# WATER CONSERVATION ELEMENT

## SANTA ROSA SUBREGIONAL LONG-TERM WASTEWATER PROJECT

***Prepared for***

**City of Santa Rosa**
**and**
**U.S. Army Corps of Engineers**

**December 1995**

***Prepared by***

**WEST YOST & ASSOCIATES**
***1260 LAKE BOULEVARD, SUITE 240, DAVIS, CA 95616 • 916/756-5905***

***For***

**HARLAND BARTHOLOMEW & ASSOCIATES, INC.**

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## INTRODUCTION

In the report, *Wastewater Flow Projections*, (WYA 1995), the Santa Rosa Subregional System average dry weather wastewater flow (ADWF) including conservation savings from existing Member Entity conservation programs and existing state conservation laws was projected to be 20.90 million gallons per day (mgd). Implementation of the Member Entity programs combined with the results of state conservation laws produced a reduction in the ADWF of about 5.22 mgd.

The purpose of this report is to evaluate additional, more aggressive water conservation measures which could reduce wastewater flow. Conservation measures which could reduce outside water use for landscape irrigation have no effect on wastewater flow and thus have not been evaluated. In this report, the ADWF is projected based on implementation of existing conservation programs and existing state conservation laws (as presented in the *Wastewater Flow Projections* report), and additional savings resulting from the following more aggressive conservation measures:

- Full implementation of the quantifiable and sustainable California Urban Water Conservation Council's (CUWCC) Best Management Practices (BMPs), including retrofit of all nonconservation toilets and showerheads, and metering of all water connections.
- Use of water and energy conserving clothes washers and dishwashers
- Use of waterless urinals
- Use of point of use hot water heaters
- Use of measured flow faucets
- Retrofit of hotels/motels with conservation toilets and showerheads

These measures were selected for evaluation because they would generate quantifiable and sustainable wastewater flow reductions which is consistent with the direction of the Board of Public Utilities (BPU). To be included in this flow projection, a conservation measure must be quantifiable and sustainable because sizing and operation of physical disposal facilities will be determined using the projected flows. For example, water conservation education programs are of great value. But because it is unknown how much water savings per person will result, it can not be included in a quantitative wastewater flow projection. Additionally flow reductions from an education program may not be sustainable. After the conservation education program is ended, people may forget or loose interest in conservation, and thus a flow reduction from education programs may disappear over time. Additionally, many other water conservation measures exist, which reduce outdoor water use, but because they do not reduce wastewater flow they are not included in this conservation estimate and wastewater flow projection.

The reduction in ADWF for each of the more aggressive measures is dependent upon the degree to which the measure is implemented throughout the Subregional Area. For example, if a conservation measure were required for new construction only, it would achieve a lower level of penetration than if a voluntary retrofit program were also employed. Additionally, a mandatory retrofit program would result in an even larger reduction of flow resulting from a higher level of penetration. Conservation estimates are presented below for two levels of penetration, including:

- Voluntary Conservation - in which it is assumed that a 30 percent penetration level is achieved (except for point of use hot water heaters for which a 15 percent penetration is assumed) through **voluntary** programs. A 30 percent penetration is assumed for conservation measures that use currently accepted technology, or technology that produces significant monetary savings to the owner/user through reduced water use, reduced power use, or decreased operational and maintenance (O&M) requirements. A 15 percent penetration is assumed for conservation measures that do not produce significant decreased power or O&M savings, or would be complex for home owners to implement. The costs to achieve this level of penetration are based upon rebates of up to $100 per toilet or rebates of the incremental cost of the conservation fixture above a compareable non conservation fixture.
- Maximum Conservation - in which it is assumed that a 100 percent penetration level is achieved through **mandatory** retrofit programs, **mandatory** requirements on new construction, and **mandatory** replacement upon sale of property or upon natural replacement (replacement due to breakage or remodeling). It is stressed that the only way a 100 percent, or nearly 100 percent, penetration would be achieved is through **mandatory** programs, and for this reason the costs of conservation are based upon the **total** cost of the conservation fixture (including instalation) being paid for by each of the Member Entities.

The potential ADWF reductions achievable with each of these two programs are summarized in Tables 1A and 1B by conservation measure and Member Entity, respectively. The conservation estimates are discussed in detail in the following sections. With maximum conservation (100 percent penetration), the ADWF at buildout of the Member Entities' General Plans could be reduced by about 1.46 mgd to about 19.44 mgd. With voluntary conservation (15 to 30 percent penetration), the ADWF at buildout of the Member Entities' General Plans could be reduced by about 0.27 mgd to about 20.63 mgd.

The Member Entities are independent cities and have independent water conservation programs. The mission of the BPU is to provide the community with safe, potable water; to properly collect, treat and dispose of wastewater; and maintain sound and reliable systems that meet regulatory requirements and address the economic and environmental concerns of the community at large. However, the BPU does not have the authority to force any of the Member Entities to implement a conservation program or specific elements of a conservation program. Thus, the potential ADWF reduction is also dependent upon the degree to which each independent Member Entity implements the conservation measures.

## Table 1A

Summary of ADWF Reductions by Conservation Measure

| Conservation Measure | Maximum Conservation (mgd) | Voluntary Conservation (mgd) |
|---|---|---|
| Full Implementation of CUWCC BMPs[a] | | |
| Toilets and Showerheads | 0.47 | N/A[b] |
| Water Meters | 0.12 | N/A[b] |
| Conservation Clothes and Dish Washers | 0.52 | 0.17 |
| Waterless Urinals | 0.13 | 0.04 |
| Point of Use Hot Water Heaters | 0.15 | 0.03 |
| Measured Flow Faucets | 0.05 | 0.02 |
| Conservation Retrofit of Hotels and Motels | 0.02 | 0.01 |
| Total | 1.46 | 0.27 |

WYA, 1995

[a] This measure includes retrofit of all non-ULFTs and all non-LFSHs remaining in the Subregional system at buildout of the Member Entities' General Plans, and installation of water meters on all nonmetered connections.

[b] N/A A voluntary level of implementation is not applicable in this report for this conservation measure, because it was already included in the ADWF projection presented in the *Wastewater Flow Projections* report.

## Table 1B

Summary of ADWF Reductions by Member Entity

| Member Entity | Maximum Conservation (mgd) | Voluntary Conservation (mgd) |
|---|---|---|
| Santa Rosa | 0.97 | 0.19 |
| Rohnert Park | 0.37 | 0.06 |
| Cotati | 0.05 | 0.01 |
| Sebastopol | 0.07 | 0.01 |
| Total | 1.46 | 0.27 |

WYA, 1995

For this report, the "cost of conservation" is the cost that the Member Entities would incur to implement a retrofit program for each of the conservation measures. At the voluntary conservation level, this cost of conservation includes a cost for a rebate (up to the incremental cost of the

conservation fixture over the nonconservation fixture) to the owner/user of the measure, and a cost for administration of the rebate program (assumed to be 20 percent of the costs of rebates). At the maximum conservation level, this cost of conservation includes the total cost of purchase and installation of the conservation fixture and a cost for administration of the rebate program (assumed to be 20 percent of the total cost of the fixture). The cost of conservation is presented in dollars per million gallons (MG) of water saved. The cost of conservation is calculated as the annual cost (at 6.5 percent interest over the life expectancy of the measure) of the initial capital expenditure (the rebate or the total cost of the fixture, installation, and program administration) plus any increased operation costs incurred by the Member Entities, divided by the water savings (in gallons per year) and multiplied by 1,000,000 (to reach cost per million gallons). The costs of conservation for each measure are presented in Tables 2A and 2B for the voluntary and maximum levels of penetration, respectively. The costs of conservation range from as low as $280/MG to as much as $164,750/MG.

Additionally, for some of the conservation measures the owner/user of the measure could realize decreased operational costs (such as lower water, power and detergent consumption). These decreased operational costs are discussed in this report, but because they would not be realized by the Member Entities, they are not included in the costs presented in Tables 2A and 2B.

All acronyms and abbreviations used in this report are defined in the following list:

| | |
|---|---|
| ADWF | Average Dry Weather Wastewater Flow |
| BMPs | Best Management Practices |
| BPU | Board of Public Utilities |
| CII | Commercial/Industrial/Institutional |
| CUWCC | California Urban Water Conservation Council |
| DU | Dwelling Units |
| gpcd | Gallons per capita per day |
| gpd | Gallons per day |
| gpf | Gallons per flush |
| LFSH | Low Flow Showerhead |
| MG | Million gallons |
| mgd | Million gallons per day |
| O&M | Operation & Maintenance |
| ULFT | Ultra Low Flow Toilet |
| WYA | West Yost & Associates |

# Table 2A

## Costs of Conservation for Voluntary Implementation of Conservation Measures

| Conservation Measure | Member Entity Cost per Measure ($/unit) | Life Expectancy of Measure (years) | Annual Cost of Measure ($/year) | Water Savings (gpd/unit) | Cost of Conservation[a] ($/MG) |
|---|---|---|---|---|---|
| Full Implementation of CUWCC BMPs[b] | | | | | |
| Residential Toilet Retrofit | 100 - Rebate | 33 | 7.44 | 16.7 | 1,220 |
| CII Toilet Retrofit | 100 - Rebate | 33 | 7.44 | 48.0 | 430 |
| Residential Showerhead Retrofit | 10 - Cost of unit | 20 | 0.91 | 9.0 | 280 |
| Water Meters | 425 - Total cost of meter and installation | 25 | 49.85[c] | 8.5 | 16,070 |
| Conservation Appliances | | | | | |
| Dishwashers | 420 - Rebate[d] | 20 | 38.14 | 2.5 | 41,800 |
| Clothes washers | 425 - Rebate[d] | 20 | 22.70 | 4.25 | 14,640 |
| Waterless Urinals | 100 - Rebate | 20 | 9.08 | 44.0 | 570 |
| Point of Use Hot Water Heaters | 1100 - Total cost | 25 | 90.20 | 1.5 | 164,750 |
| Measured Flow Faucets | 30 - Rebate[d] | 20 | 2.72 | 5.6 | 1,340 |
| Retrofit of Hotels & Motels | | | | | |
| Toilets | 100 - Rebate | 33 | 7.44 | 5.83[e] | 3,500 |
| Shower heads | 10 - Cost of unit | 20 | 0.91 | 7.00[f] | 360 |

WYA, 1995

[a] The cost of conservation is calculated as the annual cost (at 6.5 percent interest over the life expectancy of the measure) of the initial capital expenditure (the rebate or the total cost of the fixture and installation) plus any increased operational costs incurred by the Member Entities (e.g., meter reading) divided by the water savings (in gallons per year) and multiplied by 1,000,000 (to reach cost per million gallons).

[b] Although no additional conservation is achievable from this measure at the voluntary level, costs of conservation are shown because they represent the costs for member entities existing conservation programs.

[c] The cost shown for water meters is based upon a water meter installation cost of $425, and an annual cost of $15 for meter reading.

[d] The rebate cost is the incremental cost of a conservation fixture above a comparable nonconservation fixture.

[e] Calculated as 9.0*64.8% (the annual average occupancy factor for hotel/motels in Santa Rosa).

[f] Calculated as 10.8*64.8% (the annual average occupancy factor for hotel/motels in Santa Rosa).

## Table 2B

Costs of Conservation for Maximum Implementation of Conservation Measures

| Conservation Measure | Member Entity Cost per Measure ($/unit) | Life Expectancy of Measure (years) | Annual Cost of Measure ($/year) | Water Savings (gpd/unit) | Cost of Conservation[a] ($/MG) |
|---|---|---|---|---|---|
| Full Implementation of CUWCC BMPs | | | | | |
| Residential Toilet Retrofit | 250 - Total cost | 33 | 18.59 | 16.7 | 3,050 |
| CII Toilet Retrofit | 350 - Total cost | 33 | 26.02 | 48.0 | 1,490 |
| Residential Shower head Retrofit | 50 - Total cost | 20 | 4.54 | 9.0 | 1,390 |
| Water Meters | 425 - Total cost of meter and installation | 25 | 49.85[b] | 8.5 | 16,070 |
| Conservation Appliances | | | | | |
| Dishwashers | 820 - Total cost | 20 | 74.46 | 2.5 | 81,600 |
| Clothes washers | 700 - Total cost | 20 | 63.56 | 4.25 | 40,980 |
| Waterless Urinals | 500 - Total cost | 20 | 45.40 | 44.0 | 2,830 |
| Point of Use Hot Water Heaters | 1,100 - Total cost | 25 | 90.20 | 1.5 | 164,750 |
| Measured Flow Faucets | 110 - Total cost | 20 | 9.99 | 5.6 | 4,890 |
| Retrofit of Hotels & Motels | | | | | |
| Toilets | 350 - Total cost | 33 | 26.02 | 5.83[c] | 12,230 |
| Shower heads | 20 - Total cost | 20 | 1.82 | 7.00[d] | 720 |

WYA, 1995

[a] The cost of conservation is calculated as the annual cost (at 6.5 percent interest over the life expectancy of the measure) of the initial capital expenditure (the rebate or the total cost of the fixture and installation) plus any increased operational costs incurred by the Member Entities (e.g., meter reading) divided by the water savings (in gallons per year) and multiplied by 1,000,000 (to reach cost per million gallons).

[b] The cost shown for water meters is based upon a water meter installation cost of $425, and an annual cost of $15 for meter reading.

[c] Calculated as 9.0*64.8% (the annual average occupancy factor for hotel/motels in Santa Rosa).

[d] Calculated as 10.8*64.8% (the annual average occupancy factor for hotel/motels in Santa Rosa).

## FULL IMPLEMENTATION OF THE CALIFORNIA URBAN WATER CONSERVATION COUNCIL'S BEST MANAGEMENT PRACTICES

If, at buildout of the Member Entities' General Plans, all remaining 5.5 gallon per flush (gpf) and 3.5 gpf toilets were replaced with ultra low flow toilets (ULFT)s, all non-low flow shower heads (LFSH) were replaced with LFSHs, and all water services were metered, the ADWF could be reduced by about 0.59 mgd, as shown in Table 3. The water savings factors and number of

dwelling units (DUs) that could be retrofitted are from the *Wastewater Flow Projections* report, Section 4.4 (WYA 1995). Even though the Member Entities each have different retrofit programs (see the *Wastewater Flow Projections* report, WYA 1995), by buildout of the General Plans, the 30 percent penetration level will have been exceeded through the retrofit programs and natural replacement; thus, a "Voluntary" level is not shown in Table 3.

As shown in Table 2A, the cost to the Member Entities of conservation at the voluntary level for residential toilets is about $1,220/MG, for residential showerheads about $280/MG, for CII toilets about $430/MG, and for water meters about $16,070/MG. As shown in Table 2B, the cost to the Member Entities of conservation at the maximum level for residential toilets is about $3,050/MG, for residential showerheads about $1,390/MG, for CII toilets about $1,490/MG, and for water meters about $16,070/MG.

For residential services, if a 5.5 gpf toilet is retrofitted with an ULFT, the savings would be about 11.3 gallons per capita per day (gpcd). If a 3.5 gpf toilet is replaced, the savings would be about 8.3 gpcd. Assuming an average savings of 10.0 gpcd, 2.5 capita/dwelling unit (DU), and 1.5 toilets/DU, the average water savings is about 16.7 gpd for each toilet replaced. The life expectancy of each toilet is about 33 years. At the voluntary level, the Member Entities' costs are a $100 rebate and a program administration cost of 20 percent of the rebate cost ($20 per toilet). At the maximum conservation level, the Member Entities' costs are a $250 rebate (the total cost of toilet and installation) and a program administration cost of 20 percent of the rebate cost ($50 per toilet). At the voluntary level, the annual cost is $7.44 per year (the annual cost of $120 at 6.5 percent over 33 years), and at the maximum conservation level the annual cost is $18.59 per year (the annual cost of $300 at 6.5 percent over 33 years). With a water savings of 16.7 gpd/toilet (6095.5 gallons per year), the voluntary level cost of conservation is $1,220/MG ($7.44 per year divided by 6095.5 gallons per year times 1,000,000), and at the maximum conservation level the cost of conservation is $3,050/MG ($18.59 per year divided by 6095.5 gallons per year times 1,000,000).

For commercial/industrial/institutional (CII) toilets the average daily water savings is 48 gpd (Munzes 1995) for each toilet replaced (17,520 gallons per year per toilet). The life expectancy of a CII toilet is about 33 years. At the voluntary level, the Member Entities' costs are a $100 rebate and a program administration cost of 20 percent of the rebate cost ($20 per toilet). At the maximum conservation level, the Member Entities' costs are a $350 total replacement cost and a program administration cost of 20 percent of the total replacement cost ($70 per toilet). At the voluntary level, the annual cost is $7.44 per year (the annual cost of $120 at 6.5 percent over 33 years), and at the maximum conservation level the annual cost is $26.02 per year (the annual cost of $420 at 6.5 percent over 33 years). With a water savings of 48 gallons per toilet, the voluntary level cost of conservation is $430/MG ($7.44 per year divided by 17,520 gallons per year times 1,000,000), and at the maximum conservation level the cost of conservation is $1,490/MG ($26.02 per year divided by 17,520 gallons per year times 1,000,000).

For pre-1980 showerheads, the average savings is about 7.2 gpcd, and for 1980 to 1992 era shower heads, the average savings is about 3.4 gpcd. Assuming an average savings of 5.4 gpcd, 1 shower/day/capita, 2.5 capita/DU, and 1.5 showerheads/DU, then the average savings is 9.0 gpd per shower head replaced. The average life expectancy is about 20 years. At the voluntary level, showerheads would be provided to home owners who would install the showerheads. The cost of providing a shower head is about $10 (Maddaus 1995), and thus at the voluntary level, the cost of conservation is about $0.91/MG. At the maximum conservation level, showerheads would be installed for home owners. The cost of providing and installing a shower head is about $50, and thus at the maximum level, the cost of conservation is about $1,390/MG.

Because low flow showerheads result in less hot water use, they result in lower power consumption and additional monetary savings to the owner/user (this savings is not included in Tables 2A and 2B because it would not be realized by the Member Entities).

Throughout most of the Subregional System, water connections are metered. However, pre-1992 single family residences in Rohnert Park are not metered. The cost for installation of a residential water meter is about $425, and the cost per meter reading is about $2.50 (Maddaus 1995), or $15 per year (read every second month). The life expectancy of a meter is about 25 years. Thus, the annual cost of a water meter is $49.85. Meters do not in and of themselves generate a water savings. However, they create an incentive to reduce water use. Through this incentive, toilets and showerheads are more likely to be retrofit with conservation fixtures. Additionally, meters cause some changes in peoples water use patterns; thus, a 5 percent decrease in the per dwelling unit water use is assumed (8.5 gpd per water meter installed). The cost of conservation would be about $16,070/MG. Because it is unlikely that home owners would voluntarily (even for a $100 rebate) install water meters, the total cost to the Member Entity of the meter, installation and reading is used for the cost of conservation for both the voluntary and maximum levels of conservation.

## Table 3

### Potential Average Dry Weather Flow Reduction Through Full Implementation of California Urban Water Conservation Council Best Management Practices

| Member Entity / Conservation Measure | Conservation Calculation Assumptions[a] | Maximum Conservation (mgd) |
|---|---|---|
| Santa Rosa[b] | | |
| Residential 5.5 gpf toilets | 5,535 DUs @ 27.01 gal/day/DU | 0.15 |
| Residential 3.5 gpf toilets | 7,626 DUs @ 19.84 gal/day/DU | 0.15 |
| Rohnert Park | | |
| Residential 5.5 gpf toilets | 1,191 DUs @ 28.96 gal/day/DU | 0.03 |
| Residential 3.5 gpf toilets | 2,150 DUs @ 21.28 gal/day/DU | 0.05 |
| CII 5.5 gpf toilets | 1,568 Employees @ 7.8 gal/day/employee | 0.01 |
| CII 3.5 gpf toilets | 4,377 Employees @ 3.8 gal/day/employee | 0.02 |
| Water Meters | 5% of 13,783 DUs @ 171.1 gpd/DU | 0.12 |
| Cotati | | |
| Residential 5.5 gpf toilets | 313 DUs @ 28.96 gal/day/DU | 0.01 |
| Residential 3.5 gpf toilets | 565 DUs @ 21.12 gal/day/DU | 0.01 |
| CII 5.5 gpf toilets | 183 Employees @ 7.8 gal/day/employee | > 0.00 |
| CII 3.5 gpf toilets | 508 Employees @ 3.8 gal/day/employee | > 0.00 |
| Sebastopol | | |
| Residential 5.5 gpf toilets | 627 DUs @ 18.28 gal/day/DU | 0.01 |
| Residential 3.5 gpf toilets | 671 DUs @ 13.43 gal/day/DU | 0.01 |
| CII 5.5 gpf toilets | 921 Employees @ 7.8 gal/day/employee | 0.01 |
| CII 3.5 gpf toilets | 1,491 Employees @ 3.8 gal/day/employee | < 0.01 |

## Table 3

Potential Average Dry Weather Flow Reduction Through Full Implementation of California Urban Water Conservation Council Best Management Practices

| Member Entity / Conservation Measure | Conservation Calculation Assumptions[a] | Maximum Conservation (mgd) |
|---|---|---|
| Showerheads | 241 DUs @ 16.73 gal/day/DU | > 0.00 |
| Total | | 0.59 |

WYA, 1995

[a] The residential toilet savings factors are based upon 14.7 percent and 10.8 percent flow reduction in the per dwelling unit flow for retrofit of 5.5 gpf and 3.5 gpf toilets, respectively, with ULFTs.

[b] Through Santa Rosa's aggressive retrofit program and natural replacement, all of the CII sector non-ULFTs should be replaced by buildout of the Santa Rosa General Plan.

## CONSERVATION CLOTHES & DISHWASHERS

Conservation clothes and dishwashers are appliances designed to use less water and energy without reducing the appliances cleaning capability or level of service. Conservation clothes washers use about 25 gallons per load, whereas nonconservation clothes washers use about 42 gallons per load (POWER 1994). Conservation dishwashers use about 4.5 to 5.0 gallons per load, whereas nonconservation dishwashers use about 8 gallons per load (A&A Building Supply, 1995). Use of water conserving clothes washers could save about 1.7 gpcd and use of water conserving dishwashers could save about 1.0 gpcd (American Water Works Association 1994).

Use of these conservation appliances could produce a maximum water savings of about 0.52 mgd, as shown in Table 4. At a voluntary penetration rate of 30 percent, a water savings of about 0.17 mgd would result. These savings are based on average water savings from use of conservation clothes washers of 1.7 gpcd and from conservation dishwashers of 1.0 gpcd. When people move, they often take their clothes washers with them, which could result in some conservation clothes washers being removed from the subregional area and replaced with nonconservation clothes washers. Thus, a factor of 75% has been included in Table 4 in the clothes washer water savings estimate to account for removal of conservation clothes washers from the subregional area.

As shown in Table 2A, the voluntary level cost to the Member Entities of conservation from clothes washers and dishwashers is $14,640/MG and $41,800/MG, respectively. The average water savings from use of conservation clothes washers is about 1.7 gpcd. If there are 2.5 capita per DU, and 1 clothes washer per DU, then the average water savings is about 4.25 gpd per conservation clothes washer. The average water savings from use of conservation dishwashers is about 1.0 gpcd. If there are 2.5 capita per DU, and 1 dishwasher per DU, then the average water savings is about 2.5 gpd per conservation dishwasher. The lives of these units are about 20 years (A&A Building Supply 1995). If a $425 rebate were offered for clothes washers, and a $400 rebate were offered for dishwashers (the incremental cost of the conservation appliances over similar nonconservation appliances), and a retrofit program administration cost of 20 percent of the

rebate is assumed, the cost of conservation to the Member Entities would be about $14,640/MG and $41,800/MG, for clothes washers and dishwashers, respectively.

Similarly, at the maximum level of conservation, the total cost of clothes washers would be about $700 (POWER 1995) and for dishwashers about $820 (retail for about $640 to $995, A&A Building Supply 1995). The cost of conservation to the Member Entities would be about $40,980/MG and $81,600/MG, for clothes washers and dishwashers, respectively.

In addition to decreased water use and wastewater flow, the owner/user of the conservation appliance would realize energy and detergent costs. In fact, over the life of the appliance, conservation appliances can cost less than nonconservation appliances.

## Table 4

Potential Average Dry Weather Flow Reduction Through Use of Water Conservation Appliances

| Member Entity / Conservation Measure | Conservation Calculation Assumptions | Maximum Conservation (mgd) | Voluntary Penetration Rate (%) | Voluntary Conservation (mgd) |
|---|---|---|---|---|
| Santa Rosa | | | | |
| Dishwashers | 174,500 capita * 1.0 gal/capita/day | 0.17 | 30 | 0.05 |
| Clothes washers | 174,500 capita * 1.7 gal/capita/day * 75% | 0.22 | 30 | 0.07 |
| Rohnert Park | | | | |
| Dishwashers | 40,000 capita * 1.0 gal/capita/day | 0.04 | 30 | 0.01 |
| Clothes washers | 40,000 capita * 1.7 gal/capita/day * 75% | 0.05 | 30 | 0.02 |
| Cotati | | | | |
| Dishwashers | 10,649 capita * 1.0 gal/capita/day | 0.01 | 30 | > 0.00 |
| Clothes washers | 10,649 capita * 1.7 gal/capita/day * 75% | 0.01 | 30 | < 0.01 |
| Sebastopol | | | | |
| Dishwashers | 10,418 capita * 1.0 gal/capita/day | 0.01 | 30 | > 0.00 |
| Clothes washers | 10,418 capita * 1.7 gal/capita/day * 75% | 0.01 | 30 | < 0.01 |
| Total | | 0.52 | | 0.17 |

WYA, 1995

## WATERLESS URINALS

Waterless urinals are nonflushing fixtures that use no water at all. Instead, urine drains by gravity through a lighter-than-water liquid cap. The liquid cap prevents escape of urine and sewer odors, is biodegradable, and less than one five-hundredth of an ounce of the cap liquid is lost per use.

Use of waterless urinals in CII facilities could produce a maximum water savings of about 0.13 mgd as shown in Table 5. At a voluntary penetration rate of 30 percent, a water savings of about 0.04 mgd would result. This savings is based upon an average current urinal water use of 1.5 gpf, 1.5 flushes per day per male employee, and a 1:1 ratio of male to female employees, resulting in a savings factor of 2.2 gpd/male employee.

As shown in Tables 2A and 2B, the cost of conservation from waterless urinals at the voluntary and maximum levels would be about $570/MG and about $2,830/MG, respectively. Waterless urinals cost less than standard urinals to install; thus, for the voluntary level a $100 rebate has been used (plus 20 percent for program administration) as the Member Entity cost. For the maximum conservation level, the whole cost to purchase and install a waterless urinal has been used, and about $500 has been used as the Member Entity cost. The life of these units is about 20 years which is comparable to standard urinals

The Uniform Plumbing Code lists ratios of urinals to male persons for several building uses. These ratios vary significantly from about 1 urinal per 10 males to as much as 1 urinal per 100 males. At a ratio of 1 urinal per 20 male employees, the water savings would be about 44 gpd per waterless urinal.

In addition to decreased water use and wastewater flow, the owner/user of the waterless urinals would realize other savings and benefits. The cost of a waterless urinal is under $500 (installed), which is significantly less than the cost of a conventional urinal ($800 or more installed, including urinal, flush valve, and water supply). If waterless urinals were incorporated into the design of new buildings, plumbing of water supply to urinals would not be required, and plumbing construction costs would be decreased. These facilities, however, would require a variation from the standard building code. Also, the waterless urinals have no moving parts, resulting in lower maintenance costs.

## Table 5

### Potential Average Dry Weather Flow Reduction Through Use of Waterless Urinals

| Member Entity | Conservation Assumptions[(a)] | Maximum Conservation (mgd) | Voluntary Penetration Rate (%) | Voluntary Conservation (mgd) |
|---|---|---|---|---|
| Santa Rosa | 49,250 emp * 2.2 gal/emp/day | 0.11 | 30 | 0.03 |
| Rohnert Park | 10,000 emp * 2.2 gal/emp/day | 0.02 | 30 | < 0.01 |
| Cotati | 1,165 emp * 2.2 gal/emp/day | > 0.00 | 30 | > 0.00 |
| Sebastopol | 3,300 emp * 2.2 gal/emp/day | > 0.00 | 30 | > 0.00 |
| Total | | 0.13 | | 0.04 |

WYA, 1995

(a) A ratio of male to female employees of 1:1 is assumed; only male employees are included.

## POINT OF USE HOT WATER HEATERS

Point of use hot water heaters are small water heaters located immediately under the faucet they serve (unlike a central water heater which is normally in the garage or other central point in the house). The point of use heaters either heat the water as it is needed or store hot water under the sink. Water savings from the point of use heaters result from not having to run the faucet for a period of time while hot water flows from the centrally located water heater to the sink (e.g., from the garage to the kitchen or bathroom sink). Another technology that could generate the same or larger water savings is recirculation hot water plumbing in which hot water is continuously circulated through a loop from the heater to the sinks and back to the heater.

Installation of point of use hot water heaters could produce a maximum water savings of about 0.15 mgd as shown in Table 6. A voluntary penetration rate of 15 percent (installation of one heater in 15 percent of the houses) would result in a water savings of about 0.03 mgd. These savings vary significantly for each installation depending upon the house plan and piping. Savings in this report are based upon a faucet flow rate of about 2.2 gpm, an average wait for hot water of 20 seconds, and use of hot water at the sink twice per day (resulting in a savings factor of 1.5 gpd/DU). This savings could be increased by retrofitting more than one sink per house, but because these units are expensive (relative to other measures) and somewhat complex to install, it is unlikely that many houses would be retrofit with more than one point of use water heater.

Because point of use hot water heaters do not replace a nonconservation appliance, the voluntary and maximum conservation level costs are the same. As shown in Table 2A and 2B, the cost of conservation from point of use hot water heaters would be about $164,750/MG. This cost is based on a water savings of 1.5 gpd per heater installed (2 uses per day, 20 seconds per use at 2.2 gpm), a $1,100 total cost (adapted from A&A Building Supply), and a program administration cost of 20 percent of the total cost.

The owner/user of a point of use hot water heater would realize reduced power consumption from not heating as much water per hot water use.

### Table 6

Potential Average Dry Weather Flow Reduction Through Point of Use Water Heaters

| Member Entity | Conservation Assumptions | Maximum Conservation (mgd) | Voluntary Penetration Rate (%) | Voluntary Conservation (mgd) |
|---|---|---|---|---|
| Santa Rosa | 72,900 DU * 1.5 gal/DU/day | 0.11 | 15 | 0.02 |
| Rohnert Park | 15,059 DU * 1.5 gal/DU/day | 0.02 | 15 | < 0.01 |
| Cotati | 4,066 DU * 1.5 gal/DU/day | 0.01 | 15 | > 0.00 |
| Sebastopol | 4,359 DU * 1.5 gal/DU/day | 0.01 | 15 | > 0.00 |
| Total | | 0.15 | | 0.04 |

WYA, 1995

## MEASURED FLOW FAUCETS

Measured flow faucets are spring loaded faucets (common in public rest rooms) that automatically stop the water flow after about 2 to 5 seconds of use. Typically they are only installed in sinks where the primary use is for washing of hands. Water savings from the measured flow faucets result from the water running only to wet the hands, and to rinse off soap. Water does not run while the soap is being lathered and the hands are scrubbed.

Use of measured flow faucets in the CII sector could produce a maximum water savings of about 0.05 mgd, as shown in Table 7. A voluntary penetration rate of 30 percent would result in a water savings of about 0.02 mgd. These savings are based on a savings factor of about 0.56 gpd/employee. Also, these faucets are already in use in many public rest rooms, and thus no additional water savings could be generated from these rest rooms. It is assumed that 25 percent of the CII rest rooms already have measured flow faucets, or 75 percent of the CII rest rooms could still be retrofit with measured flow faucets.

The savings factor of 0.56 gpd/employee was developed as follows: If a typical hand washing with a conventional faucet requires about 0.55 gallons, and with a measured flow faucet requires about 0.29 gallons, the average water savings is about 0.26 gallons per hand washing. Also, if the average employee washes their hands 2.5 times per day and this occurs, on the average, 6 days per week (most facilities are used at least 5 days per week, but many are used 7 days per week; thus, an average use of 6 days per week is assumed), the water savings factor for these faucets would be about 0.56 gpd/employee.

As shown in Tables 2A and 2B, the cost of conservation from measured flow faucets would be about $1,340/MG at the voluntary level and about $4,890/MG at the maximum conservation level. The cost of a commercial grade measured flow faucet is about $70, and the cost of a commercial grade standard faucet is about $40. Thus, the incremental cost for use of a measured flow faucet over a standard faucet is about $30. At the voluntary level, a rebate of $30 would cover the incremental cost of the measured flow faucet. At the maximum conservation level, the total cost would be about $110 ($70 for the faucet and $40 for installation). The cost of conservation is also based upon a water savings of 0.56 gpd employee, and a ratio of 10 employees per measured flow faucet.

**Table 7**

Potential Average Dry Weather Flow Reduction Through Measured Flow Faucets

| Member Entity | Conservation Assumptions | Maximum Conservation (mgd) | Voluntary Penetration Rate (%) | Voluntary Conservation (mgd) |
|---|---|---|---|---|
| Santa Rosa | 98,500 emp *75%* 0.56 gal/capita/day | 0.04 | 30 | 0.01 |
| Rohnert Park | 20,000 emp *75% * 0.56 gal/capita/day | 0.01 | 30 | < 0.01 |
| Cotati | 2,331 emp * 75% * 0.56 gal/capita/day | > 0.00 | 30 | > 0.00 |
| Sebastopol | 6,600 emp * 75% * 0.56 gal/capita/day | > 0.00 | 30 | > 0.00 |
| Total | | 0.05 | | 0.02 |

WYA, 1995

## RETROFIT OF HOTELS AND MOTELS WITH CONSERVATION TOILETS / SHOWERHEADS

Retrofit of hotel and motel toilets and showerheads could produce a maximum water savings of about 0.02 mgd as shown in Table 8. At a voluntary penetration rate of 30 percent, a water savings of about 0.01 mgd would result.

The showerhead water savings factor is 10.8 gpd/room, and is based on a shower water savings of 7.2 gal/shower, 1 shower/day/occupant, and 1.5 occupants per room. The ULFT savings factor is 9.0 gpd/room and is based on a water savings of 3 gpf, 2 flushes/day/occupant, and 1.5 occupants per room.

The total possible water savings is also dependent on the occupancy rate (i.e. an unoccupied room generates no water savings) and the number of rooms currently without conservation fixtures that could be retrofit. The Santa Rosa Chamber of Commerce indicated that there are about 1,800 hotel/motel rooms in Santa Rosa with an average occupancy rate of 64.8 percent (in 1994). There are about 600 hotel/motel rooms in Rohnert Park. The Cotati and Sebastopol Chambers of Commerce indicated that there were no hotels/motels in Cotati and Sebastopol. Using the residential 1994 LFSH (60 percent ) and ULFT (13 percent) penetration rates from the *Wastewater Flow Projections* report, in 1994 Santa Rosa had about 720 rooms with non-LFSHs and about 1,566 rooms with non-ULFTs; Rohnert park had about 240 rooms with non-LFSHs and 522 rooms with non-ULFTs. Because hotels/motels constructed between 1994 and buildout of the general plans will be constructed with conservation fixtures, these new facilities could not be retrofit and thus are not included in this conservation estimate.

## Table 8

Potential Average Dry Weather Flow Reduction Through Retrofit of Hotel/Motel Toilets and Showerheads[a]

| Member Entity | Conservation Assumptions | Maximum Conservation (mgd) | Voluntary Penetration (%) | Voluntary Conservation (mgd) |
|---|---|---|---|---|
| Santa Rosa | | | | |
| Showerheads | 720 rooms * 10.8 gpd/room * 64.8% | < 0.01 | 30 | > 0.00 |
| Toilets | 1,566 rooms * 9.0 gpd/room * 64.8% | 0.01 | 30 | < 0.01 |
| Rohnert Park | | | | |
| Showerheads | 240 rooms * 10.8 gpd/room * 64.8% | > 0.00 | 30 | > 0.00 |
| Toilets | 522 rooms * 9.0 gpd/room * 64.8% | > 0.00 | 30 | > 0.00 |
| Total | | 0.02 | | 0.01 |

WYA, 1995

[a] Cotati and Sebastopol have no hotels or motels.

As shown in Table 2A and 2B, the costs of conservation from retrofit of hotel/motel toilets would be about $3,500/MG and $12,230/MG for the voluntary and maximum conservation levels, respectively. The costs of conservation from retrofit of hotel/motel showerheads would be about $360/MG and $720/MG for the voluntary and maximum conservation levels, respectively.

## TOTAL POSSIBLE CONSERVATION

As shown in Table 9, the maximum combined reduction in ADWF from all of the more aggressive measures is about 1.46 mgd, which would reduce the ADWF from about 20.90 to about 19.44 mgd. Again, to achieve this level of savings all of the conservation measures would have to be fully implemented (100% penetration) throughout the Subregional Area through **mandatory** requirements on new construction, natural replacement of existing facilities, and aggressive retrofit programs. At the voluntary level, the combined reduction in ADWF from all of the more aggressive measures is about 0.27 mgd, which would reduce the ADWF from about 20.90 to about 20.63 mgd.

## Table 9

Summary of Potential Average Dry Weather Flow Reduction Through Implementation of More Aggressive Water Conservation Measures & ADWF Projections

| ***Member Entity*** **Conservation Source** | **Maximum Conservation ADWF Reduction & Flow (mgd)** | **Voluntary Conservation ADWF Reduction & Flow (mgd)** |
|---|---|---|
| ***Santa Rosa*** | | |
| Full Implementation of CUWCC BMPs | 0.30 | NA[(a)] |
| Conservation Clothes and Dishwashers | 0.39 | 0.12 |
| Waterless Urinals | 0.11 | 0.03 |
| Point of Use Hot Water Heaters | 0.11 | 0.02 |
| Measured Flow Faucets | 0.04 | 0.01 |
| Conservation Retrofit of Hotels and Motels | 0.02 | < 0.01 |
| Total Conservation | 0.97 | 0.19 |
| Previously Projected ADWF (WYA 1995) | 15.97 | 15.97 |
| Projected ADWF with more aggressive conservation | 15.00 | 15.78 |
| ***Rohnert Park*** | | |
| Full Implementation of CUWCC BMPs | 0.23 | NA[(a)] |
| Conservation Clothes and Dishwashers | 0.09 | 0.03 |
| Waterless Urinals | 0.02 | < 0.01 |
| Point of Use Hot Water Heaters | 0.02 | < 0.01 |
| Measured Flow Faucets | 0.01 | < 0.01 |
| Conservation Retrofit of Hotels and Motels | > 0.00 | > 0.00 |
| Total Conservation | 0.37 | 0.06 |

# Table 9

Summary of Potential Average Dry Weather Flow Reduction Through Implementation of More Aggressive Water Conservation Measures & ADWF Projections

| ***Member Entity*** **Conservation Source** | **Maximum Conservation ADWF Reduction & Flow (mgd)** | **Voluntary Conservation ADWF Reduction & Flow (mgd)** |
|---|---|---|
| Previously Projected ADWF (WYA 1995) | 3.43 | 3.43 |
| Projected ADWF with more aggressive conservation | 3.06 | 3.37 |
| ***Cotati*** | | |
| Full Implementation of CUWCC BMPs | 0.02 | NA[(a)] |
| Conservation Clothes and Dishwashers | 0.02 | 0.01 |
| Waterless Urinals | > 0.00 | > 0.00 |
| Point of Use Hot Water Heaters | 0.01 | > 0.00 |
| Measured Flow Faucets | > 0.00 | > 0.00 |
| Conservation Retrofit of Hotels and Motels | 0 | 0 |
| Total Conservation | 0.05 | 0.01 |
| Previously Projected ADWF (WYA 1995) | 0.76 | 0.76 |
| Projected ADWF with more aggressive conservation | 0.71 | 0.75 |
| ***Sebastopol*** | | |
| Full Implementation of CUWCC BMPs | 0.04 | NA[(a)] |
| Conservation Clothes and Dishwashers | 0.02 | 0.01 |
| Waterless Urinals | > 0.00 | > 0.00 |
| Point of Use Hot Water Heaters | 0.01 | > 0.00 |
| Measured Flow Faucets | > 0.00 | > 0.00 |
| Conservation Retrofit of Hotels and Motels | 0 | 0 |
| Total Conservation | 0.07 | 0.01 |
| Previously Projected ADWF (WYA 1995) | 0.74 | 0.74 |
| Projected ADWF with more aggressive conservation | 0.67 | 0.73 |
| ***Subregional System*** | | |
| Full Implementation of CUWCC BMPs | 0.59 | NA[(a)] |
| Conservation Clothes and Dishwashers | 0.52 | 0.17 |
| Waterless Urinals | 0.13 | 0.04 |

# Table 9

## Summary of Potential Average Dry Weather Flow Reduction Through Implementation of More Aggressive Water Conservation Measures & ADWF Projections

| ***Member Entity*** **Conservation Source** | **Maximum Conservation ADWF Reduction & Flow (mgd)** | **Voluntary Conservation ADWF Reduction & Flow (mgd)** |
|---|---|---|
| Point of Use Hot Water Heaters | 0.15 | 0.03 |
| Measured Flow Faucets | 0.05 | 0.02 |
| Conservation Retrofit of Hotels and Motels | 0.02 | 0.01 |
| Total Conservation | 1.46 | 0.27 |
| Previously Projected ADWF (WYA 1995) | 20.90 | 20.90 |
| Projected ADWF with more aggressive conservation | 19.44 | 20.63 |

WYA, 1995

[a] N/A A voluntary level of implementation is not applicable in this report for this conservation measure, because it was already included in the ADWF projection presented in the *Wastewater Flow Projections* report.

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