

DATE: July 17, 2015
TO: Water Supply Advisory Committee
FROM: Rosemary Menard, Santa Cruz Water Director
SUBJECT: Summary of WSAC Work on Demand Management Options and Options for Integrating Demand Management into potential Water Supply Advisory Committee Recommendations and Agreement

Throughout the Water Supply Advisory Committee's (WSAC) process there has been a strong and consistent interest in and support for integrating additional water demand management activities into the Committee's recommendations. The purpose of this memo is to summarize the WSAC's work to date on demand management and to suggest options for the WSAC's consideration about how to integrate demand management recommendations into any potential Committee agreement.

Attached to this summary are a series of more detailed materials developed through the Committee's process. Each attachment is referenced in the discussion that follows where it relates to the material being presented.

Summary of WSAC Work with and on Demand Management Issues

During the Committee's Reconnaissance Phase, the WSAC received several presentations about customer water use trends. In the spring and summer of 2014, in parallel processes attended by several WSAC members the Santa Cruz Water Commission held public workshops to delve into options for additional demand management measures developed as part of the Long Term Conservation Master Plan work. In addition the Santa Cruz Water Department staff and Maddaus Water Management provided several model demonstration sessions for those interested in understanding how costs and savings for demand management options are estimated.

In October, 2014, the WSAC held a community based event "Our Water, Our Future, the Santa Cruz Water Supply Convention," to elicit ideas about how to improve the reliability of the Santa Cruz water system. Water conservation and demand management strategies were well represented in the 50+ ideas that were presented at this event. The WSAC technical team used inputs received from the Water Supply Convention to create a set of Consolidated Alternatives for further exploration by the WSAC. Consolidated Alternatives 1 through 5 were focused on various demand management strategies. The Stratus memo is provided as Attachment 1 to this summary.

Beginning in early December 2014, the Water Department sponsored and facilitated a set of open to the public working sessions to provide the community with an opportunity to learn more about the details of the modeling and forecasting tools used in water supply planning. These "Modeling and Forecasting Working Group" covered hydrology, groundwater management, fisheries issues, demand forecasting, supply reliability modeling, modeling of demand management programs, and short term/seasonal water management planning. City staff and consultants involved in developing and using data and modeling and forecasting tools for use in water supply planning and management tools presented detailed information about data inputs and assumptions used in modeling and forecasting tools, demonstrated these tools, and answered questions from participants about them.

Several of the Water Convention Alternatives focused on the effects of the price of water on user demand. This concept, called “price elasticity of demand” had not been incorporated into the City’s previous 2005 or 2010 demand forecasting for future water supply. However, data from the City’s revenue forecasts for the 2004 to 2011 period, when rates were scheduled to increase by more than 120%, compared to actual revenue generated during that period indicated that both the overall price of water, and the structure of the rates used to generate the water revenues are important parameters in predicting future consumption.

The City’s demand forecasting consultant, David Mitchell of M Cubed, presented compelling information in his Modeling and Forecasting Working Group presentation on the sensitivity of consumption to changes in price from work done in several Bay Area water utilities. The [Demand Forecasting Presentation](#) is available for review on the City’s website. In the interim demand forecast created for the WSAC process and presented at the February 2015 WSAC meeting indicated that price is expected to be a continuing motivator of behavior change for Santa Cruz water service customers. Additional work on water rate structures, with a focus on structures that incentivize conservation, is underway and planned for implementation in the summer of 2016.

Following the Demand Forecasting presentation, the Modeling and Forecasting Working Group held a session on the Demand Management Decision Support System (DSS) model. It, too, is available on the City’s website: [DSS Model Presentation](#)

Following the DSS Modeling and Forecasting Working Group session, two Committee members worked with City staff and members of the consultant technical team to delve more deeply into the DSS model. Among the factors motivating these Committee members to undertake this effort was a concern about the transparency of the DSS model (or real or perceived lack thereof), and questions about a variety of assumptions, for example, how elements such as administrative costs allocated to each demand management program as part of its assumptions might (or might not) be affecting the overall cost effectiveness calculation of some of the proposed programs.

One of the issues by the two WSAC reviewers raised during the DSS related to the way administrative costs were generated for the individual measures. The concern was that the approach being used in the DSS model might result in higher administrative costs than would really be needed being assigned to the measures being reviewed. If the administrative costs were, in fact, too high, they could negatively influence the cost/benefit calculations that the DSS model produced for each measure. City staff agreed that a more effective approach would be to identify and apply an overall administrative cost to whatever package of measures (or programs) is ultimately adopted and implemented. This approach is likely to produce a more realistic estimate of the administrative cost of developing and implementing demand management programs.

Stratus Consulting developed a memo summarizing the work it did with WSAC members and City staff to sort through DSS model issues. This draft memo is provided as Attachment 2 and is still being reviewed by WSAC members who were involved in the DSS model review effort.

As the WSAC process has moved ahead, it has become very clear to everyone that the system’s vulnerability is focused in the peak season. During the March 2015 WSAC meeting, the Committee decided to form an informal working group of Committee members to look at how demand management activities might be best focused to reduce peak season demand. Working through the

Spring and early Summer of 2015, this group recommendation that an enrichment session focusing on the City's past, present and future demand management actions and options would be very useful in setting the stage for considering the future of demand management in Santa Cruz. This session was held on May 21, 2015. Attachment 3 is the presentation provided during that meeting.

The presentation in Attachment 3 includes several parts:

- the results of the Baseline Conservation Survey,
- a focus on the City's ongoing water budget program for large irrigators, and
- an overview of the work of the Peak Season Demand Management working group ideas.

Following the enrichment session, the Working Group developed a report on their analysis and a table of the estimated range of savings that could result from the measures and strategies they identified. Attachment 4 is their report and Attachment 5 is the summary spreadsheet of the Working Group's estimate of savings from the measures and strategies they identified.

Finally City staff conducted a review of the measures identified by the Working Group and developed a brief memo summarizing its review, which is provided as Attachment 6. In summary, the City's review concluded that, aside from a very few specific ideas, the recommendations of the working group are well-aligned with the set of measures and overall direction currently being contemplated as part of the Water Conservation Master Plan. That project is temporarily on hold until a contract amendment and additional funding is approved to complete the program design and analytical work. Some of the suggestions will require modifying existing cost and savings estimates, or making new estimates of cost so they can be evaluated from a benefit/cost perspective and to understand the unit cost of savings involved. The working group made its own separate estimates of water savings, but staff cautions that because of overlap with estimates in the DSS model, it's not clear at this point how much additional water savings could be obtained by the 2035 timeframe above that already projected. Additional work will also need to be done to ensure savings are not double counted in both the DSS model and the new water demand forecast.

This summary demonstrates both the diversity of the Committee's and community's interest in demand management efforts as well as the depth of the Committee's exploration of the topic. The City's current and very recent messaging related to drought and the community's significant and consistent responsiveness to those messages has resulted in a level of awareness among community members that is unprecedented and likely provides a unique opportunity upon which to build additional long term changes in water use. The question for the WSAC is "what is the best way to reflect and take advantage of this opportunity in the crafting of its recommendations and the development of its agreements?"

Options for Addressing Demand Management Programs in Committee Recommendations and/or Agreements

While certainly not an exhaustive list of options, at least the following three options would seem to cover the spectrum of possible approaches for addressing water demand management activities in the Committee's potential recommendations and agreements:

1. Identify specific, individual, demand management programs and specify details about timing, participation targets, cost and savings assumptions and targets and timelines;

2. Identify a package of demand management programs and specify priorities for timing of implementation, levels of rebates and/or incentives to target certain kinds of demand reductions; and
3. Provide results oriented, policy level direction with guidance about key criteria to emphasize in developing and implementing program and adapting the program over time.

There isn't a right answer to the question of which approach to adopt or whether some kind of hybrid might better suit the Committee's needs and purposes. For each approach identified, I've provided some further discussion, an example or two and an issue or two to think about if that approach is selected.

1. Identify specific, individual, demand management programs.

In this approach the details and assumptions underpinning all of the programs identified and evaluated in the DSS model would be reviewed, specified, and the DSS model would be rerun to provide details of the recommended program, its cost and savings. For example, specific provisions of the types of eligible fixtures and levels of rebates for toilet and washing machines would be identified. Marketing plans and timings would be developed and reflected in the modeling inputs. Similar level of detail would be developed for other programs to be included. The results generated by the DSS model would identify individual and composite program costs and water savings. These details would be the basis of the Committee's recommendations and would be reflected in any Committee agreement.

For this approach to work in the given time frame for developing the Committee's recommendations and agreement, it will likely require that a working group of Committee members spend time in the coming weeks to work with City staff to develop for the full Committee's consideration recommendations that specify the details of individual programs to be included in the Committee's recommendation and agreements.

2. Identify a package of demand management programs.

In this approach, the Committee would adopt a package of demand management programs, provide more general (rather than individual program specific) details about implementation timing, participation and program focus areas and then reflect this direction and target outcomes in its recommendations and agreements. Program Crec, which the WSAC has had information about as one of the demand management Consolidated Alternatives is an example of the kind of package of programs that might be created.

Should the Committee want to pursue this approach, it would likely make sense for the Committee to establish a working group to work with City staff over the coming weeks to develop recommendations for the full Committee's consideration about exactly what is in the package of programs to be included and to define any additional parameters or directions to be recommended.

3. Provide results oriented, policy level direction with guidance about key criteria.

In this approach, the recommendation for demand management might be something like: “Implement demand management programs as needed to produce a XXX mgy reduction in demand by 2035. In selecting programs to implement emphasize those programs that are the most cost-effective and give priority to those that focus on peak season demand management first.” This approach could work if WSAC members feel they understand the currently available options and approaches related to demand management and that result oriented policy direction with some specific priorities and key criteria to be considered in selecting and implementing programs is adequate direction to ensure that the right things will happen in the future. For this approach to work, the Committee would need to have confidence that City staff, with the oversight of the Water Commission and the City Council, would take appropriate and timely steps to achieve the savings goal and would do so in a manner aligned with the Committee’s priorities and goals.

As indicated above, these three options aren’t the only choices, but this range of approaches should be adequate to generate a discussion about this topic at the July WSAC meeting and to provide staff with additional information help the Committee make a decision about this topic at the August meeting.

Memorandum

To: Water Supply Advisory Committee members
From: Carolyn Wagner Bob Raucher, and Karen Raucher, Stratus Consulting Inc.
Date: 6/2/2015
Subject: June Meeting Summary: Demand-Side Consolidated Alternatives

In this memorandum, we present an update on the technical work performed on the demand-side consolidated alternatives (CAs) since the March Water Supply Advisory Committee (WSAC) meeting. The focus of the technical work has been on CA-01 Peak Season Reduction, and CA-03 Water Conservation Measures (Program C Rec). Additional information on these two CAs is provided separately. The status of the all demand-side alternatives is as follows:

- ▶ **CA-01 Peak Season Reduction:** The peak season reduction subcommittee met with the Water Department several times in May 2015 to develop a joint enrichment session focused on peak season demand and potential water use reduction strategies. The subcommittee is the process of preparing a summary report that will then be evaluated by the technical team.
- ▶ **CA-02 Water Neutral Development:** This alternative has been set aside for now because (1) it provides a limited amount of expected water savings (it may, however, accelerate when savings are realized), (2) several critical issues pertaining to how the program might be paid for need to be addressed including the equity and related issues associated with placing the direct financial burden on builders/developers and homeowners/renters, and (3) the costs escalate over time as opportunities for water saving investments become increasing scarce and expensive. The technical team also points out that this CA and the suite of associated issues has been examined recently by the Water Commission.
- ▶ **CA-03 Water Conservation Measures (Program C Rec):** A separate memorandum titled, “Clarification of Program C Recommended,” is provided and provides a listing of the various measures contained within that program. That memorandum also describes how the program measures are assessed within the Maddaus Water Management DSS Model, in terms of inputs and assumptions, model specification, and interpreting the outputs of the modeled results.
- ▶ **CA-04 WaterSmart Home Water Reports:** This alternative has been removed from further separate consideration due to the fact that it is also included within CA-03 (Program C Rec). Please note that the initial water savings and costs reported for CA-04 are different than the modeled savings and cost included as part of C Rec. This is because the measure, as analyzed for C Rec, assumes a participation rate of 20% of residential customers, whereas the calculations for the separate CA-04, WaterSmart Home Water

Reports program, assumed full participation (i.e., that all residential customers would receive water reports). Both calculations reported in the April 2015 packet assumed every customer receiving a report reduces water use, with savings of 3%. The Water Department assumes that sending a Water Report to all customers would not be cost effective as the expected savings from customers who are already low-water users are likely to be very small and not worth the administrative costs. If the city was to send water reports to all customers, then the water savings rate, currently 3%, would need to be revised to reflect that the average savings would be reduced.

- ▶ **CA-05 Home Water Recycling and CA-06 Commercial Scale Graywater:** No additional work has been conducted on these CAs since the memorandum that was provided as part of the packet for the April/May 2015 WSAC meeting.

Table 1 provides the preliminary water savings and costs estimated for the CAs. This table has not been updated since the April 2015 meeting and is intended as a reminder rather than an update.

Table 1. Summary of CAs 01-05 with preliminary water savings and costs

| CA-# and title | 30-year PV savings (MG) | 30-year PV cost (\$) | 30-year PV cost/30-year PV saved (\$/MG) | 30-year average savings (MG) | 30-year average cost (\$) | Energy saved over 30 years (MWh) | Energy saved per year, on average (MWh) |
|--|--------------------------------|-----------------------------|---|-------------------------------------|----------------------------------|---|--|
| CA-01 Peak Season Reduction | In progress | In progress | In progress | In progress | In progress | In progress | In progress |
| CA-02 Water Neutral Development | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| CA-03 Water Conservation Measures (Program C Rec) ^a | 2,788 | \$23.1 million | 8,301 | 173 | \$1.31 million | 6,318 | 277.4 |
| CA-04 WaterSmart Home Water Reports | 770 | \$3.17 million | 4,119 | 37 | \$151,529 | 1,766 | 58.9 |
| CA-05 Home Water Recycling | 229 | \$7.8 million | 34,061 | 11.9 | N/A | 571 | 19.0 |

MG: million gallons; MWh: megawatt hours; PV: present value.

a. Values reported for CA-03 are for a 25-year period, rather than a 30-year period.

Memorandum

To: Water Supply Advisory Committee and Toby Goddard, Santa Cruz Water Department

From: Carolyn Wagner, Karen Raucher, and Bob Raucher, Stratus Consulting Inc.

Date: 6/2/2015

Subject: Clarification of Conservation Program C Recommended

In this memorandum, we provide additional explanatory information about the measures and modeling approach used by Maddaus Water Management (MWM) to estimate the savings and costs associated with Program C Recommended (CRec). The purpose of this memorandum is to provide additional insights into Program CRec, and to provide transparency and clarity with regards to MWM's model, including inputs and assumptions, model specification, derivation of model outputs, and interpretation of outputs.¹

1. Overview and Background

In 2013 and 2014, the Santa Cruz Water Department (SCWD) focused on the role of demand management by developing the Water Conservation Master Plan (recently recognized as a national model). The planning objective was to select a program that would maximize water savings based on total annual volume of water saved, with a secondary objective of selecting the more cost effective measures. The Water Conservation Plan was developed with the support of analysis conducted by MWM, using its Least Cost Planning Decision Support System Model (DSS Model). The DSS Model evaluates conservation programs based on cost effectiveness. MWM and SCWD developed and evaluated four programs: A, B, C, and D, each comprised of unique sets of conservation measures [e.g., rebates for ultra-high efficiency toilets (UHETs)]. After careful review of each set of measures, the SCWD identified Program C as providing the community with the largest set of benefits given costs. Program C was shared with the community for public comment in March 2014. After incorporating public comments, several measures within Program C were optimized and the program was renamed "Program C Recommended." The city concluded: "C recommended (CRec) was determined to be the best option for a long-range conservation plan for the City at this time" (Maddaus and Maddaus, 2014, p. 2).

1. This memorandum was developed by Stratus Consulting with support and insights provided by MWM and Toby Goddard at SCWD. Stratus Consulting is not an expert on the DSS Model and we do not have direct access to the inner workings of the MWM proprietary DSS Model. Appropriate caveats should be noted. We greatly appreciate the time and effort provided by Toby Goddard, Lisa Maddaus, and Bill Maddaus in giving us relevant information and insights.

The extensive work conducted by the SCWD in developing the Water Conservation Master Plan, where 50 measures were assembled into 4 potential conservation programs, provides a strong foundation of information that can be used by the Water Supply Advisory Committee (WSAC) in understanding the role of demand management in developing a long-term water supply plan; however, the process was extensive and the modeling work complex. This memorandum is designed to provide insight into how the DSS Model operates and why the results are not always intuitively clear.

The DSS Model

The DSS Model is a nationally recognized tool used to identify the cost-effectiveness of conservation programs. The model estimates program-level savings and costs using inputs and assumptions that are based on historical data and adjusted to city-specific parameters. Additional details about the assumptions and inputs are provided in the next section.

An issue with understanding the results of the DSS Model runs for the demand management consolidated alternatives is the relationship between Program A, which the city is already implementing, and Program C, because Program C builds upon Program A the costs and savings are not independent (as they are for other Alts). Stratus Consulting netted out the costs and savings associated with Program A and plumbing codes for our comparison with other consolidated alternatives, and those adjustments are reflected in the information provided for CRec as it is portrayed as a consolidated alternative. The information included in the remainder of this memorandum is inclusive of both Program A and plumbing codes; and thus, it is not possible to compare the information provided directly with other consolidated conservation programs.

1.1 Assumptions and Inputs

General assumptions within the DSS calculations include:

- ▶ The timeframe includes years 2014–2040.
- ▶ The demand forecast used in the DSS Model was estimated by MWM based on input from SCWD. MWM reran the DSS Model to produce updated savings and cost estimates taking into account the revised interim demand forecast developed by David Mitchell (Mitchell, 2015). Additionally, the model adjusts forecasted demand to account for the impact of future plumbing codes.

- ▶ Present value (PV) calculations include:
 - Costs are discounted at 2.25%
 - Savings are not discounted
 - PV costs per unit of water saved [PV\$/million gallons (mg)] are calculated using utility cost only (does not include costs to customers).
- ▶ Water savings calculations are based on end-use water allocation assumptions (see the example calculation below). These data are based on national averages that, where possible, are scaled to be more accurate to Santa Cruz. For example, Figure 1 provides a screenshot of the end-use breakdowns that are included as inputs to the DSS Model.
- ▶ The model calculates savings using percentages. As such, as plumbing codes and other measures reduce “baseline” water usage (i.e., the amount of water to which the percent savings is applied), the amount of estimated savings also decreases. The model is intended to evaluate the programs rather than the individual measures, and thus use of the individual measure-level savings output is cautioned.
- ▶ Administrative costs are estimated as a percentage of the cost of each measure, and are included in the cost outputs. (Note that for our assessment of CRec as a consolidated alternative, we have separated out administrative costs from each measure, and instead consider administrative costs at the program-wide level).

In addition to these general assumptions, each measure has specific assumptions and inputs (for example, see Section 2 for inputs specific to the UHETs measure). One particularly uncertain and driving assumption is the percent of accounts targeted. We present this assumption for each measure in Table 1. While these inputs are uncertain, they are based on best professional judgment informed over years of conservation work by MWM and SCWD.

Table 1 presents the measures included in Programs A and CRec, a description of Program A and CRec, the types and percent of accounts targeted, and the outputs (e.g., water savings and PV cost per water saved).

Figures 2 and 3 provide the water savings and cost per unit of savings for each measure, respectively, as derived from the DSS Model runs for Santa Cruz.

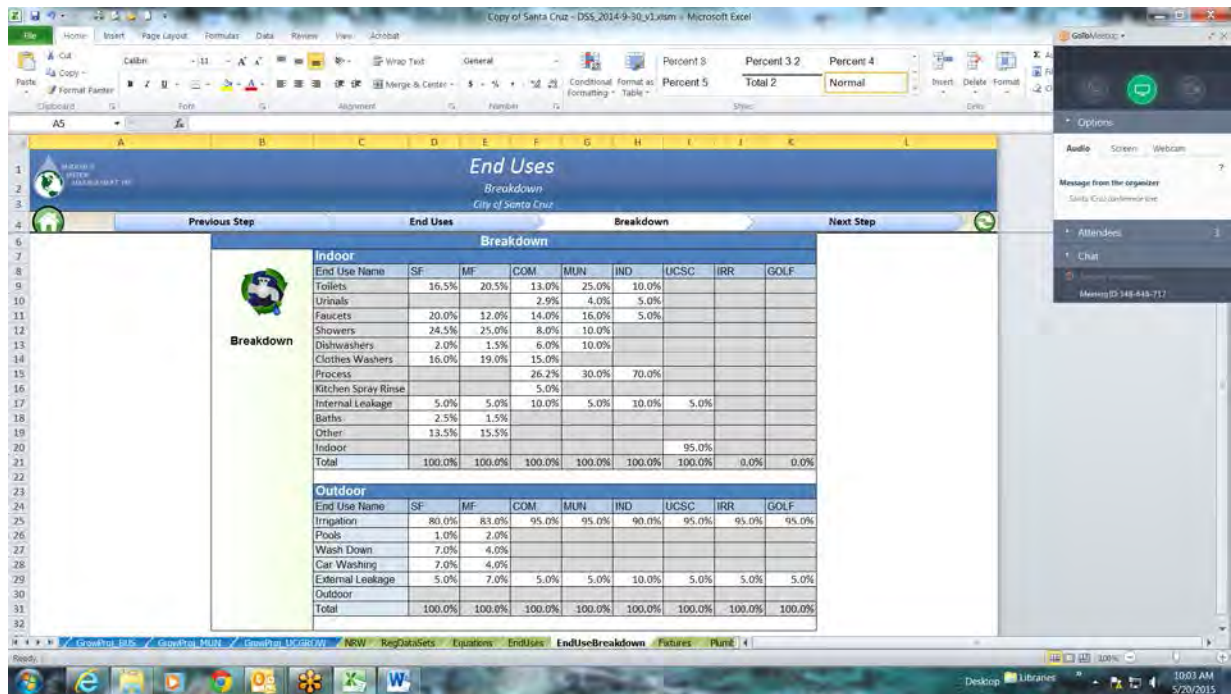


Figure 1. Least-cost planning DSS Model screenshot of the end-use breakdowns.

Source: Toby Goddard, Administrative Services Manager, SCWD, personal communication, May 20, 2015.

2. Detailed Example of DSS Calculation

In this section, we present an example calculation of the saving and costs associated with the measure, “Res UHET Rebates,” which provides a rebate or voucher for the installation of an UHET to residential (SF and MF) customers. This example calculation was developed by Toby Goddard at the SCWD (Toby Goddard, Administrative Services Manager, SCWD, personal communication, May 20, 2015), based on his access to a version of the DSS Model.

Table 2 presents the water savings calculation for 2014, and compares the calculated savings to the reported savings in the measure output screenshot. While the final calculated water savings are close (about 3% difference), they are not an exact match. We believe this small difference is due to plumbing code changes that reduce toilet end-use water consumption between 2010 and 2014, which are netted out in the DSS Model before the active program savings are calculated (Toby Goddard, Administrative Services Manager, SCWD, personal communication, May 20, 2015).

Table 1. Description of Program A and CRec measures (per DDS Model)

| Name of measure | Included in revised Program CRec and Program A | Description of measure | Type of accounts targeted | Accounts targeted (%) | Average water savings (mgd) | Cost per unit volume (\$/mg) |
|--|--|--|---------------------------|-----------------------|-----------------------------|------------------------------|
| Reduce Water Loss | Optimized in CRec | Seek to maintain low nonrevenue water rates through controlling both apparent and real water losses. | All | N/A | 0.10759 | \$1,803 |
| Advanced Metering Infrastructure (AMI) | CRec only | Install or retrofit system with AMI meters and associated network capable of providing continuous consumption data to utility offices. | SF MF COM | 3.00% | 0.00764 | \$4,967 |
| Water Rates | Optimized in CRec | Develop individualized monthly water budgets for all or a selected category of customers. | IRR | 36.00% | 0.016291 | \$178 |
| General Public Information | Both programs | Comprehensive education and public awareness campaign that would evolve over the years and seek to drive participation in other conservation programs. | SF | 50.00% | 0.015917 | \$6,268 |
| Public Information (Home Water Use Report) | CRec only | Detailed water billing reports for customers with neighborhood use comparisons and suggestions on customer-specific conservation actions. | SF | 20.00% | 0.02454 | \$1,795 |
| Residential Leak Assistance | CRec only | May require that customer leaks be repaired, but either subsidize part of the repair and/or pay the cost with revolving funds that are paid back with water bills over time. | SF MF | 0.50% | 0.058182 | \$1,080 |
| Residential SF Survey | Both programs | Outdoor water surveys for existing SF residential customers. Target those with high water use and provide a customized report to owner. May include giveaway of efficient shower heads, aerators, or toilet devices. | SF | 1.50% | 0.005116 | \$12,615 |
| Plumbing Fixture Giveaway | Optimized in CRec; non-optimized in Program A | Utility would buy showerheads and faucet aerators in bulk and give them away at utility offices and/or community events. | SF | 2.50% | 0.052487 | \$182 |

Table 1. Description of Program A and CRec measures (per DDS Model) (cont.)

| Name of measure | Included in revised Program CRec and Program A | Description of measure | Type of accounts targeted | Accounts targeted (%) | Average water savings (mgd) | Cost per unit volume (\$/mg) |
|--|--|---|---------------------------|-----------------------|-----------------------------|------------------------------|
| Residential High Efficiency Toilet (HET) Rebates | Program A only | Provide a rebate or voucher for the installation of a HET. | SF MF | 1.75% | 0.022056 | \$2,079 |
| Residential UHET Rebates | CRec only | Provide a rebate or voucher for the installation of an UHET. | SF MF | 1.20% | 0.036127 | \$4,294 |
| High Efficiency Clothes Washer (HECW), Rebates A | Program A only | Provide a rebate for HECW to SF homes and in-unit condo/apartment complexes that do <i>not</i> have common laundry rooms. | SF MF | 2.25% | 0.064606 | \$993 |
| HECW, Rebates B | Optimized in CRec | Provide a rebate for HECW to SF homes and in-unit condo/apartment complexes that do <i>not</i> have common laundry rooms. | SF MF | 3.75% | 0.096686 | \$2,097 |
| HECW, New Development | Optimized in CRec | Require developers to install an HECW that meets certain water-efficiency standards. | SF MF COM | 100.00% | 0.026061 | \$812 |
| Hot Water On Demand, New Development | CRec only | Work with developers and permitted remodels to equip new homes or buildings with efficient hot water on demand systems. | SF MF COM | 100.00% | 0.010568 | \$2,407 |
| Toilet Retrofit Time of Sale (TOS) | Both programs | Work with the real estate industry to require a certificate of compliance that verifies a plumber has inspected the property and efficient fixtures were either already there or were installed at the TOS. | SF MF COM | 0.85% | 0.021117 | \$1,070 |
| CII MF Common HECW | Optimized in CRec | Provide a \$400 rebate for the installation of a high-efficiency commercial washer (HEW) in CII and MF common area laundry. | MF COM | 35.00% | 0.006112 | \$3,128 |

Table 1. Description of Program A and CRec measures (per DDS Model) (cont.)

| Name of measure | Included in revised Program CRec and Program A | Description of measure | Type of accounts targeted | Accounts targeted (%) | Average water savings (mgd) | Cost per unit volume (\$/mg) |
|---------------------------------------|--|---|---------------------------|-----------------------|-----------------------------|------------------------------|
| CII Incentives | Both programs | After the free water-use survey has been completed at site, the utility will analyze the recommendations on the findings report that is provided and determine if the site qualifies for a financial incentive. | MF COM | 0.50% | 0.036742 | \$305 |
| Pre-Rinse Noz Giveaway | CRec only | Provide free spray nozzles and possibly free installation for the rinse and clean operation in restaurants and other commercial kitchens. | COM | 5.71% | 0.025215 | \$241 |
| CII Surveys | Both programs | Offer top water customers from each category a professional water survey to evaluate ways for the business to save water and money. | MF COM | 0.50% | 0.037584 | \$2,389 |
| High Efficiency Urinals (HEU) Program | Optimized in CRec; non optimized in Program A | Provide a rebate or voucher for the installation of a HEU. | COM MUN IND | 5.00% | 0.004734 | \$5,792 |
| Public Restroom Faucet Retrofit COM | MUN and COM in CRec; "Regular" in neither | Consider direct install program, rebates, or grants for the installation of high-efficiency sensor faucet fixtures in all or selected high-use commercial or institutional buildings. | COM MUN IND | 2.50% | 0.031747 | \$3,902 |
| Public Restroom Faucet Retrofit MUN | MUN and COM in CREC; "Regular" in neither | Consider direct install program, rebates, or grants for the installation of high-efficiency sensor faucet fixtures in all or selected high-use commercial or institutional buildings. | COM MUN IND | 2.50% | 0.031747 | \$3,902 |
| School Retrofit | CRec only | School retrofit program where school receives grant to replace fixtures and upgrade IRR systems. | MUN | 1.00% | 0.008923 | \$581 |

Table 1. Description of Program A and CRec measures (per DDS Model) (cont.)

| Name of measure | Included in revised Program CRec and Program A | Description of measure | Type of accounts targeted | Accounts targeted (%) | Average water savings (mgd) | Cost per unit volume (\$/mg) |
|-----------------------------------|--|---|---------------------------|-----------------------|-----------------------------|------------------------------|
| Landscape Ordinance | Both programs | Include less IRR demand for new accounts due to more efficient landscape designs due to City Code. | MF COM MUN IND | 100.00% | 0.013626 | \$382 |
| Residential SF Turf Removal A | Optimized in CRec; non-optimized in Program A | Provide a per square foot incentive to remove turf and replace with low water-use plants or permeable hardscape. | SF | 0.20% | 0.00279 | \$17,920 |
| Residential MF CII Turf Removal A | Optimized in CRec; non-optimized in Program A | Provide a per square foot incentive to remove turf and replace with low water-use plants or hardscape. | MF COM | 0.10% | 0.001019 | \$24,534 |
| Expand IRR Survey Water Budgets | CRec only | Outdoor water audits offered for existing large landscape customers. | IRR | 2.20% | 0.003293 | \$11,157 |
| Sprinkler Nozzle Rebates | CRec only | Provide rebates to replace standard spray sprinkler nozzles with rotating nozzles that have lower application rates. | SF MF COM | 0.50% | 0.005583 | \$3,051 |
| Gray Water Retrofit | CRec only | Provide a workshop to support a gray water challenge. Offer rebate to assist covering certain percentage of the cost to SF homeowners per year to install gray water systems. | SF | 0.10% | 0.000831 | \$8,206 |
| Support Residential Rain Barrel | Both programs | Provide incentive for installation of rain barrels. | SF | 2.00% | 0.007404 | \$2,857 |

COM: commercial; CII: commercial, industrial, and institutional; IND: industrial; IRR: irrigation; MF: multi-family; mgd: millions of gallons per day; MUN: municipal; SF: single-family.

Source: MWM, Undated.

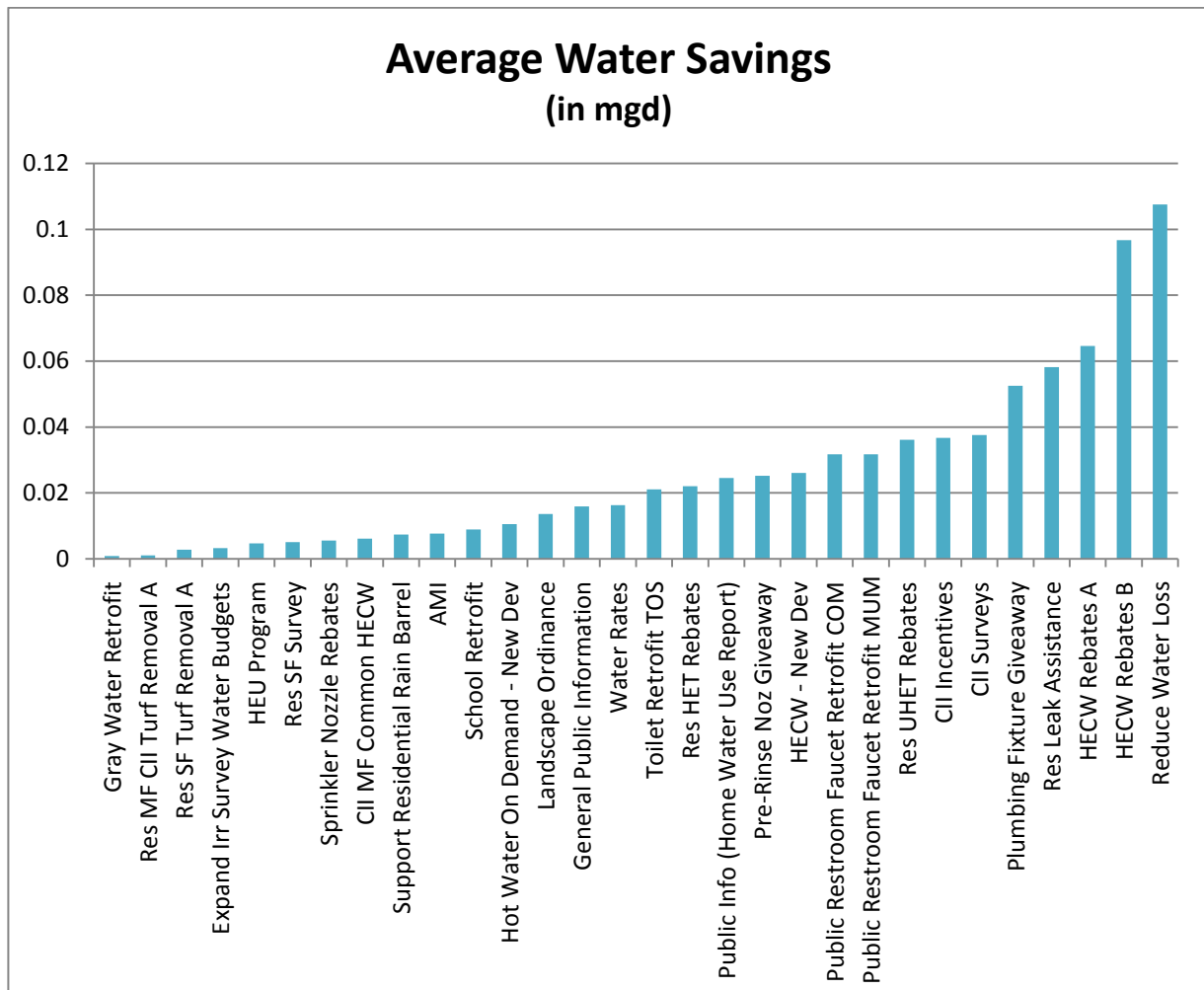


Figure 2. Average water savings for each CRec measure.

Source: MWM, Undated.

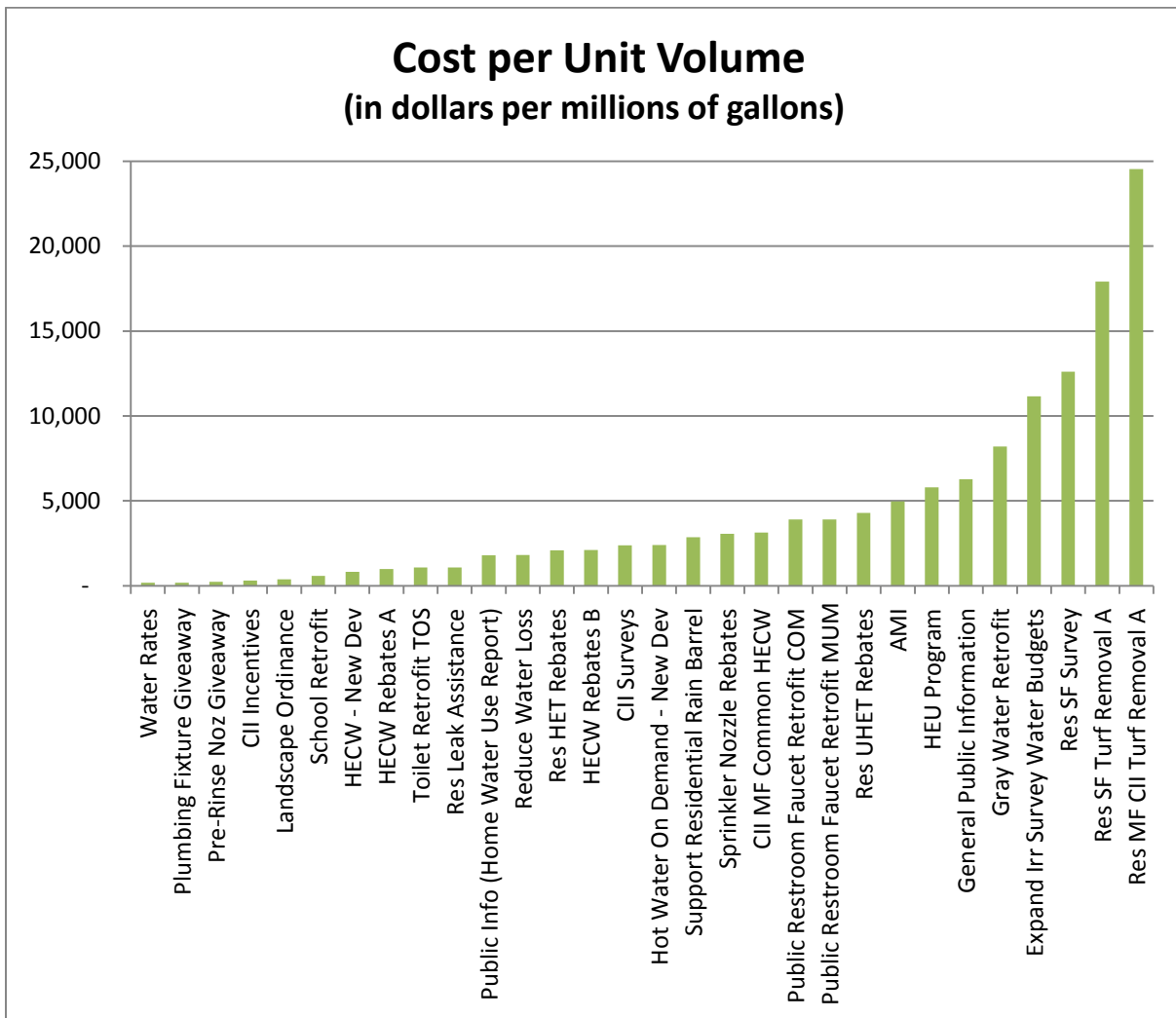


Figure 3. Cost per unit volume for each CRec measure.

Source: MWM, Undated.

Table 2. Example calculation for water savings in 2014 residential UHET measure

| Step | Step description | Input | SF | MF |
|---|--|---|------------------|-----------------|
| Step 1 Determine number of targeted accounts | | | | |
| 1.1 | Use number of accounts in 2010 | 2010 accounts ^a | 18,862 | 2,726 |
| 1.2 | Scale up number of accounts in 2010 by population to starting year, 2014 | 2014 population ^b | 49,209 | 35,536 |
| | | 2010 population ^b | 48,493 | 34,378 |
| | | SF account scalar | 1.014765018 | 1.033684333 |
| | | 2014 accounts | 19,140.50 | 2,817.82 |
| 1.3 | Apply % of accounts targeted/year to determine number of targeted accounts in starting year | % accounts targeted | 1.2% | 1.2% |
| | | Accounts targeted, 2014 | 230 | 34 |
| Step 2 Determine targeted end use in gallons/account/day | | | | |
| 2.1 | Find average account use in gallons per account per day | Gallons/account/day ^a | 199.49 | 742.42 |
| 2.2 | Multiple by percent of indoor use | % indoor use | 76.7% | 88.4% |
| | | Gallons/account/day used indoors | 153.01 | 656.30 |
| 2.3 | Multiple indoor use by percent of end use, i.e., toilets, to get the gallons per account per day | % indoor use toilets | 16.5% | 20.5% |
| | | Gallons/account/day used for toilets | 25.25 | 134.54 |
| Step 3 Apply estimated savings to targeted accounts and target end use | | | | |
| | | Accounts targeted, 2014 | 230 | 34 |
| 3.1 | Multiply targeted accounts from 1.3 by end use | Gallons/account/day | 25.25 | 134.54 |
| | | Gallons/day for toilet use, accounts targeted | 5,798.8 | 4,549.4 |
| 3.2 | Multiply by the percent saving per account | % savings ^a | 37.5% | 37.5% |
| | | Savings, gallons/day | 2,174.53 | 1,706.01 |

Table 2. Example calculation for water savings in 2014 residential UHET measure (cont.)

| Step | Step description | Input | SF | MF |
|------|---|--|---------------------------|--------------------|
| 3.3 | Divide by 1,000,000 to determine savings in mgd | Million factor | 1,000,000 | 1,000,000 |
| | | 2014 savings, mgd | 0.002174534 | 0.001706012 |
| | | Total 2014 savings (SF + MF), calculated here (mgd) | 0.00388 | |
| | | Total 2014 savings, reported from DSS Model (mgd) ^c | 0.00376 (97% of above) | |

a. Toby Goddard, Administrative Services Manager, SCWD, personal communication, May 20, 2015.

b. MWM, Undated.

c. Difference is due to plumbing code changes reducing toilet end use between 2010 and 2014, which is subtracted in the model before the active program savings.

Table 3 presents the cost calculation for 2014, and compares our calculated savings to the DSS Model-reported savings in the measure output screenshot. The resulting cost estimates are virtually identical (within \$3, or 0.001%); they are not an exact match, probably due to rounding (Toby Goddard, Administrative Services Manager, SCWD, personal communication, May 20, 2015).

Table 3. Example calculation for water costs in 2014: Residential UHET measure

| Step | Step description | Input | SF | MF | Total (SF + MF) |
|---------------|---|------------------------------------|--------------|-------------|---------------------|
| Step 4 | Determine customer and utility costs per account | | | | |
| 4.1 | Utility costs = utility costs per fixture multiplied by the number of fixtures and the markup percentage for administration | Fixture costs/account ^a | \$445.50 | \$810.00 | |
| 4.2 | Customer costs = customer cost per fixture multiplied by the number of fixtures | Fixture costs/account ^a | \$330.00 | \$600.00 | |
| Step 5 | Multiply costs per account by target end number of accounts for: | | | | |
| 5.1 | Utility | Accounts targeted, 2014 | \$102,325.10 | \$27,389.24 | \$129,714.35 |
| 5.2 | Customer | Accounts targeted, 2014 | \$75,796.37 | \$20,288.33 | \$96,084.70 |
| 5.3 | Total (UHET total costs for 2014) calculated here | | | | \$225,799.05 |
| | Total costs reported | | | | \$225,802 |

a. MWM, Undated.

3. Conclusions

As our example demonstrates that while the DSS Model has some “black box” characteristics in its current form, initial-year savings and cost calculations are reproducible once one has the right input values and understands the steps in the calculation process. Results for future years are more difficult to reproduce due to the fact that water savings are calculated as percent decreases, and the initial (baseline) amount of water to which the present savings are applied is reduced over time due to the impact of plumbing codes and other measures. Additionally, during our review of CRec, we realized that many of the questions concerning water savings and their associated costs stem from the lack of information on the inputs. It is our hope that this memorandum provides some level of clarity on how these inputs are used, and offers a level of transparency in how the model derives its results. We recognize that the inputs themselves may be of interest and encourage readers to contact us with additional questions.

References

Maddaus, L. and B. Maddaus. 2014. Overview of Current Findings from Water Conservation Master Planning Effort. Technical Memorandum. Prepared for: The City of Santa Cruz; Project: Water Conservation Master Plan. Maddaus Water Management Inc. September 30.

Mitchell, D. 2015. Memorandum to City of Santa Cruz WSAC re: Low and high interim demand forecasts. M.Cubed. April 17.

MWM. Undated. Least Cost Planning Decision Support System Model: Screenshots of Individual Conservation Measures. Prepared for the City of Santa Cruz by Maddaus Water Management and provided by the City of Santa Cruz.

Suggested Conservation Elements from the Working Group on Reducing Peak Water Demand

Peter Beckmann, Doug Engfer, Sue Holt, Rick Longinotti, Sarah Mansergh

Contents

Why Reduce Water Demand?

Reducing Peak Season Use

Residential Outdoor Use

Dedicated Landscape Accounts

Reducing Indoor Use

Residential Washing Machines and
Dishwashers

Commercial Best Practices

Code Requirements

Next Generation Water Savings: Innovation Incubator

Spreadsheets of Water Savings

Why Reduce Water Demand?



1. Water RELIABILITY

The water we conserve today is saved in Loch Lomond reservoir in case next year is a drought. Pending the implementation of a new water supply project, e.g. aquifer storage, this is our only interim water reliability strategy.

2. Wildlife HABITAT

The water we conserve today allows the City to leave more water in streams for fish habitat.

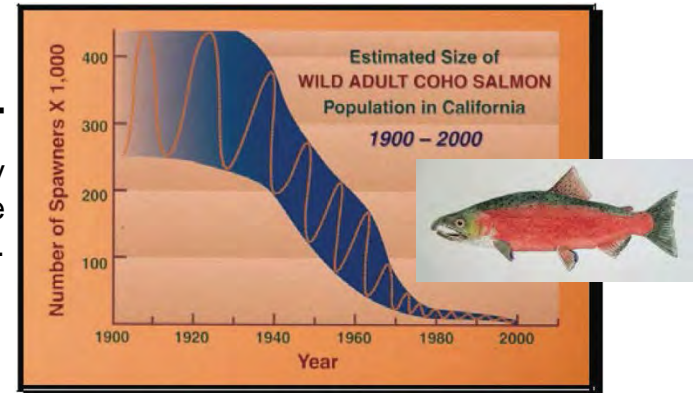


Figure 2: Visual Representation of Extinction Vortex of Coho Salmon (Peter Moyle, pers. comm.)



3. Reduced ENERGY

Conserving water reduces the energy used in pumping and treating water---and the energy used in heating water at the consumer end.

“Goal: Continue to reduce per capita and total energy use within the Santa Cruz Service area.” -*Climate Action Plan*

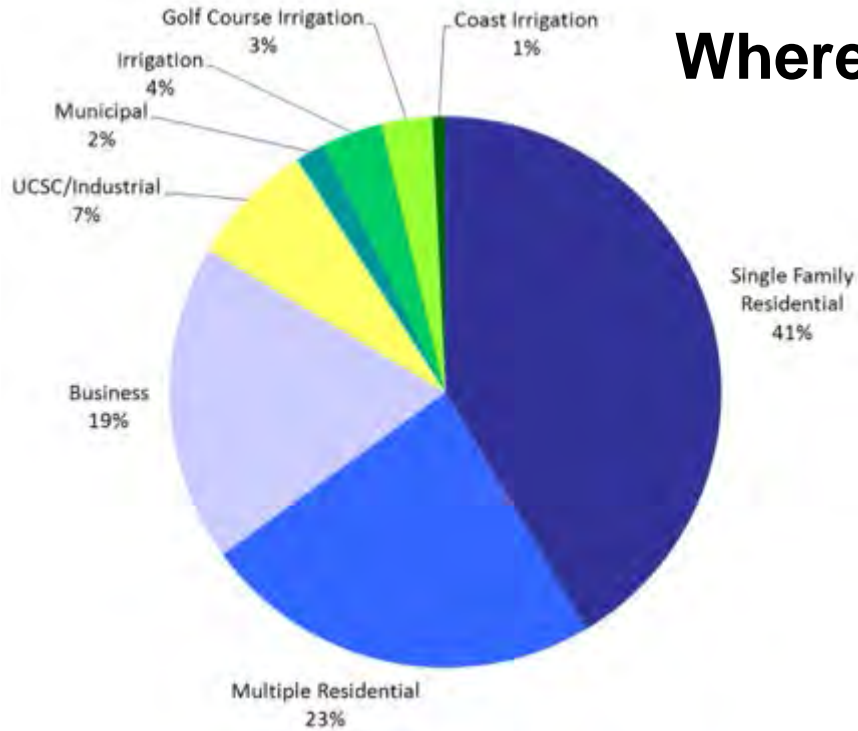
4. Avoided COSTS

Reducing demand reduces the investment needed for new water supply infrastructure

| | Yield | Cost |
|--|--------------|----------|
| Water Transfers , including turbid water treatment, GHTP upgrade, interties, Tait diversion upgrade * | 558 mil gals | \$92 mil |
| Conservation Program Crec** | 205 mil gals | \$13 mil |

* John Ricker presentation 4/15/15

**Maddaus, Draft Master Cons Plan



Where can we find the Savings?



In these recommendations we chose to include indoor and outdoor features (some of which draw from other alternatives) because even though the bulk of peak season demand comes from outdoor use the longer days also lead to increases in indoor use.

All savings are in MGS=million gallons per season-24 weeks from May-Oct. Customers=96,000; Peak Season Hump=700 MG

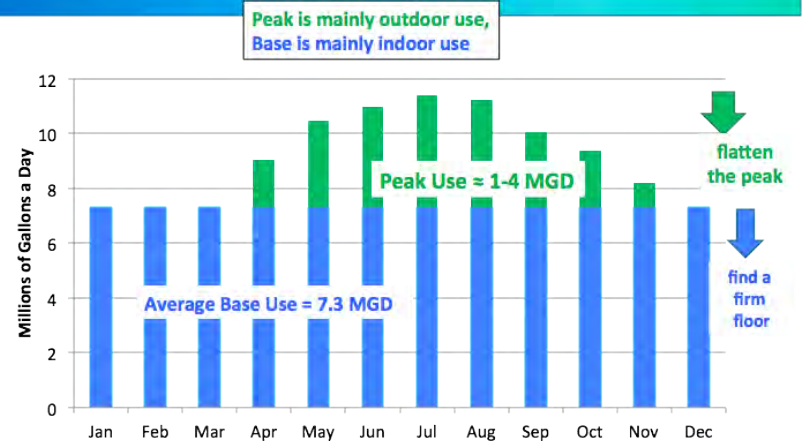
A. Reducing Peak Season Use

1. Residential outdoor use
2. Dedicated landscape accounts

B. Reducing Base (Indoor) Use

1. Residential washing machines
2. Commercial best practices
3. Code requirements

Base vs. Peak Water Use



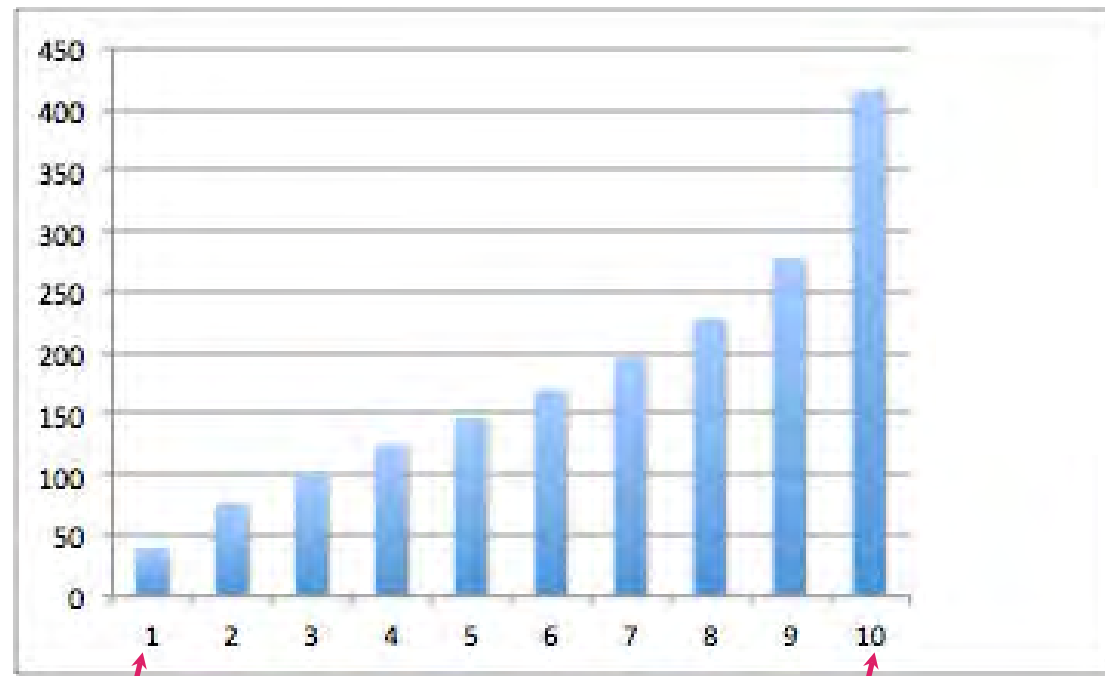
Residential outdoor use:

Recommendations:

- **Promote social norms**
- **Personalized outreach to highest users & generic landscape budgets**
- **Climate-appropriate landscaping & rainwater infiltration**
- **Price incentives for all users**

Average Gallons Per Customer Per Day, 2013

Each bar represents 10% of single family residential customers



Lowest 10% of customers

Highest 10% of customers

Residential outdoor use:

Recommendation: **Social Norms: Home Water Use Reports**

Evidence suggests that high water users are more influenced by the norms of their community than they are by price incentives. The Soquel Creek Water District has achieved a 5% reduction among recipients of home water use reports over a control group who do not receive the reports. This savings has held up even during the restrictions implemented in the 2014 drought. The cost per million gallons saved is lowest among conservation measures. Hence this program should be prioritized, with a goal of achieving 5% savings.

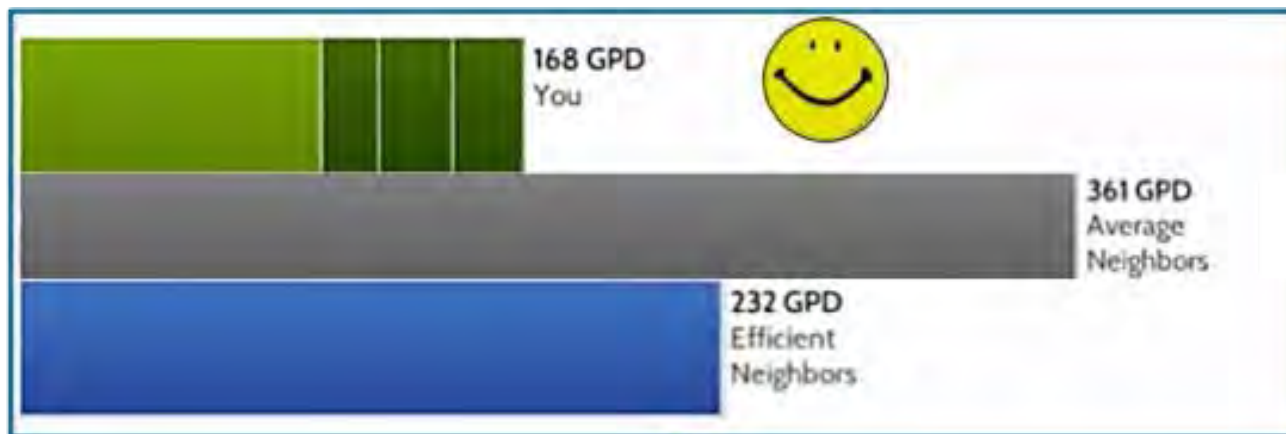
Recommendation: **Personalized Outreach to Highest Users & Generic Landscape Budgets**

We recommend that Home Water Use Reports be combined with personalized outreach to the top tiers of water users in order to connect those users to landscape professionals who are proficient in climate-appropriate landscaping. Highest residential users would be given generic water budgets based on lot size with average plant types and climate appropriate landscaping suggestions.

References:

<http://california-water-foundation.org/leads/1200201710-Water-use-reports-FINAL-12-12-120020250-26>

Sample Home Water Use Report



62

Savings: 18 Million Gallons Season (MGS) for 3% and 30 MGS for 5%

Formula: $3\% / (5\%) \text{yr} = 40 \text{ (66) MGY} / 52 \text{ weeks} * 24 \text{ weeks}$

Residential outdoor use:

Climate-appropriate landscaping & rainwater infiltration

Drought tolerant plants require little dry season irrigation. Native plants require no irrigation or fertilizer, and provide habitat for native insects and birds.

Rainwater infiltration features such as swales or rain gardens capture water runoff from roofs and paved surfaces. Enhanced infiltration increases soil porosity, which provides moisture to trees and landscape plants during dry periods, reducing stress on trees during droughts. In some areas, rainwater that infiltrates the landscape recharges aquifers, adding to our water supply. For example, Kennedy/Jenks estimates that water infiltration modifications could add 300-500 acre feet per year to the aquifer beneath Scotts Valley.



In areas with less permeable clay soils, rainwater infiltration slows runoff into local creeks, reducing stormwater erosion and increasing creek flows during dry months, enhancing biodiversity. Paving can be done with permeable materials and/or in conjunction with infiltration swales. Examine the implementation of these systems at schools as part of the Drought Response Outreach for Schools State program.

References:

Irrigation:<http://cuwcc.org/Portals/0/Document%20Library/Resources/Publications/Potential%20BMP%20Reports/2014%20Drip%20Irrigation%20BMP.pdf>

<http://www.rainbird.com/documents/drip/LandscapedripConversionGuide.pdf>

Infiltration: See Infiltration documents in the Infiltration folder on our Google Drive.

Water Transfers Santa Cruz County:<http://sceh.com/Home/Programs/WaterResources/IntegratedRegionalWaterManagement.aspx>

Drought Response Outreach for Schools:<http://ca.gov/drought/news/story-97.html>



Recommendations:

- Increase turf conversion rebate
- Require conversion of spray to drip for shrub irrigation
- Require rainwater infiltration feature with turf rebate
- Support local initiatives for climate-appropriate landscaping
- Landscaping narrower than 8ft-no spray irrigation

Savings: 2-4.5MGS per 1000 lawns and 1 MGS per 1000 spray to drip conversions for shrubs

Formula: 1GPM*20min/week*24*4 sprays*60%



Recommendation: **Price incentives for all residential users-water and sewer**

In order to optimize a price reward for conservation, customers need to be able to experience a reduction in their water bill in response to their cutback on water use. This price responsiveness is diminished when the fixed charge for water makes up a high proportion of the monthly bill.

Currently, the fixed charge is higher than the volume charge for a majority of residential customers.

There are a variety of ways to revise the rate structure to make it more rewarding of conservation:

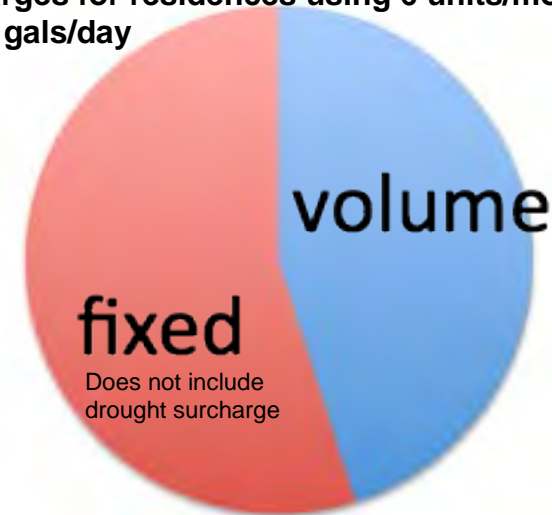
- Put tiers in the fixed charge based on levels of peak use.
- Increase the price differential between tiers.
- Update the tier steps in order to better differentiate outdoor use from indoor use.*
- Tiered sewer rates based on water consumption.

References:

<http://www.nrdc.org/water/files/Volumetric-Wastewater-FS.pdf>

* The current residential rate structure identifies water use up to nine units per month as satisfying “average indoor needs”. Nine units per month is 225 gallons per day. In the past, that may have been average for indoor needs, but that is no longer the case.

Charges for residences using 6 units/mo = 150 gals/day

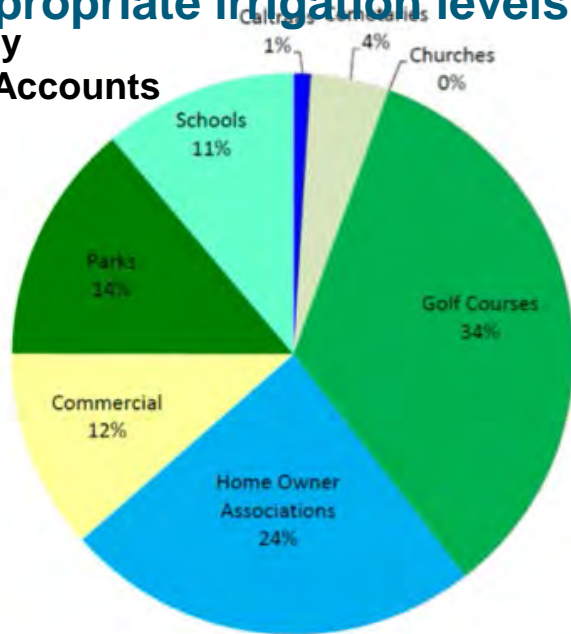


**Savings: 9MGS potential for tiered sewer rates
Water rate savings TBD**

Dedicated Landscape Accounts

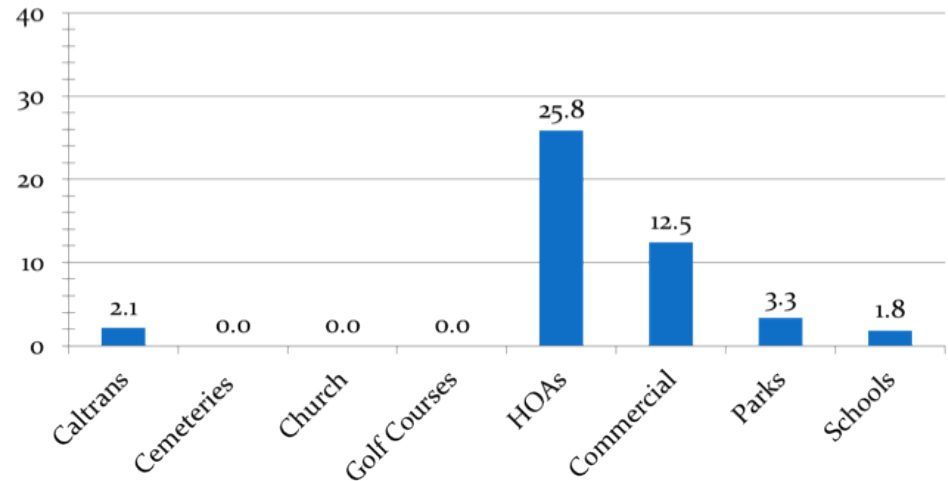
Recommendation: Gradually shift landscape budgets towards climate-appropriate irrigation levels

Water Use by Landscape Accounts



Over-watering by Landscape Accounts* MGS

*as defined by WaterFluence climate-adjusted budget 2012



The largest dedicated landscape accounts have irrigation budgets prepared by the WaterFluence program. In 2012 45 MG was identified as overwatering. Overwatering in 2013 resulted in 30MGS of water that can still be eliminated. Going further in the future we recommend that the water budgets be gradually reduced over time to encourage a shift in landscape plants towards drought tolerant and native plants. Set a goal of a 10% reduction in irrigated turf as part of this program. We also recommend that the price of water for landscapes be tiered---to reward customers who stay within their water budget. We recommend that water budgets be extended to all dedicated landscape accounts (see California Urban Water Conservation Council Best Management Practices).

References:

<http://www.santacruzwatersupply.com/resource/enrichment-52115-presentation-clara-cartwright-toby-goddard>

Savings: 30MGS from overwatering plus 5-15MGS with 10% conversion

Formula: 1.38 Msqft of turf*2 feet/year*25%(up to 75%)

Reducing Base (Indoor) Use

Recommendation: Install efficient washing machines and dishwashers in residences and rebate hot water recirculation systems

Due to state and national standards for efficiency, washing machines are rapidly becoming more efficient. Just a few years ago a washing machine was considered efficient if it used under 30 gallons per load. Now machines are available for \$550 that use 15 gallons or less.

<https://www.energystar.gov/products/certified-products/detail/clothes-washers>

Dishwashers have seen similar technological advances with some machines now offering 2.5 GPL. The old standard 10-15 GPL has been updated to 5.5 GPL for an Energy Star certified product.

<https://www.energystar.gov/products/certified-products/detail/dishwashers>

Hot Water Demand Recirculation Systems are a tool that helps address the water loss we all experience while waiting for hot water-for showers, hand washing and dishwashing. The simpler systems are installed into existing plumbing and act by returning the cooled water back through the cold water line at the push of a button-even from the warmth of your bed. For a shower the wait can waste 2 gallons or more of water. <http://www.osti.gov/scitech/biblio/885864>

Our initial consideration of cost effectiveness suggests that the City could benefit from supporting financing the installation of efficient machines in order to accelerate the timeframe for demand reduction.

The financing mechanism could be one of the following:

1. Pay as You Save (PAYS) program, financing home retrofits through the savings on water and sewer bills. Example: Windsor, Ca. <http://www.townofwindsor.com/index.aspx?nid=819>
2. Property Assessed Clean Energy (PACE) finances water and energy improvements through property tax bills. See the Sac Bee article on Sacramento's adoption of PACE: <http://www.greencitysac.com/Niagara-Sac-Bee.pdf>
3. City-owned machines. The City would purchase efficient and durable washing machines in bulk and install them in single and multi-unit buildings.

Savings: 7-76 MGS

Clothes: Formula: $15\text{GPL} \times 96,000 \times 1\text{per week} \times 24\text{ weeks} \times 10\% \text{ participation}$ (up to 100%)

Dishwashers: Formula: $8\text{GPL} \times 96,000 \times 1\text{per week} \times 24\text{ weeks} \times 10\% \text{ participation}$ (up to 100%)

Hot Water Recirc: Formula: $2\text{G per shower} \times 96,000 \times 5\text{days per week} \times 24\text{ weeks} \times 10\% \text{ participation}$ (up to 100%)



Reducing Base (Indoor) Use

Recommendation: Offer commercial customers who employ best practices increased supply reliability and lower price

For a business, the imposition of rationing during severe drought years hits the bottom line. This proposal suggests that the City's *Water Shortage Contingency Plan* be modified so that businesses who adopt best practices such as efficient plumbing fixtures, hotel laundry recycling, and climate-appropriate landscaping, would incur a lower level of curtailment in a severe drought.

For example, in a Stage 4 drought, with a system-wide goal of 35% curtailment, the current plan is to ration businesses to 87% of their normal year water use. Under our recommendation, businesses adopting best practices would be expected to cut back to 95% of normal use.

These businesses could also be rewarded with a lower rate for their water use.

As with residential clothes washers, the City could facilitate the financing of landscape retrofits, hotel laundry recycling, compressed air pre-wash stations, etc.

References:

<http://www.aquarecycle.com/WastewaterRecycle 8-13-14.pdf>



Hotel Laundry Recycling example

EPA study – Grand Hyatt, Seattle, 457 rooms

- \$100,000 retrofit cost
- saved \$134,000 in first year,
- saved 38 GPD per occupied room
- Laundry uses 80% less water, 50% less heat

Savings: 9MGS for laundry recycling

Formula: $38\text{GPCD} \times 2300 \text{ rooms} \times 60\% \text{ occupancy} \times 24 \text{ weeks} \times 7 \text{ days per week}$

Code Requirements

Recommendation: **Convene a working group of planners, builders, conservation groups, and Water Dept personnel to evaluate possible additions to current codes and fee structures that would encourage water conservation.**

The Draft Master Conservation Plan Program Crec includes two mandates that go beyond current California Building Code:

- a. Requiring high efficiency washers in new development
- b. Require hot water on demand/structured plumbing in new development

Currently there is a spurt of innovation in water efficiency. A working group could evaluate innovative measures for cost effectiveness and recommend them for inclusion in local code. Some possible measures listed by Maddaus:

- a) Require .25 gal/flush urinals in new development
- b) Require efficient dishwashers in new development
- c) Require plumbing for gray water in new development
- d) Ordinance requiring fixture replacement in existing buildings (e.g. toilets)



Some other possible measures:

- Require efficient dish wash sprayers in restaurants.
- Require replacement of all toilets using more than 1.6 gallons per flush in existing buildings.
- Require low-flush urinals in existing buildings.
- Require highest efficiency toilets & faucets in new construction & retrofit upon sale
- Require weather-based controllers in new landscapes

Savings: 4MGS for spray nozzles already realized

Formula: $206 \text{ valves} * 38,000\text{G per year} / 52 \text{ weeks per year} * 24 \text{ weeks}$

Additional savings TBD

Recommendation:

Establish an Innovation Incubator Program

Santa Cruz can continue its leadership in water stewardship by creating a program that: supports innovations in:

- Supports innovative new technologies, customer financing programs, and customer outreach programs
- Supports pilot projects to facilitate popular adoption of:
 - rainwater for toilets & washers
 - composting toilets in institutional buildings
 - onsite recycling of graywater
 - rainwater irrigated lawns
 - promotion of native plant landscapes
 - onsite recycling of graywater



**Total Savings: 81-183 MGS +
11-25% of peak demand +**

+ =not all savings were calculated for recommendations

7-15-15

To: WSAC
From: WSAC Conservation Working Group
Re: WSAC CWG Report

We began this working group to further examine potential demand reduction strategies for use in CA-1: Peak Season Demand Reduction. The Conservation Working Group (CWG) set forth a goal to identify 150-200 MG of savings during the peak season, in addition to the savings estimated to result from the adoption of Program CRec. We defined this as a 6-month period (24 weeks) with an average incremental demand of 700MGS (million gallon per season) above base demand (non-peak season demand). The group worked to identify realistic programmatic elements that would effectively target reductions during peak demand. Some of those elements provide year-round savings, but our primary focus was on reducing the peak-season increment. We started by examining measures to fast track from Program C, CRec and D, to this we added new suggestions, provided some alternative financing possibilities and included thoughts on next steps.

At a policy level, the CWG posits that the goal of reducing peak-season demand by 150MGS by 2035 is reasonably attainable and should be adopted by the WSAC as part of its policy-level findings. The CWG would propose that the Department would take on the responsibility to design, develop, and manage the program, including selecting, deploying, optimizing, and managing the individual elements. Operating within the existing City governance structure, the Department would be accountable to the Water Commission and, ultimately, the City Council. Those institutions would need to establish appropriate reporting, measuring, and monitoring guidelines to ensure transparency and ongoing effectiveness (both cost and demand) of the program over time.

Attached you will find a document that outlines suggested elements that the working group created as examples for the development of a peak season targeted strategy for demand management. We created a table of water savings calculations that are based on estimates of water use from the sources indicated as well as national statistics. The formulas are included for your reference and all values are calculated as MGS=million gallons per season (savings during the peak season, some elements may have year round savings that are not captured here). Some of the "next step" elements will need to be evaluated further before calculating water savings. As you can see, there is ample opportunity just among these potential elements to comfortably achieve our goal of a 150 MGS reduction in peak-season demand. This gives us confidence that our proposed policy-level goal is viable and has merit.

Here is a link to the short overview that Sarah presented at the June Meeting:
http://prezi.com/9cftbunfqc4e/?utm_campaign=share&utm_medium=copy&rc=ex0share

Key Thoughts on CWG Findings:

Communication: This is a key component in implementing any water conservation strategy. Home Water Use Reports, Waterfluence (Large landscapes water budget tool), and the Green Business program can all be utilized as a gateway to the successful roll out of the program.

Fast Track Some Indoor Measures: The following elements should be earmarked for earlier implementation to maximize the savings potential.

Residential: High-efficiency Clothes Washers (big savings year round, increase participation rapidly) Hot Water on Demand, High-efficiency Dishwashers
Commercial: Spray Nozzle replacement (already fast tracked and implemented-see below), on-site hotel laundry water recycling and other hospitality industry targeted measures to capitalize on the increase in visitors during the summer.

Other strategies to increase participation could include increasing rebates, targeted marketing and alternative financing strategies that might provide additional funds to strengthen the programs.

Costs: Create a portfolio with an overall cost less than \$7500/MG. This assumes that administrative costs are provided programmatically rather than for each individual element.

Governance: Assess the portfolio routinely to ensure that elements are achieving goals, adjust when necessary, and eliminate elements that do not meet intended targets. This analysis would be done with the understanding that the benefit of specific elements may not be purely based on element-specific financial/water returns, but may provide a key role in communication, education, and engagement. Develop an implementation schedule to achieve peak season targeted savings of 75 MG by 2020, 100MG by 2025, 125 MG by 2030 and 150 MG by 2035. Some key strategies could include combining elements that are easily rolled out together, staggering implementation of customer category elements to better target relevant programs, implementing programs early on that have high consumer buy-in and so forth.

Partnerships: Utilize local resources to help with education, social norm influence, CII program adoption, etc. Identify and collaborate with those who can act as ambassadors or marketers of the programs -- such as the local appliance distributors as ambassadors of the rebate programs. Expand marketing and target appropriate audiences -- clothes washer rebates for families with young kids. Public / private partnerships (with local contractors, for example), and public / public partnerships (with educational institutions, perhaps) should both be part of the mix and feed Santa Cruz's continuing leadership in conservation.

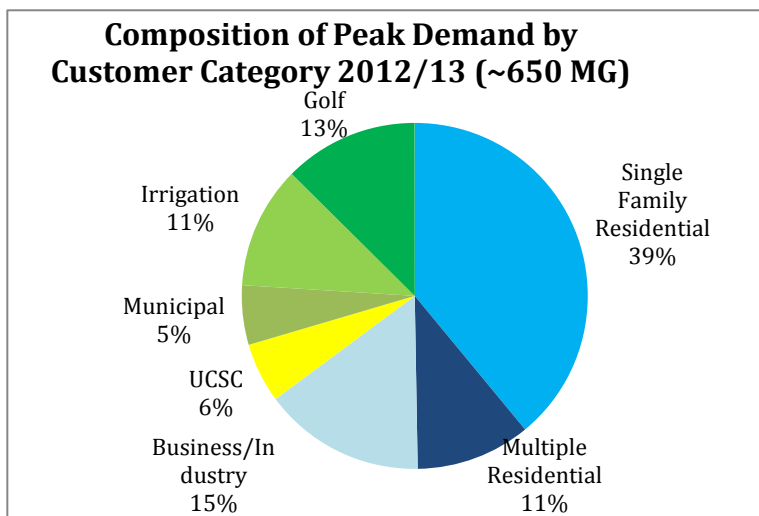
Verification of Conservation Measure Success: The effectiveness of some conservation measures may be difficult to evaluate. For example, how much conservation results from smart-metering of customers, apart from prior or simultaneous effects of other elements such as water use reports, rebates, etc? Nationwide, uncertainties exist in effectiveness assessment, but these can be substantially reduced or removed by proper design of a pilot program. For example, Soquel Creek Water District conducted a natural experiment for single-family residences with WaterSmart home reports during 2014 comparing “treatment groups” that received the reports against a “control group” that did not receive any documentation. Due to this information they were able to identify a 5% conservation effect due to home reports, above and beyond existing conservation elements. Resulting differences in water use, and synergies with other conservation elements, can then reasonably be attributed to smart meters. Water districts are more likely to conduct these “natural experiments” now, and the City may consider doing so itself.

Innovation Incubator: Continue with Santa Cruz’s leadership in conservation practices. Maximize water efficiency as per UWMP Chapter 10-3, including taking advantage of proximity to Silicon Valley for technological innovations, supporting the implementation of pilot projects and providing an arena where water demand reduction strategies can thrive.

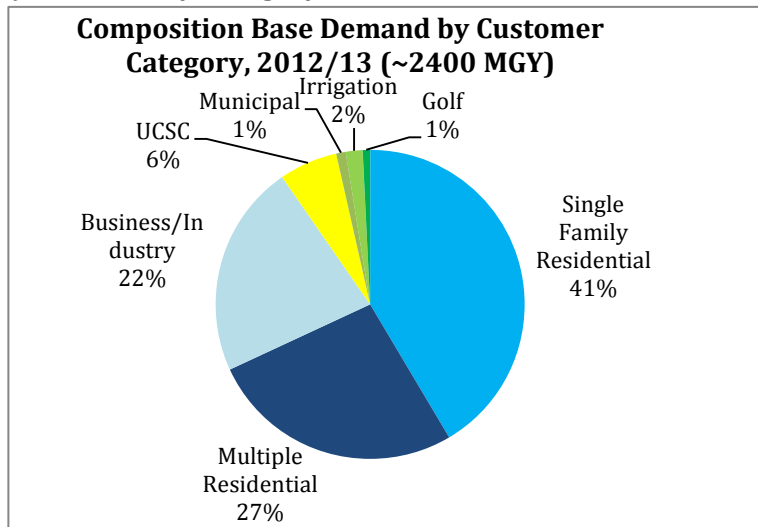
Additional Background Information:

Who Uses Water (2012/2013 data) or where can water savings be realized:

a) % of use by category peak demand water



b) % of use by category of base demand water



Program CRec Water Savings Adjustment Explained:

An additional question that came up in our deliberations related to the change in the yield of Program CRec from 490MGY to 178 MGY. Since some of the demand management water savings have been incorporated into the new baseline projections provided to us by David Mitchell the water savings provided by the plumbing code changes and water conservation elements Program A have been realized in those number adjustments. Those savings (around 300MGY) include demand reduction from normal plumbing changes and savings under the current conservation measures (Program A).

Lessons from Recently Implemented Water Conservation Measures:

Here are two examples of measures that have rolled out recently and some thoughts on how we incorporated that information into our suggested elements.

1) Large Landscape Water Budgets

The communication tool (Waterfluence) determines budgets based on existing landscaping needs and assigns a water budget for each month determined by ET and seasonal data. The data is shared with the landowner, landscapers and homeowners (if appropriate).

The CRec documentation projected a savings for this measure of 8 MGY. Upon implementation the project identified 45 MGY in overwatering across 250 of its landscape budget accounts. In the first 2 years of the program 15MGY of water savings was realized, leaving an additional 30 MGY of overwatering that could be reduced.

What this tells us:

- a) People overwater-especially HOAs and Commercial users
- b) Communication helps-especially when all parties are involved
- c) The tool can be adjusted to implement curtailment goals
- d) Adjusting the tool to point toward climate-optimized goals could provide further opportunities to reduce landscape demand.

Future Strategies:

- a) Use the Waterfluence tool to drive the implementation of resilient landscaping by communicating what a water wise landscape water budget would require.
- b) Set a goal to reduce turf in large landscapes by 10% overall by 2030
- c) Transfer some of these lessons to the residential sector.
- c) Efficiency-based targets, along the lines of the work done at Irvine Ranch Water District, could provide “templated” yet reasonably individualized targets for (say) the top 20% of customers.
- d) Homes are more likely to implement appropriate watering with personalized communication. The department could provide watering consultants who visit residences and generate a site-specific assessment of irrigation needs and excesses, and identify fixes to the irrigation system and operating program.

2) Restaurant Spray Nozzles:

In this program pre-rinse spray nozzles in restaurants were replaced with updated water efficient replacements. This program included a second round of replacements to provide more effective tools to the customer. The first distribution of low flow nozzles did not realize the goals for the measure due to a design that restricted workflow in restaurants (the nozzle took longer to rinse the dishes). The new design provides a concentrated line of water that is used to swipe the dishes clean.

This measure did not reach its intended water savings goal and was adjusted to reap larger savings on the second pass. This measure also highlights an investment in a measure that provides year round savings but realizes the most savings during peak demand (when restaurants see an increase in customers).

What this tells us:

- a) Not every measure will work the first time
- e) Examining the needs of the customer leads to a better program
- f) It is worth adjusting measures before throwing them out

Future Strategies:

- a) Evaluate measures throughout their implementation and make adjustments to fix underperformance.
- b) Prioritize measures for business that target peak season demand reduction-like hotel laundry recycling
- c) Reward Best Management Practices-so businesses continue to use conservation tools.

Peak Season Demand Reduction Water Savings: Agenda Item 6a Attachment 5

MGS=million gallons for season Season=24 weeks with 700MGS demand

| | Assumptions | Potential (MGS) | Season Reductio n | Reference: | Notes: |
|---|--|-----------------|-------------------|---|--|
| Home Water Use Reports* | 3% reduction overall use =40 MGY so for 24 weeks 5% savings= 66MGY | 18 30 | 2.6% 4.4% | | |
| Resilient Landscaping: | | | | | |
| Converting Spray to Drip (Lawn) | 60% reduction via capping sprinklers and install of 1 drip system per 4 sprays. Spray=1GPM*20min/week* 24 weeks *4 sprays*60%. 500 sqft lawn (average size lawn) have about 5-8 sprinklers=3840MGS per lawn. Per 1000 lawns per drip system (1 drip for 4 spray) 1000 conversions | 2 | 0.3% | Rain Bird estimates for standard home Drip irrigation potential UC Davis | If use 2 ft/yr watering (as above in LB calcs) then the number is 4.5 MGS. |
| Converting Spray to Drip (shrubs) | 100% reduction 1000 | 1 | 0.2% | | |
| Xeriscaping-"no water"r lawn replacen homes | | 7 | 1.1% | | |
| Tiered Sewer Rates* | 4 GPCD for 24 weeks | 9 | 1.3% | http://www.nrdc.org/water/files/Volumetric-Wastewater-FS.pdf | |
| Large Landscapes: | | | | | |
| Landscape Budgets (Water Fluence) | 2013 data (pre-drought) 10% turf replaced=1.38 Msqft watered at 2ft/yr. | 30 | 4.3% | SCWD overwatering statistics | |
| LB + Adding Climate appropriate recs additional water savings | Water reduction assumed as 25% water reduction. 75% water reduction | 5 15 | 0.7% 2.2% | SCWD statistics on irrigation accounts | |

Peak Season Demand Reduction Water Savings:

MGS=million gallons for season

Season=24 weeks with 700MGS demand

| | | | | | | | | | |
|---|--|------------|--------------|---------------------------------|--|--|--|--|---------------------------------|
| | weekly use assumed consistant all year round and each nozzle saves | | | | | | | | This is already in place |
| Restaurant Spray Nozzles* | 38,000 gpy*206 valves | 4 | 0.5% | SCWD Nozzle replacement info | | | | | |
| | Up to 38GPD per occupied room: 2300 | | | | | | | | Need info: on- site laundry. |
| Commercial Laundry Recycling Sy | rooms*60%occupancy | 9 | 1.3% | EPA study-Seattle | | | | | |
| | 1 load per person (96,000) per week at 15 gallons per load (GPL) saved and 10% of population participating. | 3 | 0.5% | Energy Star data | | | | | |
| | 40% | 14 | 2.0% | | | | | | |
| | 100% | 35 | 4.9% | | | | | | |
| | 1 load per person per week at 8 GPL 10% participaton | 2 | 0.3% | Energy Star data | | | | | |
| Dishwashers* | 40% | 7 | 1.1% | | | | | | |
| | 100% | 18 | 2.6% | | | | | | |
| | 5 showers per person per week at 2 G per shower | | | | | | | | |
| Hot Water Recirculating Systems: | 10% | 2 | 0.3% | | | | | | |
| | 40% | 9 | 1.3% | | | | | | |
| | 100% | 23 | 3.3% | | | | | | |
| Additional Building Code Adoptions* | | TBD | | | | | | | |
| | Potential MGS savings low | 81 | 11.6% | | | | | | |
| | Potential MGS savings hig | 183 | 26.2% | | | | | | |
| *Additional Year round savings will be found for these programs | | | | | | | | | |



WATER DEPARTMENT MEMORANDUM

DATE: July 17, 2015
TO: Water Supply Advisory Committee
FROM: Toby Goddard
SUBJECT: Peak Season Demand Management Strategies

BACKGROUND: Earlier this year, the Water Supply Advisory Committee created an informal subcommittee or “working group” consisting of five members interested in examining new opportunities to promote sustainable and efficient water use. The focus of this working group was on measures that could save water primarily during the peak season, the critical time period in which water availability is generally lowest, water demand is highest, and the system is the most vulnerable to water shortage.

Members of this working group prepared and contributed to the following products for the full Committee’s consideration:

- A public enrichment presentation held May 21, 2015;
- A progress presentation made before the entire Committee at its regular meeting June 11, 2015; and
- A written report of the working group summarizing its findings and recommendations dated July 15, 2015.

The purpose of this memo is to offer staff’s review and comment on the working groups’ recommendations contained in its written report with respect to consistency with the overall direction of the City’s Water Conservation Master Plan project and with adopted City goals and policies for managing the water system.

ANALYSIS: The working group’s report includes nine separate categories consisting of one or more recommendations in each category. The first five are targeted primarily at reducing outdoor use, consistent with the focus of the working group. It also provides a number recommendation’s aimed at reducing indoor or “base” water use, acknowledging the interrelationship between indoor and outdoor use in shaping peak season water demand, and recognizing that indoor use in some commercial sectors, like hotels and

restaurants, is higher in the peak season given the City's attraction as a visitor destination in summer months, and therefore is an appropriate target for helping reduce peak season demands.

The working group's recommendations, as described at the June 11 progress presentation, were also intended for implementation over different time scales. Seven of the nine recommendations are proposed as near-term enhancements to the City's existing water conservation program. The remaining two were offered as recommendations for future consideration and implementation.

Our review and comments offered below follow the same order in which they appear in the working group's report:

1. **Home Water Use Reports.** This measure is one that is currently proposed in the Water Conservation Master Plan, and consistent with the direction the Water Department has been considering as it developed the Conservation Master Plan. Staff is in agreement with this recommendation and acknowledges that the estimated savings in the latest DSS model should be increased from 1% to (at least) 3% to reflect higher anticipated water savings.
2. **Personalized Outreach to Highest Users and Generic Landscape Budgets.** The City has promoted and provided landscape water surveys or home water audits to its top residential users since 2006. Marketing this program with the Home Water Use reports would be simple and straightforward, and would likely expand participation. The current program already offers recommendations on irrigation scheduling and resources for helping transform landscapes. Calculating a generic water budget could be made part of the program. Its usefulness as a one-time recommendation following a landscape site survey, though, may not prove to be highly effective.
3. **Climate-Appropriate Landscaping and Rainwater Infiltration** This proposal consists of several related voluntary and mandatory actions, some of which staff support; some of which have been considered but not selected for implementation earlier in the conservation planning process, and some of which we believe are a better fit with another City Department or agency to incentivize, fund, or mandate.
 - Staff agrees with the call for increasing the amount of the turf conversion rebate. Our current rebate level has fallen behind that of many other agencies, both locally and statewide, yet it is a popular program with customers and has a direct impact on reducing peak season water use at those properties that remove all or portions of their turf. Increasing the rebate level may increase participation level. Program C

now calls for continuing the existing program. It should be amended to include the higher rebate level, higher participation, and larger estimated savings.

- A landscape incentives program was considered but not included with Program C. This approach merits reconsideration, though, in light of the desire to emphasize peak season savings.
 - Staff does not support the proposal for making rainwater infiltration a condition of receiving the turf rebate, as proposed by the working group, for two reasons. First, the City's Public Works Department serves as lead agency with regard to storm water best management practices and low-impact development regulations. Residential and commercial development and remodels are already subject to these requirements that are designed to capture sediment and keep pollution out of local waterways and the ocean, as mandated by the State and Regional Water Quality Control Boards. Second, from a groundwater recharge perspective, past studies have concluded enhanced recharge of shallow zones would have very limited effect of deep water recharge, where municipal production is occurring (Hydrologic Conceptual Model, Johnson, 2004). This is because in most places along the Marine Terrace, there is a 100 to 150 foot layer of silt, sand, and clay cap, acting as an aquitard, and because recharge is believed to occur mostly in the hills and streams in the Santa Cruz Mountains north of the main marine terrace, where most urban development lies. Incorporating rainwater infiltration as part of a landscape design is something that individuals may choose to do and landscape contractors may seek to promote, but in staff's view does not warrant spending ratepayer dollars to incentivize as a water supply solution.
4. **Conservation Pricing – Water and Wastewater.** The City is currently in the process of conducting a cost of service analysis that will be used to establish new rate structures. This effort is expected occurring independent of the Water Conservation Master Plan work and the results are expected to be implemented in July 2016.

In terms of pricing objectives, promoting water conservation and efficiency ranked high and were considered to be very important objectives by both the City Council and Water Commission during their March 2015 study session on this topic. The challenge is how to best balance the goal of sending an effective conservation pricing signal with all the other important pricing objectives, such as ensuring revenue stability and sufficiency, and complying with state laws involving retail water pricing.

Although perhaps not on the same timeline, the issue of conservation pricing of sewer service is something that City Council did discuss as part of a recent water rates workshop, and is something that the City is committed to pursue as a signatory to the California Urban Water Conservation Council's MOU.

5. Shifting Landscape Budgets towards Climate Appropriate Irrigation Levels.

The large landscape water budget program has been an important and established component of the City's existing water conservation program since 2010. Staff envisions it being expanded to cover more properties and potentially adding a budget-based pricing system over time. As a drought management tool, it has already served in some respects to spur landscape changes by dramatically limiting landscape allotments as part of water rationing. Staff is supportive of the working group's ideas with respect to pursuing strategies for reducing overwatering in the near-term and reducing overall volume of irrigation in the longer term using landscape water budgets as a management tool.

6. Efficient Clothes Washing Machines, Dishwashers, and Hot Water

Recirculation Systems. Of all the potential measures to reduce water use, high efficiency clothes washers offers one of the largest remaining sources of water savings, and is included in the Water Conservation Master Plan to be continued and expanded. On the other hand, providing incentives to encourage a homeowner to purchase an efficient dishwasher (meeting certain water efficiency standards, such as a limit on the gallons/load) when replacing an existing dishwasher, was considered in planning process but screened out early on given the relatively small amount of water represented by this end use. In staff's view, this is an area where some plumbing code water savings may be realized, as dishwashers turn over relatively quickly, but not something that is worth the Water Department building a program around. Hot water recirculation was modeled but not included in Program C due to its relatively low water savings and high cost, but in a recent review of the measures included in Program C, staff felt this one was deserving of reconsideration due to ongoing public interest in the measure.

7. Rewarding Businesses for Adopting Best Practices. Two ideas were set forth here by the working group. One involves granting relief to businesses that adopt best practices in future periods of water curtailment. This concept has already been instituted in the City's Water Shortage Contingency Plan and associated water shortage regulations and restrictions, beginning in Stage 4, through the granting of an exception. The Municipal Code allows for the Director to provide an exception under the following circumstances:

A business customer has already implemented environmental sustainability measures that have reduced water consumption to the maximum extent feasible. As used in this subsection the term “environmental sustainability measures” refers to installation of high efficiency plumbing fixtures, devices, equipment, and appliances, recycled water systems, and landscaping consisting exclusively of low-water-using plant materials using drip or similar high efficiency, nonspray irrigation systems, or to buildings that are designed, built, and continuously operated according to Leadership in Energy and Environmental Design (LEED) certification standards.

The second idea involves the City facilitating/financing various promoting water efficiency improvements, such as hotel laundry recycling, as a way to reduce peak water use by reducing indoor usage in visitor serving facilities. This idea is consistent with both the Commercial Incentives measure proposed in the Conservation Plan, as well as with past programs the City has offered its commercial customers (LightWash and Smart Rebates programs) in the past.

8. **Additional Building Code Requirements.** This recommendation was set forth as one of two items for future implementation and includes various ideas for strengthening building codes and retrofit regulations to accelerate innovations in technology and water-efficient equipment. The Water Department has already implemented some of the listed recommendations, including requiring weather based controllers in new landscape, replacing kitchen pre-rinse spray valves, and requiring fixture replacement in existing buildings. A number of conservation initiatives (stricter landscape requirements, water/energy efficient technologies) are being driven at the state level by drought emergency regulations. This recommendation is generally consistent with the Water Department’s direction to pursue measures with long-term savings where they can be justified in terms of their cost of implementation.
9. **Innovation Incubator Program.** This final recommendation was meant as a long-range program to support innovative new technologies and approaches to further water use efficiency. The City has an adopted policy in its General Plan and its Urban Water Management Plan to play a leadership role in supporting research, policy development, standards, and legislation aimed at furthering water use efficiency across the state, and has been recognized in the past for its efforts. The working group’s recommendation is broadly consistent with this policy. Staff considers the listed items as suggestions, and recognizes that ideas may also arise over time for organizing pilot projects around and researching. Staff’s only reservation with this proposal is related to organizational capacity and limited time

that is able to be devoted to this type of work, given all the various priorities that exist.

SUMMARY: Aside from a very few specific ideas, the recommendations of the working group are well-aligned with the set of measures and overall direction currently being contemplated as part of the Water Conservation Master Plan. That project is temporarily on hold until a contract amendment and additional funding is approved to complete the program design and analytical work. Some of the suggestions will require modifying existing cost and savings estimates, or making new estimates of cost so they can be evaluated from a benefit/cost perspective and to understand the unit cost of savings involved. The working group made its own separate estimates of water savings, but staff cautions that because of overlap with estimates in the DSS model, it's not clear at this point how much additional water savings could be obtained by the 2035 timeframe above that already projected. Additional work will also need to be done to ensure savings are not double counted in both the DSS model and the new water demand forecast.

Staff has identified the need to revisit both the entire list of measures contained in Program C as well as the proposed implementation timetable. We appreciate the thought and effort that went into the report and recommend incorporating the ideas of the working group into the final plan, tailoring the overall emphasis of the plan more around peak season than currently exists.