45	\$0.51	\$0.51	
Irrigation Systems - school audits and financial assist	\$4,000.00	1.0	\$4,000.00	10	1.0	\$66,500	\$3.12	\$3.12	\$1.09	\$1.09	\$3.12	\$3.12	\$1.09	\$1.09		

Footnotes:

- a. Direct costs include rebates & hardware, but do not include staff, marketing or distribution
- b. Costs (e.g.rebates) or estimates based on professional knowledge, including the Handbook of Water Use and Conservation by Amy Vickers
- c-i. Calculations.
- j. See measure definitions for explanation of how measure has unique treatment for participation, savings and costs due to fact that only a portion of toilets leak, but measure must be marketed all toilets.

City of Everett - Comprehensive Water Plan - Conservation Measures Analysis Summary - 6 Yr Planning Period

1	2	3	4	5	6	7	8
Conservation Measure	Participants		Savings		Direct Costs		
	W/ Free Riders (affects cost)	W/o Free Riders (affects savings)	Annual GPD at Full Implementation (w/ free riders)	CCF Over Measure Life (w/ free riders)	Total Cost Over Plan Period	Cost per CCF Saved During Entire Year Over Measure Life (w/ savings free riders)	
Single Family	Toilets - 1.6 gpf ultra low flow toilets (ULFT) ^q	13,619	6,810	442,636	755,872	\$2,349,278	\$3.11
	Toilets - 1.0 gpf high efficiency toilets (HET)	14,519	14,519	235,208	2,868,963	\$3,339,370	\$1.16
	Toilets - leak detection ^p	36,297	36,297	289,481	988,670	\$105,988	\$0.11
	Showerheads - 2.0 gpm	58,632	58,632	171,559	1,255,560	\$351,792	\$0.28
	Faucet aerators bathroom - 1.0 gpm	65,970	65,970	316,656	2,317,460	\$164,925	\$0.07
	Faucet aerators kitchen - 2.2 gpm	0	0	0	0	\$0	N/A
	Hot Water - on demand recirculating systems	2,904	2,904	29,040	212,530	\$435,600	\$2.05
	Clotheswashers - residential capacity (in unit)	25,215	22,694	368,139	2,335,008	\$2,521,500	\$1.08
	Outdoor Irrigation Kits	24,739	24,739	157,500	537,913	\$321,607	\$0.60
Multifamily	Toilets - 1.6 gpf ultra low flow toilets (ULFT)	7,106	5,330	206,074	351,904	\$959,310	\$2.73
	Toilets - 1.0 gpf high efficiency toilets (HET)	8,159	8,159	118,317	1,443,176	\$1,468,620	\$1.02
	Toilets - leak detection ^p	20,398	20,398	145,343	496,392	\$9,247	\$0.02
	Showerheads - 2.0 gpm	39,355	39,355	147,581	1,080,079	\$177,098	\$0.16
	Faucet aerators bathroom - 1.0 gpm	37,339	37,339	190,429	1,393,662	\$56,009	\$0.04
	Faucet aerators kitchen - 2.2 gpm	6,414	3,207	30,313	14,790	\$6,414	\$0.43
	Clotheswashers - residential capacity (in unit)	4,292	3,863	55,796	353,899	\$429,200	\$1.21
	Clotheswashers - residential capacity (in common area)	4,292	3,863	55,796	353,899	\$85,840	\$0.24
Outdoor Irrigation Kits	778	778	9,966	34,036	\$10,114	\$0.30	
Commercial	Toilets - 1.6 gpf ultra low flow toilets (ULFT)	1,012	759	277,795	474,380	\$607,200	\$1.28
	Toilets - 1.0 gpf high efficiency toilets (HET)	108	108	17,496	213,409	\$86,400	\$0.40
	Toilets - leak detection ^p	252	252	12,928	44,152	\$4,876	\$0.11
	Urinals - 1.0 gpf ^r	623	467	50,463	61,553	\$140,175	\$2.28
	Urinals - 0.5 gpf	1,084	1,084	29,268	285,599	\$243,900	\$0.85
	Faucet aerators bathroom - 0.5 gpm	584	438	84,754	41,352	\$2,336	\$0.06
	Clotheswashers - commercial capacity (in laundromat)	5	5	6,720	42,623	\$15,000	\$0.35
	Indoor Audit	259	259	92,651	452,045	\$77,700	\$0.17
	Outdoor Audit	271	271	12,767	62,291	\$135,500	\$2.18
	Irrigation Systems - school audits only	11	11	3,323	16,215	\$8,250	\$0.51
Irrigation Systems - school audits and financial assistance	28	28	12,463	60,806	\$66,500	\$1.09	

City of Everett - Comprehensive Water Plan - Conservation Measures Analysis Demographics & Fixture Assumptions - 20 Yr Planning Period

Demographics						
1	2	3	4	5		
#	Parameter	First Plan Yr	Last Plan Yr	Change Between First & Last Plan Yr		
1	Year	2006	2025	20		
2	Single Family Households (SF HH)	132,500	198,853	66,353		
3	Multifamily (MF) Accounts	11,522	17,947	6,425		
4	HHs per MF account	6	6	0		
5	Multifamily Households (MF HH)	69,132	107,680	38,548		
6	Industrial, Commercial, Institutional (ICI) Acc	4,922	7,043	2,121		
7	Persons Per SF HH	2.8	2.8	0		
8	Persons Per MF HH	2.5	2.5	0		
9	Employees Per ICI Account	45	45	0		
10	Employees	221,495	316,956	95,461		
Footnotes:						
a. Provided by client.						
b. HDR March 14, 2006 demographics technical memorandum, Table 10.						
c. Used 2006 Everett retail ratio of 18,395 MF HH (from HDR March 14, 2006 demographics technical memorandum, Table 10) divided by 3,090 MF accounts (from HDR March 16, 2006 demand technical memorandum, Table 1).						
d. Applied "HHs per MF account" ratio to MF HHs.						
e. 2000 U.S. Census data for area approximating Everett's retail and wholesale service area.						
f. Used 2006 Everett retail ratio of 90,995 employees (from HDR March 14, 2006 demographics technical memorandum, Table 10) divided by 2,003 ICI accounts (from HDR March 16, 2006 demand technical memorandum, Table 1).						
g. Applied "employees per ICI account" ratio to employees.						
h. Calculation.						
i. Calculation.						

Shaded cells contain data and assumptions entered specifically for client.

Fixture Assumptions							
6	7	8	9	10	11	12	13
Percent of HH/Businesses With The Following Fixtures:	Eligible SF HH		Eligible MF HH		Eligible ICI Acct.		Avg Life Remaining for Code Fixtures ^k
	Existing	New	Existing	New	Existing	New	
Toilet - Tank Style	100%	100%	100%	100%	20%	20%	6
Toilet - Flushometer Style	0%	0%	0%	0%	80%	80%	6
Toilet - Tank Style w/ Leaks	25%	12%	25%	12%	10%	5%	N/A
Urinal	0%	0%	0%	0%	80%	80%	4
Showerhead	100%	100%	100%	100%	N/A	N/A	1
Faucet - Bathroom	100%	100%	100%	100%	100%	100%	1
Faucet - Kitchen	100%	100%	100%	100%	N/A	N/A	1
Clotheswasher - Residential capacity (in unit)	90%	100%	25%	45%	N/A	N/A	N/A
Clotheswasher - Residential capacity (in common area)	N/A	N/A	25%	45%	N/A	N/A	N/A
Clotheswasher - Commercial capacity (at laundromat)	N/A	N/A	N/A	N/A	0.5%	0.5%	N/A
School Irrigation Systems	N/A	N/A	N/A	N/A	2.5%	0%	N/A
Long Wait Times for Hot Water	20%	20%	N/A	N/A	N/A	N/A	N/A
Manual Irrigation	75%	75%	25%	25%	N/A	N/A	N/A
Irrigate Facility	N/A	N/A	N/A	N/A	50%	50%	N/A
Facility Not Fully Efficient	N/A	N/A	N/A	N/A	50%	50%	N/A
Sources for data in the table include estimates based on professional knowledge, client input, and sources as indicated below:							
j. Calculation. Opposite of the percent of customers with tank style toilets.							
k. Based on fixture lifespan and time elapsed since code went into effect.							
l. For MF, these are the households that have a clotheswasher in their unit.							
m. For MF, these are the households that access a clotheswasher in a common laundry area.							
n. Estimated based on number of schools in Everett school district and population in Everett compared to population in wholesale areas.							

**City of Everett - Comprehensive Water Plan - Conservation Measures Analysis
Participation - 20 Yr Planning Period**

1	2	3	4	5	6	7	8	9	10 Participation						15	16									
									Conservation Measure	Target Audience	Existing (E) or New (N) Customers ^a	Free Riders ^b	Existing SF/MF/ICI				New SF/MF/ICI			Total SF/MF/ICI		Follow Through Rate			
													Eligible ^c	Not Already Implemented ^d			Target ^e	Eligible ^c	Not Implemented Naturally ^d	Target ^e	Target ^h		Participation Rate ^d	Participating	
																								W/ free riders ^j (affects cost)	W/out free riders ^j (affects savings)
Single Family	Toilets - 1.6 gpf ultra low flow toilets (ULFT)	SF HH pre-code models	E	50%	100%	41%	54,475	100%	0%	0	54,475	25%	13,619	6,810	n/a										
	Toilets - 1.0 gpf high efficiency toilets (HET)	SF HH all models	EN	0%	100%	100%	132,500	100%	100%	66,353	198,853	10%	19,885	19,885	n/a										
	Toilets - leak detection ^k	SF HH all models	EN	0%	100%	100%	132,500	100%	100%	66,353	198,853	25%	49,713	49,713	n/a										
	Showerheads - 2.0 gpm	SF HH > 2.0 gpm	EN	0%	100%	85%	112,111	100%	100%	66,353	178,464	50%	89,232	89,232	75%										
	Faucet aerators bathroom - 1.0 gpm	SF HH all models	EN	0%	100%	90%	119,250	100%	100%	66,353	185,603	50%	92,802	92,802	75%										
	Faucet aerators kitchen - 2.2 gpm	SF HH pre-code models	E	50%	100%	0%	0	100%	0%	0	0	75%	0	0	75%										
	Hot Water - on demand recirculating systems	SF HH with long wait times	EN	0%	20%	100%	26,500	20%	100%	13,271	39,771	10%	3,977	3,977	n/a										
	Clotheswashers - residential capacity (in unit)	SF HH less efficient models	EN	10%	90%	75%	89,438	100%	90%	59,718	149,156	25%	37,289	33,560	n/a										
	Outdoor Irrigation Kits	SF HH w/ manual irrigation	EN	0%	75%	90%	89,438	75%	100%	49,765	139,203	25%	34,801	34,801	75%										
Multifamily	Toilets - 1.6 gpf ultra low flow toilets (ULFT)	MF HH pre-code models	E	25%	100%	41%	28,423	100%	0%	0	28,423	25%	7,106	5,330	n/a										
	Toilets - 1.0 gpf high efficiency toilets (HET)	MF HH all models	EN	0%	100%	100%	69,132	100%	100%	38,548	107,680	10%	10,768	10,768	n/a										
	Toilets - leak detection ^k	MF HH all models	EN	0%	100%	100%	69,132	100%	100%	38,548	107,680	25%	26,920	26,920	n/a										
	Showerheads - 2.0 gpm	MF HH all models	EN	0%	100%	97%	66,949	100%	100%	38,548	105,497	50%	52,749	52,749	75%										
	Faucet aerators bathroom - 1.0 gpm	MF HH all models	EN	0%	100%	90%	62,219	100%	100%	38,548	100,767	50%	50,384	50,384	75%										
	Faucet aerators kitchen - 2.2 gpm	MF HH pre-code models	E	50%	100%	12%	8,552	100%	0%	0	8,552	75%	6,414	3,207	75%										
	Clotheswashers - residential capacity (in unit)	MF HH using in unit	EN	10%	25%	75%	12,962	45%	75%	13,010	25,972	25%	6,493	5,844	n/a										
	Clotheswashers - residential capacity (in common area)	MF HH using in common area	EN	10%	25%	75%	12,962	45%	75%	13,010	25,972	25%	6,493	5,844	n/a										
	Outdoor Irrigation Kits	MF accounts w/ manual irrigation	EN	0%	25%	90%	2,592	25%	100%	1,606	4,198	25%	1,050	1,050	75%										
Commercial	Toilets - 1.6 gpf ultra low flow toilets (ULFT)	ICI accts pre-code models	E	25%	100%	41%	2,024	100%	0%	0	2,024	50%	1,012	759	n/a										
	Toilets - 1.0 gpf high efficiency toilets (HET)	ICI accts tank models	EN	0%	20%	100%	984	20%	100%	424	1,408	10%	141	141	n/a										
	Toilets - leak detection ^k	ICI accts tank models	EN	0%	20%	100%	984	5%	100%	106	1,090	25%	273	273	n/a										
	Urinals - 1.0 gpf	ICI accts pre-code models	E	25%	80%	32%	1,245	80%	0%	0	1,245	50%	623	467	n/a										
	Urinals - 0.5 gpf	ICI accts all models	EN	0%	80%	100%	3,938	80%	100%	1,697	5,635	25%	1,409	1,409	n/a										
	Faucet aerators bathroom - 0.5 gpm	ICI accts pre-code models	E	25%	100%	16%	778	100%	0%	0	778	75%	584	438	75%										
	Clotheswashers - commercial capacity (in laundromat)	ICI accts less efficient models	EN	10%	0.5%	75%	18	0.5%	75%	8	26	25%	7	6	n/a										
	Indoor Audit	ICI accts not fully efficient	EN	0%	100%	50%	2,461	100%	25%	530	2,991	10%	299	299	n/a										
	Outdoor Audit	ICI accts that irrigate	EN	0%	50%	100%	2,461	50%	100%	1,061	3,522	10%	352	352	n/a										
	Irrigation Systems - school audits only	ICI school accounts	E	0%	2.5%	90%	111	0%	100%	0	111	10%	11	11	n/a										
	Irrigation Systems - school audits and financial assist.	ICI school accounts	E	0%	2.5%	90%	111	0%	100%	0	111	25%	28	28	50%										

Key definitions:

Eligible: HH/businesses that have the appropriate fixture/behavior for the measure (e.g., have a shower, clotheswasher, or irrigation system).

Target: Eligible hh/businesses that have not already implemented the measure (e.g., do not already have efficient models).

Participating: Target hh/businesses that take the first, and in many cases only, step in implementing the measure (e.g., take a free efficient showerhead, purchase an efficient clotheswasher, accept an irrigation audit).

Follow Through: Participating hh/business that follow through on any associated steps for the measure (e.g., install the showerhead or implement the majority of audit recommendations).

Footnotes:

- a. Whether the measure affects existing or new customers.
- b. Customers who will implement the measure even without the conservation program. Therefore, the utility spends money that does not gain them additional water savings. Source is estimates based on professional knowledge.
- c. Linked to Demographic & Fixtures worksheet.
- d. Estimates based on professional knowledge.
- e. Calculation.
- f. Estimates based on professional knowledge. Note that for measures targeting only pre-code models, this number represents the percent not already at code and is based on natural replacement rates.
- g-j. Calculations.
- k. See measure definitions for explanation of how this measure has unique treatments for participation, savings and costs related to fact that only a portion of toilets leak, but measure must be marketed to all toilets.

**City of Everett - Comprehensive Water Plan - Conservation Measures Analysis
Savings - 20 Yr Planning Period**

1	2	3	4	5	6	7	8	9	10	10	12	13	14	15	16	17	18	19	20	21	
Conservation Measure		Savings																			
		gal. per capita or employee per day ^a	gal. per hh or business per day ^b	gal. per hh or business per year ^c	Gallons Per Year (at full implementation)		Season	Days in Effect	Annual GPD (at full implementation)		Peak Season GPD (at full implementation)		Gallons Over Plan Period		CCF Over Plan Period		Gallons Over Measure Life		CCF Over Measure Life		
					w/ free riders ^d	w/o free riders ^e			w/ free riders ^f	w/o free riders ^g	w/ free riders ^h	w/o free riders ⁱ	w/ free riders ^j	w/o free riders ^k	w/ free riders ^l	w/o free riders ^m	w/ free riders ⁿ	w/o free riders ^o			
Single Family	Toilets - 1.6 gpf ultra low flow toilets (ULFT) ^f	11.6	32.5	11,863	161,562,197	80,787,030	Full Yr	365	442,636	221,334	442,636	221,334	565,467,690	282,754,605	755,872	377,964	565,467,690	282,754,605	755,872	377,964	
	Toilets - 1.0 gpf high efficiency toilets (HET)	5.6	15.7	5,731	113,960,935	113,960,935	Full Yr	365	312,222	312,222	312,222	312,222	1,713,215,483	1,713,215,483	2,290,089	2,290,089	2,849,023,375	2,849,023,375	3,808,346	3,808,346	
	Toilets - leak detection ^p	11.4	31.9	11,644	144,714,543	144,714,543	Full Yr	365	396,478	396,478	396,478	396,478	2,141,964,743	2,141,964,743	2,863,206	2,863,206	2,628,938,655	2,628,938,655	3,514,154	3,514,154	
	Showerheads - 2.0 gpm	1.5	4.2	1,533	102,594,492	102,594,492	Full Yr	365	281,081	281,081	281,081	281,081	1,395,648,450	1,395,648,450	1,865,591	1,865,591	2,321,654,580	2,321,654,580	3,103,401	3,103,401	
	Faucet aerators bathroom - 1.0 gpm	2.4	6.7	2,446	170,245,269	170,245,269	Full Yr	365	466,425	466,425	466,425	466,425	2,432,633,918	2,432,633,918	3,251,750	3,251,750	3,998,422,035	3,998,422,035	5,344,769	5,344,769	
	Faucet aerators kitchen - 2.2 gpm	2.5	7.0	2,555	0	0	Full Yr	365	0	0	0	0	0	0	0	0	0	0	0	0	0
	Hot Water - on demand recirculating systems	n/a	10.0	3,650	14,516,050	14,516,050	Full Yr	365	39,770	39,770	39,770	39,770	214,866,375	214,866,375	287,216	287,216	350,235,750	350,235,750	468,167	468,167	
	Clotheswashers - residential capacity (in unit)	5.2	14.6	5,329	198,713,081	178,841,240	Full Yr	365	544,419	489,976	544,419	489,976	2,834,055,458	2,550,672,560	3,788,338	3,409,534	4,389,836,072	3,950,877,207	5,867,980	5,281,215	
	Outdoor Irrigation Kits	n/a	n/a	n/a	71,212,500	71,212,500	Peak	122	195,103	195,103	583,709	583,709	1,108,968,750	1,108,968,750	1,482,380	1,482,380	1,351,350,000	1,351,350,000	1,806,376	1,806,376	
	Multifamily	Toilets - 1.6 gpf ultra low flow toilets (ULFT)	11.6	29.0	10,585	75,217,010	56,418,050	Full Yr	365	206,074	154,570	206,074	154,570	263,259,535	197,463,175	351,904	263,953	263,259,535	197,463,175	351,904	263,953
Toilets - 1.0 gpf high efficiency toilets (HET)		5.6	14.0	5,110	55,024,480	55,024,480	Full Yr	365	150,752	150,752	150,752	150,752	844,539,470	844,539,470	1,128,913	1,128,913	1,375,612,000	1,375,612,000	1,838,808	1,838,808	
Toilets - leak detection ^p		11.4	28.5	10,403	70,012,190	70,012,190	Full Yr	365	191,814	191,814	191,814	191,814	1,055,592,410	1,055,592,410	1,411,031	1,411,031	1,292,154,029	1,292,154,029	1,727,248	1,727,248	
Showerheads - 2.0 gpm		1.9	4.8	1,752	69,312,186	69,312,186	Full Yr	365	189,896	189,896	189,896	189,896	1,058,512,958	1,058,512,958	1,414,935	1,414,935	1,713,022,243	1,713,022,243	2,289,831	2,289,831	
Faucet aerators bathroom - 1.0 gpm		2.7	6.8	2,482	93,789,816	93,789,816	Full Yr	365	256,958	256,958	256,958	256,958	1,398,489,105	1,398,489,105	1,869,388	1,869,388	2,275,679,096	2,275,679,096	3,041,945	3,041,945	
Faucet aerators kitchen - 2.2 gpm		2.5	6.3	2,300	11,064,150	5,532,075	Full Yr	365	30,313	15,156	30,313	15,156	11,064,150	5,532,075	14,790	7,395	11,064,150	5,532,075	14,790	7,395	
Clotheswashers - residential capacity (in unit)		5.2	13.0	4,745	30,809,285	27,729,780	Full Yr	365	84,409	75,972	84,409	75,972	434,725,038	391,272,700	581,106	523,022	674,970,488	607,504,723	902,246	812,064	
Clotheswashers - residential capacity (in common area)		5.2	13.0	4,745	30,809,285	27,729,780	Full Yr	365	84,409	75,972	84,409	75,972	434,725,038	391,272,700	581,106	523,022	674,970,488	607,504,723	902,246	812,064	
Outdoor Irrigation Kits		n/a	n/a	n/a	4,725,000	4,725,000	Peak	122	12,945	12,945	38,730	38,730	71,812,500	71,812,500	95,993	95,993	87,806,250	87,806,250	117,372	117,372	
Commercial		Toilets - 1.6 gpf ultra low flow toilets (ULFT)	6.1	274.5	100,193	101,395,316	76,046,487	Full Yr	365	277,795	208,347	277,795	208,347	354,883,606	266,162,705	474,380	355,785	354,883,606	266,162,705	474,380	355,785
	Toilets - 1.0 gpf high efficiency toilets (HET)	3.5	157.5	57,488	8,105,808	8,105,808	Full Yr	365	22,208	22,208	22,208	22,208	124,653,960	124,653,960	166,627	166,627	202,645,200	202,645,200	270,880	270,880	
	Toilets - leak detection ^p	11.4	513.0	187,245	5,111,789	5,111,789	Full Yr	365	14,005	14,005	14,005	14,005	85,524,154	85,524,154	114,322	114,322	103,218,806	103,218,806	137,975	137,975	
	Urinals - 1.0 gpf	1.8	81.0	29,565	18,418,995	13,806,855	Full Yr	365	50,463	37,827	50,463	37,827	46,047,488	34,517,138	61,553	46,140	46,047,488	34,517,138	61,553	46,140	
	Urinals - 0.5 gpf	0.6	27.0	9,855	13,885,695	13,885,695	Full Yr	365	38,043	38,043	38,043	38,043	210,970,913	210,970,913	282,009	282,009	277,713,900	277,713,900	371,226	371,226	
	Faucet aerators bathroom - 0.5 gpm	4.3	193.5	70,628	30,935,064	23,201,298	Full Yr	365	84,754	63,565	84,754	63,565	30,935,064	23,201,298	41,352	31,014	30,935,064	23,201,298	41,352	31,014	
	Clotheswashers - commercial capacity (in laundromat)	n/a	1344.0	490,560	3,433,920	2,943,360	Full Yr	365	9,408	8,064	9,408	8,064	46,603,200	46,603,200	62,295	62,295	70,605,600	70,605,600	94,380	94,380	
	Indoor Audit	n/a	n/a	n/a	44,362,500	44,362,500	Full Yr	365	121,541	121,541	121,541	121,541	670,893,750	670,893,750	896,797	896,797	811,928,571	811,928,571	1,085,321	1,085,321	
	Outdoor Audit	n/a	n/a	n/a	6,120,000	6,120,000	Peak	122	16,767	16,767	50,164	50,164	92,500,000	92,500,000	123,647	123,647	111,971,429	111,971,429	149,674	149,674	
	Irrigation Systems - school audits only	n/a	n/a	n/a	1,213,036	1,213,036	Peak	122	3,323	3,323	9,943	9,943	21,228,127	21,228,127	28,376	28,376	24,260,716	24,260,716	32,430	32,430	
Irrigation Systems - school audits and financial assist	n/a	n/a	n/a	4,548,884	4,548,884	Peak	122	12,463	12,463	37,286	37,286	79,605,475	79,605,475	106,410	106,410	90,977,686	90,977,686	121,612	121,612		

Footnotes:
a. Sources are estimates based on professional knowledge, including the Handbook of Water Use and Conservation by Amy Vickers. Calculations used by modelers are provided in a more user friendly format elsewhere as part of the measure definitions.
b.-o. Calculations.
p. See measure definitions for explanation of how this measure has unique treatments for participation, savings and costs related to fact that only a portion of toilets leak, but measure must be marketed all toilets.
q. 1.6 gpf ULFT toilets save more "gallons per capita or employee per day" compared to 1.0 gpf HET toilets since ULFT target only pre-code (very inefficient) toilets.
r. 1.0 gpf urinals save more "gallons per capita or employee per day" compared to 0.5 gpf urinals since 1.0 models target only pre-code (very inefficient) urinals.

City of Everett - Comprehensive Water Plan - Conservation Measures Analysis
Direct Costs^a - 20 Yr Planning Period

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
Direct Costs															
Conservation Measure	Cost Per Fixture ^b	Measure Per Participating HH or Business ^b	Cost Per HH or Business ^c	Lifespan ^b	Weighted Avg Times Implemented in Planning Period ^d	Total Cost Over Plan Period ^e	Cost per CCF Saved During Entire Year Over Plan Period		Cost per CCF Saved During Entire Year Over Measure Life		Cost per CCF Saved During Peak Season Over Plan Period		Cost per CCF Saved During Peak Season Over Measure Life		
							w/ savings free riders ^f	w/o savings free riders ^g	w/ savings free riders ^h	w/o savings free riders ⁱ	w/ savings free riders ⁱ	w/o savings free riders ⁱ	w/ savings free riders ⁱ	w/o savings free riders ⁱ	
Single Family	Toilets - 1.6 gpf ultra low flow toilets (ULFT)	\$75.00	2.3	\$172.50	25	1.0	\$2,349,278	\$3.11	\$6.22	\$3.11	\$6.22	\$9.30	\$18.60	\$9.30	\$18.60
	Toilets - 1.0 gpf high efficiency toilets (HET)	\$100.00	2.3	\$230.00	25	1.0	\$4,573,550	\$2.00	\$2.00	\$1.20	\$1.20	\$5.97	\$5.97	\$3.59	\$3.59
	Toilets - leak detection ^j	\$0.10	2.3	\$0.23	7.5	2.6	\$218,121	\$0.08	\$0.08	\$0.06	\$0.06	\$0.23	\$0.23	\$0.19	\$0.19
	Showerheads - 2.0 gpm	\$3.00	2.0	\$6.00	15	1.5	\$807,708	\$0.43	\$0.43	\$0.26	\$0.26	\$1.30	\$1.30	\$0.78	\$0.78
	Faucet aerators bathroom - 1.0 gpm	\$1.00	2.5	\$2.50	15	1.6	\$363,262	\$0.11	\$0.11	\$0.07	\$0.07	\$0.33	\$0.33	\$0.20	\$0.20
	Faucet aerators kitchen - 2.2 gpm	\$1.00	1.0	\$1.00	15	1.0	\$0	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
	Hot Water - on demand recirculating systems	\$150.00	1.0	\$150.00	15	1.6	\$959,550	\$3.34	\$3.34	\$2.05	\$2.05	\$10.00	\$10.00	\$6.13	\$6.13
	Clotheswashers - residential capacity (in unit)	\$100.00	1.0	\$100.00	13	1.7	\$6,336,643	\$1.67	\$1.86	\$1.08	\$1.20	\$5.00	\$5.56	\$3.23	\$3.59
	Outdoor Irrigation Kits	\$13.00	1.0	\$13.00	7	2.7	\$1,226,447	\$0.83	\$0.83	\$0.68	\$0.68	\$0.83	\$0.83	\$0.68	\$0.68
Multifamily	Toilets - 1.6 gpf ultra low flow toilets (ULFT)	\$75.00	1.8	\$135.00	25	1.0	\$959,310	\$2.73	\$3.63	\$2.73	\$3.63	\$8.16	\$10.87	\$8.16	\$10.87
	Toilets - 1.0 gpf high efficiency toilets (HET)	\$100.00	1.8	\$180.00	25	1.0	\$1,938,240	\$1.72	\$1.72	\$1.05	\$1.05	\$5.14	\$5.14	\$3.15	\$3.15
	Toilets - leak detection ^j	\$0.10	1.8	\$0.18	7.5	2.6	\$17,491	\$0.01	\$0.01	\$0.01	\$0.01	\$0.04	\$0.04	\$0.03	\$0.03
	Showerheads - 2.0 gpm	\$3.00	1.5	\$4.50	15	1.6	\$391,101	\$0.28	\$0.28	\$0.17	\$0.17	\$0.83	\$0.83	\$0.51	\$0.51
	Faucet aerators bathroom - 1.0 gpm	\$1.00	1.5	\$1.50	15	1.6	\$122,250	\$0.07	\$0.07	\$0.04	\$0.04	\$0.20	\$0.20	\$0.12	\$0.12
	Faucet aerators kitchen - 2.2 gpm	\$1.00	1.0	\$1.00	15	1.0	\$6,414	\$0.43	\$0.87	\$0.43	\$0.87	\$1.30	\$2.59	\$1.30	\$2.59
	Clotheswashers - residential capacity (in unit)	\$100.00	1.0	\$100.00	13	1.7	\$1,094,221	\$1.88	\$2.09	\$1.21	\$1.35	\$5.63	\$6.26	\$3.63	\$4.03
	Clotheswashers - residential capacity (in common area)	\$100.00	0.2	\$20.00	13	1.7	\$218,844	\$0.38	\$0.42	\$0.24	\$0.27	\$1.13	\$1.25	\$0.73	\$0.81
	Outdoor Irrigation Kits	\$13.00	1.0	\$13.00	7	2.7	\$36,238	\$0.38	\$0.38	\$0.31	\$0.31	\$0.38	\$0.38	\$0.31	\$0.31
Commercial	Toilets - 1.6 gpf ultra low flow toilets (ULFT)	\$150.00	4.0	\$600.00	25	1.0	\$607,200	\$1.28	\$1.71	\$1.28	\$1.71	\$3.83	\$5.11	\$3.83	\$5.11
	Toilets - 1.0 gpf high efficiency toilets (HET)	\$200.00	4.0	\$800.00	25	1.0	\$112,800	\$0.68	\$0.68	\$0.42	\$0.42	\$2.03	\$2.03	\$1.25	\$1.25
	Toilets - leak detection ^j	\$0.10	4.0	\$0.40	7.5	2.9	\$11,648	\$0.10	\$0.10	\$0.08	\$0.08	\$0.30	\$0.30	\$0.25	\$0.25
	Urinals - 1.0 gpf	\$150.00	1.5	\$225.00	20	1.0	\$140,175	\$2.28	\$3.04	\$2.28	\$3.04	\$6.81	\$9.09	\$6.81	\$9.09
	Urinals - 0.5 gpf	\$150.00	1.5	\$225.00	20	1.0	\$317,025	\$1.12	\$1.12	\$0.85	\$0.85	\$3.36	\$3.36	\$2.55	\$2.55
	Faucet aerators bathroom - 0.5 gpm	\$1.00	4.0	\$4.00	15	1.0	\$2,336	\$0.06	\$0.08	\$0.06	\$0.08	\$0.17	\$0.23	\$0.17	\$0.23
	Clotheswashers - commercial capacity (in laundromat)	\$250.00	12.0	\$3,000.00	13	1.8	\$38,750	\$0.62	\$0.62	\$0.41	\$0.41	\$1.86	\$1.86	\$1.23	\$1.23
	Indoor Audit	\$300.00	1.0	\$300.00	10	1.7	\$148,940	\$0.17	\$0.17	\$0.14	\$0.14	\$0.50	\$0.50	\$0.41	\$0.41
	Outdoor Audit	\$500.00	1.0	\$500.00	10	1.7	\$292,019	\$2.36	\$2.36	\$1.95	\$1.95	\$2.36	\$2.36	\$1.95	\$1.95
	Irrigation Systems - school audits only	\$750.00	1.0	\$750.00	10	2.0	\$16,500	\$0.58	\$0.58	\$0.51	\$0.51	\$0.58	\$0.58	\$0.51	\$0.51
Irrigation Systems - school audits and financial assist	\$4,000.00	1.0	\$4,000.00	10	2.0	\$133,000	\$1.25	\$1.25	\$1.09	\$1.09	\$1.25	\$1.25	\$1.09	\$1.09	

Footnotes:
a. Direct costs include rebates & hardware, but do not include staff, marketing or distribution
b. Costs (e.g.rebates) or estimates based on professional knowledge, including the Handbook of Water Use and Conservation by Amy Vickers
c-i. Calculations.
j. See measure definitions for explanation of how measure has unique treatment for participation, savings and costs due to fact that only a portion of toilets leak, but measure must be marketed all toilets.

City of Everett - Comprehensive Water Plan - Conservation Measures Analysis Summary - 20 Yr Planning Period

1	2	3	4	5	6	7	8
Conservation Measure	Participants		Savings		Direct Costs		
	W/ Free Riders (affects cost)	W/o Free Riders (affects savings)	Annual GPD at Full Implementation (w/ free riders)	CCF Over Measure Life (w/ free riders)	Total Cost Over Plan Period	Cost per CCF Saved During Entire Year Over Measure Life (w/ savings free riders)	
Single Family	Toilets - 1.6 gpf ultra low flow toilets (ULFT)	13,619	6,810	442,636	755,872	\$2,349,278	\$3.11
	Toilets - 1.0 gpf high efficiency toilets (HET)	19,885	19,885	312,222	3,808,346	\$4,573,550	\$1.20
	Toilets - leak detection	49,713	49,713	396,478	3,514,154	\$218,121	\$0.06
	Showerheads - 2.0 gpm	89,232	89,232	281,081	3,103,401	\$807,708	\$0.26
	Faucet aerators bathroom - 1.0 gpm	92,802	92,802	466,425	5,344,769	\$363,262	\$0.07
	Faucet aerators kitchen - 2.2 gpm	0	0	0	0	\$0	N/A
	Hot Water - on demand recirculating systems	3,977	3,977	39,770	468,167	\$959,550	\$2.05
	Clotheswashers - residential capacity (in unit)	37,289	33,560	544,419	5,867,980	\$6,336,643	\$1.08
	Outdoor Irrigation Kits	34,801	34,801	195,103	1,806,376	\$1,226,447	\$0.68
Multifamily	Toilets - 1.6 gpf ultra low flow toilets (ULFT)	7,106	5,330	206,074	351,904	\$959,310	\$2.73
	Toilets - 1.0 gpf high efficiency toilets (HET)	10,768	10,768	150,752	1,838,808	\$1,938,240	\$1.05
	Toilets - leak detection	26,920	26,920	191,814	1,727,248	\$17,491	\$0.01
	Showerheads - 2.0 gpm	52,749	52,749	189,896	2,289,831	\$391,101	\$0.17
	Faucet aerators bathroom - 1.0 gpm	50,384	50,384	256,958	3,041,945	\$122,250	\$0.04
	Faucet aerators kitchen - 2.2 gpm	6,414	3,207	30,313	14,790	\$6,414	\$0.43
	Clotheswashers - residential capacity (in unit)	6,493	5,844	84,409	902,246	\$1,094,221	\$1.21
	Clotheswashers - residential capacity (in common area)	6,493	5,844	84,409	902,246	\$218,844	\$0.24
	Outdoor Irrigation Kits	1,050	1,050	12,945	117,372	\$36,238	\$0.31
Commercial	Toilets - 1.6 gpf ultra low flow toilets (ULFT)	1,012	759	277,795	474,380	\$607,200	\$1.28
	Toilets - 1.0 gpf high efficiency toilets (HET)	141	141	22,208	270,880	\$112,800	\$0.42
	Toilets - leak detection	273	273	14,005	137,975	\$11,648	\$0.08
	Urinals - 1.0 gpf	623	467	50,463	61,553	\$140,175	\$2.28
	Urinals - 0.5 gpf	1,409	1,409	38,043	371,226	\$317,025	\$0.85
	Faucet aerators bathroom - 0.5 gpm	584	438	84,754	41,352	\$2,336	\$0.06
	Clotheswashers - commercial capacity (in laundromat)	7	6	9,408	94,380	\$38,750	\$0.41
	Indoor Audit	299	299	121,541	1,085,321	\$148,940	\$0.14
	Outdoor Audit	352	352	16,767	149,674	\$292,019	\$1.95
	Irrigation Systems - school audits only	11	11	3,323	32,430	\$16,500	\$0.51
Irrigation Systems - school audits and financial assist.	28	28	12,463	121,612	\$133,000	\$1.09	

Appendix B

Measure Definitions

Appendix B Measure Definitions



1.0 Toilets - 1.6 GPF Ultra Low Flow Toilets (ULFT)

Provide financial incentives for customers to replace less efficient toilets with 1.6 gpf toilets, which is the maximum allowed under the plumbing code. The target audience is existing customers with pre-code toilets. The target audience excludes new customers since they will be built with 1.6 gpf models due to the plumbing code. This measure is analyzed for SF, MF, and ICI sectors.

Savings Calculation for SF and MF:

3.5 gpf pre-code toilets
 - 1.6 gpf toilets
 * 5.1 flushes per person per day
 = 9.7 gallons per person per day savings from flush volume reduction
 + 1.9 gallons per person per day savings from elimination of leaks¹
 = 11.6 gallons per person per day savings total

Savings Calculation for ICI:

3.5 gpf pre-code toilets
 - 1.6 gpf toilets
 * 2.2 flushes per person per day²
 = 4.2 gallons per person per day savings from flush volume reduction
 + 1.9 gallons per person per day savings from elimination of leaks¹
 = 6.1 gallons per person per day savings total

2.0 Toilets - 1.0 GPF High Efficiency Toilets (HET)

Provide financial incentives for customers to replace less efficient toilets with high efficiency toilets (HETs) in tank style toilets. HETs are technically defined as toilets flushing at a maximum of 1.28 gpf. However, a flush volume of 1.0 gpf is used in the analysis since most models flush at this volume. HETs include both dual flush toilets and pressure assist tank style toilets. This measure assumes dual flush toilets are used for the single family and multifamily sectors and pressure assist toilets are used for the commercial sector. The target audience is existing and new customers with tank style toilets. This measure is analyzed for SF, MF, and ICI sectors.

Savings Calculation for SF:

1.72 gpf weighted avg (*currently 27% at 3.5 gpf pre-code & 73% at 1.6 gpf + natural replacement*)⁵
 - 1.0 gpf toilets
 * 5.1 flushes per person per day
 = 3.7 gallons per person per day savings from flush volume reduction
 + 1.9 gallons per person per day savings from elimination of leaks¹
 = 5.6 gallons per person per day savings total

Savings Calculation for MF:

1.72 gpf weighted avg (currently 26% at 3.5 gpf pre-code & 74% at 1.6 gpf + natural replacement)⁵
 - 1.0 gpf toilets
 * 5.1 flushes per person per day
 = 3.7 gallons per person per day savings from flush volume reduction
 + 1.9 gallons per person per day savings from elimination of leaks¹
 = 5.6 gallons per person per day savings total

Savings Calculation for ICI:

1.73 gpf weighted avg (currently 29% at 3.5 gpf pre-code & 71% at 1.6 gpf + natural replacement)⁵
 - 1.0 gpf toilets
 * 2.2 flushes per person per day²
 = 1.6 gallons per person per day savings from flush volume reduction
 + 1.9 gallons per person per day savings from elimination of leaks¹
 = 3.5 gallons per person per day savings total

3.0 Toilets - Leak Detection

Provide free toilet leak detection dye tablets for customers to determine if their toilets leak and provide detailed information on how to fix leaks. The target audience is existing and new customers with tank style toilets. Only tank style toilets are targeted since most leaks occur in that type of toilet, usually via flapper leaks. This measure is analyzed for SF, MF, and ICI sectors.

Note that this measure has a unique treatment of participation, savings, and costs. Only a portion of customers have leaking toilets, but since there is no way to know which customers have the leaking toilets, the measure must be targeted to all customers (with tank style toilets). Therefore, the costs are calculated for all customers, since the utility must budget for purchasing that quantity of dye tablets. However, the savings are calculated only for the portion of participating customers with leaks and only for those that follow through and fix the leaks.

Note that the “gallons per person per day” savings takes into account the follow through rate on fixing leaks, but does not take into account the percent of customers with leaks. That second reduction occurs when calculating the “annual gpy” savings. This methodology is used so the “gallons per person per day” saved for this measure has a similar meaning to other measures, namely that it represents savings expected from customers that have potential savings. If the “gallons per person per day” savings were to incorporate the percent of customers with leaks, it would instead represent the savings expected from all participating customers, including those without leaks where no savings can be achieved.

Below is a hierarchical summary of these unique treatments:

Sent dye tabs: All customers (from the demographics worksheet)

Use the dye tabs: “Participating” customers (on the participation worksheet)

Have leaks: Incorporated in the “annual gpy” savings (on the savings worksheet)

Fix leaks: Incorporated in the “gallons per person per day” savings (on the savings worksheet)

Savings Calculation for SF, MF and ICI:

9.5 gallons per person per day lost to all leaks (for average customer, not just leaky ones)
 * 80% [estimated percent of total leaks which are toilet leaks (still average customer; not just leaky ones)]
 = 7.6 gallons per person per day lost to toilet leaks (still average customer; not just leaky ones)
 * 200% (estimated percent leaky toilet customers as % of average customers)
 = 15.2 gallons per person per day lost to toilet leaks (now just leaky toilets; not average customer)
 * 75% (estimated percent with leaky toilets that follow through & fix leaks)
 = 11.4 gallons per person per day saved by toilet leak detection

4.0 Urinals - 1.0 GPF

Provide financial incentives for customers to replace pre-code urinals with 1.0 gpf urinals, which is the maximum allowed under the plumbing code. The target audience is existing ICI customers with pre-code urinals. The target audience excludes new customers since they will be built to this standard due to the plumbing code.

Savings Calculation for ICI:

2.8 gpf avg for pre-code urinals
 -1.0 gpf urinals
 * 1 flushes per person per day³
 = 1.8 gallons per person per day

5.0 Urinals – 0.5 GPF

Provide financial incentives for customers to replace less efficient urinals with 0.5 gpf urinals, which is more efficient than the maximum of 1.0 gpf allowed under the plumbing code. The target audience is existing and new ICI customers with models using more than 0.5 gpf.

Savings Calculation for ICI:

1.08 gpm weighted avg (*currently 22% at 2.8 gpm pre-code & 78% at 1.0 code + natural replacement*)⁵
 - 0.5 gpf urinals
 * 1 flushes per person per day³
 = 0.6 gallons per person per day

6.0 Showerheads - 2.0 GPM

Provide free 2.0 gpm showerheads, which is more efficient than the maximum of 2.5 gpm allowed under the plumbing code, for customers to replace less efficient showerheads. The target audience is existing and new customers with models using more than 2.0 gpm. However, it is recognized that some customers already at 2.0 gpm may received showerheads via the conservation program. Therefore, the weighted average of the replaced showerheads uses values for all of the existing showerheads, not just those greater than 2.0 gpm. This measure is analyzed for SF and MF.

Savings Calculation for SF:

2.42 gpm weighted avg rated flow for all showers (*0% at 3.3 gpm pre-code, 85% at 2.5 code, 15% at 2.0 gpm*)⁵

- 2.0 gpm rated flow for new showerheads
- * .67 since actual flow is only 2/3 of rated flow
- * 5.3 minutes per person per shower per day⁴
- = 1.5 gallons per person per day

Savings Calculation for MF:

- 2.55 gpm weighted avg rated flow for all showers (8% at 3.3 gpm pre-code, 89% at 2.5 code, 3% at 2.0 gpm)⁵
- 2.0 gpm rated flow for new showerheads
- * .67 since actual flow is only 2/3 of rated flow
- * 5.3 minutes per person per shower per day⁴
- = 1.9 gallons per person per day

7.0 Faucet Aerators Bathroom 1.0 GPM

Provide free 1.0 gpm bathroom faucet aerators, which is more efficient than the maximum 2.5 gpm allowed under the plumbing code for residential sectors, for customers to replace less efficient aerators. The target audience is existing and new SF and MF customers with models using more than 1.0 gpm. This measure is not analyzed for ICI since the maximum allowed under the plumbing code for ICI is 0.5 gpm.

Savings Calculation for SF:

- 2.35 gpm weighted avg rated flow for all faucets (0% at 2.9 gpm pre-code, 85% at 2.5 code, 15% at 1.5)⁵
- 1.0 gpm rated flow for new faucet
- * .67 since actual flow is only 2/3 of rated flow
- * 8.1 minutes per person per faucet per day
- * .33 since 1/3 of faucet time is for bathrooms & 2/3 is for kitchens
- = 2.4 gallons per person per day

Savings Calculation for MF:

- 2.5 gpm weighted avg rated flow for all faucets (8% at 2.9 gpm pre-code, 89% at 2.5 code, 3% at 1.5)⁵
- 1.0 gpm rated flow for new faucet
- * .67 since actual flow is only 2/3 of rated flow
- * 8.1 minutes per person per faucet per day
- * .33 since 1/3 of faucet time is for bathrooms & 2/3 is for kitchens
- = 2.7 gallons per person per day

8.0 Faucet Aerators Bathroom 0.5 GPM

Provide free 0.5 gpm bathroom faucet aerators for customers to replace less efficient aerators. This measure is only analyzed for the ICI sector. 0.5 gpm is the maximum allowed under the plumbing code for the ICI sector. Therefore, the target audience is only existing customers with pre-code models.

Savings Calculation for ICI:

- 2.9 gpm avg pre-code rated flow for pre-code faucets
- 0.5 gpm rated flow for new faucet

- * .67 since actual flow is only 2/3 of rated flow
 - * 8.1 minutes per person per faucet per day
 - * .33 since 1/3 of faucet time is for bathrooms & 2/3 is for kitchens
- = 4.3 gallons per person per day

9.0 Faucet Aerators Kitchen 2.2 GPM

Provide free 2.2 gpm kitchen faucet aerators to customers to replace pre-code aerators. This measure is treated as bringing customers up to code, even though technically the maximum flow rate allowed under the plumbing code is slightly higher at 2.5 gpm. The target audience is existing SF and MF customers with pre-code models.

Savings Calculation for SF and MF:

- 2.9 gpm avg rated flow for pre-code faucets
 - 2.2 gpm rated flow for new faucet
 - * .67 since actual flow is only 2/3 of rated flow
 - * 8.1 minutes per person per faucet per day
 - * .67 since 1/3 of faucet time is for bathrooms & 2/3 is for kitchens
- = 2.5 gallons per person per day

10.0 Hot Water – On Demand Recirculating Systems

Provide financial incentives for customers to install on demand recirculating systems. These systems eliminate the water that is sent down the drain between the time when the user turns on the hot water tap and when the water reaches the desired temperature. These systems have two main features. First, unwarmed water in the hot water line is returned back to the hot water tank (via the cold water line) rather than sent down the drain. Second, a pump accelerates the delivery time of water from the hot water heater. Together, these features essentially eliminate water waste. This measure is analyzed for the SF sector. This measure is applied to both existing and new customers.

Savings Calculation for SF:

= 10.0 gallons per household per day lost waiting for hot water⁶

11.0 Clotheswashers-Residential Capacity (In Unit)

Provide financial incentives for customers to replace less efficient residential-capacity clotheswashers with more efficient models. This measure is analyzed for SF and MF sectors. For MF, this measure targets only clotheswashers in individual households. (A separate measure targets the MF sector for clotheswashers in common laundry areas.) This measure is applied to both existing and new customers.

The measure targets customers who are ready to purchase a new machine. It is not intended to accelerate replacement before the normal lifespan ends. Therefore, participation rates are intentionally decreased to reflect the fact that only a portion of the target customers will purchase a new machine during the planning period.

Savings Calculation for SF and MF:

41 avg gpl for non-efficient washers
 - 27 gpl for efficient washers
 * 0.37 loads per person per day
 = 5.2 gallons per person per day

12.0 Clotheswashers-Residential Capacity (Common Area)

Provide financial incentives for customers to replace less efficient residential-capacity clotheswashers with more efficient models. This measure is analyzed for the MF sector and targets only clotheswashers in common laundry areas. (A separate measure targets the MF sector for clotheswashers in individual households.) It should be noted that while the targeted machines are located in common laundry areas, the savings are presented in terms of households for consistency with the other MF measures. This measure is applied to both existing and new customers.

A new water efficiency standard for coin operated machines will become effective January 1, 2007, per the federal 2005 Energy Policy Act. The standard is a water factor of 9.5. Generally, measures that are associated with a code requirement are not applied to new customers since those customers will already have equipment meeting the new code requirement. However, a different approach is applied to this measure. The 9.5 water factor is not necessarily considered the height of reasonably achieved efficiency, as evidenced by two movements. First, in order to achieve the Energy Star label, a water factor more efficient than 9.5 is expected to be required within the next year or so. Second, as part of passing the new 9.5 water factor standard, the U.S. government is required to perform additional reviews to determine whether to tighten that standard. Therefore, this measure is modeled to apply to both existing and new customers.

The measure targets customers who are ready to purchase a new machine. It is not intended to accelerate replacement before the normal lifespan ends. Therefore, participation rates are intentionally decreased to reflect the fact that only a portion of the target customers will purchase a new machine during the planning period.

Savings Calculation for MF:

41 avg gpl for non-efficient washers
 - 27 gpl for efficient washers
 * 0.37 loads per person per day
 = 5.2 gallons per person per day

13.0 Clotheswashers-Commercial Capacity (Laundrymat)

Provide financial incentives for customers to replace less efficient commercial-capacity clotheswashers with more efficient models. This measure is analyzed for the ICI sector and targets clotheswashers in laundrymats. This measure is applied to both existing and new customers. It should be noted that industrial-capacity clotheswashers are not included in this analysis.

A new water efficiency standard for coin operated machines will become effective January 1, 2007, per the federal 2005 Energy Policy Act. The standard is a water factor of 9.5. Generally, measures that are associated with a code requirement are not applied to new customers since those customers will already have equipment meeting the new code requirement. However, a different approach is applied to this measure. The 9.5 water factor is not necessarily considered the height of reasonably achieved efficiency, as evidenced by two movements. First, in order to achieve the Energy Star label, a water factor more efficient than 9.5 is expected to be required within the next year or so. Second, as part of passing the new 9.5 water factor standard, the U.S. government is required to perform additional reviews to determine whether to tighten that standard. Therefore, this measure is modeled to apply to both existing and new customers.

The measure targets customers who are ready to purchase a new machine. It is not intended to accelerate replacement before the normal lifespan ends. Therefore, participation rates are intentionally decreased to reflect the fact that only a portion of the target customers will purchase a new machine during the planning period.

Savings Calculation for ICI:

41 avg gpl for non-efficient washers
 - 27 gpl for efficient washers
 * 8 loads per day per machine
 * 12 machines per laundromat
 = 1,344 gallons per business per day

14.0 Outdoor Irrigation Kits

Provide free outdoor irrigation kits with devices and information to improve the irrigation efficiency of residential customers that manually irrigate their landscaping. Historically, the kits have included items such as a watering timer and shut-off device, a spring-loaded hose nozzle, a rain gauge, hose washers, and a conservation brochure. This measure is applied to the SF and MF sectors and to existing and new customers.

Savings Calculation for SF:

2,532,000,000 gpy used throughout the EWSA for SF irrigation⁸
 * 75% of customers using manual irrigation
 * 25% participation rate
 * 75% installation rate
 * 20% savings from improved efficiency⁹
 = 71,212,500 gpy savings from all participating customers

Savings Calculation for MF:

504,000,000 gpy used throughout the EWSA for MF irrigation⁸
 * 25% of customers using manual irrigation
 * 25% participation rate
 * 75% installation rate
 * 20% savings from improved efficiency⁹
 = 4,725,000 gpy savings from all participating customers

15.0 ICI Indoor Audit

Provide free indoor audits to commercial customers to determine efficiencies that could be achieved through hardware improvements or operational changes. The audits would be performed by a contracted professional auditor. This measure is applied to the ICI sector and to existing and future customers.

Savings Calculation for ICI:

6,527,000,000 gpy used throughout the EWSA for all ICI purposes⁸
 - 612,000,000 gpy used throughout the EWSA for ICI irrigation⁸
 = 5,915,000,000 gpy used throughout the EWSA for ICI indoor purposes
 * 50% of customers which are not fully efficient
 * 10% participation rate
 * 15% savings from improved efficiency
 = 44,362,500 gpy savings from all participating customers

16.0 ICI Outdoor Audit

Provide free irrigation audits to commercial customers to improve the efficiency of their irrigation systems. Efficiencies can be achieved through hardware improvements or operational changes. The audits are performed by a contracted professional landscape irrigation auditor. This measure is applied to the ICI sector and to existing and new customers.

Savings Calculation for ICI:

612,000,000 gpy used throughout the EWSA for irrigation⁸
 * 10% participation rate
 * 10% savings from improved efficiency (note this matches the savings % from the school audits measure)
 = 6,120,000 gpy savings from all participating customers

17.0 Irrigation Systems – School Audits Only

Provide free irrigation audits to schools to improve the efficiency of their irrigation systems. Efficiencies can be achieved through hardware improvements or operational changes. It is assumed that all schools accepting an audit implement some level of system upgrades and therefore experience savings. The audits are performed by a contracted professional landscape irrigation auditor. This measure is applied to the ICI sector and to existing customers. This measure is similar to the next measure; however, it has a lower participation rate since it is assumed to be less attractive due to the absence of matching funds for system upgrades.

Savings Calculation for ICI:

121,303,581 gpy estimated irrigation water use from schools in Everett retail & wholesale service area⁷
 * 10% participation rate (i.e., schools that accept an audit)
 * 10% savings from improved efficiency
 = 1,213,036 gpy savings from all participating schools

18.0 Irrigation Systems – School Audits and Financial Assistance

Provide free irrigation audits and financial assistance to schools to improve the efficiency of their irrigation systems. Efficiencies can be achieved through hardware improvements or operational changes. The audits are performed by a contracted professional landscape irrigation auditor. Financial assistance is then made available to cost share system upgrades with the school districts. It is assumed that all schools accepting an audit implement some level of system upgrades and therefore experience savings. However, it is assumed that schools that additionally receive utility funds for system upgrades implement more upgrades and therefore experience higher savings. This measure is applied to the ICI sector and to existing customers. This measure is similar to the previous measure; however, it has a higher participation rate since it is assumed to be more attractive due to the presence of matching funds for system upgrades.

Savings Calculation for ICI:

121,303,581 gpy estimated irrigation water use from schools in Everett retail & wholesale service area⁷
 * 25% participation rate (i.e., schools that accept an audit)
 * 50% of audited schools take money for system upgrades
 * 20% savings from improved efficiency
 = 3,032,590 gpy savings from audited schools that take money for system upgrades

+

121,303,581 gpy estimated irrigation water use from schools in Everett retail & wholesale service area⁷
 * 25% participation rate (i.e., schools that accept an audit)
 * 50% of audited schools do not take money for system upgrades
 * 10% savings from improved efficiency
 = 1,516,295 gpy savings from audited schools that do not take money for system upgrades
 = 4,548,884 gpy savings from all participating schools

Footnotes:

1. Replacement of toilets has the potential to achieve savings not only from flush volume reduction, but also from leak elimination since some of the replaced toilets may have had leaks. Therefore, a leak elimination savings is added to the savings calculations. The leak elimination savings number was developed as follows:
 - 9.5 gallons per person per day lost to all leaks (for average customer, not just leaky ones)
 - * 80% [estimated percent of total leaks which are toilet leaks (still average customer; not just leaky ones)]
 - = 7.6 gallons per person per day lost to toilet leaks (still average customer; not just leaky ones)
 - * 25% (only claim credit for 25% of the toilet leak savings since these savings will erode over time)
 - = 1.9 gallons per person per day leaks savings claimed
2. Weighted average of flushes between men and women given percent of tank style vs flushometer toilets (women always use toilet 3 times, men use a toilet 1 time if urinal present and 3 times if no urinal).
3. Average of flushes between men and women. Women use urinal 0 times and men use it 2 times.

4. Actual average shower length is 8.2 minutes, however 5.3 minutes incorporates number of people who don't use shower but use bath instead.
5. Based on year of plumbing code, natural replacement rates, and previous utility conservation program.
6. *Hot Water Distribution System Part 1*, Plumbing Systems & Design magazine, January/February 2005, Gary Klein, California Energy Commission.
7. Extrapolated from sales data provided by Everett.
8. Extrapolated from sales data provided by Everett, water system plans for EWUC members, and May 2006 Planning Data Memorandum.
9. 20% savings rate used at the request of Everett staff.

**Appendix 5-3 –
Conservation Savings Detailed Calculations**

INDOOR KITS

Highlighted cells are main numbers used in Table 5-8 in Volume I.

	Total <u>GPD¹</u>	Potential <u>Units¹</u>	GPD/ <u>Unit</u>	Annual <u>Units</u>	Annual <u>GPD</u>	Annual <u>MGD</u>	Total <u>MGD</u>
1) 2007							
Single Family:							
Showerheads	171,559	58,632	2.93 ²	1,875	5,490	0.005	0.005
Bathroom Aerators	316,656	65,970	4.80 ³	1,875	9,000	0.009	0.009
				1,875	14,490	0.014	0.014
Multi Family:							
Showerheads	147,581	39,355	3.75 ⁴	1,875	7,030	0.007	0.007
Bathroom Aerators	190,429	37,339	5.10 ⁵	1,875	9,560	0.010	0.010
Kitchen Aerators	30,313	6,414	4.73 ⁶	1,875	2,530 ⁷	0.003	0.003
				1,875	19,120	0.019	0.019
2007 Total				3,750 ⁸	33,610	0.034	0.034
2) 2008-2012							
Single Family:							
Showerheads	171,559	58,632	2.93 ²	4,125	12,070	0.012	0.060
Bathroom Aerators	316,656	65,970	4.80 ³	4,125	19,800	0.020	0.099
				4,125	31,870	0.032	0.159
Multi Family:							
Showerheads	147,581	39,355	3.75 ⁴	4,125	15,469	0.015	0.077
Bathroom Aerators	190,429	37,339	5.10 ⁵	4,125	21,038	0.021	0.105
Kitchen Aerators	30,313	6,414	4.73 ⁶	4,125	5,557 ⁷	0.006	0.028
				4,125 ⁸	42,064	0.042	0.210
2008-2012 Total				8,250	73,933	0.074	0.370
3) Total Program				45,000	403,277		0.403

¹ Based on HDR measure analysis.

² Assumes 2 showerheads per home.

³ Assumes 2.5 bathroom aerators per home.

⁴ Assumes 1.5 showerheads per home.

⁵ Assumes 1.5 bathroom aerator per home.

⁶ Assumes 1 kitchen aerator per home.

⁷ Assumes 28.5% of participants achieve savings for this measure (i.e., 6,414 potential units /22,500 participants).

⁸ Assumes 50:50 SF/MF split.

OUTDOOR KITS

	Total <u>GPD¹</u>	Potential <u>Units¹</u>	GPD/ <u>Unit</u>	Annual <u>Units</u>	Annual <u>GPD</u>	Annual <u>MGD</u>	Total <u>MGD</u>
1) 2007, 2010-2012							
Single Family	157,500	24,739	6.37 ²	3,600 ³	22,919	0.023	0.092
Multi Family	9,966	778	12.81 ²	150 ⁴	1,921	0.002	0.008
				3,750	24,841	0.025	0.099
2) 2008-2009							
Single Family	157,500	24,739	6.37 ²	7,250 ³	46,157	0.046	0.092
Multi Family	9,966	778	12.81 ²	250 ⁴	3,202	0.003	0.006
				7,500	49,359	0.049	0.099
3) Total Program				30,000	198,082		0.198

¹ Based on HDR measure analysis.

² Assumes one kit per residence.

³ Assumes potential is greater than HDR estimates (29,500 vs. 24,739).

⁴ Assumes potential is greater than HDR estimates (1,100 vs. 778).

TOILET LEAKS

	Total GPD ¹	Potential Units ¹	GPD/ Unit	Annual Units	Annual GPD	Annual MGD	Total MGD
1) Single Family							
2007	289,481	145,189	1.99	132,500	264,181	0.264	0.264
2008-2012				2,540	5,064	0.005	0.025
				145,200			0.290
2) Multi Family							
2008	145,343	81,590	1.78	69,100	123,094	0.123	0.123
2009-2012				3,120	5,558	0.006	0.022
				81,580			0.145
3) ICI							
2009	12,928	5,418	2.39	5,100	12,169	0.012	0.012
2010-2012				100	239	0.0002	0.0007
Total				5,500			0.013
4) Total Program							0.448

¹ Based on HDR measure analysis.

TOILET REBATES

	Total GPD ¹	Potential Units ¹	GPD/HH or Bus.			
Single Family	235,208	14,519	16.20			
Multi Family	118,317	8,159	14.50			
ICI	17,496	108	162.00			
1) 2008						
Single Family	450	2.3	196	3,170	0.003	0.003
Multifamily	225	1.8	125	1,810	0.002	0.002
ICI	75	4.0	19	3,040	0.003	0.003
	750		339	8,020	0.008	0.008
2) 2009-2011						
Single Family	966	2.3	420	6,800	0.007	0.020
Multifamily	483	1.8	268	3,890	0.004	0.012
ICI	161	4.0	40	6,520	0.007	0.020
	1,610		729	17,210	0.017	0.052
3) 2012						
Single Family	972	2.3	423	6,850	0.007	0.007
Multifamily	486	1.8	270	3,920	0.004	0.004
ICI	162	4.0	41	6,560	0.007	0.007
	1,620		733	17,330	0.017	0.017
4) Total Program	7,200		3,258	76,980		0.077

¹ Based on HDR measure analysis.

² Based on a 60:30:10 split for SF/MF/ICI

WASHER REBATES

	Total <u>GPD</u> ¹	Potential <u>Units</u> ¹	GPD/HH <u>or Bus.</u>	
Single Family	368,139	25,215	14.60	
Multi Family (Units) ²	111,592	8,584	13.00	
ICI (Laundromats)	6,720	60 ³	112.00	
1) 2008	<u>Rebates</u> ⁴	<u>GPD</u>	<u>MGD</u>	<u>Total MGD</u>
Single Family	590	8,620	0.009	0.009
Multi Family	148	1,919	0.002	0.002
ICI (Laundromats)	<u>12</u>	<u>1,344</u>	<u>0.001</u>	<u>0.001</u>
	750	11,883	0.012	0.012
2) 2009-2011				
Single Family	1,278	18,665	0.019	0.056
Multifamily	320	4,155	0.004	0.012
ICI	<u>12</u>	<u>1,344</u>	<u>0.001</u>	<u>0.004</u>
	1,610	24,163	0.024	0.072
3) 2012				
Single Family	1,286	18,781	0.019	0.019
Multifamily	322	4,181	0.004	0.004
ICI	<u>12</u>	<u>1,344</u>	<u>0.001</u>	<u>0.001</u>
	1,620	24,306	0.024	0.024
4) Total Program	7,200	108,679		0.109

¹ Based on HDR measure analysis.

² Based on total of washers in units and common areas.

³ Based on HDR's figures of 5 laundromats @ 12 washers each.

⁴ Based 1 laundromat per year and a 80:20 split of balance for SF/MF.

ICI AUDITS

	Total <u>GPD</u> ¹	Potential <u>Units</u> ¹	GPD/ <u>Unit</u>	
Average Savings	92,651	259	357.73	
	<u>Audits</u>	<u>GPD</u>	<u>MGD</u>	<u>Total MGD</u>
2008	5	1,789	0.002	0.002
2009-2011	28	10,016	0.010	0.030
2012	<u>31</u>	<u>11,090</u>	<u>0.011</u>	<u>0.011</u>
Total	120	42,927		0.043

¹ Based on HDR measure analysis.

SCHOOL AUDITS

	Total <u>GPD</u> ¹	Potential <u>Units</u> ¹	GPD/ <u>Unit</u>	
Average Savings	3,323	11	302.09	
	<u>Audits</u> ²	<u>GPD</u>	<u>MGD</u>	<u>Total MGD</u>
2008	5	1,510	0.002	0.002
2009-2011	15	4,531	0.005	0.014
2012	<u>10</u>	<u>3,021</u>	<u>0.003</u>	<u>0.003</u>
Total	60	18,125		0.018

¹ Based on HDR measure analysis.

² Assumes more units than HDR estimated.