WATER CONSERVATION POTENTIAL ASSESSMENT

2004 UPDATE

December 2004

Seattle Public Utilities

This 2004 CPA Update will be available on the Seattle Public Utilities website, www.seattle.gov/util/services/, in January of 2005. Many of the referenced supporting documents are currently available on that website.

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1.0 Executive Summary

1.1 Introduction to the 2004 Conservation Potential Assessment Update

In 1998, Seattle Public Utilities (SPU) completed a Water Conservation Potential Assessment (1998 CPA) at the request of the Seattle City Council. A subsequent City of Seattle Ordinance, Number 120532, September 2001, specified an update to the CPA every four years beginning in 2004.

This *2004 CPA Update* (2004 CPA) is an analysis of the cost, volume, and reliability of water conservation opportunities available within SPU's entire retail service area and a portion of its wholesale service area through 2030. (See Section 5.2 for a discussion of which purveyors are included in the 2004 CPA.) The 2004 CPA also calculates indirect economic and environmental benefits from the water conservation measures analyzed.

The 2004 CPA details enhancements to the 1998 CPA, defines its critical role in the SPU Water System Planning process, and describes SPU's plans to continuously update the CPA for a variety of applications.

1.2 Meeting the Requirements of Ordinance 120532

The City of Seattle Ordinance 120532 specifies an update of the CPA every four years beginning in 2004.

The 2004 CPA is based on a new computer model (CPA Model) that significantly enhances analytical power and flexibility for SPU's policy makers, interested stakeholders, water economists and analysts, and program planners. The CPA Model: 1) calculates water savings potential for 126 conservation measures based on various cost or savings policy criteria; 2) estimates the impacts of code and programmatic conservation for the SPU water demand forecast; and 3) assists SPU program planners in designing programs to meet policy goals.

This 2004 CPA presents analysis of a select number of conservation measures that are significant in terms of their water saving potential and that have a large degree of confidence based on research and field experience. In 2005, as part of the Water Supply Planning process, SPU will consult with key stakeholders and national experts to gain perspective on additional measures.

The Ordinance also requires that the 2004 CPA should quantify best estimates of other benefits obtained by water conservation measures, including savings relating to reductions in demand for electricity use, along with wastewater and stormwater discharges. The 2004 CPA includes a description of the methodology used for valuing those indirect benefits as well as provides calculations for selected conservation measures.

1.3 The CPA: Use and Continuous Updates

The 2004 CPA is intended as an analytical tool to assess water conservation measures and indirect benefits with the likelihood of ensuring long-term savings at the lowest cost to SPU customers and the region. By itself, the 2004 CPA does not set water conservation policy, expenditure levels, or plan programs. Rather, the 2004 CPA is an important part of the regional water planning process and will be integrated into the *2007 Water System Plan Update*.

CPA analysis in 2005 will be first incorporated into the SPU Demand Forecast. That work will be followed by "what if" scenarios for the Drinking Water Supply Planning Model. Various combinations of conservation measures will be packaged and analyzed for water savings potential, expenditure levels and interaction with conventional supply options along with other utility goals including environmental stewardship.

This 2004 CPA is the foundation that will enable SPU to conduct detailed analysis and develop policies for the future role of demand management in its portfolio of supply options. The 2004 CPA should be viewed as a powerful tool built for a variety of functions and well integrated into the regional water planning process.

While the CPA Model could be used by other water utilities, the model inputs (e.g., demographics, cost estimates, etc.) are relevant only to SPU's service area included in the 2004 CPA. The results of the 2004 CPA are SPU-specific and should not be used directly by other water utilities.

2.0 The 2004 CPA Update

In 1998, the Seattle Public Utilities (SPU) completed a Water Conservation Potential Assessment (1998 CPA) at the request of the Seattle City Council. This 2004 CPA fulfills the requirements of the City of Seattle Ordinance, Number 120532, September 2001.

The 2004 CPA is an analysis of the cost, volume, and reliability of water conservation opportunities available within SPU's entire retail service area and a portion of its wholesale service area through 2030. (See Section 5.2 for a discussion of which purveyors are included in the 2004 CPA.) The 2004 CPA is conducted using the criterion that *no measure identified and analyzed will result in a loss of service or satisfaction for the customer.* Water shortage actions such as irrigation bans are considered curtailment rather than conservation, and are therefore not included in the 2004 CPA.

The 2004 CPA is based on a new relational database computer model (CPA Model). The CPA Model is intended to: 1) calculate water savings potential for conservation measures based on various cost or savings criteria; 2) estimate the impacts of code and programmatic conservation for the SPU water demand forecast; and 3) assist SPU program planners in designing programs to meet policy goals.

Development of the CPA Model was a significant component of the 2004 CPA – it replaces a cumbersome series of spreadsheets used in 1998 that are no longer replicable. The 2004 CPA

incorporates current research pertaining to the performance of conservation measures. It is also enhanced by six years of field experience gained by the SPU Resource Conservation staff experts along with utilities participating in the regional Saving Water Partnership.

The 2004 CPA is intended as an analytical tool to assess water conservation measures with the likelihood of ensuring long-term savings at the lowest cost to SPU customers and the region. By itself, the 2004 CPA does not set water conservation policy, expenditure levels, or plan programs. Rather, the 2004 CPA is an integral part of the regional water planning process as described in the Section 3.

SPU intends that the 2004 CPA will provide a solid foundation for informing future conservation efforts, just as the 1998 CPA analysis was instrumental in the design of the current regional 1% Water Conservation Program.

The 1998 CPA laid the foundation for this effort along with the field experience of SPU conservation experts and conservation measure research. Readers familiar with the *1998 CPA* (Water Conservation Potential Assessment, Seattle Public Utilities, 1998) and the *1% 2003 Annual Report* (Regional 1% Water Conservation Program, Saving Water Partnership, 2004) will find this 2004 CPA consistent with those previous publications. However, it should be noted that direct comparisons between conservation measures in the 1998 CPA and the 2004 CPA may not always be appropriate since underlying assumptions, such as costs or target audiences, may have changed since the 1998 CPA.

The CPA Model calculates and reports on water savings and levelized costs for both average annual demand and peak season demand for 126 measures, a limited number of which are included in this 2004 CPA. The 1998 CPA reported only peak season demand and levelized cost for 65 measures. New also to the 2004 CPA are calculations of other benefits obtained by the conservation measures including savings from reductions in demand for electricity, stormwater, and wastewater. This indirect benefit analysis meets the requirements of Ordinance Number 120532 as well.

3.0 The 2004 CPA and Regional Water Planning

SPU provides drinking water to nearly 1.3 million people in its retail and wholesale service areas in the greater Seattle region. The *2007 Water System Plan Updat*e will report on how SPU is currently meeting demand for water and plans for addressing forecasts of future supply needs. Included in that discussion will be policies outlining the role of water conservation as a method of demand management.

Historically, water supply planning and development has followed a predictable path of tapping a single large water source every 30-50 years to meet growth in regional water demand. Today, reliance on any single option to meet future demand is an increasingly high-risk gamble due to environmental, political, and demographic uncertainties. In response to this uncertain future, Seattle and its partners are creating a diverse portfolio of water supply and conservation options including new supply, enhanced system efficiency, and demand management (conservation).

This portfolio approach provides decision-makers with many options to meet growing water demand efficiently and reliably.

Exhibit 3-1 illustrates the front-end position of the 2004 CPA within the context of the current regional planning process. Appendix A defines the individual components of the "Stepping Stones to Water Supply Strategy".

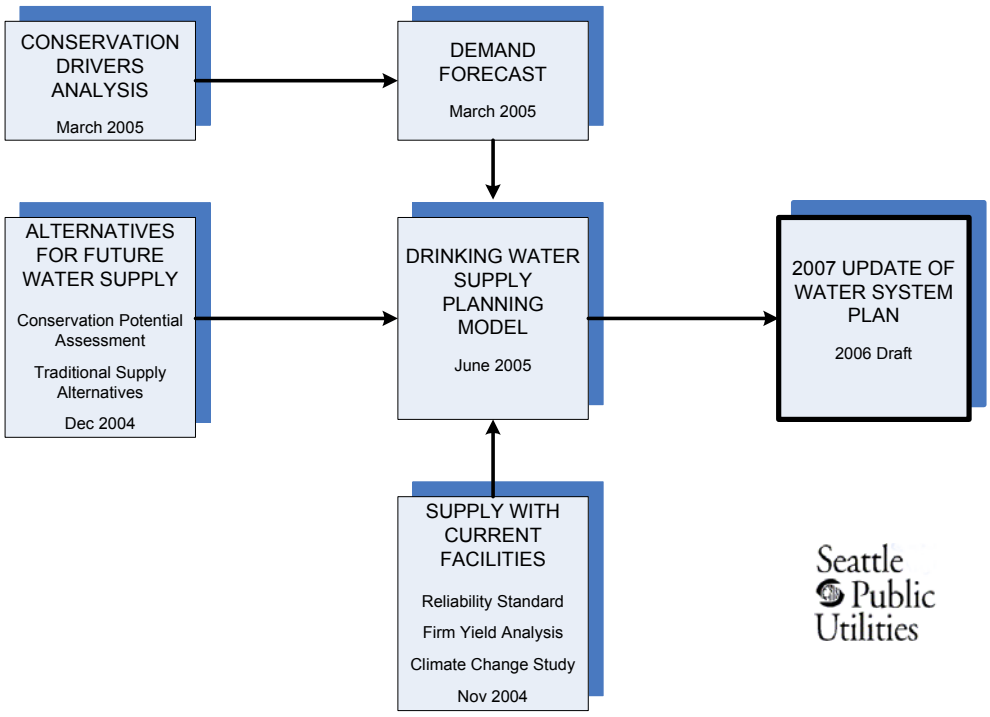

Exhibit 3-1
Stepping Stones to Water Supply Strategy

4.0 Current Conservation Programs

SPU manages two key water conservation programs. The regional "1% Water Conservation Program" (1% Program) and the program serving low-income Seattle residents known as "Everyone Can Conserve".

1% Water Conservation Program

The 1% Program is sponsored by the Saving Water Partnership which includes the City of Seattle and a group of 17 utilities that purchase wholesale water from SPU and participate in regional conservation programs. SPU administers the 1% Program in cooperation with these utilities, under terms of long-term contracts.

The 1% Program was created in 1999 and expanded into a regional program in 2000. It is based on conservation measures identified in the 1998 CPA that were cost-effective (i.e. less than or

equal to Seattle's avoided cost of new supply). These measures were incorporated into the 1% Program and are designed to reduce personal and business water consumption in the regional service area by 1% each year through 2010, for a total goal of 14.5 million gallons per day[1] (mgd) of peak water savings. This savings goal roughly corresponds to the forecasted growth in water demand in the service region over the same time period. Achieving the 1% goal by 2010 will hold water demand by the Saving Water Partnership utilities to approximately the same level as in 2000.

A Ten Year Water Conservation Program Plan (Seattle Public Utilities, 2002) details program budgets, savings targets and implementation strategies through 2010. *The Regional 1% Water Conservation Program, 2003 Annual Report* and annual reports for 2001 and 2002 review progress of the regional program and provide data on actual expenditures, water savings, and program strategies by targeted sector. These strategies were developed for the 1% Program using analysis from the 1998 CPA. In the coming years, the CPA will continue to provide a tool to refine these sector specific approaches.

Everyone Can Conserve

In addition to updating the CPA every four years, the City of Seattle Ordinance Number 120532[2] requires SPU to provide conservation services to low-income residents through the "Everyone Can Conserve" program. This program differs from the 1% Program in that it only applies to City of Seattle direct service customers and water saving measures are more prescribed than for the 1% Program. SPU is working with the Office of Housing to substantially retrofit all qualifying low-income units and buildings within the city limits. This program is underway and is anticipated to save 1.6 mgd by the end of 2010.

5.0 CPA Model Structure and Data Sources

5.1 Overview

The 1998 CPA Water Model was developed by SPU as a series of linked Microsoft Excel spreadsheets. One of the challenges with the 1998 CPA Water Model was its lack of established relationships among data entities, which made it cumbersome to use correctly without intimate knowledge of these relationships and how to ensure the calculations are properly applied.

Significant effort was spent in 2003-04 to develop a flexible CPA Model that will be used to: 1) calculate water savings potential for conservation measures based on various cost or savings criteria; 2) estimate the impacts of code and programmatic conservation for the water demand forecast; and 3) assist in designing programs to meet policy goals.

[1] The 1% Program goal set in 1999 was 18 mgd. The 2004 through 2010 targeted savings were adjusted down 20% to reflect withdrawal of the Cascade Water Alliance from the 1% Program.

[2] Ordinance120532 requires an additional 3 MGD of conservation savings by 2010 beyond that provided by the 1% Program. The "Everyone Can Conserve" program will account for a portion of these required savings. The remainder will be provided by other non-programmatic activities, such as system efficiencies, reuse projects or other cost-effective approaches, as outlined in *City of Seattle Supplement to the Ten Year Conservation Program Plan*, April 2003.

Projecting the conservation potential over time requires development of a detailed, accurate regional water use and demographics baseline that can be easily updated as conditions change. For the 1998 CPA, a large part of the effort was collecting, reviewing, and analyzing water use and conservation measure data. Having up-to-date information on customer preferences and equipment performance is key to ensuring the accuracy of the 2004 CPA. SPU continues to sponsor and review national conservation research on the latest and best available data for residential and commercial water use.

The CPA Model is comprised of three main components: the Master Water Balance, the Measure Library, and the Package Wizard. The relationship between these components is shown in Exhibit 5-1.

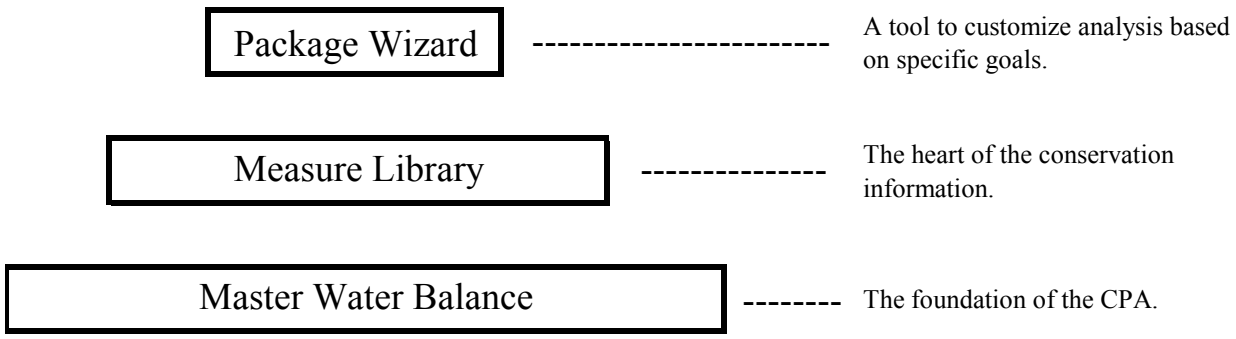

Exhibit 5-1
CPA Model Components

5.2 Master Water Balance

The Master Water Balance is an accounting of all water uses and is comprised of three main components 1) end uses; 2) demographics; and 3) demands, as shown in Table 5-1. The information is presented in 5-year increments from 1995 to 2030. The information is divided into three main sectors: single family, multifamily, and non-residential. The information covers SPU's entire retail service area and a portion of its wholesale service areas, which is collectively called the combined service area. SPU provides wholesale water service to a total of 25 purveyors. Only the 17 purveyors that participate in SPU's regional conservation program are included in the 2004 CPA. Table 5-2 details which purveyors are included in the 2004 CPA and which purveyors are not included.

Table 5-1
Master Water Balance Components

Time Period	End Uses	Demographics[2]	Demands
Historical (1995-2005)[1]	Based on 1998 CPA, with updates from more recent national and local research and experience. Then calibrated to match actual demands.	U.S. Census data apportioned to water service areas. PSRC forecasts by TAZ and FAZ. Regional projections from Dick Conway and Associates.	Actuals from SPU billing records and annual purveyor survey.
Future (2010 – 2030)	Based on 1998 CPA, with updates from more recent national and local research and experience.	PSRC forecasts by TAZ, FAZ.	Model calculates based on end uses and demographics.

[1]2005 was included in the historical time period through extrapolations of data from 2001 to 2004.

[2]PSRC is the Puget Sound Regional Council. TAZ and FAZ are Traffic and Forecast Analysis Zones, which are geographic areas for which the PSRC makes demographic projections.

Table 5-2
Purveyor Relationship to the 2004 CPA

#	Purveyor	Inclusion In CPA
1	Bellevue, City of	Excluded: Part of Cascade Water Alliance which is no longer part of the Saving Water Partnership.
2	Bothell, City of	Included in the CPA.
3	Cedar River Water & Sewer District	Included in the CPA.
4	Coal Creek Utility District	Included in the CPA.
5	Duvall, City of	Included in the CPA.
6	Edmonds, City of	Excluded: Participates in Everett's conservation programs.
7	Highline Water District	Included in the CPA.
8	King County Water District 20	Included in the CPA.
9	King County Water District 45	Included in the CPA.
10	King County Water District 49	Included in the CPA.
11	King County Water District 90	Included in the CPA.
12	King County Water District 119	Included in the CPA.
13	King County Water District125	Included in the CPA.
14	Kirkland, City of	Excluded: Part of Cascade Water Alliance which is no longer part of the Saving Water Partnership.
15	Lake Forest Park, City of	Excluded: SPU only provides back up supply for fire flow.
16	Mercer Island, City of	Included in the CPA.
17	Northshore Utility District	Included in the CPA.
18	Olympic View Water & Sewer District	Included in the CPA.
19	Redmond, City of	Excluded: Part of Cascade Water Alliance which is no longer part of the Saving Water Partnership.
20	Renton, City of	Excluded: SPU only provides supply to Boeing.
21	Shoreline Water District	Included in the CPA.
22	Skyway Water & Sewer District	Excluded: Part of Cascade Water Alliance which is no longer part of the Saving Water Partnership.
23	Soos Creek Water & Sewer District	Included in the CPA.
24	Tukwila, City of	Excluded: Part of Cascade Water Alliance which is no longer

		part of the Saving Water Partnership.
25	Woodinville Water District	Included in the CPA.

25 total purveyors:17 included in CPA, 5 excluded related to CWA (Cascade Water Alliance), 3 excluded for other reasons.

The end use component of the Master Water Balance consists of approximately 60 end uses, which are ways customers use water such as toilet flushing, irrigation, and/or boiler operation. Each end use contains data about what percentages of customers have particular hardware (e.g. 1.6 gallon per flush toilets) and behaviors (e.g. 4 flushes per day) related to the end use. Water is allocated to each end use based on information from the 1998 CPA, plus more recent national and local research and experience. These allocations are believed to be highly accurate in areas where extensive data are available, such as for most indoor residential end uses and to a lesser degree many non-residential end uses based on surveys of SPU non-residential customers. The remaining unallocated water has been distributed across the remaining end uses based on best professional judgment. The plumbing code is incorporated into relevant end uses reflecting new construction with efficient fixtures, as well as existing construction being retrofitted with more efficient fixtures over time. For the historical time period of 1995-2005, the allocation of water to end uses was then calibrated against actual demand.

The demographic component of the Master Water Balance consists of demographic data and forecasts such as the number of households, businesses, people per household, employees, etc. Demographic information was obtained from the U.S. Census, the Puget Sound Regional Council, and other sources.

The demand component of the Master Water Balance consists of actual or projected demand. For 1995-2005, the demand is actual demand based on SPU and purveyor billing records. For 2010-2030, the demand is projected by the CPA Model using information from the end use and demographic components.

5.3 Measure Library

The Measure Library contains information on 126 individual conservation measures that could be implemented to decrease water use. A conservation measure is defined as a change in water-using hardware or behavior that results in reduced water consumption. This translates into changing the volume of use per application or changing the frequency of the applications. For example, the replacement of an old 3.5 gallon per flush (gpf) toilet with a new 1.6 gpf toilet was evaluated as a hardware measure. Decreasing the number of toilet flushes was evaluated as a behavioral measure. Measure data pertains to water savings, customer acceptance, participation levels, costs, and rebate amounts. The measures are then applied to the Master Water Balance to determine water savings.

Measures were identified and included in the 2004 CPA based on four criteria. First, no measure could have a negative impact on customer satisfaction or service. Second, all measures would have to provide reliable water savings. Third, measures must be proven in the marketplace. Fourth, the measures must meet regulatory or code requirements, where applicable. Some of the measures from the 1998 CPA have been omitted from the 2004 CPA because they did not meet these criteria and/or prove to be practical.

The data sources for the measures came from the 1998 CPA and were updated by more recent national and local market research and conservation experience. This included extensive input from SPU conservation staff, who were given a training and a User's Guide on the CPA Model in October 2004.

The Measure Library will continue to be updated as new information becomes available. Other than what is practical, there is no limit to the number of measures that can be included in the CPA Model.

5.4 Package Wizard

The Package Wizard is a tool designed to group individual measures to share certain costs and/or to achieve a certain level of water savings or have costs at or below a particular dollar amount per unit of water saved. For example, the Package Wizard can display a technical potential package encapsulating all measures that could be implemented through 2030. This would illustrate the total amount of water that could be saved regardless of cost. Another possible package could be designed to keep per capita demand flat, similar to the 1% Program. Still another package could be designed with the most cost-effective measures given an avoided cost of the next best available source of supply. The Package Wizard will be employed early in 2005 to generate results for the *2007 Water System Plan Update*.

6.0 Analysis of Individual Conservation Measures

Each of the 126 conservation measures included in the CPA Model has been analyzed to determine the maximum amount of water savings technically possible, regardless of cost, for each individual measure. Much of this analysis occurred during the process of creating the Measure Library. The model determines how many customers might implement a measure through an optimization process that draws from relevant measure information related to the number of target customers, measure attractiveness, marketing budgets, measure costs, and customer investment payback time. This number of participating customers in turn determines the water savings potential. The number of participating customers also affects results such as total customer costs, total utility costs, and the levelized cost per unit of water saved.

Table 6-1 lists the 126 conservation measures included in the 2004 CPA. Detailed definitions for each conservation measure are located in Appendix B. The table provides the following information for each measure:

- Measure Name – The measure names are generally self explanatory. The codes CSF, CMF, or CNR refer to the combined service area (C) [as explained in Section 5.2], single family (SF), multifamily (MF), and non-residential (NR).
- Subsector – Either single family, multifamily, or non-residential.
- Major End Use - Either domestic, landscaping, recreation, cooling, food services, process, or other.
- End Use – The exact end use that the measure acts on.

- Indirect Benefits – Indicates whether there is a positive, neutral, or negative indirect benefit for wastewater, stormwater, and energy. The percent of hot water use is provided for any measure with an energy indirect benefit.

Table 6-1
Conservation Measures Included in the 2004 CPA

#	Measure Name	Sub Sector	Major End Use	End Use	Indirect Benefits			
					Waste Water	Storm Water	Energy	% Hot Water
1	Boiler Performance Improvement CNR	Non-Residential	Process	Boilers	Positive	Neutral	Positive	100%
2	Car Wash Low Flow Equip CNR	Non-residential	Other	Vehicle Washing - Business w/ Own Equip	Positive	Neutral	Positive	75%
3	Car Wash Recycle Improvement CNR	Non-residential	Other	Vehicle Washing - Retail Car Wash	Positive	Neutral	Positive	75%
4	Car Wash Replacement Water CNR	Non-residential	Other	Vehicle Washing - Retail Car Wash	Positive	Neutral	Positive	75%
5	Catchment in Detention System CNR	Non-residential	Landscaping	Irrigation - Sprinkler In Ground Auto	Neutral	Neutral	Neutral	0%
6	Catchment in Rain Barrel CSF	Single Family	Landscaping	Irrigation - Hand Held	Neutral	Neutral	Neutral	0%
7	Clotheswasher Efficient Model (Common Area) CMF	Multi Family	Domestic	Clotheswasher - Res. Capacity in Common Area	Positive	Neutral	Positive	50%
8	Clotheswasher Efficient Model (In Unit) CMF	Multi Family	Domestic	Clotheswasher - Res. Capacity In Unit	Positive	Neutral	Positive	50%
9	Clotheswasher Efficient Model CNR	Non-residential	Other	Clotheswasher - Laundrymat	Positive	Neutral	Positive	50%
10	Clotheswasher Efficient Model CSF	Single Family	Domestic	Clotheswasher - Res. Capacity In Unit	Positive	Neutral	Positive	35%
11	Clotheswasher Eliminate Partial Loads CMF	Multi Family	Domestic	Clotheswasher - Res. Capacity In Unit	Positive	Neutral	Positive	50%
12	Clotheswasher Eliminate Partial Loads CSF	Single Family	Domestic	Clotheswasher - Res. Capacity In Unit	Positive	Neutral	Positive	35%
13	Clotheswasher Ultra Efficient Model (In Unit) CMF	Multi Family	Domestic	Clotheswasher - Res. Capacity In Unit	Positive	Neutral	Positive	50%
14	Clotheswasher Ultra Efficient Model CSF	Single Family	Domestic	Clotheswasher - Res. Capacity In Unit	Positive	Neutral	Positive	35%
15	Cooling System Performance Improvement CNR	Non-residential	Cooling	Other Equip Towers	Positive	Neutral	Negative	0%
16	Cooling System Switching to Air CNR	Non-residential	Cooling	Once through	Positive	Neutral	Negative	0%
17	Dishwasher Efficient Model CMF	Multi Family	Domestic	Dishwashing – Machine Res. Capacity	Positive	Neutral	Positive	100%
18	Dishwasher Efficient Model CNR	Non-residential	Food Services	Dishwashing – Machine Comm. Capacity	Positive	Neutral	Positive	100%
19	Dishwasher Efficient Model CSF	Single Family	Domestic	Dishwashing – Machine Res. Capacity	Positive	Neutral	Positive	100%
20	Dishwasher Eliminate	Multi Family	Domestic	Dishwashing –	Positive	Neutral	Positive	100%

	Partial Load CMF			Machine Res. Capacity				
21	Dishwasher Eliminate Partial Load CNR	Non-residential	Domestic	Dishwashing – Machine Comm. Capacity	Positive	Neutral	Positive	100%

Table 6-1 (cont.)
Conservation Measures Included in the 2004 CPA

#	Measure Name	Sub Sector	Major End Use	End Use	Indirect Benefits			
					Waste Water	Storm Water	Energy	% Hot Water
22	Dishwasher Eliminate Partial Load CSF	Single Family	Domestic	Dishwashing – Machine Res. Capacity	Positive	Neutral	Positive	100%
23	Disposal Usage Improvement CMF	Multi Family	Food Services	Disposal - Res Capacity	Positive	Neutral	Neutral	0%
24	Disposal Usage Improvement CNR	Non-residential	Food Services	Disposal - Comm. Capacity	Positive	Neutral	Neutral	0%
25	Disposal Usage Improvement CSF	Single Family	Food Services	Disposal - Res Capacity	Positive	Neutral	Neutral	0%
26	Drip Irrigation CMF	Multi Family	Landscaping	Irrigation - Sprinkler In Ground Auto	Neutral	Neutral	Neutral	0%
27	Drip Irrigation CNR	Non-residential	Landscaping	Irrigation - Sprinkler In Ground Auto	Neutral	Neutral	Neutral	0%
28	Drip Irrigation CSF	Single Family	Landscaping	Irrigation - Sprinkler In Ground Auto	Neutral	Neutral	Neutral	0%
29	Faucet Aerator 0.5 gpm (Misc Flow Customer) CNR	Non-Residential	Domestic	Faucet - Misc by Flow	Positive	Neutral	Positive	20%
30	Faucet Aerator 1.5 gpm (Misc Flow) CMF	Multifamily	Domestic	Faucet - Misc by Flow	Positive	Neutral	Positive	20%
31	Faucet Aerator 1.5 gpm (Misc Flow) CSF	Single Family	Domestic	Faucet - Misc by Flow	Positive	Neutral	Positive	20%
32	Faucet Run Til Hot Recirculate (Dishwash Employ) CNR	Non-residential	Domestic	Faucet - Dishwashing Hand by Flow	Positive	Neutral	Positive	100%
33	Faucet Run Til Hot Recirculate (Dishwash) CMF	Multi Family	Domestic	Faucet - Dishwashing Hand by Flow	Positive	Neutral	Positive	100%
34	Faucet Run Til Hot Recirculate (Dishwash) CSF	Single Family	Domestic	Faucet - Dishwashing Hand by Flow	Positive	Neutral	Positive	100%
35	Faucet Run Til Hot Recirculate (Misc Flow Cust) CNR	Non-residential	Domestic	Faucet - Misc by Flow	Positive	Neutral	Positive	100%
36	Faucet Run Til Hot Recirculate (Misc Flow Employ) CNR	Non-residential	Domestic	Faucet - Misc by Flow	Positive	Neutral	Positive	100%
37	Faucet Run Til Hot Recirculate (Misc Flow) CMF	Multi Family	Domestic	Faucet - Misc by Flow	Positive	Neutral	Positive	100%
38	Faucet Run Til Hot Recirculate (Misc Flow) CSF	Single Family	Domestic	Faucet - Misc by Flow	Positive	Neutral	Positive	100%
39	Faucet Use Decrease for Dishwashing CMF	Multi Family	Domestic	Faucet - Dishwashing Hand by Flow	Positive	Neutral	Positive	70%
40	Faucet Use Decrease for Dishwashing CNR	Non-residential	Domestic	Faucet - Dishwashing Hand by Flow	Positive	Neutral	Positive	70%
41	Faucet Use Decrease for Dishwashing CSF	Single Family	Domestic	Faucet - Dishwashing Hand by Flow	Positive	Neutral	Positive	70%

Table 6-1 (cont.)
Conservation Measures Included in the 2004 CPA

#	Measure Name	Sub Sector	Major End Use	End Use	Indirect Benefits			
					Waste Water	Storm Water	Energy	% Hot Water
42	Faucet Use Decrease for Misc Use (Customer) CNR	Non-residential	Domestic	Faucet - Misc by Flow	Positive	Neutral	Positive	20%
43	Faucet Use Decrease for Misc Use (Employee) CNR	Non-residential	Domestic	Faucet - Misc by Flow	Positive	Neutral	Positive	20%
44	Faucet Use Decrease for Misc Use CMF	Multi Family	Domestic	Faucet - Misc by Flow	Positive	Neutral	Positive	20%
45	Faucet Use Decrease for Misc Use CSF	Single Family	Domestic	Faucet - Misc by Flow	Positive	Neutral	Positive	20%
46	Food Preparation and Washing Improvements CNR	Non-residential	Process	Food Processing	Positive	Neutral	Positive	20%
47	Fountain Efficiency CMF	Multi Family	Other	Fountain	Neutral	Neutral	Neutral	0%
48	Fountain Efficiency CNR	Non-residential	Other	Fountain	Neutral	Neutral	Neutral	0%
49	Fountain Efficiency CSF	Single Family	Other	Fountain	Neutral	Neutral	Neutral	0%
50	Hot Tub Use Improvement CNR	Non-residential	Recreation	Hot Tub	Positive	Neutral	Positive	100%
51	Hot Tub Use Improvements CMF	Multi Family	Recreation	Hot Tub	Positive	Neutral	Positive	100%
52	Hot Tub Use Improvements CSF	Single Family	Recreation	Hot Tub	Positive	Neutral	Positive	100%
53	Irrigation Controllers Weather Based CMF	Multi Family	Landscaping	Irrigation - Sprinkler In Ground Auto	Neutral	Neutral	Neutral	0%
54	Irrigation Controllers Weather Based CNR	Non-residential	Landscaping	Irrigation - Sprinkler In Ground Auto	Neutral	Neutral	Neutral	0%
55	Irrigation Controllers Weather Based CSF	Single Family	Landscaping	Irrigation - Sprinkler In Ground Auto	Neutral	Neutral	Neutral	0%
56	Irrigation Scheduling Improvement CMF	Multi Family	Landscaping	Irrigation - Sprinkler In Ground Auto	Neutral	Neutral	Neutral	0%
57	Irrigation Scheduling Improvement CNR	Non-residential	Landscaping	Irrigation - Sprinkler In Ground Auto	Neutral	Neutral	Neutral	0%
58	Irrigation Scheduling Improvement CSF	Single Family	Landscaping	Irrigation - Sprinkler In Ground Auto	Neutral	Neutral	Neutral	0%
59	Irrigation System Performance Improvement CMF	Multi Family	Landscaping	Irrigation - Sprinkler In Ground Auto	Neutral	Neutral	Neutral	0%
60	Irrigation System Performance Improvement CNR	Non-residential	Landscaping	Irrigation - Sprinkler In Ground Auto	Neutral	Neutral	Neutral	0%
61	Irrigation System Performance Improvement CSF	Single Family	Landscaping	Irrigation - Sprinkler In Ground Auto	Neutral	Neutral	Neutral	0%
62	Laundry Wash Water Recycle CNR	Non-residential	Other	Clotheswasher - Industrial Capacity	Positive	Neutral	Positive	50%
63	Leak Reduction (Cooling) CNR	Non-residential	Cooling	Leaks - Cooling	Neutral	Positive	Positive	10%

Table 6-1 (cont.)
Conservation Measures Included in the 2004 CPA

#	Measure Name	Sub Sector	Major End Use	End Use	Indirect Benefits			
					Waste Water	Storm Water	Energy	% Hot Water
64	Leak Reduction (Domestic) CMF	Multi Family	Domestic	Leaks - Domestic	Neutral	Positive	Positive	10%
65	Leak Reduction (Domestic) CNR	Non-residential	Domestic	Leaks - Domestic	Neutral	Positive	Positive	10%
66	Leak Reduction (Domestic) CSF	Single Family	Domestic	Leaks - Domestic	Neutral	Positive	Positive	10%
67	Leak Reduction (Food Service) CNR	Non-residential	Food Service	Leaks - Food Service	Neutral	Positive	Positive	10%
68	Leak Reduction (Landscape) CNR	Non-residential	Landscaping	Leaks - Landscape	Neutral	Neutral	Neutral	0%
69	Leak Reduction (Other) CNR	Non-residential	Other	Leaks - Other	Neutral	Positive	Positive	10%
70	Leak Reduction (Process) CNR	Non-residential	Process	Leaks - Process	Neutral	Positive	Positive	10%
71	Leak Reduction (Recreation) CNR	Non-residential	Recreation	Leaks - Recreation	Neutral	Positive	Positive	75%
72	Plants With Low Water Use CMF	Multi Family	Landscaping	Irrigation - Sprinkler In Ground Auto	Neutral	Neutral	Neutral	0%
73	Plants With Low Water Use CNR	Non-residential	Landscaping	Irrigation - Sprinkler In Ground Auto	Neutral	Neutral	Neutral	0%
74	Plants With Low Water Use CSF	Single Family	Landscaping	Irrigation - Sprinkler In Ground Auto	Neutral	Neutral	Neutral	0%
75	Process Water Control Improvements CNR	Non-residential	Process	Process Washing	Positive	Neutral	Neutral	0%
76	Process Water Recycle CNR	Non-residential	Process	Process Washing	Positive	Neutral	Neutral	0%
77	Shower Run Til Hot Recirculate CMF	Multi Family	Domestic	Shower	Positive	Neutral	Positive	100%
78	Shower Run Til Hot Recirculate CNR	Non-residential	Domestic	Shower	Positive	Neutral	Positive	100%
79	Shower Run Til Hot Recirculate CSF	Single Family	Domestic	Shower	Positive	Neutral	Positive	100%
80	Shower Use Decrease CMF	Multi Family	Domestic	Shower	Positive	Neutral	Positive	75%
81	Shower Use Decrease CNR	Non-residential	Domestic	Shower	Positive	Neutral	Positive	75%
82	Shower Use Decrease CSF	Single Family	Domestic	Shower	Positive	Neutral	Positive	75%
83	Showerheads 1.5 GPM CMF	Multi Family	Domestic	Shower	Positive	Neutral	Positive	75%
84	Showerheads 1.5 GPM CNR	Non-residential	Domestic	Shower	Positive	Neutral	Positive	75%
85	Showerheads 1.5 GPM CSF	Single Family	Domestic	Shower	Positive	Neutral	Positive	75%
86	Showerheads 2.0 GPM CMF	Multi Family	Domestic	Shower	Positive	Neutral	Positive	75%
87	Showerheads 2.0 GPM CNR	Non-residential	Domestic	Shower	Positive	Neutral	Positive	75%
88	Showerheads 2.0 GPM CSF	Single Family	Domestic	Shower	Positive	Neutral	Positive	75%
89	Sidewalk Cleaning by Broom CMF	Multi Family	Domestic	Sidewalk Washing	Neutral	Positive	Neutral	0%

Table 6-1 (cont.)
Conservation Measures Included in the 2004 CPA

#	Measure Name	Sub Sector	Major End Use	End Use	Indirect Benefits			
					Waste Water	Storm Water	Energy	% Hot Water
90	Sidewalk Cleaning by Broom CNR	Non-residential	Domestic	Sidewalk Washing	Neutral	Positive	Neutral	0%
91	Sidewalk Cleaning by Broom CSF	Single Family	Domestic	Sidewalk Washing	Neutral	Positive	Neutral	0%
92	Soil Amendment Improvements CMF	Multi Family	Landscaping	Irrigation - Sprinkler In Ground Auto	Neutral	Neutral	Neutral	0%
93	Soil Amendment Improvements CNR	Non-residential	Landscaping	Irrigation - Sprinkler In Ground Auto	Neutral	Neutral	Neutral	0%
94	Soil Amendment Improvements CSF	Single Family	Landscaping	Irrigation - Sprinkler In Ground Auto	Neutral	Neutral	Neutral	0%
95	Soil Moisture Sensors CMF	Multi Family	Landscaping	Irrigation - Sprinkler In Ground Auto	Neutral	Neutral	Neutral	0%
96	Soil Moisture Sensors CNR	Non-residential	Landscaping	Irrigation - Sprinkler In Ground Auto	Neutral	Neutral	Neutral	0%
97	Soil Moisture Sensors CSF	Single Family	Landscaping	Irrigation - Sprinkler In Ground Auto	Neutral	Neutral	Neutral	0%
98	Sprinkler Rain Shutoff CMF	Multi Family	Landscaping	Irrigation - Sprinkler In Ground Auto	Neutral	Neutral	Neutral	0%
99	Sprinkler Rain Shutoff CNR	Non-residential	Landscaping	Irrigation - Sprinkler In Ground Auto	Neutral	Neutral	Neutral	0%
100	Sprinkler Rain Shutoff CSF	Single Family	Landscaping	Irrigation - Sprinkler In Ground Auto	Neutral	Neutral	Neutral	0%
101	Swimming Pool Use Improvement CMF	Multi Family	Recreation	Pool	Positive	Neutral	Positive	100%
102	Swimming Pool Use Improvement CNR	Non-residential	Recreation	Pool	Positive	Neutral	Positive	100%
103	Swimming Pool Use Improvement CSF	Single Family	Recreation	Pool	Positive	Neutral	Positive	100%
104	Toilet 1.2 GPF CMF	Multi Family	Domestic	Toilet	Positive	Neutral	Neutral	0%
105	Toilet 1.2 GPF CSF	Single Family	Domestic	Toilet	Positive	Neutral	Neutral	0%
106	Toilet 1.6 GPF CMF	Multi Family	Domestic	Toilet	Positive	Neutral	Neutral	0%
107	Toilet 1.6 GPF CNR	Non-residential	Domestic	Toilet	Positive	Neutral	Neutral	0%
108	Toilet 1.6 GPF CSF	Single Family	Domestic	Toilet	Positive	Neutral	Neutral	0%
109	Toilet 1.6 GPF Longlife CMF	Multi Family	Domestic	Toilet	Positive	Neutral	Neutral	0%
110	Toilet 1.6 GPF Longlife CNR	Non-residential	Domestic	Toilet	Positive	Neutral	Neutral	0%
111	Toilet 1.6 GPF Longlife CSF	Single Family	Domestic	Toilet	Positive	Neutral	Neutral	0%
112	Toilet Flapper Replacement CMF	Multi Family	Domestic	Toilet	Positive	Neutral	Neutral	0%
113	Toilet Flapper Replacement CNR	Non-residential	Domestic	Toilet	Positive	Neutral	Neutral	0%

Table 6-1 (cont.)
Conservation Measures Included in the 2004 CPA

#	Measure Name	Sub Sector	Major End Use	End Use	Indirect Benefits			
					Waste Water	Storm Water	Energy	% Hot Water
114	Toilet Flapper Replacement CSF	Single Family	Domestic	Toilet	Positive	Neutral	Neutral	0%
115	Toilet Flush Decrease CMF	Multi Family	Domestic	Toilet	Positive	Neutral	Neutral	0%
116	Toilet Flush Decrease CSF	Single Family	Domestic	Toilet	Positive	Neutral	Neutral	0%
117	Toilet Flushes by Rainwater CMF	Multi Family	Domestic	Toilet	Positive	Positive	Neutral	0%
118	Toilet Flushes by Rainwater CNR	Non-residential	Domestic	Toilet	Positive	Positive	Neutral	0%
119	Toilet Flushes by Rainwater CSF	Single Family	Domestic	Toilet	Positive	Positive	Neutral	0%
120	Urinal 0.5 GPF CNR	Non-residential	Domestic	Urinal	Positive	Neutral	Neutral	0%
121	Urinal 1.0 GPF CNR	Non-residential	Domestic	Urinal	Positive	Neutral	Neutral	0%
122	Urinal Flushes by Rainwater CNR	Non-residential	Domestic	Urinal	Positive	Positive	Neutral	0%
123	Urinal No Water CNR	Non-residential	Domestic	Urinal	Positive	Neutral	Neutral	0%
124	Water Use Alerting CMF	Multi Family	Landscaping	Irrigation - Sprinkler In Ground Auto	Neutral	Neutral	Neutral	0%
125	Water Use Alerting CNR	Single Family	Landscaping	Irrigation - Sprinkler In Ground Auto	Neutral	Neutral	Neutral	0%
126	Water Use Alerting CSF	Single Family	Landscaping	Irrigation - Sprinkler In Ground Auto	Neutral	Neutral	Neutral	0%

Further results for selected conservation measures are presented in Table 6-2. The selected measures have moderate to large water savings and the analysis of their savings and costs are nearly complete. The results assume implementing the measures from 2005 to 2030 and the values are those achieved in the final year. The table includes values for the quantity of water saved and the levelized cost per unit of saved water, both on a peak season (May 15 to September 15) and annual basis. The table also includes the present value per participant for both life cycle costs and indirect benefits.

Table 6-2
Results for Selected Conservation Measures[1]

# (from Table 6-1)	Measure Name	MGD Water Saved		Levelized Cost Per CCF[2]		PV Life Cycle Cost Per Participant[3]	Indirect Benefits			
		Peak Season	Annual	Peak Season	Annual		Waste Water	Storm Water	Energy	PV of Indirect Benefits Per Participant[4]
12	Clotheswasher Eliminate Partial Loads CSF	0.61	0.61	$2.46	$0.82	$8.76	Positive	Neutral	Positive	$12.00
16	Cooling System Switching to Air CNR	0.61	0.61	$2.54	$0.85	$2,265.15	Positive	Neutral	Negative	$346.00
70	Leak Reduction (Process) CNR	0.47	0.47	$2.06	$0.69	$2,750.00	Neutral	Positive	Positive	$2,755.00
83	Showerheads 1.5 GPM CMF	0.54	0.54	$2.18	$0.73	$31.88	Positive	Neutral	Positive	$168.00
85	Showerheads 1.5 GPM CSF	0.81	0.81	$1.40	$0.47	$34.54	Positive	Neutral	Positive	$285.00
86	Showerheads 2.0 GPM CMF	0.55	0.55	$3.52	$1.18	$19.31	Positive	Neutral	Positive	$63.00
88	Showerheads 2.0 GPM CSF	0.75	0.75	$2.41	$0.80	$20.29	Positive	Neutral	Positive	$97.00
104	Toilet 1.2 GPF CMF	0.86	0.86	$18.70	$6.25	$467.87	Positive	Neutral	Neutral	$10.00
105	Toilet 1.2 GPF CSF	3.76	3.76	$19.52	$6.52	$827.79	Positive	Neutral	Neutral	$16.00
115	Toilet Flush Decrease CMF	0.88	0.88	$3.54	$1.18	$22.99	Positive	Neutral	Neutral	$3.00
116	Toilet Flush Decrease CSF	1.34	1.34	$2.32	$0.78	$24.61	Positive	Neutral	Neutral	$5.00

[1] These results assume implementing the measures from 2005 to 2030 and the results are those achieved in the final year.
[2] Levelized Cost Per CCF is the discounted (at a 5% discount rate) total cost over the program life divided by the total discounted volume of water saved.
[3] Present Value Life Cycle Cost Per Participant is the total cost of implementing the measure over the measure life, discounted using a 5% discount rate.
[4] Present Value of Indirect Benefits Per Participant is the discounted (at a 5% discount rate) value over the measure life of the indirect benefits, which are further explained in Section 7.

Several notes about interpreting the data in Table 6-2 are important. First, the mgd of water saved is the same on a peak season or annual basis. This is because these particular measures are not peak-related and the savings are expressed in units per day. Second, the levelized cost per ccf of saved water is always different between the peak season and annual since that calculation uses a water savings volume (e.g. ccf) tied to the appropriate time period (e.g. 4 months for peak season or 12 months for annual). Third, direct comparisons between conservation measures in the 1998 CPA and the 2004 CPA may not always be appropriate since underlying assumptions, such as costs or target audiences, may have changed since the 1998 CPA.

Table 6-2 shows that substantial water savings are associated with clotheswashers, showers, and toilets in the residential sector. This is expected since these three end uses are among the largest water uses in households. The results also show that the non-residential sector has strong water conservation savings potential, in this case related to cooling systems.

The results from Table 6-2 highlight why it is not appropriate to simply add the water savings and costs of each individual measure to generate a total number of potential water savings and costs. First, some measures are duplicative and would not be implemented together. For example, the model allows for independent analysis of retrofitting households with either 1.5

gpm or 2.0 gpm showerheads. SPU would review the analysis and only implement one of these options. Second, as discussed below, packaging together measures reduces costs and thus the costs listed in individual measures are often not the true costs of implementation.

The results from Table 6-2 also show why packaging measures together is important. In many cases, measures would be implemented together, which would reduce marketing costs since those costs would be shared across multiple measures. Packaging may be appropriate for measures that target the same customers, especially if the nature of the measures is similar. For example, it would make sense to combine toilet and showerhead retrofit programs for multifamily households. The Package Wizard part of the model will be used to optimize the measure groupings as SPU continues to update the CPA analysis.

Appendix C contains CPA Model summary reports of the measures listed in Table 6-2. Those summary reports document assumptions such as participation rates, marketability scores, and life of the program and are included to illustrate inputs to individual conservation measures.

7.0 Incorporation of Indirect Benefits

The 1998 CPA noted that many of the conservation measures have additional economic and environmental benefits beyond water savings. For example, installation of water recycling systems in industrial applications can reduce energy use as well as wastewater and stormwater discharges. Similarly, more efficient clothes washers reduce energy use and wastewater discharges in both residential and commercial sectors.

The 1998 CPA identified which water conservation measures had indirect benefits but did not quantify the benefits. The 2004 CPA presents assumptions for analyzing these benefits along with calculations as illustrated in Table 6-2 in Section 6. This analysis meets a requirement of the City of Seattle's Ordinance Number 120532, that the 2004 CPA should quantify "best estimates of other benefits obtained by conservation measures, including savings relating to reduced demand for electricity, sewer, stormwater, etc."

The indirect benefits from water conservation for energy[3], stormwater, and wastewater were determined to be: 1) reduced demand for energy from Seattle City Light and Puget Sound Energy; and 2) a reduction in the sizing of Sanitary Sewer Overflow (SSO) and Combined Sewer Overflow (CSO) facilities by Seattle Public Utilities. Another possible indirect benefit would be to King County wastewater facilities and operations.

The present value of indirect benefits is made up of two components: wastewater/stormwater and energy benefits. The wastewater/stormwater benefit was defined as the savings to utilities from a delay in the need to invest in CSO/SSO storage facilities valued at $6/gallon. The energy benefits are the energy savings from hot water. Energy savings for the region was based on the avoided cost of electricity valued by Seattle City Light at $36/kwh.

[3] The Ordinance reference to "electricity" was interpreted more broadly as "energy" – including both natural gas and electricity.

In Table 6-2, indirect benefits can be contrasted to the life-cycle cost of the measure by comparing the "Present Value Lifecycle Cost Per Participant" column to the "Present Value of Indirect Benefits Per Participant" column. The PV of lifecycle costs is defined as the total cost of implementing the measure over the measure life, discounted using a 5% discount rate. The PV of the indirect benefits were also calculated based on the measure life and using a discount rate of 5%.

Appendix D describes the methodology used to ascribe a positive, negative or neutral wastewater, stormwater, and energy indirect benefit to each of the 126 water conservation measures displayed in Table 6-1.

8.0 Continuous Updates and Use

The 2004 CPA is intended as an analytical tool to assess water conservation measures with the likelihood of ensuring long-term savings and indirect benefits at the lowest cost to SPU customers and the community. While the CPA Model structure could be used by other water utilities, the model inputs (i.e. Master Water Balance and Measure Library) are relevant only to SPU's service areas and purveyors included in the 2004 CPA. The results of the 2004 CPA are SPU-specific and should not be used directly by other water utilities.

By itself, the 2004 CPA does not set water conservation policy, expenditure levels, or plan programs. Rather, the 2004 CPA is an important part of the regional water planning process and will be integrated into the *2007 Water System Plan Update*.

CPA analysis in 2005 will be incorporated into the SPU Demand Forecast. That work will be followed by "what if" scenarios for the Drinking Water Supply Planning Model. Various combinations of conservation measures will be packaged and analyzed for water saving potential, expenditure levels and interaction with conventional supply options along with other utility goals including environmental stewardship.

As part of that process, SPU will be consulting with key stakeholders and national experts to gain external perspective prior to finalizing the analysis of all 126 of the individual measures, as well as combinations of conservation measures to meet a variety of policy goals.

This 2004 CPA is the foundation that will enable SPU to conduct detailed analysis and development policies for the future role of demand management in its portfolio of supply options. The 2004 CPA should be viewed as a powerful tool built for a variety of functions and well integrated into the regional water planning process.

APPENDIX A: Definitions of Water Supply Planning "Stepping Stones"

- **Conservation Drivers Analysis** – An SPU analysis of external commitments and customer expectations related to its water conservation efforts. The analysis will help answer the following questions: 1) What are the reasons SPU provides water conservation programs if it is not to offset the need for additional water supply?; and 2) What volume of savings is needed to meet those objectives? The result of this work, along with the 2004 CPA, will help set SPU's baseline level of conservation to feed into the demand forecast, and form the foundation of SPU's policy direction for conservation in the *2007 Water System Plan Update.*

- **Alternatives for Future Water Supply** – There are two components:
  1) Conservation Potential Assessment: The CPA's primary purpose is to zero in on the most desirable conservation opportunities. It is a rigorous analysis of the cost, volume, and reliability of water conservation opportunities available within Seattle's wholesale and direct service areas through 2030.

  2) Traditional Supply Alternatives: SPU is updating information on alternative supply sources other than conservation that may be developed by to meet future water demands. The supply alternatives include ways to make more use the current sources and development of new sources of supply. Information used to evaluate the different alternatives available to SPU includes up-to-date estimates of firm yield and costs, as well as assessments of environmental impacts, implementation issues, and operational criteria.

- **Demand Forecast Model** – SPU is developing a Variable Flow Factor Demand Forecast Model that will project demand through approximately 2060. Water demand flow factors by sector (single and multi-family residential, commercial, etc.) for Seattle and each wholesale customer will be developed based on current consumption, demographic and weather data. Rather than keeping the flow factors constant over the forecast period, the factors will be adjusted over time to reflect the impacts on consumption of conservation and changes in water/sewer prices and household income. The CPA Model will be used to estimate the impacts of code and programmatic conservation on the flow factors over time.

- **Drinking Water Supply Planning Model** – SPU is creating a planning model to help make water supply investment decisions that consider risks and uncertainties associated with future demands and supplies. The model will include both a decision tree model to evaluate cost risks and a weighted criteria model to incorporate the environmental and social aspects of alternatives that are not easily converted to monetary units. The demand forecast, firm yield of current and alternative sources of supply, and the 2004 CPA will provide information to the planning model. This model will be used to determine the cost-effective level for conservation relative to traditional supply alternatives.

- **Supply with Current Facilities** – SPU currently supplies water to its customers from its surface water facilities on the Cedar River and the South Fork Tolt River, as well as from its well fields south of Seattle. These sources can supply up to 171 million gallons per day on an average annual basis at 98% reliability. SPU periodically updates the firm yield estimates

for its supply sources to account for recent hydrologic events, changes in regulations and instream flow requirements, and other factors. Recently, SPU has studied the potential impacts that climate change could have on its sources, and will consider this information in its water supply planning efforts.

- **2007 Update of Water System Plan** – Every six years SPU is required to update its comprehensive water system plan, which provides guidance for the different aspects of utility functions. Meeting future demand is a key element of the plan, along with maintaining reliability in delivering water, continuing to meet water quality regulations, and sustaining a financially sound position for ratepayers. To address how SPU will meet future demand, SPU must prepare a demand forecast, an analysis of yield and supply alternatives, and an evaluation of conservation as a source of supply. The 2004 CPA provides the analysis of conservation alternatives for this exercise.

APPENDIX B: Conservation Measure Draft Definitions

C = Combined Service Area (includes retail and a portion of the wholesale service areas)
SF = Single family
MF = Multifamily
NR = Non Residential

1. Boiler Performance Improvement CNR - Improved water quality control and increase boiler cycles. Direct cost includes chemicals & increased monitoring. In some boilers, this measure may also include steam condensation recovery.

2. Car Wash Low Flow Equipment CNR – Conversion car washing in businesses which currently use hose and bucket to alternatives like on-site equipment that is more efficient like power washers, and/or defer washing on-site and switch to commercial car washes.

3. Car Wash Recycle Improvement CNR – Equipment that treats and recycles the same wash water to wash other vehicles. This measure differs from car wash low flow equipment in that it only needs to use drinking water for make up (about 10 to 20%).

4. Car Wash Replacement Water CNR - Substitutes source water by conversion of a car wash from using drinking water to using non-potable water (ground water or reclaimed water).

5. Catchment in Detention System CNR – Substitutes rain water for drinking water for non-potable uses like irrigation. Can make double use of a stormwater detention pond or tank to retain, rather than just detain, the water. This measure differs from rain barrels in that the volume of water is much larger (much more dry weather storage) and the water used is not substituted for water hand held watering, rather, automatic irrigation systems.

6. Catchment in Rain Barrel CSF – Rainwater gutter catchment and storage in small barrels. Measure substitute rainwater for drinking water used for hand held irrigation. Use is restricted to customers with very small irrigation needs (10 gallons a day or less) since irrigation rainfall in the Seattle area limits barrel filling to under 10 times in an "average" summer. Measure substitutes source water and changes <u>how often</u> drinking water is needed as make-up for rainwater.

7. Clotheswasher Efficient Model (Common Area) CMF – Converts an inefficient washer to a more efficient model in the common area of an apartment building, usually coin op washers. These common area washers serve many tenants.

8. Clotheswasher Efficient Model (In Unit) CMF – Converts an inefficient washer to a more efficient model inside each individual apartment unit. Usually the washer is not owned by the tenant. Each washer serves only one tenant.

9. Clotheswasher Efficient Model CNR – Converts an inefficient washer to a more efficient model in each business, institution, dorm, or other non-residential situation including laundromats. Usually coin-op washers serve many users.

10. Clotheswasher Efficient Model CSF – Converts an inefficient washer to a more efficient model in each single family home and condo. Usually, unless the residence is rented, the washer is owned by the occupant.

11. Clotheswasher Eliminate Partial Loads CMF - Lowering the frequency of use of a machine, whether it be efficient or non-efficient, by encouraging multi-family customers with individual machines to load machines to full capacity, rather than do a series of smaller loads. (Note: common area coin op machines and those at laundromats usually have full loads so they are not included here).

12. Clotheswasher Eliminate Partial Loads CSF - Lowering the frequency of use of a machine, whether it be efficient or non-efficient, by encouraging customers to load machines to full capacity, rather than do a series of smaller loads.

13. Clotheswasher ULTRA Efficient Model (In Unit) CMF – Converts an inefficient washer to a more efficient model (water factor under 6.0) in each multifamily home. Usually, unless the residence is rented, the washer is owned by the occupant.

14. Clotheswasher ULTRA Efficient Model CSF – Converts an inefficient washer to an ultra efficient model (water factor under 6.0) in each single family home. Usually, unless the residence is rented, the washer is owned by the occupant.

15. Cooling System Performance Improvement CNR – Adding monitoring equipment that increases the cycles of concentration (less purge water and less drinking water make-up). Equipment monitors and adjusts feed water. Also involves periodic inspection for water overflows and other cooling maintenance issues that directly relate to water use (measure covers all water cooling except conversion to closed loop air cooling). Includes plumbing a single pass cooling application into a cooling loop system.

16. Cooling System Switching to Air CNR – Conversion of equipment in a business from a water-cooled flow through system to an air-cooled system with external heat exhaust coil. Examples could include ice machines or refrigeration equipment.

17. Dishwasher Efficient Model CMF - Converts older inefficient dishwasher equipment to more efficient models in multi-family households who have machines.

18. Dishwasher Efficient Model CNR – Converts commercial style higher capacity dishwashers used in the food service industry to more efficient models.

19. Dishwasher Efficient Model CSF - Converts older inefficient dishwashers to more efficient models in households who have machines.

20. Dishwasher Eliminate Partial Loads CMF – reduces the frequency of use in multifamily households with machines by encouraging the behavior of loading the machine to full capacity, rather than doing a series of smaller loads.

21. Dishwasher Eliminate Partial Loads CNR - reduces the frequency of use in commercial food services by encouraging the behavior of loading the machine to full capacity, rather than doing a series of smaller loads.

22. Dishwasher Eliminate Partial Loads CSF – reduces the frequency of use in single family households with machines by encouraging the behavior of loading the machine to full capacity, rather than doing a series of smaller loads.

23. Disposal Usage Improvement CMF – Reduces the time of use of multifamily garbage disposal use by encouraging pre-screening and removal/composing of certain types of food waste.

24. Disposal Usage Improvement CNR – Reduces the time of use of commercial food service garbage disposal by encouraging pre-screening and removal/composing of certain types of food waste.

25. Disposal Usage Improvement CSF – Reduces the time of use of single family garbage disposal by encouraging pre-screening and removal/composing of certain types of food waste.

26. Drip Irrigation CMF – Use of soaker hoses or micro irrigation technology in the multi-family residential sector that delivers water close to the root zone of plants and reduces losses associated with evaporation and run off.

27. Drip Irrigation CNR – Use of soaker hoses or micro irrigation technology in the non-residential sector that delivers water close to the root zone of plants and reduces losses associated with evaporation and run off.

28. Drip Irrigation CSF – Use of soaker hoses or micro irrigation technology in single family households that delivers water close to the root zone of plants and reduces losses associated with evaporation and run off.

29. Faucet Aerator 0.5 gpm (Misc. Flow) CNR – replacement of a higher capacity aerator with a 0.5 gpm max capacity aerator in non-residential restrooms. Required by code in new construction only.

30. Faucet Aerator 1.5 gpm (Misc. Flow) CMF – replacement of a higher capacity aerator with a 1.5 gpm max capacity aerator in multifamily bathrooms. Replacement usually results in savings since average flows are well below maximum flow rate. Measure goes beyond code.

31. Faucet Aerator 1.5 gpm (Misc. Flow) CSF – replacement of a higher capacity aerator with a 1.5 gpm max capacity aerator in single family bathrooms. Replacement usually results in savings since average flows are well below maximum flow rate. Measure goes beyond code.

32. Faucet Run to Hot Recirculate (Dishwash Employee) CNR – Install a re-circulating system in commercial kitchen faucets that returns cold water to hot water tank instead of wasting

it while waiting for hot water. Consists of a pump and thermal sensor and plumbing, using the cold water line as the re-circulating line.

33. Faucet Run To Hot Recirculate (Dishwash) CMF - Install a re-circulating system in multifamily kitchen faucets that returns cold water to hot water tank instead of wasting it while waiting for hot water. Consists of a pump and thermal sensor and plumbing, using the cold water line as the re-circulating line.

34. Faucet Run To Hot Recirculate (Dishwash) CSF - Install a re-circulating system in single family kitchen faucets that returns cold water to hot water tank instead of wasting it while waiting for hot water. Consists of a pump and thermal sensor and plumbing, using the cold water line as the re-circulating line.

35. Faucet Run To Hot Recirculate (Misc. Flow Customer) CNR - Install a re-circulating system in commercial rest rooms that returns cold water to hot water tank instead of wasting it while waiting for hot water. Consists of a pump and thermal sensor and plumbing, using the cold water line as the re-circulating line. Depending on size of business, more than one system per business may be required.

36. Faucet Run To Hot Recirculate (Misc. Flow Employee) CNR - Install a re-circulating system in commercial rest rooms that returns cold water to hot water tank instead of wasting it while waiting for hot water. Consists of a pump and thermal sensor and plumbing, using the cold water line as the re-circulating line. Depending on size of business, more than one system per business may be required.

37. Faucet Run To Hot Recirculate (Misc. Flow) CMF - Install a re-circulating system in multi-family rest rooms that returns cold water to hot water tank instead of wasting it while waiting for hot water. Consists of a pump and thermal sensor and plumbing, using the cold water line as the re-circulating line. Only one system per household required.

38. Faucet Run To Hot Recirculate (Misc Flow) CSF - Install a re-circulating system in single family rest rooms that returns cold water to hot water tank instead of wasting it while waiting for hot water. Consists of a pump and thermal sensor and plumbing, using the cold water line as the re-circulating line. Only one system per household required.

39. Faucet Use Decrease (For Dishwashing) CMF – Reduction in length of time of faucet running in multi-family homes by either greater use of auto dishwasher without pre-wash and/or use of sink and stopper, rather than running faucet behavior.

40. Faucet Use Decrease (For Dishwashing) CNR – Reduction in length of time of faucet running in commercial food services by either greater use of auto dishwasher without pre-wash and/or use of sink and stopper, rather than running faucet behavior.

41. Faucet Use Decrease (For Dishwashing) CSF – Reduction in length of time of faucet running in single family homes by either greater use of auto dishwasher without pre-wash and/or use of sink and stopper, rather than running faucet behavior.

42. Faucet Use Decrease (Misc. Uses - Customer) CNR – Reduction in length of time faucet is running in commercial buildings for all purposes other than dishwashing such as hand washing, shaving, brushing teeth, cleaning items, etc.

43. Faucet Use Decrease (Misc. Uses - Employee) CNR – Reduction in length of time faucet is running in commercial buildings for all purposes other than dishwashing such as hand washing, shaving, brushing teeth, cleaning items, etc.

44. Faucet Use Decrease (Misc. Uses) CMF – Reduction in length of time faucet is running in multi-family households for all purposes other than dishwashing such as hand washing, shaving, brushing teeth, cleaning items, etc.

45. Faucet Use Decrease (Misc. Uses) CSF – Reduction in length of time faucet is running in single family households for all purposes other than dishwashing such as hand washing, shaving, brushing teeth, cleaning items, etc.

46. Food Preparation and Washing Improvement CNR – Reduction in the common practice of thawing frozen foods by use of running water in the commercial food service sector. Lower the time water is used by moving frozen foods to refrigerator a day before they need to be used.

47. Fountain Efficiency CMF – Improvement and waste reduction in the use of water in outside apartments and condo's for fountains, ponds, etc. by reducing leaks, overflows, and evaporation.

48. Fountain Efficiency CNR – Improvement and waste reduction in the use of water in outdoor non-residential applications for fountains, ponds, etc. by reducing leaks, overflows, and evaporation.

49. Fountain Efficiency CSF – Improvement and waste reduction in the use of water in single family yards for fountains, ponds, etc. by reducing leaks, overflows, and evaporation.

50. Hot Tub Improvements CNR – Reduction in the number of times the commercial hot tub is drained, filled or water is purged by the use of monitoring and chemical additions. This measure would apply to heath clubs, pools, and similar situations.

51. Hot Tub Improvements CMF – Reduction in the number of times the hot tub is drained, filled or water is purged by the use of monitoring and chemical additions in apartments and condo's.

52. Hot Tub Improvements CSF – Reduction in the number of times the hot tub is drained, filled or water is purged by the use of monitoring and chemical additions in single family households

53. Irrigation Controllers Weather Based CMF – Installing an auto irrigation timer system that adjusts watering schedules to meet weather adjusted water needs of plants in apartments and condo landscapes.

54. Irrigation Controllers Weather Based CNR – Installing an auto irrigation timer system that adjusts watering schedules to meet weather adjusted water needs of plants in non-residential irrigated landscapes.

55. Irrigation Controllers Weather Based CSF – Installing an auto irrigation timer system that adjusts watering schedules to meet weather adjusted water needs of plants in single family irrigated landscapes.

56. Irrigation Scheduling Improvements CMF – Providing on-site recommendations or self-auditing check sheets to lower the frequency or duration of watering. This measure requires the multi-family landscape maintenance person (with professional guidance) to manually adjust auto controllers periodically over the irrigation season as opposed to the controller doing so automatically (see alternative measure Irrigation Controller Weather Based).

57. Irrigation Scheduling Improvements CNR – Providing on-site recommendations or self-auditing check sheets to lower the frequency or duration of watering. This measure requires the commercial landscape maintenance person (with professional guidance) to manually adjust auto controllers periodically over the irrigation season as opposed to the controller doing so automatically (see alternative measure Irrigation Controller Weather Based).

58. Irrigation Scheduling Improvements CSF – Providing on-site recommendations or self-auditing check sheets to lower the frequency or duration of watering. This measure requires the single family customer (with professional guidance) to manually adjust auto controllers periodically as opposed to no adjustment over the irrigation season or having the controller doing so automatically (see alternative measure Irrigation Controller Weather Based).

59. Irrigation System Performance Improvement CMF – Improve the efficiency of irrigation systems in multi-family irrigated landscapes by the adjustment of spray patterns, repair of leaks, equipment upgrades, and adjustments (downsizing) in the number and location of heads.

60. Irrigation System Performance Improvement CNR –Improve the efficiency of irrigation systems in non-residential irrigated landscapes by the adjustment of spray patterns, repair of leaks, equipment upgrades, and adjustments (downsizing) in the number and location of heads.

61. Irrigation System Performance Improvement CSF – Improve the efficiency of irrigation systems in single family irrigated landscapes by the adjustment of spray patterns, repair of leaks, equipment upgrades, and adjustments (downsizing) in the number and location of heads.

62. Laundry Wash Water Recycle CNR – Treatment of wash water in a commercial laundry so a portion of it can be used again in another cycle or another load. Can involve ozone or other treatment methods.

63. Leak Reduction Cooling CNR – Identification and repair of leaks.

64. Leak Reduction Domestic CMF – Identification and repair of leaks.

65. Leak Reduction Domestic CNR – Identification and repair of leaks.

66. Leak Reduction Domestic CSF – Identification and repair of leaks.

67. Leak Reduction Food Service CNR – Identification and repair of leaks.

68. Leak Reduction Landscape CNR – Identification and repair of leaks.

69. Leak Reduction Other CNR – Identification and repair of leaks.

70. Leak Reduction Process Water CNR – Identification and repair of leaks.

71. Leak Reduction Recreation CNR – Identification and repair of leaks.

72. Plants With Low Water Use CMF – The design and PROPER installation of a low water use apartment and condo landscapes (one that does not need extensive, regular irrigation once established). This measure involves proper soil prep, right plant, right place, good plant installation practices, and periodic care (not a zero maintenance landscape, but a low maintenance landscape). A characteristic of this type of landscape is that no in-ground irrigation system is present. The measure is best suited to either new or extensive landscape construction and remodeling.

73. Plants With Low Water Use CNR – The design and PROPER installation of a low water use non-residential landscapes (one that does not need extensive, regular irrigation once established). This measure involves proper soil prep, right plant, right place, good plant installation practices, and periodic care (not a zero maintenance landscape, but a low maintenance landscape). A characteristic of this type of landscape is that no in-ground irrigation system is present. The measure is best suited to either new or extensive landscape construction and remodeling.

74. Plants With Low Water Use CSF – The design and PROPER installation of a low water use single family home landscapes (one that does not need extensive, regular irrigation once established). This measure involves proper soil prep, right plant, right place, good plant installation practices, and periodic care (not a zero maintenance landscape, but a low maintenance landscape). A characteristic of this type of landscape is that no in-ground irrigation system is present. The measure is best suited to either new or extensive landscape construction and remodeling.

75. Process Water Control Improvements CNR – Modification or addition of equipment or practices in the manufacturing sector, such as reverse washing technology. Improvements are always characterized by a volume reduction in the amount of water used.

76. Process Water Recycle CNR – Similar to process water control improvements, but differs in that wastewater is treated (cleaned up) and used again for another non-potable use (the same volume of water is still needed, but the source of the water changes).

77. Shower Run To Hot Recirculate CMF - Install tankless hot water or a re-circulating system in apartment or condo showers that returns cold water to hot water tank instead of wasting it while waiting for hot water. Consists of a pump and thermal sensor and plumbing, using the cold water line as the re-circulating line.

78. Shower Run To Hot Recirculate CNR - Install tankless hot water or a re-circulating system in non-residential showers that returns cold water to hot water tank instead of wasting it while waiting for hot water. Consists of a pump and thermal sensor and plumbing, using the cold water line as the re-circulating line. Depending on size of business, more than one system per business may be required.

79. Shower Run To Hot Recirculate CSF - Install tankless hot water or a re-circulating system in showers that returns cold water to hot water tank instead of wasting it while waiting for hot water. Consists of a pump and thermal sensor and plumbing, using the cold water line as the re-circulating line.

80. Shower Use Decrease CMF – Reduction in the time used to shower (about 10% less time per person per shower). Measure might include shower timer or other visual reminder.

81. Shower Use Decrease CNR – Reduction in the time used to shower (about 10% less time per person per shower). Applies to gyms, health clubs, and showering facilities provided to employees at work. Measure might include shower timer or other visual reminder.

82. Shower Use Decrease CSF – Reduction in the time used to shower (about 10% less time per person per shower). Measure might include shower timer or other visual reminder.

83. Showerheads 1.5 gpm CMF - Replacement of showerheads with ULTRA efficient heads with on-off features. These heads save more water per shower but can have lower customer acceptance.

84. Showerheads 1.5 gpm CNR - Replacement of showerheads with ULTRA efficient heads with on-off features. These heads save more water per shower but trade off lower customer acceptance.

85. Showerheads 1.5 gpm CSF - Replacement of showerheads with ULTRA efficient heads with on-off features. These heads save more water per shower but trade off lower customer acceptance

86. Showerheads 2.0 gpm CMF - Replacement of showerheads with high efficient heads with on-off features. These heads save more water per shower than code required showerheads.

87. Showerheads 2.0 gpm CNR - Replacement of showerheads with high efficient heads with on-off features. These heads save more water per shower than code required showerheads

88. Showerheads 2.0 gpm CSF - Replacement of showerheads with high efficient heads with on-off features. These heads save more water per shower than code required showerheads.

89. Sidewalk Cleaning by Broom CMF – Reduction or elimination of frequent washing of multifamily sidewalks with a hose, and instead, encouraging the use of brooms

90. Sidewalk Cleaning by Broom CNR – Reduction or elimination of frequent washing of commercial, governmental, and institutional sidewalks with a hose, and instead, encouraging the use of brooms

91. Sidewalk Cleaning by Broom CSF – Reduction or elimination of frequent washing of sidewalks and driveways in single family households with a hose, and instead, encouraging the use of brooms

92. Soil Amendment Improvements CMF – The proper prep of deep soils using aeration, compost, and soil conditioning, so that plants can develop healthy and drought tolerant root systems and the soils can hold more moisture. Measure best suited to new construction or extensive re-landscaping.

93. Soil Amendment Improvements CNR – The proper prep of deep soils using aeration, compost, and soil conditioning, so that plants can develop healthy and drought tolerant root systems and the soils can hold more moisture. Measure best suited to new construction or extensive re-landscaping.

94. Soil Amendment Improvements CSF – The proper prep of deep soils using aeration, compost, and soil conditioning, so that plants can develop healthy and drought tolerant root systems and the soils can hold more moisture. Measure best suited to new construction or extensive re-landscaping.

95. Soil Moisture Sensors CMF – Install sensors to over-ride an auto irrigation controller and prevent irrigation until the soil moisture indicates the plants actually need water. Reduces the frequency of irrigation.

96. Soil Moisture Sensors CNR – Install sensors to over-ride an auto irrigation controller and prevent irrigation until the soil moisture indicates the plants actually need water. Reduces the frequency of irrigation.

97. Soil Moisture Sensors CSF – Install sensors to over-ride an auto irrigation controller and prevent irrigation until the soil moisture indicates the plants actually need water. Reduces the frequency of irrigation.

98. Sprinkler Rain Shut Off CMF – Install a rain shut off sensor which over-rides an auto irrigation controller and prevents irrigation if the sensor detects recent rainfall. Reduces the frequency of irrigation.

99. Sprinkler Rain Shut Off CNR – Install a rain shut off sensor which over-rides an auto irrigation controller and prevents irrigation if the sensor detects recent rainfall. Reduces the frequency of irrigation.

100. Sprinkler Rain Shut Off CSF – Install a rain shut off sensor which over-rides an auto irrigation controller and prevents irrigation if the sensor detects recent rainfall. Reduces the frequency of irrigation.

101. Swimming Pool Use Improvement CMF – Reduction in the amount of water added to pools by lowering make up and drain and fill needs by the use of chemicals and treatment to maintain high quality water. Also involves proper maintenance of refill valves and pool side cleanup

102. Swimming Pool Use Improvement CNR – Reduction in the amount of water added to pools by lowering make up and drain and fill needs by the use of chemicals and treatment to maintain high quality water. Also involves proper maintenance of refill valves and pool side cleanup

103. Swimming Pool Use Improvement CSF – Reduction in the amount of water added to pools by lowering make up and drain and fill needs by the use of chemicals and treatment to maintain high quality water. Also involves proper maintenance of refill valves and pool side cleanup.

104. Toilet 1.2 GPF CMF – Installation of residential dual flush toilets which use a smaller flush cycle for liquid waste than for solid waste. The average flush is 1.2 gallons per flush.

105. Toilet 1.2 GPF CSF – Installation of residential dual flush toilets which use a smaller flush cycle for liquid waste than for solid waste. The average flush is 1.2 gallons per flush.

106. Toilet 1.6 GPF CMF – Acceleration of code required toilets as retrofits for existing non-code toilets (toilets that flush more than 1.6 gpf are considered non-code). These toilets require periodic flapper replacement to retain their savings.

107. Toilet 1.6 GPF CNR – Acceleration of code required toilets as retrofits for existing non-code toilets (toilets that flush more than 1.6 gpf are considered non-code). These toilets require periodic flapper replacement to retain their savings.

108. Toilet 1.6 GPF CSF – Acceleration of code required toilets as retrofits for existing non-code toilets (toilets that flush more than 1.6 gpf are considered non-code). These toilets require periodic flapper replacement to retain their savings.

109. Toilet 1.6 GPF Long Life Models CMF – Replacement of non-code toilets with toilets that do not require frequent flapper replacement to retain their savings. In addition, these toilets are designed such that their volume per flush will not increase significantly if an improper replacement flapper is installed. Currently is very common in most 1.6 gpf toilets for most customers not to be able to find the correct flapper replacement (risking loss of water savings of up to 2 gallons more per flush). This measure also includes flapperless toilet designs (toilets not dependent on flapper technology and where savings are likely to persist for the entire life of the toilet).

110. Toilet 1.6 GPF Long Life Models CNR – Replacement of non-code toilets with toilets that do not require frequent flapper replacement to retain their savings. In addition, these toilets are designed such that their volume per flush will not increase significantly if an improper replacement flapper is installed. Currently is very common in most 1.6 gpf toilets for most customers not to be able to find the correct flapper replacement (risking loss of water savings of up to 2 gallons more per flush). This measure also includes flapperless toilet designs (toilets not dependent on flapper technology and where savings are likely to persist for the entire life of the toilet).

111. Toilet 1.6 GPF Long Life Models CSF – Replacement of non-code toilets with toilets that do not require frequent flapper replacement to retain their savings. In addition, these toilets are designed such that their volume per flush will not increase significantly if an improper replacement flapper is installed. Currently is very common in most 1.6 gpf toilets for most customers not to be able to find the correct flapper replacement (risking loss of water savings of up to 2 gallons more per flush). This measure also includes flapperless toilet designs (toilets not dependent on flapper technology and where savings are likely to persist for the entire life of the toilet).

112. Toilet Flapper Replacement CMF – Encouraging customers to perform toilet leak testing and repair and providing "universal" replacement flappers that fit the most common toilets in the region.

113. Toilet Flapper Replacement CNR – Encouraging customers to perform toilet leak testing and repair and providing "universal" replacement flappers that fit the most common toilets in the region.

114. Toilet Flapper Replacement CSF – Encouraging customers to perform toilet leak testing and repair and providing "universal" replacement flappers that fit the most common toilets in the region.

115. Toilet Flush Decrease CMF - For those customers who are willing to do so and have frequent toilet flushing in their household, suggesting they allow liquid waste to "mellow", and not flush after every use. Reduces the frequency of toilet flushing. Measure is not appropriate for non-residential settings.

116. Toilet Flush Decrease CSF - For those customers who are willing to do so and have frequent toilet flushing in their household, suggesting they allow liquid waste to "mellow", and not flush after every use. Reduces the frequency of toilet flushing. Measure is not appropriate for non-residential settings.

117. Toilet Flushes by Rainwater CMF - Substitutes rain water for the drinking water normally used to flush toilets. Requires plumbing permits, storage, dual plumbing, and frequently added energy use for pumping the water. Can require increased maintenance and use of drinking water for flushing during periods of low rainfall or freezing.

118. Toilet Flushes by Rainwater CNR - Substitutes rain water for the drinking water normally used to flush toilets. Requires plumbing permits, storage, dual plumbing, and frequently added energy use for pumping the water. Can require increased maintenance and use of drinking water for flushing during periods of low rainfall or freezing.

119. Toilet Flushes by Rainwater CSF - Substitutes rain water for the drinking water normally used to flush toilets. Requires plumbing permits, storage, dual plumbing, and frequently added energy use for pumping the water. Can require increased maintenance and use of drinking water for flushing during periods of low rainfall or freezing.

120. Urinal 0.5 gpf CNR - Installation of an ULTRA efficient urinal by modification of the flush valve to go beyond current code of 1.0 gpf. Works in most but not all urinal flush valves, however in some cases the urinal itself must be replaced. This measure goes beyond code requirements.

121. Urinal 1.0 gpf CNR – Acceleration of the replacement of urinals that meet code in locations where higher gpf urinals currently exist.

122. Urinal Flushes by Rainwater CNR - Substitutes rain water for the drinking water normally used to flush urinals. Requires plumbing permits, storage, dual plumbing, and frequently added energy use for pumping the water. Can require increased maintenance and use of drinking water for flushing during periods of low rainfall or freezing.

123. Urinal No Water CNR - Install a urinal that does not require flushing but instead uses a neutralizing fluid to reduce odors. This measure is more appropriate for non-residential applications where the number of uses per day is high enough to off-set the additional maintenance and fluid costs from the water savings.

124. Water Use Alerting CMF – Installation of a metering device that warns users and/or cuts off water flow at levels set to avoid waste. Equipment may include alarms or volume or time measurement. If the water is not automatically shut off (for example a spring loaded faucet or solenoid), the alert stimulates the water user to take specific water saving behaviors.

125. Water Use Alerting CNR – Installation of a metering device that warns users and/or cuts off water flow at levels set to avoid waste. Equipment may include alarms or volume or time measurement. If the water is not automatically shut off (for example a spring loaded faucet or solenoid), the alert stimulates the water user to take specific water saving behaviors.

126. Water Use Alerting CSF – Installation of a metering device that warns users and/or cuts off water flow at levels set to avoid waste. Equipment may include alarms or volume or time measurement. If the water is not automatically shut off (for example a spring loaded faucet or solenoid), the alert stimulates the water user to take specific water saving behaviors.

APPENDIX C: Summary Reports for Selected Individual Conservation Measures

Conservation Potential Assessment
Measure Report

Clotheswasher Eliminate Partial Loads CSF

Scenario	Measure Library (With
Parent Scenario	Measure Library (Without
Service	Combined
Sector	Residential
SubSector	Single Family
End Use	Clotheswasher - Res.
Major EndUse	Domestic
Years to Max Participation	25
Start Year	2005
Measure Life	3
Program Life	25
Measure ReOpt Factor	80.00%
Free Riders	No
Measure Type	Behavior
Behavior Type	Residential
Notes	B=WW, E. 10/20 AD changed sat cost to 20K, marketability from low avg to quite modest.

Participation Outputs at End of Program Life

Total Customers This SubSector	281,050
Average Targeted Customers	149,996
Maximum Participation Rate	**49.86%**
Peak Season MGD Saved	0.6057 mgd
Annual MGD Saved	0.6057 mgd
Total Program Participants	78,469
Average Annual Participants	3,139
Total Number Of Rebates	0
Average Annual Number of Rebates	0
Total Number of Free Riders	0
Average Annual Free Riders	0
Participant Pay Back in Years	0
Total Utility Cost/Participant	$6.37
Peak Season Levelized Cost per CCF	$2.46
Annual Levelized Cost per CCF	$0.82
Peak Savings/Participant	7.72 gpd
NonPeak Savings/Participant	7.72 gpd
PV Life Cycle Savings/Participant	10.65 ccf
PV Life Cycle Cost/Participant	$8.76

Marketing Inputs

Marketability Score	Quite Modest
Market Saturation Cost	$20,000
Marketing and Rebate Budget	
Target Participation Rate	100.00%
Rebate Increment Amount	$0
Maximum Rebate as Percent of	100%

Measure Costs

Measure Direct Cost	$0.00
Measure Rebate Cost	$0.00
Measure Customer Cost	$0.00
Measure O&&M Cost	$0.00

Utility Annual Costs

Utility Annual Overhead Cost	$7,500
Utility Annual Marketing Cost	$20,000
Utility Average Annual Rebate Cost	$0
Total Utility Average Annual Cost	$27,500

Customer Annual Costs

Customer Average Annual Measure	$0
Customer Average Annual O&&M Cost	$0
Total Customer Average Annual Cost	$0

Utility Total Program Costs

Utility Program Overhead Cost	$187,500
Utility Program Marketing Cost	$500,000
Utility Program Rebate Cost	$0
Total Utility Program Cost	$687,500

Customer Total Program Costs

Customer Program Measure Cost	$0
Customer Program O&&M Cost	$0
Total Customer Program Cost	$0

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Conservation Potential Assessment
Measure Report

Cooling System Switching to Air CNR

Scenario	Measure Library (With
Parent Scenario	Measure Library (Without
Service	Combined
Sector	Non-Residential
SubSector	All Non-Residential
End Use	Once through
Major EndUse	Cooling
Years to Max Participation	25
Start Year	2005
Measure Life	20
Program Life	25
Measure ReOpt Factor	90.00%
Free Riders	Yes
Measure Type	Volume
Behavior Type	
Notes	B=WW 10/25 AD direct cost: assumes ready to purchase & $2,000 is is incremental cost. assumes external coil; changed marketability score to low average. Warning: a portion of target market covered by code or could become code.

Participation Outputs at End of Program Life

Total Customers This SubSector	22,616
Average Targeted Customers	1,956
Maximum Participation Rate	**72.90%**
Peak Season MGD Saved	0.6070 mgd
Annual MGD Saved	0.6071 mgd
Total Program Participants	1,650
Average Annual Participants	66
Total Number Of Rebates	1,688
Average Annual Number of Rebates	68
Total Number of Free Riders	21
Average Annual Free Riders	1
Participant Pay Back in Years	0
Total Utility Cost/Participant	$2,148.10
Peak Season Levelized Cost per CCF	$2.54
Annual Levelized Cost per CCF	$0.85
Peak Savings/Participant	367.92 gpd
NonPeak Savings/Participant	367.92 gpd
PV Life Cycle Savings/Participant	2671.01 ccf
PV Life Cycle Cost/Participant	$2,265.15

Marketing Inputs

Marketability Score	Low Average
Market Saturation Cost	$10,000
Marketing and Rebate Budget	
Target Participation Rate	100.00%
Rebate Increment Amount	$100
Maximum Rebate as Percent of	100%

Measure Costs

Measure Direct Cost	$2,000.00
Measure Rebate Cost	$2,000.00
Measure Customer Cost	$0.00
Measure O&&M Cost	$0.00

Utility Annual Costs

Utility Annual Overhead Cost	$7,500
Utility Annual Marketing Cost	$10,000
Utility Average Annual Rebate Cost	$135,040
Total Utility Average Annual Cost	$152,540

Customer Annual Costs

Customer Average Annual Measure	$0
Customer Average Annual O&&M Cost	$0
Total Customer Average Annual Cost	$0

Utility Total Program Costs

Utility Program Overhead Cost	$187,500
Utility Program Marketing Cost	$250,000
Utility Program Rebate Cost	$3,376,000
Total Utility Program Cost	$3,813,500

Customer Total Program Costs

Customer Program Measure Cost	$0
Customer Program O&&M Cost	$0
Total Customer Program Cost	$0

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Conservation Potential Assessment
Measure Report

Leak Reduction (Process) CNR

Scenario	Measure Library (With
Parent Scenario	Measure Library (Without
Service	Combined
Sector	Non-Residential
SubSector	All Non-Residential
End Use	Leaks - Process
Major EndUse	Process
Years to Max Participation	25
Start Year	2005
Measure Life	5
Program Life	25
Measure ReOpt Factor	90.00%
Free Riders	No
Measure Type	Volume
Behavior Type	
Notes	AD Direct cost: labor and materials.

Participation Outputs at End of Program Life

Total Customers This SubSector	22,616
Average Targeted Customers	452
Maximum Participation Rate	**49.86%**
Peak Season MGD Saved	0.4671 mgd
Annual MGD Saved	0.4672 mgd
Total Program Participants	261
Average Annual Participants	10
Total Number Of Rebates	264
Average Annual Number of Rebates	11
Total Number of Free Riders	0
Average Annual Free Riders	0
Participant Pay Back in Years	0
Total Utility Cost/Participant	$1,946.97
Peak Season Levelized Cost per CCF	$2.06
Annual Levelized Cost per CCF	$0.69
Peak Savings/Participant	1789.89 gpd
NonPeak Savings/Participant	1789.89 gpd
PV Life Cycle Savings/Participant	3999.95 ccf
PV Life Cycle Cost/Participant	$2,750.00

Marketing Inputs

Marketability Score	Quite Modest
Market Saturation Cost	$10,000
Marketing and Rebate Budget	
Target Participation Rate	100.00%
Rebate Increment Amount	$0
Maximum Rebate as Percent of	100%

Measure Costs

Measure Direct Cost	$1,000.00
Measure Rebate Cost	$1,000.00
Measure Customer Cost	$0.00
Measure O&&M Cost	$0.00

Utility Annual Costs

Utility Annual Overhead Cost	$7,500
Utility Annual Marketing Cost	$10,000
Utility Average Annual Rebate Cost	$10,560
Total Utility Average Annual Cost	$28,060

Customer Annual Costs

Customer Average Annual Measure	$0
Customer Average Annual O&&M Cost	$0
Total Customer Average Annual Cost	$0

Utility Total Program Costs

Utility Program Overhead Cost	$187,500
Utility Program Marketing Cost	$250,000
Utility Program Rebate Cost	$264,000
Total Utility Program Cost	$701,500

Customer Total Program Costs

Customer Program Measure Cost	$0
Customer Program O&&M Cost	$0
Total Customer Program Cost	$0

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Conservation Potential Assessment
Measure Report

Showerheads 1.5 GPM CMF

Scenario	Measure Library (With
Parent Scenario	Measure Library (Without
Service	Combined
Sector	Residential
SubSector	Multi Family
End Use	Shower
Major EndUse	Domestic
Years to Max Participation	25
Start Year	2005
Measure Life	15
Program Life	25
Measure ReOpt Factor	25.00%
Free Riders	No
Measure Type	Volume
Behavior Type	
Notes	Combine w/ toilets. Direct cost: would not have purchased on own; $10 cost of hardware & install by maintenance staff x 1.2 per MF HH = $12.

Participation Outputs at End of Program Life

Total Customers This SubSector	249,608
Average Targeted Customers	214,706
Maximum Participation Rate	**26.82%**
Peak Season MGD Saved	0.5421 mgd
Annual MGD Saved	0.5421 mgd
Total Program Participants	72,330
Average Annual Participants	2,893
Total Number Of Rebates	88,822
Average Annual Number of Rebates	3,553
Total Number of Free Riders	0
Average Annual Free Riders	0
Participant Pay Back in Years	0
Total Utility Cost/Participant	$26.07
Peak Season Levelized Cost per CCF	$2.18
Annual Levelized Cost per CCF	$0.73
Peak Savings/Participant	7.49 gpd
NonPeak Savings/Participant	7.49 gpd
PV Life Cycle Savings/Participant	43.66 ccf
PV Life Cycle Cost/Participant	$31.88

Marketing Inputs

Marketability Score	Impossible
Market Saturation Cost	$50,000
Marketing and Rebate Budget	
Target Participation Rate	100.00%
Rebate Increment Amount	$0
Maximum Rebate as Percent of	100%

Measure Costs

Measure Direct Cost	$12.00
Measure Rebate Cost	$12.00
Measure Customer Cost	$0.00
Measure O&&M Cost	$0.00

Utility Annual Costs

Utility Annual Overhead Cost	$7,500
Utility Annual Marketing Cost	$50,000
Utility Average Annual Rebate Cost	$42,635
Total Utility Average Annual Cost	$100,135

Customer Annual Costs

Customer Average Annual Measure	$0
Customer Average Annual O&&M Cost	$0
Total Customer Average Annual Cost	$0

Utility Total Program Costs

Utility Program Overhead Cost	$187,500
Utility Program Marketing Cost	$1,250,000
Utility Program Rebate Cost	$1,065,864
Total Utility Program Cost	$2,503,364

Customer Total Program Costs

Customer Program Measure Cost	$0
Customer Program O&&M Cost	$0
Total Customer Program Cost	$0

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Conservation Potential Assessment
Measure Report

Showerheads 1.5 GPM CSF

Scenario	Measure Library (With
Parent Scenario	Measure Library (Without
Service	Combined
Sector	Residential
SubSector	Single Family
End Use	Shower
Major EndUse	Domestic
Years to Max Participation	25
Start Year	2005
Measure Life	15
Program Life	25
Measure ReOpt Factor	40.00%
Free Riders	No
Measure Type	Volume
Behavior Type	
Notes	Direct cost: would not have purchased on own; $5 cost of hardware +$1 install x 1.94 per SF HH = $12.

Participation Outputs at End of Program Life

Total Customers This SubSector	281,050
Average Targeted Customers	225,582
Maximum Participation Rate	**26.82%**
Peak Season MGD Saved	0.8106 mgd
Annual MGD Saved	0.8105 mgd
Total Program Participants	63,770
Average Annual Participants	2,551
Total Number Of Rebates	78,163
Average Annual Number of Rebates	3,127
Total Number of Free Riders	0
Average Annual Free Riders	0
Participant Pay Back in Years	0
Total Utility Cost/Participant	$27.99
Peak Season Levelized Cost per CCF	$1.40
Annual Levelized Cost per CCF	$0.47
Peak Savings/Participant	12.71 gpd
NonPeak Savings/Participant	12.71 gpd
PV Life Cycle Savings/Participant	74.04 ccf
PV Life Cycle Cost/Participant	$34.54

Marketing Inputs

Marketability Score	Impossible
Market Saturation Cost	$50,000
Marketing and Rebate Budget	
Target Participation Rate	100.00%
Rebate Increment Amount	$0
Maximum Rebate as Percent of	100%

Measure Costs

Measure Direct Cost	$12.00
Measure Rebate Cost	$12.00
Measure Customer Cost	$0.00
Measure O&&M Cost	$0.00

Utility Annual Costs

Utility Annual Overhead Cost	$7,500
Utility Annual Marketing Cost	$50,000
Utility Average Annual Rebate Cost	$37,518
Total Utility Average Annual Cost	$95,018

Customer Annual Costs

Customer Average Annual Measure	$0
Customer Average Annual O&&M Cost	$0
Total Customer Average Annual Cost	$0

Utility Total Program Costs

Utility Program Overhead Cost	$187,500
Utility Program Marketing Cost	$1,250,000
Utility Program Rebate Cost	$937,956
Total Utility Program Cost	$2,375,456

Customer Total Program Costs

Customer Program Measure Cost	$0
Customer Program O&&M Cost	$0
Total Customer Program Cost	$0

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Conservation Potential Assessment
Measure Report

Showerheads 2.0 GPM CMF

Scenario	Measure Library (With
Parent Scenario	Measure Library (Without
Service	Combined
Sector	Residential
SubSector	Multi Family
End Use	Shower
Major EndUse	Domestic
Years to Max Participation	25
Start Year	2005
Measure Life	15
Program Life	25
Measure ReOpt Factor	90.00%
Free Riders	No
Measure Type	Volume
Behavior Type	
Notes	Combine w/ toilets. Direct cost: would not have purchased on own; $10 cost of hardware & install by maintenance staff x 1.2 per MF HH = $12.

Participation Outputs at End of Program Life

Total Customers This SubSector	249,608
Average Targeted Customers	214,706
Maximum Participation Rate	**72.90%**
Peak Season MGD Saved	0.5538 mgd
Annual MGD Saved	0.5538 mgd
Total Program Participants	196,601
Average Annual Participants	7,864
Total Number Of Rebates	202,570
Average Annual Number of Rebates	8,103
Total Number of Free Riders	0
Average Annual Free Riders	0
Participant Pay Back in Years	0
Total Utility Cost/Participant	$18.17
Peak Season Levelized Cost per CCF	$3.52
Annual Levelized Cost per CCF	$1.18
Peak Savings/Participant	2.82 gpd
NonPeak Savings/Participant	2.82 gpd
PV Life Cycle Savings/Participant	16.41 ccf
PV Life Cycle Cost/Participant	$19.31

Marketing Inputs

Marketability Score	Low Average
Market Saturation Cost	$50,000
Marketing and Rebate Budget	
Target Participation Rate	100.00%
Rebate Increment Amount	$0
Maximum Rebate as Percent of	100%

Measure Costs

Measure Direct Cost	$12.00
Measure Rebate Cost	$12.00
Measure Customer Cost	$0.00
Measure O&&M Cost	$0.00

Utility Annual Costs

Utility Annual Overhead Cost	$7,500
Utility Annual Marketing Cost	$50,000
Utility Average Annual Rebate Cost	$97,234
Total Utility Average Annual Cost	$154,734

Customer Annual Costs

Customer Average Annual Measure	$0
Customer Average Annual O&&M Cost	$0
Total Customer Average Annual Cost	$0

Utility Total Program Costs

Utility Program Overhead Cost	$187,500
Utility Program Marketing Cost	$1,250,000
Utility Program Rebate Cost	$2,430,840
Total Utility Program Cost	$3,868,340

Customer Total Program Costs

Customer Program Measure Cost	$0
Customer Program O&&M Cost	$0
Total Customer Program Cost	$0

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Conservation Potential Assessment
Measure Report

Showerheads 2.0 GPM CSF

Scenario	Measure Library (With
Parent Scenario	Measure Library (Without
Service	Combined
Sector	Residential
SubSector	Single Family
End Use	Shower
Major EndUse	Domestic
Years to Max Participation	25
Start Year	2005
Measure Life	15
Program Life	25
Measure ReOpt Factor	90.00%
Free Riders	No
Measure Type	Volume
Behavior Type	
Notes	Direct cost: would not have purchased on own; $5 cost of hardware + $1 install x 1.94 per SF HH = $12

Participation Outputs at End of Program Life

Total Customers This SubSector	281,050
Average Targeted Customers	225,582
Maximum Participation Rate	**72.90%**
Peak Season MGD Saved	0.7507 mgd
Annual MGD Saved	0.7506 mgd
Total Program Participants	173,337
Average Annual Participants	6,933
Total Number Of Rebates	179,852
Average Annual Number of Rebates	7,194
Total Number of Free Riders	0
Average Annual Free Riders	0
Participant Pay Back in Years	0
Total Utility Cost/Participant	$18.95
Peak Season Levelized Cost per CCF	$2.41
Annual Levelized Cost per CCF	$0.80
Peak Savings/Participant	4.33 gpd
NonPeak Savings/Participant	4.33 gpd
PV Life Cycle Savings/Participant	25.23 ccf
PV Life Cycle Cost/Participant	$20.29

Marketing Inputs

Marketability Score	Low Average
Market Saturation Cost	$50,000
Marketing and Rebate Budget	
Target Participation Rate	100.00%
Rebate Increment Amount	$0
Maximum Rebate as Percent of	100%

Measure Costs

Measure Direct Cost	$12.00
Measure Rebate Cost	$12.00
Measure Customer Cost	$0.00
Measure O&&M Cost	$0.00

Utility Annual Costs

Utility Annual Overhead Cost	$7,500
Utility Annual Marketing Cost	$50,000
Utility Average Annual Rebate Cost	$86,329
Total Utility Average Annual Cost	$143,829

Customer Annual Costs

Customer Average Annual Measure	$0
Customer Average Annual O&&M Cost	$0
Total Customer Average Annual Cost	$0

Utility Total Program Costs

Utility Program Overhead Cost	$187,500
Utility Program Marketing Cost	$1,250,000
Utility Program Rebate Cost	$2,158,224
Total Utility Program Cost	$3,595,724

Customer Total Program Costs

Customer Program Measure Cost	$0
Customer Program O&&M Cost	$0
Total Customer Program Cost	$0

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Conservation Potential Assessment
Measure Report

Toilet 1.2 GPF CmF

Scenario	Measure Library (With
Parent Scenario	Measure Library (Without
Service	Combined
Sector	Residential
SubSector	Multi Family
End Use	Toilet
Major EndUse	Domestic
Years to Max Participation	25
Start Year	2005
Measure Life	20
Program Life	25
Measure ReOpt Factor	0.50%
Free Riders	No
Measure Type	Volume
Behavior Type	
Notes	10/21 B=WW This is dual flush average. Direct cost: assumes ready to purchase. Add $7.10 0 &M. ($350 efficient - $100 reg) + $50 install x 1.1 per MF HH = $330.

Participation Outputs at End of Program Life

Total Customers This SubSector	249,608
Average Targeted Customers	249,608
Maximum Participation Rate	**26.82%**
Peak Season MGD Saved	0.8597 mgd
Annual MGD Saved	0.8597 mgd
Total Program Participants	83,358
Average Annual Participants	3,334
Total Number Of Rebates	94,830
Average Annual Number of Rebates	3,793
Total Number of Free Riders	0
Average Annual Free Riders	0
Participant Pay Back in Years	0
Total Utility Cost/Participant	$356.32
Peak Season Levelized Cost per CCF	$18.70
Annual Levelized Cost per CCF	$6.25
Peak Savings/Participant	10.31 gpd
NonPeak Savings/Participant	10.31 gpd
PV Life Cycle Savings/Participant	74.87 ccf
PV Life Cycle Cost/Participant	$467.87

Marketing Inputs

Marketability Score	Impossible
Market Saturation Cost	$100,000
Marketing and Rebate Budget	
Target Participation Rate	100.00%
Rebate Increment Amount	$35
Maximum Rebate as Percent of	100%

Measure Costs

Measure Direct Cost	$330.00
Measure Rebate Cost	$330.00
Measure Customer Cost	$0.00
Measure O&&M Cost	$7.10

Utility Annual Costs

Utility Annual Overhead Cost	$7,500
Utility Annual Marketing Cost	$100,000
Utility Average Annual Rebate Cost	$1,251,756
Total Utility Average Annual Cost	$1,359,256

Customer Annual Costs

Customer Average Annual Measure	$0
Customer Average Annual O&&M Cost	$23,671
Total Customer Average Annual Cost	$23,671

Utility Total Program Costs

Utility Program Overhead Cost	$187,500
Utility Program Marketing Cost	$2,500,000
Utility Program Rebate Cost	$31,293,900
Total Utility Program Cost	$33,981,400

Customer Total Program Costs

Customer Program Measure Cost	$0
Customer Program O&&M Cost	$591,785
Total Customer Program Cost	$591,785

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Conservation Potential Assessment
Measure Report

Toilet 1.2 GPF CSF

Scenario	Measure Library (With
Parent Scenario	Measure Library (Without
Service	Combined
Sector	Residential
SubSector	Single Family
End Use	Toilet
Major EndUse	Domestic
Years to Max Participation	25
Start Year	2005
Measure Life	20
Program Life	25
Measure ReOpt Factor	90.00%
Free Riders	No
Measure Type	Volume
Behavior Type	
Notes	10/21 B=WW This is dual flush average. Direct cost: assumes ready to purchase. ($350 efficient - $100 reg) + $20 install x 2.35 per SF HH = $640. M o&m = $11/yr; MS=A; MSC $200K;

Participation Outputs at End of Program Life

Total Customers This SubSector	281,050
Average Targeted Customers	281,139
Maximum Participation Rate	**72.90%**
Peak Season MGD Saved	3.7554 mgd
Annual MGD Saved	3.7554 mgd
Total Program Participants	214,899
Average Annual Participants	8,596
Total Number Of Rebates	218,849
Average Annual Number of Rebates	8,754
Total Number of Free Riders	0
Average Annual Free Riders	0
Participant Pay Back in Years	0
Total Utility Cost/Participant	$662.86
Peak Season Levelized Cost per CCF	$19.52
Annual Levelized Cost per CCF	$6.52
Peak Savings/Participant	17.48 gpd
NonPeak Savings/Participant	17.48 gpd
PV Life Cycle Savings/Participant	126.87 ccf
PV Life Cycle Cost/Participant	$827.79

Marketing Inputs

Marketability Score	Low Average
Market Saturation Cost	$200,000
Marketing and Rebate Budget	
Target Participation Rate	100.00%
Rebate Increment Amount	$25
Maximum Rebate as Percent of	100%

Measure Costs

Measure Direct Cost	$640.00
Measure Rebate Cost	$640.00
Measure Customer Cost	$0.00
Measure O&&M Cost	$11.00

Utility Annual Costs

Utility Annual Overhead Cost	$7,500
Utility Annual Marketing Cost	$200,000
Utility Average Annual Rebate Cost	$5,602,534
Total Utility Average Annual Cost	$5,810,034

Customer Annual Costs

Customer Average Annual Measure	$0
Customer Average Annual O&&M Cost	$94,556
Total Customer Average Annual Cost	$94,556

Utility Total Program Costs

Utility Program Overhead Cost	$187,500
Utility Program Marketing Cost	$5,000,000
Utility Program Rebate Cost	$140,063,360
Total Utility Program Cost	$145,250,860

Customer Total Program Costs

Customer Program Measure Cost	$0
Customer Program O&&M Cost	$2,363,900
Total Customer Program Cost	$2,363,900

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Conservation Potential Assessment
Measure Report

Toilet Flush Decrease CMF

Scenario	Measure Library (With
Parent Scenario	Measure Library (Without
Service	Combined
Sector	Residential
SubSector	Multi Family
End Use	Toilet
Major EndUse	Domestic
Years to Max Participation	25
Start Year	2005
Measure Life	3
Program Life	25
Measure ReOpt Factor	50.00%
Free Riders	No
Measure Type	Behavior
Behavior Type	Residential
Notes	DB Benefits = WW.

Participation Outputs at End of Program Life

Total Customers This SubSector	249,608
Average Targeted Customers	187,206
Maximum Participation Rate	**26.82%**
Peak Season MGD Saved	0.8806 mgd
Annual MGD Saved	0.8806 mgd
Total Program Participants	62,519
Average Annual Participants	2,501
Total Number Of Rebates	0
Average Annual Number of Rebates	0
Total Number of Free Riders	0
Average Annual Free Riders	0
Participant Pay Back in Years	0
Total Utility Cost/Participant	$19.99
Peak Season Levelized Cost per CCF	$3.54
Annual Levelized Cost per CCF	$1.18
Peak Savings/Participant	14.09 gpd
NonPeak Savings/Participant	14.09 gpd
PV Life Cycle Savings/Participant	19.44 ccf
PV Life Cycle Cost/Participant	$22.99

Marketing Inputs

Marketability Score	Impossible
Market Saturation Cost	$50,000
Marketing and Rebate Budget	
Target Participation Rate	100.00%
Rebate Increment Amount	$0
Maximum Rebate as Percent of	100%

Measure Costs

Measure Direct Cost	$0.00
Measure Rebate Cost	$0.00
Measure Customer Cost	$0.00
Measure O&&M Cost	$0.00

Utility Annual Costs

Utility Annual Overhead Cost	$7,500
Utility Annual Marketing Cost	$50,000
Utility Average Annual Rebate Cost	$0
Total Utility Average Annual Cost	$57,500

Customer Annual Costs

Customer Average Annual Measure	$0
Customer Average Annual O&&M Cost	$0
Total Customer Average Annual Cost	$0

Utility Total Program Costs

Utility Program Overhead Cost	$187,500
Utility Program Marketing Cost	$1,250,000
Utility Program Rebate Cost	$0
Total Utility Program Cost	$1,437,500

Customer Total Program Costs

Customer Program Measure Cost	$0
Customer Program O&&M Cost	$0
Total Customer Program Cost	$0

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Conservation Potential Assessment
Measure Report

Toilet Flush Decrease CSF

Scenario	Measure Library (With
Parent Scenario	Measure Library (Without
Service	Combined
Sector	Residential
SubSector	Single Family
End Use	Toilet
Major EndUse	Domestic
Years to Max Participation	25
Start Year	2005
Measure Life	3
Program Life	25
Measure ReOpt Factor	50.00%
Free Riders	No
Measure Type	Behavior
Behavior Type	Residential
Notes	DB Benefits = WW.

Participation Outputs at End of Program Life

Total Customers This SubSector	281,050
Average Targeted Customers	207,551
Maximum Participation Rate	**26.82%**
Peak Season MGD Saved	1.3414 mgd
Annual MGD Saved	1.3414 mgd
Total Program Participants	58,402
Average Annual Participants	2,336
Total Number Of Rebates	0
Average Annual Number of Rebates	0
Total Number of Free Riders	0
Average Annual Free Riders	0
Participant Pay Back in Years	0
Total Utility Cost/Participant	$21.40
Peak Season Levelized Cost per CCF	$2.32
Annual Levelized Cost per CCF	$0.78
Peak Savings/Participant	22.97 gpd
NonPeak Savings/Participant	22.97 gpd
PV Life Cycle Savings/Participant	31.70 ccf
PV Life Cycle Cost/Participant	$24.61

Marketing Inputs

Marketability Score	Impossible
Market Saturation Cost	$50,000
Marketing and Rebate Budget	
Target Participation Rate	100.00%
Rebate Increment Amount	$0
Maximum Rebate as Percent of	100%

Measure Costs

Measure Direct Cost	$0.00
Measure Rebate Cost	$0.00
Measure Customer Cost	$0.00
Measure O&&M Cost	$0.00

Utility Annual Costs

Utility Annual Overhead Cost	$7,500
Utility Annual Marketing Cost	$50,000
Utility Average Annual Rebate Cost	$0
Total Utility Average Annual Cost	$57,500

Customer Annual Costs

Customer Average Annual Measure	$0
Customer Average Annual O&&M Cost	$0
Total Customer Average Annual Cost	$0

Utility Total Program Costs

Utility Program Overhead Cost	$187,500
Utility Program Marketing Cost	$1,250,000
Utility Program Rebate Cost	$0
Total Utility Program Cost	$1,437,500

Customer Total Program Costs

Customer Program Measure Cost	$0
Customer Program O&&M Cost	$0
Total Customer Program Cost	$0

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APPENDIX D: Indirect Benefits Methodology

The following describes the methodology used to ascribe a positive, negative or neutral wastewater, stormwater, and energy indirect benefit to each of the water conservation measures.

Wastewater

An indirect benefit from water conservation on wastewater is a reduction in the sizing of SSO/CSO facilities by Seattle Public Utilities. Another possible indirect benefit would be to King County wastewater facilities and operations.

The allocation of wastewater benefits was allocated to each of the measures in the following manner:

- All landscaping measures are neutral (except for "grey water for irrigation") since this water would not have gone to the sewer system.
- Most non-landscaping measures are positive since this water would have gone to the sewer system.
- A few exceptions exist where the water would have not have gone to the sewer system and therefore are classified as neutral. This is the case for leaks, outdoor sweeper, and dry sidewalk cleaning.

Reduction in sewer volume may have an impact on capacity issues in King County's wastewater system in three ways:

1. Relieve capacity constraints on the conveyance system.
2. Cost of operations at treatment facility.
3. Delay date of bringing new King County Brightwater treatment plant on-line.

Reduction in sewer volume going to sewage treatment facility was assumed to have no benefit to King County, since it was indeterminate whether a reduction in volume of water was a benefit or negative impact on King County operations, and has not been quantified. The reduction in volume going to King County facilities may have little impact since sizing of the facility is driven by peak flows from storm water, and from solids loading[4]. Therefore no indirect benefit was attributed to King County treatment from water conservation by the City of Seattle.

Reduction in the volume of wastewater from north Seattle being sent to King County may delay the bringing on of the Brightwater plant, but the benefit was not quantified.

Stormwater

An indirect benefit from water conservation on stormwater is a reduction in the sizing of SSO/CSO facilities by Seattle Public Utilities.

[4] Email from Karen Huber of King County 11/17/2004

The allocation of stormwater benefits was allocated to each of the measures in the following manner:

- All landscaping measures are neutral since landscape water is used during the summer, and the reduction in sizing of CSO and SSO facilities is based on winter flows.
- Most non-landscaping measures are neutral since this water would not have gone to the stormwater system.
- A few exceptions exist where water would have gone to the stormwater system and therefore are classified as positive. This is the case for leaks, outdoor sweeper, dry sidewalk cleaning, and toilet/urinal flushing with stormwater.

Energy

Indirect benefit to Seattle City Light and Puget Sound Energy:

- Puget Sound Energy supplies Seattle and King County with natural gas.
- Seattle City Light supplies Seattle with electricity.

The allocation of energy benefits was allocated to each of the measures in the following manner:

- Any measure with a hot water percentage is positive, otherwise it is neutral.
- A few exceptions exist for measures that will now require more energy and are therefore identified as negative. This is the case for air cooling, recirculating cooling systems, and cooling tower improvements.