Appendix G: BMP Economic Analysis Assumptions

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

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

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

Assumptions:

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

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

2. Single family water usage = 646 gpd/unit (51% is outdoor use)

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

3. Multifamily water usage = 201 gpd/unit (19% is outdoor use)

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

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

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

5. Water surveys decrease outdoor water use by 10%

MOU estimate is 10% (page 17).

6. Each water survey costs $50

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

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

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

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

BMP 2 – Residential Plumbing Retrofit

Description: Install plumbing retrofit devices in single and multifamily residences.

Assumptions:

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

MOU, page 19.

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

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

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

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

4. There are an average of 1.0 showers, 1.5 toilets, and 2.3 faucets (1 kitchen faucet and 1.3 other faucets) per residence.

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

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

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

6. Water savings from one faucet aerator = 1.5 gpd

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

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

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

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

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

9. Indoor water savings = 11.4 gpd/unit.

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

$$[(1.0*5.5) + (1.0*3.0+1.3*1.5) + (1.5*8*0.08)]$$

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

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

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

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

BMP 5 – Large Landscape Conservation Programs and Incentives

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

Assumptions:

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

MOU (Page 27, Section C.a.)

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

MOU (Page 27, Section C.b.)

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

MOU (Page 28, Section E.d.)

4. There are 0 dedicated landscape metered accounts and 694 CII mixed use accounts.

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

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

This is based on professional judgement.

6. Water use prior to the survey is 3.7 ft per year.

Irrigation allocation is equal to 100 percent of local evapotranspiration (ETo), and the MOU estimates that surveys will reduce water usage by 15 percent. The local ETo was determined (39 in/year based on California Irrigation Management Information System data) and multiplied by 1.15 to obtain 45 inches (3.7 ft) per year for current water use. (Most conservative approach for economic analysis)

7. Surveys will reduce water usage by 15%.

MOU, page 29.

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

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

9. Each survey will cost $250 per acre.

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

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

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

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

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

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

Assumptions:

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

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

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

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

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

MOU BMP 9, A.(c)

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

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

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

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

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

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

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

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

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

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

BMP 14 – Residential ULFT Replacement Programs

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

Assumptions:

1. There are an average of 3.6 people per single family residence and 2.6 people per multifamily residence.

Palos Verdes has an average of 2.9 people per household (California Department of Finance Report E-5, Table 2 "City/County Population and Housing Estimates" January 1, 2000). Because useful data quantifying single-family and multi-family household sizes in this CSA are unavailable, it is assumed that a ratio of multi-family to single-family household sizes is 0.7.

2. There are an average of 1.5 toilets per single family residence and 1.3 toilets per multifamily residence.

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

3. Water savings from ULFTs are 30.0 gpd/unit for single family residences and 51.0 gpd/unit for multifamily residences.

MOU, Exhibit 6, Table 1 and Table 2.

4. Homes constructed after 1991 already have ULFTs.

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

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

MOU, page 70.

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

MOU, page 70.

7. Average resale rate for single family units in Los Angeles County is 4.5%

Assumption based on the 1996 single family average resale rate for Los Angeles County. This rate was obtained from the CUWCC Website, WWW.CUWCC.ORG, November 2000.

8. Average resale rate for multifamily units in Los Angeles County is 9.0%

Assumption based on the 1998 multifamily average resale rate for Los Angeles County. This rate was obtained from the CUWCC Website, WWW.CUWCC.ORG, November 2000.

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