Appendix I: BMP Economic Analysis Assumptions

Marysville
Results of Economic Analysis of Water Conservation BMPs

BMP No.	BMP Name	Total Discounted Cost ($)	Total Water Saved (acre-feet)	Benefit / Cost Ratio	Simple Payback Analysis (years)	Discounted Cost / Water Saved ($/acre-feet)	Net Present Value / Water Saved ($/acre-feet)
1	Water Survey Programs for Single-family Residential and Multi-family Residential Customers	27,932	63	0.6	21	441	-164
2	Residential Plumbing Retrofits	89,505	131	0.4	39	683	-438
4	Metering with Commodity Rates for All New Connections and Retrofit of Existing Connections	1,730,596	5,179	0.6	39	334	-145
5	Large Landscape Conservation Programs and Incentives	10,413	168	4.2	3	62	199
6	High-efficiency Washing Machine Rebate Programs	26,555	80	0.5	37	331	-151
9	Conservation Programs for Commercial, Industrial, and Institutional (CII) Accounts	82,602	437	1.2	11	189	34
14	Residential ULFT Replacement Programs	113,593	487	0.8	24	233	-42

Value of conserved water ($/AF) = 350
Discount rate (real) = 6.15%
System name = Marysville

Marysville

Table E-1. Assumptions Used for Economic Analysis of Water Conservation BMPs

BMP 1 – Water Survey Programs for Single-Family Residential and Multi-Family Residential Customers

Description: Conduct water surveys that include both indoor and outdoor components. Provide recommendations and install plumbing retrofit devices where needed.

Assumptions:

1. Number of surveys necessary to complete is 5% of the baseline number of housing units in 1997. 15% of single-family units and 15% of multi-family units will be surveyed within 10 years of the date implementation is to commence. Surveys will be conducted according to the following schedule: 1.5% by end of the first reporting period, 3.6% by end of second reporting period, 6.3% by end of third reporting period, 9.6% by end of fourth reporting period, and 15% by end of the fifth reporting period.

MOU, page 16 and page 17 Section E.d. California legislation requires that plumbing fixtures manufactured, sold or installed after early 1992 be low-water-use fixtures. Therefore, the greatest water savings can be achieved in pre-1992 homes.

2. Single-family water usage = 543 gpd/unit (51% is outdoor use)

Single-family water usage was calculated based on historical single family water use and single-family households. The monthly indoor water use is assumed to be equivalent to 90 percent of the total water used in the lowest water use month in 1997. Outdoor water is calculated as the difference between annual total use and the assumed annual indoor water use.

3. Multi-family water usage = 211 gpd/unit (35% is outdoor use)

Multi-family water usage was calculated based on historical multi-family water use and multi-family households. The monthly indoor water use is assumed to be equivalent to 90 percent of the total water used in the lowest water use month in 1997. Outdoor water is calculated as the difference between annual total use and the assumed annual indoor water use.

4. Water savings from indoor leak detection, not including toilet leaks = 0.5 gpd per residence

A & N Technical Services report (2000, page 2-20) (12.4 gpd per household repair; 4 percent of households audited have leaks).

5. Water surveys decrease outdoor water use by 10%

MOU estimate is 10% (page 17).

6. Each water survey costs $50

It is assumed that this BMP is done in conjunction with BMP 2.

7. The life span of a water survey is four years.

A & N Technical Services report (2000, page 2-20) gives life spans for various components of a water survey. Four years was selected as a reasonable average value based on that information.

8. Water savings from indoor plumbing retrofits are tracked under BMP 2. Only water savings from a decrease in outdoor water use and water savings from indoor leak detection are tracked in BMP 1 to avoid double counting of water savings.

Marysville

Table E-2. Economic Analysis Worksheets

BMP 1. Water Survey Programs for Single-Family and Multi-Family Residential Customers

									Benefits ($)					Costs ($)					
Calendar Year	Single Family Interventions	Multi Family Interventions	Percent Units Surveyed[a]	Single-Family Outdoor Savings (AF/yr)	Multi-Family Outdoor Savings (AF/yr)	Total Outdoor Savings (AF/yr)	Total Indoor Savings (AF/yr)	Annual Water Savings (AF/yr)	Avoided Capital Costs	Avoided Variable Costs	Avoided Purchase Costs	Total Undiscounted Benefits	Total Discounted Benefits	Capital Costs	Financial Incentives	Operating Expenses	Total Undiscounted Costs	Total Discounted Costs	Net Present Value ($)
Pre-1998	0	0	0.0%	0	0.0	0	0.00	0	0	0	0	0	0	0	0	0	0	0	0
1998	22	10	0.8%	1	0.1	1	0.02	1	0	277	0	277	331	0	0	1,618	1,618	1,935	-1,604
1999	22	10	0.8%	1	0.1	1	0.02	2	0	554	0	554	624	0	0	1,618	1,618	1,823	-1,199
2000	31	14	1.1%	1	0.1	1	0.03	3	0	942	0	942	1,000	0	0	2,265	2,265	2,405	-1,405
2001	31	14	1.1%	1	0.1	1	0.03	4	0	1,330	0	1,330	1,330	0	0	2,265	2,265	2,265	-935
2002	40	18	1.4%	1	0.2	1	0.03	4	0	1,552	0	1,552	1,462	0	0	2,913	2,913	2,744	-1,282
2003	40	18	1.4%	1	0.2	1	0.03	5	0	1,773	0	1,773	1,574	0	0	2,913	2,913	2,585	-1,011
2004	49	22	1.7%	2	0.2	2	0.04	6	0	1,995	0	1,995	1,668	0	0	3,560	3,560	2,976	-1,308
2005	49	22	1.7%	2	0.2	2	0.04	6	0	2,217	0	2,217	1,746	0	0	3,560	3,560	2,804	-1,058
2006	80	36	2.7%	2	0.3	3	0.07	8	0	2,716	0	2,716	2,015	0	0	5,825	5,825	4,322	-2,307
2007	80	36	2.7%	2	0.3	3	0.07	9	0	3,214	0	3,214	2,247	0	0	5,825	5,825	4,072	-1,825
2008								7	0	2,605	0	2,605	1,715						1,715
2009								6	0	1,995	0	1,995	1,238						1,238
2010								3	0	998	0	998	583						583
2011																			
2012																			
2013																			
2014																			
2015																			
2016																			
2017																			
2018																			
2019																			
2020																			
Totals:	445	203	15%	14	2	15	0.4	63	0	22,168	0	22,168	17,534	0	0	32,363	32,363	27,932	-10,398

[a]Percent surveyed from MOU, Exhibit 1,1.E(d)

Value of conserved water ($/AF) =	350
Discount rate (real) =	6.15%
Water savings from indoor leak detection (gpd/unit) =	0.50
Outdoor water savings =	10%
Single-family outdoor water usage (gpd/unit) =	277
Multi-family outdoor water usage (gpd/unit) =	74
Conservation measure unit cost ($) =	50
1997 single family units =	2,964
1997 multi-family units =	1,351

Benefit cost ratio:	**0.6**
Simple pay-back period (years):	**20.7**
Discounted cost / water saved ($/acre-feet):	**441**
NPV / water saved ($/acre-feet):	**-164**

Credit Table for Previously Performed Surveys

Year	Single family units surveys	Multi-family units surveys	% Credit	Single family credits	Multi-family credits
Pre-1990	0	0	0.0%	0	0
1990	0	0	12.5%	0	0
1991	0	0	25.0%	0	0
1992	0	0	37.5%	0	0
1993	0	0	50.0%	0	0
1994	0	0	62.5%	0	0
1995	0	0	75.0%	0	0
1996	0	0	87.5%	0	0
1997	0	0	100.0%	0	0
				0	0

Marysville
Table E-1. Assumptions Used for Economic Analysis of Water Conservation BMPs

BMP 2 – Residential Plumbing Retrofit

Description: Install plumbing retrofit devices in single- and multi- family residences.

Assumptions:

1. Plumbing retrofit devices will be installed at a minimum of 10% of residences per reporting period until it can be demonstrated that 75% of pre-1992 single-family residences and 75% of pre-1992 multi-family residences have low flow showerheads (LFSHs).

MOU, page 19.

2. 22.5% of residences have low-water-use fixtures.

Based on professional judgement, it was estimated that 45% of plumbing fixtures in pre-1992 residences have been replaced with low-water-use fixtures due to natural attrition. Assuming that one-half of these plumbing fixtures have replaced all fixtures in some pre-1992 residences and one-half of these plumbing fixtures are spreadout, replacing only a portion of the fixtures in some pre-1992 residences, then 22.5 percent of pre-1992 residences already have low-water-use fixtures.

3. It will take approximately 10.5 years to demonstrate that 75% of residences have LFSHs.

It was assumed that two LFSHs in a residence must be replaced to meet MOU requirements. If 22.5% of the residences have low-water-use fixtures, then 52.5% of the pre-1992 residences must still be replaced. At 5% of the residences replaced per year (10% replaced per reporting period) it would take 10.5 years to demonstrate that a total of 75% of residences have LFSHs.

4. There are an average of 1.1 showers, 1.7 toilets, and 2.6 faucets (1 kitchen faucet and 1.6 other faucets) per residence.

For BMP 14, it has been determined that there is an average of 1.7 toilets per residence (see BMP 14 for details). Based on professional judgement, it is assumed there are two-thirds the number of showers as toilets, and 1.5 times the number of faucets as toilets.

5. Water savings from one low-flow showerhead = 5.5 gpd

A & N Technical Services report (2000, page 2-16).

6. Water savings from one faucet aerator = 1.5 gpd

A & N Technical Services report (2000, page 2-16).

7. Water savings from one toilet flapper = 8 gpd; assume 8 percent of toilets leak.

A & N Technical Services report (2000, page 2-16).

8. Water savings from one kitchen "flip" aerator = 3.0 gpd.

Based on data provided by Southern California Water Company. Kitchen faucet water savings are due to the intermittent use of the flip feature during the rinse cycle.

9. Indoor water savings = 12.5 gpd/unit.

The following equation was used to calculate indoor water savings, based on assumptions 4 through 8:

$$[(1.1*5.5) + (1.0*3.0+1.6*1.5) + (1.7*8*0.08)]$$

10. The BMP will cost an average of $50 per residence.

It is assumed that this BMP is done in conjunction with BMP 1.

11. The life span of the retrofit devices is four years.

A & N Technical Services report (2000, page 2-16) gives life spans for a various components of a water survey. Four years was selected as a reasonable average value based on that information.

Marysville
Table E-2. Economic Analysis Worksheets
BMP 2. Residential Plumbing Retrofit

						Benefits ($)					Costs ($)					
Calendar Year	Single Family Interventions	Multi Family Interventions	Percent Units Receiving Retrofits	Incremental Water Savings (AF/yr)	Annual Water Savings (AF/yr)	Avoided Capital Costs	Avoided Variable Costs	Avoided Purchase Costs	Total Undiscounted Benefits	Total Discounted Benefits	Capital Costs	Financial Incentives	Operating Expenses	Total Undiscounted Costs	Total Discounted Costs	Net Present Value ($)
2001	150	73	5.0%	3.1	3	0	1,092	0	1,092	1,092	0	0	11,143	11,143	11,143	-10,050
2002	150	73	5.0%	3.1	6	0	2,184	0	2,184	2,058	0	0	11,143	11,143	10,497	-8,439
2003	150	73	5.0%	3.1	9	0	3,276	0	3,276	2,908	0	0	11,143	11,143	9,889	-6,981
2004	150	73	5.0%	3.1	12	0	4,369	0	4,369	3,652	0	0	11,143	11,143	9,316	-5,663
2005	150	73	5.0%	3.1	12	0	4,369	0	4,369	3,441	0	0	11,143	11,143	8,776	-5,335
2006	150	73	5.0%	3.1	12	0	4,369	0	4,369	3,241	0	0	11,143	11,143	8,268	-5,026
2007	150	73	5.0%	3.1	12	0	4,369	0	4,369	3,054	0	0	11,143	11,143	7,789	-4,735
2008	150	73	5.0%	3.1	12	0	4,369	0	4,369	2,877	0	0	11,143	11,143	7,337	-4,461
2009	150	73	5.0%	3.1	12	0	4,369	0	4,369	2,710	0	0	11,143	11,143	6,912	-4,202
2010	150	73	5.0%	3.1	12	0	4,369	0	4,369	2,553	0	0	11,143	11,143	6,512	-3,959
2011	75	36	2.5%	1.6	11	0	3,823	0	3,823	2,104	0	0	5,571	5,571	3,067	-963
2012					8	0	2,730	0	2,730	1,416						1,416
2013					5	0	1,638	0	1,638	800						800
2014					2	0	546	0	546	251						251
2015																
2016																
2017																
2018																
2019																
2020																
Totals:	1,576	764	53%	33	131	0	45,870	0	45,870	32,158	0	0	116,996	116,996	89,505	-57,347

Value of conserved water ($/AF) =	350
Discount rate (real) =	6.15%
Water savings (gpd/unit) =	12.5
Conservation measure unit cost ($) =	50
Percent units receiving retrofits =	5%
1991 single family units =	3,001
1991 multi-family units =	1,456

Benefit cost ratio:	**0.4**
Simple pay-back period (years):	**39**
Discounted cost / water saved ($/acre-feet):	**683**
NPV / water saved ($/acre-feet):	**-438**

Marysville

Table E-1. Assumptions Used for Economic Analysis of Water Conservation BMPs

BMP 4 – Metering With Commodity Rates for all New Connections and Retrofit of Existing Connections
Description: Install water meters at connections that serve single- and multi- family residences.
Assumptions: 1. Meters will be installed at 10% of pre-1992 single-family residences every year for ten years. *The MOU (page 23) requires 100% of existing unmetered accounts to be metered within 10 years of implementation date. As of January 1992, California law requires all new services to include water meter installation.* 2. Single-family water usage = 543 gpd/unit. *See BMP 1 for determination of water usage.* 3. Metering will reduce water usage by 20%. *MOU, page 24.* 4. Meters cost an average of $620 each, including meters and overhead. *Cost estimate based on information obtained during a meter study for the City of Fresno (Brown and Caldwell, 1992).* 5. It will cost an average of $18/year to read and maintain one meter. *Cost estimate based on information obtained during a meter study for the City of Fresno (Brown and Caldwell, 1992). We also incorporated information provided by SCWC.* 6. The life span of water meters is 20 years. *Public Utilities Commission Order 103 gives a 20 year life span for smaller than one-inch meters and 15 years for one-inch meters. It is assumed meters being installed are smaller than one-inch. This analysis does not include replacement of meters.*

Marysville

Table E-2. Economic Analysis Worksheets

BMP 4. Metering With Commodity Rates for all New Connections and Retrofit Existing Connections

					Benefits ($)					Costs ($)						
Calendar Year	Percent of Meters Installed	Number of Meters Installed per year	Incremental Water Savings (AF/yr)	Annual Water Savings (AF/yr)	Avoided Capital Costs	Avoided Variable Costs	Avoided Purchase Costs	Total Undiscounted Benefits	Total Discounted Benefits	Capital Costs	Financial Incentives	Annual Meters	Operating Expenses	Total Undiscounted Costs	Total Discounted Costs	Net Present Value ($)
1999	5%	131	16	16	0	5,561	0	5,561	6,266	80,972	0	131	2,351	83,323	93,887	-87,621
2000	5%	131	16	32	0	11,121	0	11,121	11,805	80,972	0	261	4,702	85,674	90,943	-79,137
2001	7%	183	22	54	0	18,906	0	18,906	18,906	113,361	0	444	7,993	121,354	121,354	-102,447
2002	7%	183	22	76	0	26,691	0	26,691	25,145	113,361	0	627	11,284	124,645	117,423	-92,278
2003	9%	235	29	105	0	36,701	0	36,701	32,571	145,750	0	862	15,515	161,265	143,120	-110,549
2004	9%	235	29	133	0	46,710	0	46,710	39,053	145,750	0	1,097	19,747	165,496	138,366	-99,313
2005	11%	287	35	168	0	58,944	0	58,944	46,426	178,138	0	1,384	24,918	203,057	159,933	-113,507
2006	11%	287	35	203	0	71,177	0	71,177	52,813	178,138	0	1,672	30,090	208,229	154,504	-101,691
2007	18%	470	57	261	0	91,196	0	91,196	63,746	291,499	0	2,142	38,553	330,052	230,708	-166,962
2008	18%	470	57	318	0	111,214	0	111,214	73,235	291,499	0	2,612	47,016	338,515	222,914	-149,679
2009				318	0	111,214	0	111,214	68,992	0	0	2,612	47,016	47,016	29,167	39,826
2010				318	0	111,214	0	111,214	64,995	0	0	2,612	47,016	47,016	27,477	37,518
2011				318	0	111,214	0	111,214	61,230	0	0	2,612	47,016	47,016	25,885	35,345
2012				318	0	111,214	0	111,214	57,682	0	0	2,612	47,016	47,016	24,385	33,297
2013				318	0	111,214	0	111,214	54,340	0	0	2,612	47,016	47,016	22,972	31,368
2014				318	0	111,214	0	111,214	51,192	0	0	2,612	47,016	47,016	21,641	29,550
2015				318	0	111,214	0	111,214	48,226	0	0	2,612	47,016	47,016	20,388	27,838
2016				318	0	111,214	0	111,214	45,432	0	0	2,612	47,016	47,016	19,206	26,226
2017				318	0	111,214	0	111,214	42,800	0	0	2,612	47,016	47,016	18,094	24,706
2018				318	0	111,214	0	111,214	40,320	0	0	2,612	47,016	47,016	17,045	23,275
2019				318	0	111,214	0	111,214	37,984	0	0	2,612	47,016	47,016	16,058	21,926
2020				318	0	111,214	0	111,214	35,783	0	0	2,612	47,016	47,016	15,127	20,656
Totals:	100%	2,612	318	5,179	0	1,812,794	0	1,812,794	978,943	1,619,440	0		766,361	2,385,801	1,730,596	-751,654

Value of conserved water ($/AF) =	350	
Discount rate (real) =	6.15%	
Single-family water usage (gpd/unit) =	543	
Water savings =	20%	
Conservation measure unit cost ($) =	620	
Cost to read and maintain one meter ($/year) =	18	
Percent units receiving meters =	10%	
Number of unmetered accounts as of 1999 =	2,612	

Benefit cost ratio:	**0.6**
Simple pay-back period (years):	**39**
Discounted cost / water saved ($/acre-feet):	**334**
NPV / water saved ($/acre-feet):	**-145**

Marysville
Table E-1. Assumptions Used for Economic Analysis of Water Conservation BMPs

BMP 5 – Large Landscape Conservation Programs and Incentives

Description: Conduct water surveys for accounts with large landscaped areas including schools, cemeteries, parks, and civic centers. Provide recommendations for water conservation.

Assumptions:

1. Eto-based water use budgets will be developed for 90 percent of the CII accounts with dedicated irrigation meters by the end of the second reporting period (22.5 percent per year for four years).

MOU (Page 27, Section C.a.)

2. Water surveys will be offered to 20 percent of the CII accounts with mixed use or no meters every reporting period (10 percent per year).

MOU (Page 27, Section C.b.)

3. Irrigation water use surveys will be completed for 15 percent of CII accounts with mixed use or no meters within 10 years of the date implementation was to commence. An agency will be considered on track if the percent of CII accounts with mixed use or no meters receiving landscape water use equals or exceeds the following: 1.5% by end of the first reporting period, 3.6% by end of second reporting period, 6.3% by end of third reporting period, 9.6% by end of fourth reporting period, and 13.5 percent by end of the 9th year. 15% must be reached by the end of the fifth reporting period.

MOU (Page 28, Section E.d.)

4. There are 0 dedicated landscape metered accounts and 683 CII mixed use accounts.

Data provided by California Water Service Company in a spreadsheet entitled Water Supply and Demand Analysis and Projections, prepared October 16, 2000.

5. CII mixed use account landscape areas are assumed to be an average of 0.5 acre in size.

This is based on professional judgement.

6. Water use prior to the survey is 5.5 ft per year.

Irrigation allocation is equal to 100 percent of local evapotranspiration (ETo), and the MOU estimates that surveys will reduce water usage by 15 percent. The local ETo was determined (57 in/year based on California Irrigation Management Information System data) and multiplied by 1.15 to obtain 66 inches (5.5 ft) per year for current water use. (Most conservative approach for economic analysis)

7. Surveys will reduce water usage by 15%.

MOU, page 29.

8. The life span of the large landscape water surveys is four years.

A & N Technical Services report (2000) gives a life span of four years for turf audits (page 2-20). It is assumed that water surveys for large landscapes will have a similar life span.

9. Each survey will cost $250 per acre.

This estimate is based on information presented in Cal Poly's 1988/89 annual report on their landscape water management program. The estimate includes labor, administration, evaluation and overhead.

Marysville
Table E-2. Economic Analysis Worksheets
BMP 5. Large Landscape Conservation Programs and Incentives

							Benefits ($)					Costs ($)					
Calendar Year	CII Accounts w/Dedicated Irr. Meters	CII Accounts w/Mixed Use or No Meters	CII Accounts w/Mixed Use or No Meters		Incremental Water Savings	Annual Water Savings	Avoided Capital Costs	Avoided Variable Costs	Avoided Purchase Costs	Total Undiscounted Benefits	Total Discounted Benefits	Capital Costs	Financial Incentives	Operating Expenses	Total Undiscounted Costs	Total Discounted Costs	Net Present Value ($)
	Interventions	*Offered Surveys*	*Percent Surveyed*[a]	*Interventions*	(AF/yr)	(AF/yr)											
Pre-1999				0	0	0	0	0	0	0	0	0	0	0	0	0	0
1999	0	68	0.8%	5	2	2	0	734	0	734	827	0	0	640	640	721	106
2000	0	68	0.8%	5	2	4	0	1,468	0	1,468	1,559	0	0	640	640	680	879
2001	0	68	1.1%	7	3	7	0	2,496	0	2,496	2,496	0	0	896	896	896	1,600
2002	0	68	1.1%	7	3	10	0	3,524	0	3,524	3,320	0	0	896	896	845	2,475
2003		68	1.4%	9	4	12	0	4,111	0	4,111	3,649	0	0	1,153	1,153	1,023	2,626
2004		68	1.4%	9	4	13	0	4,699	0	4,699	3,928	0	0	1,153	1,153	964	2,965
2005		68	1.7%	11	5	15	0	5,286	0	5,286	4,163	0	0	1,409	1,409	1,110	3,054
2006		68	1.7%	11	5	17	0	5,873	0	5,873	4,358	0	0	1,409	1,409	1,045	3,313
2007		68	2.7%	18	8	21	0	7,195	0	7,195	5,029	0	0	2,305	2,305	1,611	3,418
2008		68	2.7%	18	8	24	0	8,517	0	8,517	5,608	0	0	2,305	2,305	1,518	4,090
2009						20	0	6,901	0	6,901	4,281						4,281
2010						15	0	5,286	0	5,286	3,089						3,089
2011						8	0	2,643	0	2,643	1,455						1,455
2012																	
2013																	
2014																	
2015																	
2016																	
2017																	
2018																	
2019																	
2020																	
Totals:	0	683	15%	102	42	168	0	58,735	0	58,735	43,764	0	0	12,806	12,806	10,413	33,351

[a]Percent surveyed from MOU, Exhibit 1,5.E(d)

Credit Table for Previously Performed Surveys			
Year	# of Surveys	% Credit	Credits
Surveyed prior to July 1, 1996 w/follow up inspection	0	100%	0
Surveyed prior to July 1, 1996 - have not received follow up inspection	0	50%	0
Surveyed after July 1, 1996	0	100%	0
Total			0

Value of conserved water ($/AF) =	350
Discount rate (real) =	6.15%
Acres / CII accounts with dedicated irrigation meters =	0.0
Acres / CII accounts with mixed use meters =	0.5
Annual water use (ac-ft/acre) =	5.5
Water savings =	15%
Conservation measure unit cost ($/acre) =	250
Number of CII accounts with dedicated irrigation meters in 1997 =	0
Number of CII accounts with mixed use or no meter as of 1997 =	683
Percent of CII accounts with dedicated irrigation meters to receive Eto-based water use budgets annually for two reporting periods =	22.5%
Percent of CII accounts with mixed use or no meters offered surveys annually =	10%

Benefit cost ratio:	**4.2**
Simple pay-back period (years):	**3.1**
Discounted cost / water saved ($/acre-feet):	**62**
NPV / water saved ($/acre-feet):	**199**

Marysville
Table E-1. Assumptions Used for Economic Analysis of Water Conservation BMPs

BMP 6 – High-Efficiency Washing Machine Rebate Programs
Description: Provide rebates to single-family residences for high-efficiency washing machines.
Assumptions 1. Each rebate will cost $75. *The MOU does not require implementation of this BMP if the maximum cost-effective rebate is less than $50 (MOU, page 31). A $50 rebate plus an additional $25 per rebate for program administration and overhead was assumed.* 2. Each high efficiency washing machine will reduce water usage by 5,100 gallons per year. *MOU, page 32.* 3. Rebates will be accepted by one percent of single-family residences per year for 20 years. *Estimate based on professional judgement.* 4. The life span of a high efficiency washing machine is 12 years. *CUWCC, 1996, Guidelines for Preparing Cost Effective Analysis of Urban Water Conservation Best Management Practices, September 1996, page 3-2.*

Marysville

Table E-2. Economic Analysis Worksheets

BMP 6. High-Efficiency Washing Machine Rebate Programs

					Benefits ($)					Costs ($)					
Calendar Year	Total Single-Family Units	Number of Units Accepting Rebates	Incremental Water Savings (AF/yr)	Annual Water Savings (AF/yr)	Avoided Capital Costs	Avoided Variable Costs	Avoided Purchase Costs	Total Undiscounted Benefits	Total Discounted Benefits	Capital Costs	Financial Incentives	Operating Expenses	Total Undiscounted Costs	Total Discounted Costs	Net Present Value ($)
2001	2968	30	0.5	0	0	163	0	163	163	0	1,484	742	2,226	2,226	-2,063
2002	2965	30	0.5	1	0	325	0	325	306	0	1,482	741	2,223	2,095	-1,788
2003	2961	30	0.5	1	0	487	0	487	432	0	1,481	740	2,221	1,971	-1,539
2004	2958	30	0.5	2	0	649	0	649	543	0	1,479	740	2,219	1,855	-1,312
2005	2955	30	0.5	2	0	811	0	811	639	0	1,478	739	2,216	1,746	-1,107
2006	2952	30	0.5	3	0	973	0	973	722	0	1,476	738	2,214	1,643	-921
2007	2949	29	0.5	3	0	1,134	0	1,134	793	0	1,474	737	2,211	1,546	-753
2008	2945	29	0.5	4	0	1,296	0	1,296	853	0	1,473	736	2,209	1,455	-601
2009	2942	29	0.5	4	0	1,457	0	1,457	904	0	1,471	736	2,207	1,369	-465
2010	2939	29	0.5	5	0	1,618	0	1,618	946	0	1,470	735	2,204	1,288	-343
2011	2936	29	0.5	5	0	1,779	0	1,779	979	0	1,468	734	2,202	1,212	-233
2012	2933	29	0.5	6	0	1,939	0	1,939	1,006	0	1,466	733	2,199	1,141	-135
2013	2929	29	0.5	6	0	1,937	0	1,937	947	0	1,465	732	2,197	1,073	-127
2014	2926	29	0.5	6	0	1,935	0	1,935	891	0	1,463	732	2,195	1,010	-119
2015	2923	29	0.5	6	0	1,933	0	1,933	838	0	1,462	731	2,192	951	-112
2016	2920	29	0.5	6	0	1,931	0	1,931	789	0	1,460	730	2,190	895	-106
2017	2917	29	0.5	6	0	1,929	0	1,929	742	0	1,458	729	2,187	842	-100
2018	2913	29	0.5	6	0	1,927	0	1,927	699	0	1,457	728	2,185	792	-94
2019	2910	29	0.5	5	0	1,925	0	1,925	657	0	1,455	728	2,183	745	-88
2020	2907	29	0.5	5	0	1,923	0	1,923	619	0	1,454	727	2,180	701	-83
Totals:		587	9	80	0	28,071	0	28,071	14,467	29,374	29,374	14,687	44,061	26,555	-12,089

Value of conserved water ($/AF) =	350
Discount rate (real) =	6.15%
Water savings (gpy/unit) =	5,100
Amount of rebate ($) =	50
Cost to administer rebate ($) =	25
Percent accepting rebates =	1.0%
Single family units in 2000 =	2,971
Single family units in 2005 =	2,955
Single family units in 2010 =	2,939
Single family units in 2015 =	2,923
Single family units in 2020 =	2,907

Benefit cost ratio:	**0.5**
Simple pay-back period (years):	**37**
Discounted cost / water saved ($/acre-feet):	**331**
NPV / water saved ($/acre-feet):	**-151**

Marysville

Table E-1. Assumptions Used for Economic Analysis of Water Conservation BMPs

BMP 9 – Conservation Programs for Commercial, Industrial, and Institutional (CII) Accounts

Description: Implement a program to conduct water-use surveys and customer incentives programs for CII customers.

Assumptions:

1. Water-use surveys will be conducted at 10% of CII accounts within 10 years of the date implementation is to commence. Surveys will be conducted according to the following schedule: 0.5% of the total number of surveys required by the end of the first reporting period, 2.4% by end of second reporting period, 4.2% by end of third reporting period, 6.4% by end of fourth reporting period, 9.0% by 2009 and 10% by the end of the fifth reporting period. Those customers will also be included in an incentives program.

MOU, page 37 and page 40, Section E.b.3

2. Ultra-low-flush toilets (ULFT) in CII establishments will be replaced to produce water savings over a 10 year implementation period equal to 15 percent of total water savings potential as determined in Table E-2. Economic Analysis Worksheets.

MOU, BMP 9, A.(b)ii.

3. Given the choice to implement BMP 9 A (c) or (d), BMP 9 A (c), CII Water Use Survey and Customer Incentives Program, was selected for implementation.

MOU BMP 9, A.(c)

4. The life span of a water survey is four years.

It was assumed that the life span for a CII water survey is the same as the life span for a residential survey. A & N Technical Services report (2000, page 2-20) gives life spans for various components of a residential water survey. Four years was selected as a reasonable average value based on that information.

5. The average annual water savings resulting from a commercial and institutional water survey is 0.83 acre-feet per account.

A & N Technical Services report (2000, page 2-35) gives average annual water savings for three types of surveys; "analyst surveys", "consultant surveys" and "water efficiency studies". Analyst surveys are conducted by non-engineers, consultant surveys are conducted by engineers for sites that have process water, and water efficiency studies are conducted at major industrial facilities that use very large quantities of water. For purposes of this economic analysis, it was assumed that only analyst surveys will be conducted for commercial and institutional account surveys. Values for water savings in the A & N report represent the maximum potential water savings that could occur if a customer were to implement every possible water conservation measure. Experience has shown that approximately 25% of the maximum potential water savings is actually realized, which is what was assumed (personal communication with John Sweeten, Metropolitan Water District, 5-9-00.)

6. The average annual water savings resulting from an industrial water survey is 2.1 acre-feet per account.

A & N Technical Services report (2000, page 2-35) gives average annual water savings for three types of surveys; "analyst surveys", "consultant surveys" and "water efficiency studies". Analyst surveys are conducted by non-engineers, consultant surveys are conducted by engineers for sites that have process water, and water efficiency studies are conducted at major industrial facilities that use very large quantities of water. For purposes of this economic analysis, it was assumed that only consultant surveys will be conducted for industrial account surveys. Values for water savings in the A & N report represent the maximum potential water savings that could occur if a customer were to implement every possible water conservation measure. Experience has shown that approximately 25% of the maximum potential water savings is actually realized, which is what was assumed (personal communication with John Sweeten, Metropolitan Water District, 5-9-00.)

7. Each analyst survey (for commercial and institutional accounts) will cost an average of $680 and each consultant survey (for industrial accounts) will cost an average of $1,680. These costs include the cost of conducting the survey and overhead.

Marysville

Table E-1. Assumptions Used for Economic Analysis of Water Conservation BMPs

BMP 9 – Conservation Programs for Commercial, Industrial, and Institutional (CII) Accounts
Description: Implement a program to conduct water-use surveys and customer incentives programs for CII customers.
A & N Technical Services report (2000, page 2-35). 8. The cost of toilets, advertising, administration, overhead, and toilet recycling is $126 per ULFT. The cost does not include installation, which will be covered by the customer. 9. The life span of the new ULFTs is 20 years. *MOU, page 70.* 10. Table E-2. Economic Analysis Worksheet for BMP 9 requires the input of toilet counts per CII subsector. Number of 1992 toilets per CII subgroup provided by CUWCC 10/4/00.

Marysville

Table E-2. Economic Analysis Worksheets

BMP 9. Conservation Programs for Commercial, Industrial, and Institutional (CII) Accounts

									Benefits ($)					Costs ($)					
Calendar Year	*From BMP 9 ULFT Coverage Calculator*		CII accounts surveyed				Incremental Savings	Annual Savings	Avoided Capital	Avoided Variable	Avoided Purchase	Total Undiscounted	Total Discounted	Capital Costs	Financial Incentives	Operating Expenses	Total Undiscounted	Total Discounted	Net Present
	No. of Installed Toilets	Annual Savings (AF/yr)	*Percent Surveyed*[a]	Commercial Interventions	Industrial Interventions	Institutional Interventions	(Surveys) (AF/yr)	(Total) (AF/yr)	Costs	Costs	Costs	Benefits	Benefits				Costs	Costs	Value ($)
Pre-1999			0.0%	0.0	0.0	0.0	0.0	0	0	0	0	0	0	0	0	0	0	0	0
1999			0.25%	1.5	0.0	0.2	1.4	1	0	499	0	499	563	0	0	1,169	1,169	1,317	-754
2000			0.25%	1.5	0.0	0.2	1.4	3	0	999	0	999	1,060	0	0	1,169	1,169	1,240	-180
2001	46	1	0.95%	5.8	0.0	0.6	5.4	10	0	3,367	0	3,367	3,367	0	0	10,226	10,226	10,226	-6,860
2002	46	3	0.95%	5.8	0.0	0.6	5.4	16	0	5,735	0	5,735	5,403	0	0	10,226	10,226	9,634	-4,231
2003	46	4	0.9%	5.5	0.0	0.6	5.1	21	0	7,504	0	7,504	6,659	0	0	9,993	9,993	8,868	-2,209
2004	46	5	0.9%	5.5	0.0	0.6	5.1	26	0	9,272	0	9,272	7,752	0	0	9,993	9,993	8,355	-602
2005	46	7	1.1%	6.7	0.0	0.7	6.3	29	0	10,042	0	10,042	7,910	0	0	10,928	10,928	8,607	-697
2006	46	8	1.1%	6.7	0.0	0.7	6.3	31	0	10,812	0	10,812	8,023	0	0	10,928	10,928	8,108	-85
2007	46	9	1.8%	11.0	0.1	1.2	10.3	37	0	13,081	0	13,081	9,143	0	0	14,200	14,200	9,926	-782
2008	46	11	1.8%	11.0	0.1	1.2	10.3	44	0	15,349	0	15,349	10,107	0	0	14,200	14,200	9,351	757
2009	46	12						39	0	13,622	0	13,622	8,450	0	0	5,786	5,786	3,589	4,861
2010	46	13						34	0	11,895	0	11,895	6,952	0	0	5,786	5,786	3,381	3,570
2011								24	0	8,300	0	8,300	4,570						4,570
2012								13	0	4,704	0	4,704	2,440						2,440
2013								13	0	4,704	0	4,704	2,299						2,299
2014								13	0	4,704	0	4,704	2,165						2,165
2015								13	0	4,704	0	4,704	2,040						2,040
2016								13	0	4,704	0	4,704	1,922						1,922
2017								13	0	4,704	0	4,704	1,810						1,810
2018								13	0	4,704	0	4,704	1,706						1,706
2019								13	0	4,704	0	4,704	1,607						1,607
2020								13	0	4,704	0	4,704	1,514						1,514
Totals:	459	74	10.0%	61	0	7	57	437	0	152,817	0	152,817	97,461	0	0	104,602	104,602	82,602	14,858

[a]Percent surveyed from MOU, Exhibit 1,9.E(b.3)

											Value of conserved water ($/AF) =		350					Benefit cost ratio:	**1.2**
Credit Table for Previously Installed Toilets											Discount rate (real) =		6.15%					Simple pay-back period (years):	**11.0**
Year	Avg. # of Installed Toilets	Incremental Water Savings (Ac-ft/yr)	Annual Water Savings (AF)						Analyst survey - Annual water savings (AF/account) =				0.83					Discounted cost / water saved ($/acre-feet):	**189**
1991	0	0	0						Analyst survey - Conservation measure unit cost ($) =				680					NPV / water saved ($/acre-feet):	**34**
1992	0	0	0						Consultant survey - Annual water savings (AF/account) =				2.1						
1993	0	0	0						Consultant survey - Conservation measure unit cost ($) =				1,680						
1994	0	0	0						Cost of conservation measure for ULFT replacement ($) =				126						
1995	0	0	0							Number of commercial accounts in 1997 =			613						
1996	0	0	0							Number of Industrial accounts in 1997 =			3						
1997	0	0	0							Number of Institutional accounts in 1997 =			67						
1998	0	0	0								Percent units surveyed =		10%						
1999	0	0	0																
2000	0	0	0																
Total			0																

Marysville

Table E-2. Economic Analysis Worksheets

BMP 9. Conservation Programs for Commercial, Industrial, and Institutional (CII) Accounts

Credit Table for Previously Performed Surveys								
Year	# of Surveys				Credits			
	Commercial	Industrial	Institutional	% Credit	Commercial	Industrial	Institutional	
Surveyed prior to July 1, 1996 w/follow up inspection	0	0	0	100%	0	0	0	
Surveyed prior to July 1, 1996 - have not received follow up inspection	0	0	0	50%	0	0	0	
Surveyed after July 1, 1996	0	0	0	100%	0	0	0	
Total					0	0	0	

Enter CII Toilet Census Results					Annual Savings (gpd)										
CII Subsector	Unadjusted Toilet Count	Adjusted Toilet Count	Savings Per ULFT (gpd)	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	Total	
Hotels/Motels	734	575	16	8,825	8,472	8,133	7,808	7,495	7,196	6,908	6,632	6,366	6,112	73,946	
Eating and Drinking	100	78	47	3,532	3,391	3,255	3,125	3,000	2,880	2,765	2,654	2,548	2,446	29,594	
Health Services	258	202	21	4,071	3,908	3,752	3,602	3,458	3,320	3,187	3,059	2,937	2,820	34,115	
Offices	222	174	20	3,336	3,203	3,075	2,952	2,834	2,720	2,612	2,507	2,407	2,311	27,957	
Retail/Wholesale	776	607	40	23,325	22,392	21,496	20,636	19,811	19,019	18,258	17,527	16,826	16,153	195,444	
Other	139	109	18	1,880	1,805	1,733	1,663	1,597	1,533	1,472	1,413	1,356	1,302	15,754	
Industrial	169	132	23	2,921	2,804	2,692	2,584	2,481	2,382	2,286	2,195	2,107	2,023	24,475	
Churches	42	33	28	884	848	814	782	751	721	692	664	637	612	7,405	
Gov't	59	46	25	1,108	1,064	1,021	981	941	904	868	833	800	768	9,287	
Schools: K to 12	175	137	20	2,630	2,525	2,424	2,327	2,234	2,144	2,059	1,976	1,897	1,821	22,038	
Total	2,674	2,093	258	52,513	50,412	48,396	46,460	44,601	42,817	41,105	39,461	37,882	36,367	440,013	

Estimated Rate of CII Toilet Turnover (percent of remaining stock per year)	0.04
Average Savings per toilet (gpd)	26.13

Coverage requirement is 15 percent of Total Savings Potential:	
(gpd)	(ac-ft)
66,002	74

Marysville
Table E-1. Assumptions Used for Economic Analysis of Water Conservation BMPs

BMP 14 – Residential ULFT Replacement Programs

Description: Implement a program to replace existing high-water-using toilets with ultra-low-flush toilets (ULFT) in single- and multi-family residences.

Assumptions:

1. There are an average of 3.1 people per single-family residence and 2.2 people per multi-family residence.

Marysville has an average of 2.4 people per household (California Department of Finance Report E-5, Table 2 "City/County Population and Housing Estimates" January 1, 2000). Because useful data quantifying single-family and multi-family household sizes in this CSA are unavailable, it is assumed that a ratio of multi-family to single-family household sizes is 0.7.

2. There are an average of 1.7 toilets per single-family residence and 1.5 toilets per multi-family residence.

An average of 1.7 toilets per unit was calculated using 1990 census data concerning the number of bedrooms per housing unit. Based on professional judgement, it was assumed a one bedroom unit has 1 toilet, a two bedroom unit has 1.5 toilets, a three bedroom unit has 2 toilets, a four bedroom unit has 2.5 toilets and a five bedroom unit has 3 toilets. Because multi-family units tend to have fewer toilets on average than single-family units, it was assumed 1.5 toilets per multi-family residence and calculated that the single-family units would need to have 1.7 toilets per unit to achieve an overall average of 1.7 toilets per dwelling unit.

3. Water savings from ULFTs are 37.7 gpd/unit for single-family residences and 49.0 gpd/unit for multi-family residences.

MOU, Exhibit 6, Table 1 and Table 2.

4. Homes constructed after 1991 already have ULFTs.

As of January 1992, California legislation requires that ULFTs be installed in all newly constructed homes.

5. The life span of the new ULFTs is 20 years.

MOU, page 70.

6. Natural toilet replacement rate is 4% per year.

MOU, page 70.

7. Average resale rate for single-family units in Sutter County is 3.1%

Assumption based on the 1996 single-family average resale rate for Sutter County. This rate was obtained from the CUWCC Website, WWW.CUWCC.ORG, November 2000. Although Marysville is actually in Yuba County, no data was available for resale rates. Therefore, data for neighboring Sutter County was used.

8. Average resale rate for multi-family units in Sutter County is 1.3%

Assumption based on the 1998 multi-family average resale rate for Sutter County. This rate was obtained from the CUWCC Website, WWW.CUWCC.ORG, November 2000. Although Marysville is actually in Yuba County, no data was available for resale rates. Therefore, data for neighboring Sutter County was used.

9. The cost of toilets, advertising, administration, overhead, and toilet recycling is $126 per ULFT. The cost does not include installation, which will be covered by the customer.

Marysville
Table E-2. Economic Analysis Worksheets
BMP 14. Residential ULFT Replacement Programs (3 pages)

	Determination of Water Conservation Goal: Single-Family Units										
Calendar Year	Single-Family Units	SF Units Naturally Retrofitted	SF Toilets Naturally Retrofitted	Water Savings from Natural Replacement SF (AF/yr)	Single-Family Units	SF Units Naturally Retrofitted	Single-Family Turnover	Combined SF Homes Retrofitted	Combined SF Toilets Retrofitted	Water Savings from Natural Replacement and Turnover SF (AF/yr)	Water Savings from Turnover SF (AF/yr)
1998	2,255	0	0	0	2,255	0	0	0	0	0	0
1999	2,165	90	153	4	2,094	90	71	161	273	7	3
2000	2,078	87	147	4	1,945	84	66	149	254	6	3
2001	1,995	83	141	4	1,806	78	61	139	236	6	2
2002	1,915	80	136	3	1,678	72	57	129	219	5	2
2003	1,839	77	130	3	1,558	67	53	120	203	5	2
2004	1,765	74	125	3	1,447	62	49	111	189	5	2
2005	1,695	71	120	3	1,344	58	45	103	175	4	1
2006	1,627	68	115	3	1,248	54	42	96	163	4	1
2007	1,562	65	111	3	1,159	50	39	89	151	4	1
2008	1,499	62	106	3	1,076	46	36	83	140	3	1
2009	1,439	60	102	3	1,000	43	34	77	130	3	1
2010	1,382	58	98	2	928	40	31	71	121	3	1
2011	1,326	55	94	2	862	37	29	66	113	3	0
2012	1,273	53	90	2	801	34	27	61	104	3	0
2013	1,222	51	87	2	744	32	25	57	97	2	0
2014	1,174	49	83	2	691	30	23	53	90	2	0
2015	1,127	47	80	2	641	28	22	49	84	2	0
2016	1,082	45	77	2	596	26	20	46	78	2	0
2017	1,038	43	74	2	553	24	19	42	72	2	0
2018	997	42	71	2	514	22	17	39	67	2	0
2019	957	40	68	2	477	21	16	37	62	2	0
2020	919	38	65	2	443	19	15	34	58	1	0
Totals:											

Credit Table for Previously Installed ULF Toilets

Year	Avg. # of Installed Toilets: Single Family	Avg. # of Installed Toilets: Multi-family	Incremental Water Savings (Ac-ft/yr)	Annual Water Savings (Ac-ft/yr)
1991	0	0	0	0
1992	0	0	0	0
1993	0	0	0	0
1994	0	0	0	0
1995	0	0	0	0
1996	0	0	0	0
1997	7	8	0	0
1998	9	0	0	1
1999	0	0	0	1
2000	0	0	0	1
	16	8		3

Marysville
Table E-2. Economic Analysis Worksheets
BMP 14. Residential ULFT Replacement Programs (3 pages)

	Determination of Water Conservation Goal: Multi-Family Units											Conservation Goal - Combined	
Calendar Year	Multi-Family Units	MF Units Naturally Retrofitted	MF Toilets Naturally Retrofitted	Water Savings from Natural Replacement MF (AF/yr)	Multi-Family Units	MF Units Naturally Retrofitted	Multi-Family Turnover	Combined MF Homes Retrofitted	Combined MF Toilets Retrofitted	Water Savings from Natural Replacement and Turnover MF (AF/yr)	Water Savings from Turnover MF (AF/yr)	Annual Water Savings from Turnover (AF/yr)	Cumulative Water Savings from Turnover (AF/yr)
1998	1,094	0	0	0.0	1,094	0	0	0	0	0	0	0	0
1999	1,050	44	66	2.4	1,036	44	14	58	87	3	1	4	4
2000	1,008	42	63	2.3	981	41	13	55	82	3	1	7	11
2001	968	40	60	2.2	929	39	13	52	78	3	1	10	21
2002	929	39	58	2.1	880	37	12	49	74	3	1	13	34
2003	892	37	56	2.0	834	35	11	47	70	3	1	15	49
2004	856	36	54	2.0	790	33	11	44	66	2	0	17	66
2005	822	34	51	1.9	748	32	10	42	63	2	0	19	85
2006	789	33	49	1.8	708	30	10	40	59	2	0	20	105
2007	758	32	47	1.7	671	28	9	37	56	2	0	22	127
2008	727	30	45	1.7	635	27	9	35	53	2	0	23	150
2009	698	29	44	1.6	602	25	8	34	50	2	0	24	174
2010	670	28	42	1.5	570	24	8	32	48	2	0	25	198
2011	644	27	40	1.5	540	23	7	30	45	2	0	25	224
2012	618	26	39	1.4	511	22	7	29	43	2	0	26	250
2013	593	25	37	1.4	484	20	7	27	41	1	0	26	276
2014	569	24	36	1.3	459	19	6	26	38	1	0	26	302
2015	547	23	34	1.3	434	18	6	24	36	1	0	27	329
2016	525	22	33	1.2	411	17	6	23	34	1	0	27	356
2017	504	21	31	1.2	390	16	5	22	33	1	0	27	382
2018	484	20	30	1.1	369	16	5	21	31	1	0	27	409
2019	464	19	29	1.1	349	15	5	20	29	1	0	27	436
2020	446	19	28	1.0	331	14	5	18	28	1	0	27	463
											Value of conserved water ($/AF) =		350
											Discount rate (real) =		6.15%
											Natural toilet replacement rate =		4.0%
											Annual single-family housing turnover rate =		3.1%
											Annual multi-family housing turnover rate =		1.3%
											Water savings due to toilet replacement at SF homes (gal/dwelling unit/day) =		37.7
											Water savings due to toilet replacement at MF homes (gal/dwelling unit/day) =		49.0
											Number of toilets per SF home =		1.7
											Number of toilets per MF home =		1.5
											Cost of conservation measure ($) =		126
											1991 single family units =		3,001
											1991 multi-family units =		1,456

Marysville
Table E-2. Economic Analysis Worksheets
BMP 14. Residential ULFT Replacement Programs (3 pages)

	Water Savings from ULFT Replacement Program						Benefits ($)					Costs ($)					
Calendar Year	No. of SF Toilets Required to be Replaced	Incremental[a] Water Savings SF (AF/yr)	No. of MF Toilets Required to be Replaced	Incremental[a] Water Savings MF (AF/yr)	Annual[b] Water Savings (AF/yr)	Cummulative[c] Water Savings (AF/yr)	Avoided Capital Costs	Avoided Variable Costs	Avoided Purchase Costs	Total Undiscounted Benefits	Total Discounted Benefits	Capital Costs	Financial Incentives	Operating Expenses	Total Undiscounted Costs	Total Discounted Costs	Net Present Value ($)
Pre-2001	16	0	8	0	1	3	0	888	0	888	943	0	0	3,024	3,024	3,210	-2,267
2001	100	2	30	1	4	7	0	1,496	0	1,496	1,496	0	0	19,408	19,408	19,408	-17,912
2002	100	2	30	1	8	15	0	2,750	0	2,750	2,590	0	0	16,384	16,384	15,435	-12,844
2003	100	2	30	1	11	26	0	4,004	0	4,004	3,553	0	0	16,384	16,384	14,540	-10,987
2004	100	2	30	1	15	41	0	5,258	0	5,258	4,396	0	0	16,384	16,384	13,698	-9,302
2005	100	2	30	1	19	60	0	6,512	0	6,512	5,129	0	0	16,384	16,384	12,904	-7,775
2006	100	2	30	1	22	82	0	7,766	0	7,766	5,762	0	0	16,384	16,384	12,157	-6,394
2007	100	2	30	1	26	108	0	9,020	0	9,020	6,305	0	0	16,384	16,384	11,452	-5,147
2008	100	2	30	1	29	137	0	10,274	0	10,274	6,766	0	0	16,384	16,384	10,789	-4,023
2009					29	166	0	10,274	0	10,274	6,374	0	0	0	0	0	6,374
2010					29	196	0	10,274	0	10,274	6,004	0	0	0	0	0	6,004
2011					29	225	0	10,274	0	10,274	5,656	0	0	0	0	0	5,656
2012					29	254	0	10,274	0	10,274	5,329	0	0	0	0	0	5,329
2013					29	284	0	10,274	0	10,274	5,020	0	0	0	0	0	5,020
2014					29	313	0	10,274	0	10,274	4,729	0	0	0	0	0	4,729
2015					29	343	0	10,274	0	10,274	4,455	0	0	0	0	0	4,455
2016					29	372	0	10,274	0	10,274	4,197	0	0	0	0	0	4,197
2017					29	401	0	10,274	0	10,274	3,954	0	0	0	0	0	3,954
2018					29	431	0	10,274	0	10,274	3,725	0	0	0	0	0	3,725
2019					29	460	0	10,274	0	10,274	3,509	0	0	0	0	0	3,509
2020					29	489	0	10,274	0	10,274	3,306	0	0	0	0	0	3,306
	816		248		487		0	171,257	0	171,257	93,198	0	0	137,118	137,118	113,593	-20,395

[a]Incremental Water Savings is water savings from replaced toilets during corresponding year only.

Benefit cost ratio: **0.8**

[b]Annual Water Savings is water savings from all replaced toilets through corresponding year.

Simple pay-back period (years): **24**

[c]Cummulative Water Savings is running total of water saved through corresponding year. "Cummulative Water Savings" must match "Cummulative Water Savings from Turnover" within 10% each reporting period through 2008.

Discounted cost / water saved ($/acre-feet): **233**

NPV / water saved ($/acre-feet): **-42**