CITY OF SANTA CRUZ
City Hall
809 Center Street
Santa Cruz, California 95060

Water Department

WATER COMMISSION

Regular Meeting

March 02, 2020

7:00 P.M. GENERAL BUSINESS AND MATTERS OF PUBLIC INTEREST, COUNCIL CHAMBERS

*Denotes written materials included in packet.

The City of Santa Cruz does not discriminate against persons with disabilities. Out of consideration for people with chemical sensitivities, please attend the meeting fragrance free. Upon request, the agenda can be provided in a format to accommodate special needs. Additionally, if you wish to attend this public meeting and will require assistance such as an interpreter for American Sign Language, Spanish, or other special equipment, please call Water Administration at 831-420-5200 at least five days in advance so that arrangements can be made. The Cal-Relay system number: 1-800-735-2922.

APPEALS: Any person who believes that a final action of this advisory body has been taken in error may appeal that decision to the City Council. Appeals must be in writing, setting forth the nature of the action and the basis upon which the action is considered to be in error, and addressed to the City Council in care of the City Clerk.

Other - Appeals must be received by the City Clerk within ten (10) calendar days following the date of the action from which such appeal is being taken. An appeal must be accompanied by a fifty dollar ($50) filing fee.

Call to Order

Roll Call

Statements of Disqualification - Section 607 of the City Charter states that ...All members present at any meeting must vote unless disqualified, in which case the disqualification shall be publicly declared and a record thereof made.The City of Santa Cruz has adopted a Conflict of Interest Code, and Section 8 of that Code states that no person shall make or participate in a governmental decision which he or she knows or has reason to know will have a reasonably foreseeable material financial effect distinguishable from its effect on the public generally.

Oral Communications - No action shall be taken on this item.

Announcements - No action shall be taken on this item.

Consent Agenda (Pages 1.1 - 4.1) Items on the consent agenda are considered to be routine in nature and will be acted upon in one motion. Specific items may be removed by members of the advisory body or public for separate consideration and discussion. Routine items that will be found on the consent agenda are City Council Items Affecting Water, Water Commission Minutes, Information Items, Documents for Future Meetings, and Items initiated by members for Future Agendas. If one of these categories is not listed on the Consent Agenda then those items are not available for action.

1. City Council Actions Affecting the Water Department (Pages 1.1 - 1.2)

   Accept the City Council Actions Affecting the Water Department.

2. Water Commission Minutes from February 3, 2020 (Pages 2.1 - 2.7)

   Approve the February 3, 2020 Water Commission Minutes.

3. Quarterly Update on Water Supply Augmentation Strategy (WSAS) (Pages 3.1 - 3.20)

   Accept the Quarterly WSAS Report.

4. Updated Water Commission 2020 Schedule (Page 4.1)

   Approve the updated Water Commission 2020 schedule.

Items Removed from the Consent Agenda

General Business (Pages 5.1 - 7.6) Any document related to an agenda item for the General Business of this meeting distributed to the Water Commission less than 72 hours before this meeting is available for inspection at the Water Administration Office, 212 Locust Street, Suite A, Santa Cruz, California. These documents will also be available for review at the Water Commission meeting with the display copy at the rear of the Council Chambers.

5. Presentation of 2019 Capital Investment Projects (Pages 5.1 – 5.2)

   Accept the information and presentation on 2019 CIP projects.

6. Results on the Evaluation of the Water Smart Home Water Use Reports Pilot Project (Pages 6.1 – 6.59)

   Receive a presentation and information on the first year of the Water Smart Home Water Use Reports Pilot Project.

7. Overview of Planned Community Engagement Activities for the Upcoming

Financial Planning Update, Including Work on System Development Charges and User Rates (Pages 7.1 – 7.6)

Accept the report on planned Community Engagement Activities for the 2020 Water Rates and Charges Study.

Subcommittee/Advisory Body Oral Reports - No action shall be taken on this item.

8. Santa Cruz Mid-County Groundwater Agency

9. Santa Margarita Groundwater Agency

Director's Oral Report - No action shall be taken on this item.

Information Items

Adjournment

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WATER COMMISSION
INFORMATION REPORT

DATE: 2/26/2020

AGENDA OF: March 2, 2020

TO: Water Commission

FROM: Rosemary Menard, Water Director

SUBJECT: City Council Actions Affecting the Water Department

RECOMMENDATION: That the Water Commission accept the City Council actions affecting the Water Department.

BACKGROUND/DISCUSSION:

February 11, 2020

Risk and Resiliency Assessment of the City's Water System - Professional Service Agreement with HDR Engineering, Inc. and Budget Adjustment (WT)

Motion carried to:

Authorize the City Manager to execute an agreement with HDR Engineering, Inc., in a form to be approved by the City Attorney, in the amount of $149,178, to conduct a risk and resiliency assessment of the City's water system.

Adopt Resolution No. NS-29,630 appropriating $70,000 from the Water Enterprise Operation (Fund 711) to fund the risk and resiliency assessment.

Resolution Amending the City of Santa Cruz Personnel Complement and Classification and Compensation Plans for the following departments: Water, Public Works, Economic Development, City Manager, Police and Parks and Recreation (HR)

Motion carried to:

Adopt Resolution No. NS-29,633 amending the Classification and Compensation Plans and the FY 2020 Budget Personnel Complement by approving classification and position changes.

Amend the FY 2020 budget appropriations in the amount of $100,000 for the Wharf railing safety improvements project; $50,000 for the Carbon Reduction fund-awarded projects; $75,000

for the Pogonip Lower Meadow lead remediation project; $100,000 for increased fuel costs; and $4,230,477 for Water projects (supported by a State Revolving Fund loan). Revenue offsets result in an additional net General Fund cost increase in the amount of $75,000 and an increase in the Equipment Internal Service Fund in the amount of $100,000.

Authorize the City Manager to allocate budgetary changes within the applicable funds and departments.

February 25, 2020

No items to report.

PROPOSED MOTION: Motion to accept the City Council actions affecting the Water Department.

ATTACHMENTS: None.

Water Department

Water Commission
7:00 p.m. – February 3, 2020
Council Chambers
809 Center Street, Santa Cruz

Summary of a Water Commission Meeting

Call to Order: 7:00 PM

Roll Call

Present: D. Engfer (Chair), W. Wadlow (Vice-Chair), J. Mekis, A. Páramo, S. Ryan, D. Schwarm, L. Wilshusen

Absent: None

Staff: R. Menard, Water Director; C. Coburn, Deputy Director/Operations Manager; T. Goddard, Conservation Manager; K. Crossley, Senior Professional Engineer; L. Kay, Engineering Associate; H. Luckenbach, Deputy Director/Engineering Manager; J. Martinez-McKinney, Associate Planner II; S. Perez, Associate Planner II; B. Pink, Environmental Programs Analyst II; K. Fitzgerald, Administrative Assistant III; C. Galati, Administrative Assistant III

Others: 3 members of the public.

Presentation: None.

Mr. Alejandro Páramo was introduced as the new member to the Water Commission.

Ms. Menard introduced Crystal Galati as the new staff member to the Water Department.

1. Election of Water Commission Officers for 2020

Commissioner Wadlow nominated Commissioner Engfer for Chair of the Water Commission for 2020.

Commissioner Engfer was elected as Chair of the Water Commission for 2020.

VOICE VOTE: MOTION CARRIED
AYES: All
NOES: None
ABSTAIN: None

Commissioner Wadlow nominated Commissioner Ryan for Vice-Chair of the Water Commission for 2020.

Commissioner Ryan was elected as Vice-Chair of the Water Commission for 2020.

VOICE VOTE: MOTION CARRIED
AYES: All
NOES: None
ABSTAIN: None

Statement of Disqualification: None.

Oral Communications: None

Announcements: None

Consent Agenda

2. City Council Items Affecting the Water Department
3. Water Commission Minutes from January 6, 2020

Did City Council have questions or comments regarding the adoption of Ordinance No. 2020-03, that amended Section 16.13.020 of the Santa Cruz Municipal Code?

- No.

Commissioner Wilshusen moved the Consent Agenda. Commissioner Schwarm seconded.

No public comments were received.

VOICE VOTE: MOTION CARRIED
AYES: All
NOES: None
ABSTAIN: None

Items removed from the Consent Agenda

4. Initial Water Supply Outlook for 2020

Are we currently measuring at the long-term average for cumulative precipitation, per the chart on page 4.5?

- Yes.

What does the chart on page 4.6 represent?

- The chart represents the increased probability of below-normal precipitation over the next three months and is based on climate models from the National Weather Service Climate Prediction Center.

Should the Annual Water Supply Outlook be presented to the Commission at a different time during the year if short rain seasons are becoming the new normal?

- That is a possibility if we continue to experience weather patterns of short and potentially more intense rainy seasons. The current timing of a first look in February followed by a final look in April is, in part, due to the fact that water restrictions are typically implemented no earlier than the 1st of May. Waiting longer to finalize the outlook would help in years with small shortages, like 2018. When a large shortage looms, the

information should be presented as early in the year as possible.

No public comments were received.

Commissioner Wilshusen moved Item 4. Commissioner Engfer seconded.

VOICE VOTE: MOTION CARRIED
AYES: All
NOES: None
ABSTAIN: None

General Business

5. Presentation and Discussion – Water Shortage Response Plan Update – Analyzing the Data to Inform the Plan

Ms. Menard introduced Mr. Ben Pink for the presentation and discussion of the Water Shortage Response Plan Update.

Are there any new requirements of the Water Shortage Contingency Plan that are more challenging to meet?

- All of the new standardized requirements present a challenge at some level, however, we were able to anticipate some requirements, such as the annual water supply and demand assessment which we've been doing for years, so we already have in place some parts of the new requirements that make things easier for us.

If the state requires us to implement stage 1 reductions of 10%, as displayed on slide 10 of the presentation, are we able to determine what stage 1 is?

- Yes.

Do fish flow agreements/requirements change if a drought occurs?

- Yes, they tiered based on current hydrologic conditions and are lower when drought conditions exist.

Has Coast Irrigation consumption decreased due to increased rates?

- Coast Irrigation consumption between 2002-2004 had been approx 80 million gallons. It dropped to 20 million gallons that could be a reaction to rate increases but had been trending downward even before the rate increase due to finding alternative water sources and crop changes.

During the months that UCSC is out, water usage seems to increase when it should decrease why?

- The data in the chart is based on billing data so consumption is actually reported a month later. Water use peaks on the main campus in May and October.

How is the range of years for the base period chosen and why was 2016-2018 chosen as the new base year period?

- We did not want to select a year where demand was artificially curtailed, so we chose a timeframe where demand was stable.

- The period of 2016-2018 was chosen as the new base year because during this timeframe, demand was stable and the drought had ended. This was similar to the 2002-2004 timeframe, although demand was much higher. The June through November months represent the timeframe where demand was measured in each year.

How is water use distinguished for golf courses that use water for irrigation and business activities?

- During the development of the 2009 Water Shortage Contingency Plan, an agreement was reached on how to allocate usage that represented a compromise between commercial and irrigation priorities.

What determines how municipal and commercial customers are categorized?

- They are categorized in the utility billing system. Municipal accounts include City parks, offices, wastewater plant, and other facilities, whereas County accounts are considered to be commercial or irrigation if the meter is dedicated to reading exclusively outdoor usage.

What are the three usage priorities for each customer classification?

- They are essentially broken down by indoor and outdoor usage, but the three priorities are: Health and Safety, Commerce, and Irrigation.

What has caused commerce use to decrease 50% between the 2003-2004 and 2016-2018 periods?

- One factor is that larger businesses that were higher water users in the 2003-2004 time period no longer are in business or have moved away from the City.

Why does Coast irrigation not follow the same reduction schedule as the other irrigation classification?

- Coast irrigation is categorized as a business and not an irrigation account so it follows the reduction schedule for businesses. Coast irrigation usage during 2014-2015 actually increased so a different approach may have to be taken to implement use reductions for this class of customers in the updated plan.

How are municipal accounts, such as City and County parks, categorized?

- City accounts have been classified as interdepartmental (municipal) accounts due to the way the accounts are billed through journal entries. These kinds of accounts include the wastewater plant, libraries, offices and City parks. The utility billing system does not have a separate institutional category. Accordingly, County facilities are categorized either as a commerical or an irrigation account.

Have public discussions related to the prioritization of water curtailments taken place?

- Yes.

Has a 40% reduction in single-family usage been achieved in the past?

- No.

What is the official process for adopting new curtailment goals?

- The process must be laid out in the Urban Water Management Plan. Ideally, we should

only adopt what we can realistically implement for each stage. In addition, the City would process an amendment to chapter 16.01 of the City's Municipal Code reflecting the changes.

How would restaurants be affected by mandated reductions given that part of their business is health and safety-related?

- In developing the amounts of water used by restaurants, usage has been split between commercial and health and safety uses. Health and safety uses, such as food prep and sanitation would be cut back less than commercial use, which might include things such as glasses of water being placed on tables without being specifically requested by customers.

What are the probabilities that each of the potential levels of cutbacks in the Water Shortage Contingency Plan that is under development would be experienced given our local hydrology?

- We do not have predictions on the future of water supply at this point, however, we are using the modeling work with Gary Fiske to analyze the probabilities of the size and frequencies of potential shortages and working to develop supply that would allow the system to fully meet customer demand in the worst-case hydrologic conditions.

One member of the public commented.

Commissioners and staff discussed the importance of augmenting supply given the significant reduction in customer demand and the challenges of further reducing demand in response to drought through water use restrictions. Commissioners and staff also acknowledged that while state regulations require the City to develop a water shortage response plan with 6 stages resulting in more than a 50% curtailment in consumption, from a practical perspective achieving reductions beyond 20% would be difficult and highly likely to have an undesirable economic impact.

No action was taken on this item.

6. Risk Management in Capital Projects

Ms. Menard introduced Mr. Kevin Crossley for the presentation and discussion of Risk Management in Capital Projects.

Do all projects undergo value engineering?

- Yes.

Does the City consult with independent risk assessors for moderately-sized projects?

- Yes.

Does the City have its own Risk Management department?

- Yes, however, the City's Risk Management office does not offer this level of risk assessment for capital projects.

Is this approach to assessing risk relatively new to the Department?

- No, but this approach goes in much more depth and is standardizing the methods and vocabulary used to determine risk.

How is the level of acceptance in the Department?

- The project managers that are managing larger projects have embraced this process while smaller projects have not started using the approach as yet. The project managers are all learning about new approaches as we go and recognize the importance of identifying and managing risks for their projects.

What is the approach for unexpected risks?

- The program risk reserve strategy does help to determine contingencies for unexpected risks that are not identified during the planning stages of a project. Unexpected risks are assessed as they appear accordingly.

Are other City departments using this approach to risk assessment in their capital projects?

- No.

Commissioners commented positively on the Department's new approach to risk management.

One member of the public commented.

Commissioner Schwarm moved the staff recommendation of Item 6. Commissioner Wadlow seconded.

VOICE VOTE: MOTION CARRIED
AYES: All
NOES: None
ABSTAIN: None

7. Update on the Departments Recently Revised Emergency Response Plan

Ms. Menard introduced Mr. Toby Goddard for the presentation and discussion of the Water Department's recently revised Emergency Response Plan (ERP).

Commissioners suggested that emergency response training be provided to key staff designated to act in the event of an emergency.

Commissioners recommended that those without landline phones go the county's CodeRed website to register their cell phone number in order to receive information in the event of an emergency.

Did the Department have an ERP when responding to the emergency main break during the 2017 winter storms?

- Yes, but it had not been updated for a number of years.

When did the City last activate its EOC?

- The last time the City activated its EOC was during the March 11, 2011 tsunami.

One member of the public commented.

Commissioner Wadlow moved the staff recommendation on Item 7. Commissioner Schwarm seconded.

Subcommittee/Advisory Body Oral Reports

8. Santa Cruz Mid-County Groundwater Agency
A business meeting was held on January 16th and was primarily focused on finalizing the upload process for the groundwater management plan document. The document was uploaded to the agency;'s website last week.

There is an upcoming meeting in March where the first draft of the annual report will be reviewed before it is completed and released by the April 1st deadline. A phase II grant of $500,00 was awarded under Prop 68 with a 25% cost and will go towards supporting additional groundwater monitoring and document management.

9. Santa Margarita Groundwater Agency
An update on groundwater modeling was received at the January meeting and an educational session will take place in March.

Director's Oral Report: Update on water transfers with Soquel Creek Water District: The transfers began on December 6th and a total of 20.4 million gallons were transferred in December and 13.4 million gallons transferred in January. The dry conditions experienced in January caused a decrease in transfers and the intertie had to be shut down last week due to dry conditions.

Adjournment Meeting adjourned at 10:18 PM.

Respectfully submitted,

Katy Fitzgerald, Staff

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WATER COMMISSION
INFORMATION REPORT

DATE: 02/25/2020

AGENDA OF: March 2, 2020

TO: Water Commission

FROM: Heidi Luckenbach, Deputy Director/Engineering Manager

SUBJECT: Water Supply Augmentation Strategy, Quarterly Work Plan Update

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RECOMMENDATION: Receive information regarding the status of the various components of the Water Supply Augmentation Strategy and provide feedback.

BACKGROUND and DISCUSSION: Following the completion of the Water Supply Advisory Committee (WSAC) process, the City Council accepted the Final Report on Agreements and Recommendations that included a detailed Implementation Plan and Adaptive Management Strategy. The WSAC work was adopted as part of the 2015 Urban Water Management Plan and is currently referred to as the Water Supply Augmentation Strategy (WSAS) that includes an Implementation Work Plan (Work Plan).

As per the Final Agreements and Recommendations of the Water Supply Advisory Committee (WSAC), the Water Commission shall receive quarterly updates on the status of the various elements of the recommended plan. This is the seventeenth quarterly update.

The content and format of this report will continue to be modified to provide a comprehensive overview of the progress, findings, obstacles, etc. of the various elements of work. Commissioner requests are shown throughout this document; new items will be shown in italics, ongoing items will be in normal font, completed items will be struck for one quarterly report and then removed. There are no new items in this report and none have been removed.

- Develop a spreadsheet that shows all the supply projects and portfolios of projects with all the metrics related to decision-making. The WSAS work plan will be modified in the coming months once more meaningful data is available and this spreadsheet developed.
- Develop a narrative and/or spreadsheet that shows the nexus between water supply projects specifically spelled out in the WSAC report and other projects and studies being performed by the Water Department. This is an ongoing effort. Narratives are added to each section below as appropriate. As the work plan is modified over the coming months, the process of capturing the nexus will be developed more fully.

The Water Supply Augmentation Strategy (WSAS) consists of the following elements as defined by the WSAC:

- Element 0: Demand Management. Implementation of the Long Term Water Conservation Master Plan is foundational to the WSAS.
- Element 1: In Lieu. This alternative could include the sale of water to other agencies with or without the assumption of additional water back to the City during droughts.
- Element 2: Aquifer Storage and Recovery. Evaluations of both the Mid-County and Santa Margarita Groundwater Basins are being conducted.
- Element 3: Advanced Treated Recycled Water or Seawater Desalination

Progress and status of the various WSAS-related work are described in detail below as well as that of other projects related to but not explicitly mentioned in the WSAS.

ELEMENT 0: DEMAND MANAGEMENT

Overview: Element 0 of the City's Water Supply Augmentation Strategy consists of ongoing demand management activities. The primary goal of this element is to generate an additional 200 to 250 million gallons per year in demand reduction by the year 2035 from expanded water conservation.

Summary: Since the last quarterly report in December 2019, the Water Conservation section has been actively working on the following projects:

- Water Shortage Contingency Plan update (status report presented in February)
- Preparation of the Initial Water Supply Outlook
- Emergency Response Plan update

Conservation staff met with representatives from the University of California on three occasions:

- 2020 UCSC Long Range Development Plan Workshop (December 2)
- Annual Water Meeting with University staff (December 10)
- Long Range Development Plan Infrastructure Work Group (January 14)

The City of Santa Cruz Water Department was previously selected as a case study by the national organization Alliance for Water Efficiency, which is doing a research project on "Use and Effectiveness of Municipal Irrigation Restrictions During Drought". During the last quarter, Conservation staff assisted in finalizing its report, which was issued publicly on January 23, 2020. The Executive Summary of this major study is included as Attachment 1.

Staff participated in a technical workgroup sponsored by the California Department of Water Resources (DWR) on a landscape area measurement project. The City is one of 17 water suppliers chosen by DWR in a pilot project to test the remote sensing approach being used to classify and measure landscape area that will be used by all urban water suppliers to calculate urban water use targets beginning in 2022.

Staff was also invited to participate in another upcoming DWR workshop on March 9 on the new requirement for suppliers to conduct an annual water supply and demand assessment (WSDA) pursuant to Senate Bill 606. Staff is making a presentation for that workshop that summarizes our perspective and experience to inform the development of WSDA guidance.

The following is a summary of the status of selected measures in the Water Conservation plan:

No. 5 Home Water Use Reports. An independent evaluation of the effect of the first year of this program has been completed. The final report is being provided as a separate item in the March Water Commission agenda packet.

No. 6 Water and Energy-Saving Assistance Program. This program offers free toilet replacement to qualifying low-income households, in conjunction with free weatherization and energy efficiency services funded by PG&E. The two contractors are actively replacing fixtures in households within the City's service area, and the contract is approximately 33% complete.

Finally, Water Conservation staff assisted with the kickoff and data collection for the water rate study just getting underway.

ELEMENT 1: WATER TRANSFERS AND/OR WATER EXCHANGES

Overview: This work is considering the feasibility of sending excess City surface water to neighboring agencies for the purpose of passively recharging the groundwater basin(s). In-Lieu is now described as follows.

- Water Transfers: Selling water to neighboring agencies for the purpose of augmenting their supplies and possibly (passively) recharging the groundwater basin.
- Water Exchanges: Negotiating an agreement whereby water provided to neighboring agencies would, by allowing the groundwater basins to recharge, provide additional groundwater back to the City during water supply shortages.

Summary: Based on water quality results from the initial pilot, Soquel Creek Water District (SqCWD) and City staff worked together to plan and initiate Phase II of the water transfers. Phase II expands the zone within SqCWD's service area that could receive water from the City. As previously mentioned, Phase II of the pilot into the expanded area was initially anticipated to begin on or around November 1, 2019; however, due to the weather forecast and lack of rain, initiation of the water transfers did not start until December 6, 2019, but was active during the entire month of December. During December, a total of 20.3 million gallons were transferred at an average of roughly 0.78 million gallons per day.

As mentioned in previous quarterly updates, the volume of water to be transferred and the length of time in which transfers are to occur are dependent on both the City's excess water supply and SqCWD's system demand in the expanded service area. Due to the lack of rainfall this winter, current water supply conditions and the water available from the north coast sources, Phase II of the water transfers was put on hold on January 31, 2020. The total volume of water that had been transferred up until that date was 33.7 million gallons and averaging roughly 0.6 million gallons per day. It should also be noted that there was a 6 day period in mid-January where transfers were also stopped due to the water supply conditions and water availability from the north coast sources.

Next Steps: City and SqCWD staff continue to evaluate water supply conditions and make a determination as to whether or not water transfers will resume. Water transfers will begin after water supply conditions improve, and are expected to last through April 30, 2020 once resumed.

Contract Update(s)

Purchase Order Agreement with SqCWD for cost sharing of Water Quality Sampling and Development of Water Quality Results TM

- PO Opened: January 2017
- Project Partner(s): Soquel Creek Water District
- Engaged Stakeholders: None at this time.
- Original PO Amount: $60,000
- Amount Spent: $57,427
- Amount Remaining: $2,572

ELEMENT 2: AQUIFER STORAGE AND RECOVERY

Overview: Aquifer Storage and Recovery is being evaluated as a form of actively recharging the groundwater basin(s). Work in this area includes the Mid-County Groundwater Basin (MGB) and the Santa Margarita Groundwater Basin (SMGB).

Summary: Groundwater modeling continues and will continue through the completion of Phase II as part of the iterative process to ensuring project success. Groundwater modeling scenarios (assuming 2016-2018 demands and under the GFLD2.1 hydrology) aimed at determining how much can be injected and recovered from the Beltz area were run through the groundwater model; the latest results indicate that an ASR project in the Beltz area, in conjunction with SqCWD's Pure Water Soquel Project, can have an injection capacity of 2.0 mgd and an extraction capacity of 3.0 mgd. As previously mentioned, these modeling scenarios include the conversion of the 4 existing wells to ASR wells and 4 new ASR wells for a total of 8 ASR wells in the Mid-County Groundwater Basin (MCGB).

Since the conclusion of the fieldwork conducted under Phase II work at the Beltz 12 well site on July 31, 2019, staff from the City and Pueblo Water Resources evaluated the data collected and worked to generate a Technical Memorandum (TM) documenting results of the pilot. A draft of this TM was prepared and submitted to the City by Pueblo Water Resources in mid-February; City staff is currently reviewing the TM and expects to finalize the report in April 2020. As documented in the TM, based on results for the two primary issues investigated through the pilot (Well and Aquifer Hydraulics along with Water Quality) the pilot test project at Beltz 12 is deemed a success and generally verified the findings of the Phase 1 Technical Feasibility Investigation. As part of the pilot, a total volume of approximately 20.8 million gallons (mg) of water taken from the distribution system was injected into the Purisima Aquifer of the MCGB at rates ranging between approximately 375 to 405 gallons per minute (gpm) and approximately 24.5 mg was recovered from the aquifer at rates ranging between approximately 405 to 700 gpm. During injection, well-plugging rates were relatively low, and no adverse geochemical interactions were observed during aquifer storage or recovery pumping. During storage, Disinfection ByProducts (DBPs) showed a very favorable degradation reaction with no apparent ingrowth period and both THMs and HAAs steadily degrading to near non-detect levels after 40 days of stopping injection.

Based on the findings and conclusions developed from the Beltz 12 ASR Pilot Test Program, and Pueblo's experience with similar ASR projects, they offer the following key recommendations:

- Beltz 12 should be converted to a permanent ASR facility.
- For planning purposes, a long-term operational ASR capacity of approximately 335 gpm injection and 455 gpm recovery pumping should be assumed for Beltz 12.
- During injection periods, routine backflushing at 700 gpm should be performed on a weekly basis (minimum) to limit residual plugging and maintain long-term well performance.
- Permanent ASR operations at the well should include ongoing monitoring for geochemical interactions during aquifer storage and ASR recovery, with particular focus on long-term water-quality interactions such as solubilization/leaching of metals and DBPs.

City staff worked with Pueblo to develop a test plan for pilot testing of ASR at the City's Beltz 8 well; the work plan was finalized in early December and approved by City Council on December 10, 2019. Following Council approval, the Water Department entered into a professional services contract with Pueblo and staff initiated the permitting process of an ASR pilot at Beltz 8. Work to be performed under the executed professional service contract is underway with a new monitoring well at the Beltz 8 site being drilled at the end of January and a new monitoring well at Pleasure Point in February along with retrofits of Beltz 8 for the ASR study. The schedule for pilot testing at Beltz 8 is still be developed based on the well-drillers availability.

Next Steps: Work over the next few months will include:

- Finalize the TM that discusses results (water quality and water levels) of the ASR pilot test at Beltz 12.
- Working with Pueblo to execute the work plan for pilot testing of ASR at the City's Beltz 8 well. It is expected that the first injection and extraction cycle will take place at the end of March with the other two ASR cycles expected to take place between April and early September.
- Continue with discussions on climate change modeling efforts that are used in the HCP (Habitat Conservation Plan) process, ASR groundwater modeling and the work being done for both the Santa Cruz Mid-County Groundwater Agency and the Santa Margarita Groundwater Basin.

Contract Update(s):

Consultant: Pueblo Water Resources (PWR) – Phase I

- Contract Signed: February 2016
- Project Partners: None at this time.
- Engaged Stakeholders: SqCWD, County of Santa Cruz, Scotts Valley Water District, San Lorenzo Valley Water District

- Original Contract Amount: $446,370
- Contract Amendment No. 1: $377,615
- Contract Amendment No. 2: $35,000
- Amount Spent: $713,679
- Amount Remaining: $135,306
- Status: On schedule for work in MCGB and delayed approximately 18 months for work in the SMGB.

Consultant: Pueblo Water Resources (PWR) – ASR Phase II – Beltz 12 ASR Pilot Test

- Contract Signed: October 2018
- Project Partners: None at this time.
- Engaged Stakeholders: SqCWD, County of Santa Cruz
- Original Contract Amount: $458,085
- Amount Spent: $406,429
- Amount Remaining: $51,656
- Status: On Schedule.

Consultant: Pueblo Water Resources (PWR) – ASR Phase II – Beltz 8 ASR Pilot Test

- Contract Signed: January 2020
- Project Partners: None at this time.
- Engaged Stakeholders: SqCWD, County of Santa Cruz
- Original Contract Amount: $1,051,945
- Amount Spent: $0
- Amount Remaining: $$1,051,945
- Status: On Schedule.

ELEMENT 3: ADVANCED TREATED RECYCLED WATER AND DESALINATION

Overview: Advanced Treated Recycled Water and Desalination were included within the same Element with the intention that, following feasibility-level work, just one would proceed for further evaluation and preliminary design.

Summary: In November 2018, City Council took action to prioritize recycled water over desalination. Staff has been working with Kennedy Jenks to develop a second phase of work to further refine several of the recycled water alternatives that showed potential for augmenting water supply. As a reminder, the goals of the Phase 1 study were to 1) evaluate the beneficial uses of treated wastewater as both a water supply as well as other options such as irrigation that may or may not result in supply augmentation; 2) develop supply augmentation alternatives to sufficient detail to be able to compare and contrast with the desalination alternative; and, 3) follow the prescribed format and timing of the grant received by the State Water Resources Control Board.

The Phase 2 work will build on the work developed in Phase 1 by adding a higher level of detail to those alternatives showing potential for augmenting water supply. Phase 2 will incorporate the current statuses of projects by both Scotts Valley Water District and Soquel Creek Water District.

The Water Commission reviewed the preliminary scope of work with Kennedy Jenks at their August 26, 2019 meeting. Staff incorporated specific feedback into the final scope of work as follows.

Question: How will recycled water alternatives be modeled and compared with other alternatives?

Response: To the extent, this question had to do with groundwater modeling; all modeling for recycled water projects (e.g., a groundwater replenishment project that expanded upon the Pure Water Soquel project) as well as ASR projects will be performed by Montgomery and Associates (formerly Hydrometrics). This will ensure consistent use of assumptions, interpretation of the findings, and ability to dovetail with the work of the two Groundwater Agencies, Santa Margarita and the Mid-County. With respect to costs, Kennedy Jenks is tasked with updating costs for preferred projects so as to be comparable to the costs being developed by others for the ASR projects. A key effort will be the subsequent step which includes a comparative analysis of the alternatives in a triple bottom line framework that will yield a project or suite of projects the City would pursue. This work is currently being scoped with Corona Environmental Consulting (jointly including Raucher LLC and Dr. Casey Brown, University of Massachusetts). See below for a separate discussion on Water Supply Augmentation Implementation Plan.

Question: Present work to the Water Commission following Task 3.1 Develop and Evaluate Phase 2 Alternative.

Response: Staff intends to bring mid-point findings to the Water Commission at their June or July meeting.

City Council approved the contract with Kennedy Jenks at their November 26, 2019 meeting. A kick-off meeting was held on February 21. Attendees included City staff from Public Works, Water and HDR, Soquel Creek and Scotts Valley Water District staff, Kennedy Jenks, and the County of Santa Cruz.

Next Steps: With input from the Kick-Off meeting, Kennedy Jenks is refining the shortlist of alternatives extracted from Phase 1 including updating the alternative's description based on the status of the Pure Water Soquel project, activity in Scotts Valley, and any changes in recycled water regulations in California.

Contract Update(s):

~~Consultant: Kennedy/Jenks Consultants, Regional Recycled Water Facilities Planning Study (RWFPS) – Phase 1~~

- ~~Contract Signed: February 2016~~
- ~~Amount Spent: $574,807~~
- ~~Amount Remaining: $12,500~~
- ~~Schedule: The RWFPS is complete.~~

Consultant: Kennedy Jenks, Recycled Water Feasibility Planning Study – Phase 2

- Contract Signed: December 20, 2019
- Project Partners: City Public Works

- Engaged Stakeholders: Scotts Valley Water District, Soquel Creek Water District, County of Santa Cruz
- Contract Amount: $260,000
- Amount Spent: $0
- Amount Remaining: $260,000
- Schedule: December 2020

OTHER

The projects and programs reported below were not specifically identified in the WSAC work plan but are related in various ways. Staff is in the process of organizing this quarterly report in a manner that clearly describes the relationship, or nexus, between these items with those above. This is a work in progress and the format of this quarterly report will continue to evolve.

Development of Water Supply Augmentation Implementation Plan
This proposed work plan for the Corona Environmental Consulting team provides ongoing technical assistance to the Water Department in their efforts to develop and implement a reliable water supply augmentation strategy for a highly uncertain future. The approach entails three main task areas:

1. Developing a Triple Bottom Line (TBL)-based assessment of the relevant water supply augmentation alternatives, applying relevant evaluation criteria;
2. Guiding, coordinating, and integrating a Decision Scaling analysis of climate change and other critical uncertainties and associated risks for future water supply reliability (to be conducted by Dr. Casey Brown, University of Massachusetts); and
3. Developing an adaptive management-based implementation plan based on the preceding two work items.

The technical approach supports the City's strategy of applying adaptive management in the face of considerable uncertainties regarding the future yields, costs, and feasibility of the water supply options available for consideration. The key outputs are to: (1) provide an objective evaluation and comparison of the relevant suite of water supply augmentation options, applying relevant criteria; and (2) develop an implementation plan that includes key signposts and trigger points to inform the City's selection and timing of supply option(s) implementation in the face of relevant uncertainties.

This work effort is scheduled to begin near the end of March 2020 after which time items will be scheduled with the Commission for input and discussion opportunities.

Source Water Monitoring
In 2019, the Department continued to collect and analyze untreated water samples from two stations on the San Lorenzo River for various analytes categorized under the header of Constituents of Emerging Concerns (CECs). The CECS are broadly represented as herbicides, insecticides and pesticides (e.g. DEET); wastewater indicators (e.g. sucralose); pharmaceuticals (e.g. acetaminophen); flame retardants (e.g. TCEP); and personal care products (e.g.methylparaben). We continue to detect analytes under each category, with the most common CECs being artificial sweeteners (e.g. Sucralose (Splenda) and Acesulfame-K (Sunett and Sweet One). While we are still analyzing the data, it does appear that we see more detections during the

winter months as compared to the drier months, and within the winter, we see more detections during moderate flows versus very high flow events. The Department also collected groundwater samples to analyze for the presence of PFOS / PFOA, which were not detected in any of the samples.

Santa Cruz Water Rights Project
This project involves the modification of existing City water rights to increase the flexibility of the water system by improving the City's ability to utilize surface water within existing allocations. In addition to improved flexibility, the success of this project is necessary to facilitate future regional water supply projects.

Work is continuing on the development of the Draft Environmental Impact Report, with current work still focusing on refining the scope and extent of the project and associated impact modeling. An update presentation to the Water Commission is planned for spring 2020.

Based upon finalization of the project description this winter, the project's CEQA schedule has been updated. Revised change petitions reflecting the updated project description and other requested information are expected to be completed and submitted to the State Water Resources Control Board in spring. The Draft EIR is now expected to be circulated for public review in fall 2020, and the Final EIR is expected to be completed in spring 2021.

Outreach and Communication

Outreach during this quarter has included the following:

- Monthly email newsletters to WSAC email list.
- KSCO with Rosemary Chalmers, February 13.
- Santa Cruz Sentinel article: https://www.santacruzsentinel.com/2020/02/04/early-santa-cruz-city-water-shows-good-supply-poor-rainfall/

FISCAL IMPACT: None.

PROPOSED MOTION: Receive information on the Water Supply Augmentation Strategy, Quarterly Work Plan Update.

ATTACHMENT(S):
1. Alliance for Water Efficiency, January 2020

Use and Effectiveness of Municipal Irrigation Restrictions During Drought

Executive Summary

Alliance for Water Efficiency

3.10

January 2020

ACKNOWLEDGEMENTS

The authors of this report would like to thank the funding participants for supporting the research for this Use and Effectiveness of Municipal Irrigation Restrictions During Drought Study as well as the additional participating water utilities for contributing their information to the AWE Drought Survey conducted for this project. Additionally, we would like to thank the Alliance for Water Efficiency (AWE) for making all of this possible.

The report was developed and prepared as a partnership between Western Policy Research and Maddaus Water Management, Inc.

Research Team

Maddaus Water Management, Inc.
- Lisa Maddaus, PE
- Michelle Maddaus, PE
- Tess Kretschmann
- Andrea Pacheco
- Hannah Braun
- Annikki Chamberlain

Western Policy Research
- Anil Bamezai, PhD

Contributing Project Participants

Arizona Municipal Water Users Association (AZ)
Austin, City of (TX)
Bay Area Water Supply and Conservation Agency (CA)
California Urban Water Agencies (CA)
California Water Service-Visalia (CA)
Hayward, City of (CA)
Los Angeles Department of Water and Power (CA)
Lower Colorado River Authority (TX)
Metropolitan Water District of Southern California (CA)
Plano, City of (TX)
Regional Water Authority (CA)
Sacramento, City of (CA)
Sacramento Suburban Water District (CA)
Santa Cruz, City of (CA)
Southern Nevada Water Authority (NV)

Alliance for Water Efficiency Staff and Consultants

Mary Ann Dickinson, President and CEO
Bill Christiansen, Director of Programs
Lacey Smith, Program Planner
Peter Mayer, Water Demand Management, Project Manager

Additional Funding Support

The Scotts Miracle-Gro Foundation

EXECUTIVE SUMMARY

Drought conditions prompt dramatic actions by water utilities to curb customer water demand. These actions are typically focused on limiting the frequency of lawn watering and, in more severe cases, may extend to mandatory curtailment. However, effectiveness of different actions or levels of implementation remain poorly understood or documented. The *Use and Effectiveness of Municipal Irrigation Restrictions During Drought* study was undertaken by the Alliance for Water Efficiency (AWE) to bridge this information gap.

The main purpose of the study was to explore how drought response measures have been implemented and water demand reductions have been achieved across different water suppliers in California, Texas, Arizona, and Nevada. This research study provides new information on the range of approaches used and lessons learned during a water shortage through a review of recent experiences in these four states. This Executive Summary offers an overview of the findings published in the full report[1] on the practice and impact of voluntary municipal irrigation restrictions applied during dry year conditions and mandatory restrictions subsequently required during more severe water shortages.

AWE sponsored this two-year research study, selecting Peter Mayer of Water Demand Management to serve as AWE's project manager. The study was conducted by Anil Bamezai, PhD of Western Policy Research along with Lisa Maddaus and her team at Maddaus Water Management, Inc. (Research Team).

Research Questions

The key questions addressed in the research include:

1. What demand reductions can be achieved through different levels of mandatory and voluntary restrictions?
2. How do messaging and enforcement programs influence effectiveness of restrictions?
3. During times of drought, what can water suppliers do to maximize the effectiveness of outdoor restrictions?
4. What is the longevity of demand reductions after the end of a drought?
5. What are the different forms of mandatory and voluntary irrigation restrictions typically implemented by North American water providers?

[1] The full research report is available to AWE members as a member-only benefit. Copies can be requested at: https://www.allianceforwaterefficiency.org/impact/our-work or by emailing info@a4we.org.

Summary of Findings and Conclusions

Recently, droughts of varying length and intensity impacted the provision of adequate water in the four states that participated in this study. In response to these droughts, municipal water providers have both chosen and been required to implement a variety of demand management measures. This study's key findings are largely based on the drought experiences and responses of eight retail water utilities: two from Texas and six from California. Key findings also include the experiences of three regional/wholesale water suppliers. The full report documents all these case studies in detail. Each case study participant faced intense multi-year shortages, lasting five and nine years for the two Texas case studies, and from three to four years for the six California case studies. All of the analyzed drought episodes ended in the first half of 2017 (or earlier, in the case of the two Texas case studies). This study's analytic timeframe was deliberately extended through the end of 2018 to provide a longer observation period to evaluate demand rebound after the end of the California drought.

During the analyzed drought episodes, dry year supply conditions and drivers of irrigation demand (such as evapotranspiration rates) fluctuated within each case study. Water suppliers adapted accordingly, adopting less or more stringent restrictions on irrigation accompanied by additional prohibitions on water waste and enforcement.[2] This variation in the level of restrictions over time within a case study, as well as across case studies, is leveraged to evaluate the differences in effectiveness by: 1) the stringency of restrictions, 2) the season during which restrictions were enforced, and 3) the degree to which restrictions were supported by messaging and enforcement.

What demand reductions can be achieved through different levels of mandatory and voluntary usage restrictions?

It is common practice for suppliers to ask for voluntary conservation at the first appearance of dry year supply conditions. After a few months, if supply conditions warrant, suppliers may transition to mandatory restrictions. Although not common, if drastic changes in supply conditions occur, suppliers may skip through water shortage continency plan stages. Within this study, the evaluation of restrictions on water demand indicated that calls for voluntary conservation did not generate statistically significant savings (i.e., estimated savings are indistinguishable from zero). However, mandatory restrictions did yield significant savings. The tighter the level of irrigation restrictions, the greater the savings, especially during summer months when irrigation is typically at its highest level. From pre-drought to the worst year of the drought, case study participants successfully reduced annual demand by 18%-30% and peak monthly demand by 20%-42%.[3] This was done while operating in Stage 2 or 3 of their Water Shortage Contingency

[2] Water waste that is typically prohibited and subject to penalty includes visible runoff from irrigation onto streets and sidewalks; watering at the wrong time of day or on an undesignated day; and other measures specific to the water provider.

[3] Includes total savings number from all efforts, inclusive of irrigation restrictions and any other implemented measures.

Plans (WSCPs). Despite severe drought conditions, none of the participants reached their WSCP's maximum stage or a point where irrigation was completely prohibited.

Case Study Finding - LADWP
Examination of GPCD data from the Los Angeles Department of Water and Power (LADWP) shows that water demand reached its lowest point during 2016, declining 18% between 2013 and 2016 (131 GPCD to 107 GPCD) at the annual level and by 20% at the peak monthly level (155 GPCD to 124 GPCD). Demand remained depressed during 2017 and 2018 as irrigation restrictions remained in place.

Key Takeaways

1. None of the water providers in this study reached the maximum stage of their contingency plan when irrigation would be completely banned.
2. Case study participants successfully reduced annual demand by 18%-30% and peak monthly demand by 20%-42% through a combination of mandatory demand management measures.
3. Within this study, voluntary conservation did not generate statistically significant savings (i.e., estimated savings are indistinguishable from zero).

Source: RWA, 2016.

How do messaging and enforcement programs influence effectiveness of restrictions?

Messaging and enforcement are essential components of successful drought response strategies. Comparisons across case studies reveal only a few instances where water agencies implemented similar levels of irrigation restrictions, but then buttressed them with varying levels of messaging and enforcement programs. In such comparisons, statistically significant savings were generally only detected in the presence of effective messaging **and** enforcement programs.

Two case studies also permitted the evaluation of drought surcharges linked with customer budgets on water demand, which is one form of an enforcement strategy. In both cases, a strong effect of surcharges on demand could be detected. This provides clarity that WSCPs should be carefully designed to include the following best practices as implementation strategies: messaging, enforcement, irrigation day-of-week and/or time-of-day restrictions, drought surcharges, and possible financial incentives. To be effective, these plans need codified rulemaking to include provisions that are enforceable on non-compliant customers. In addition, a well-developed

Case Study Finding – Plano, Texas
In the City of Plano cumulatively, between the latter half of 2012 and the fall of 2014, 2-3% of 83,000 connections were subject to irrigation lockouts by the City, while roughly 19% received a violation letter.

implementation plan with associated staffing and budget resources should be prepared for each stage in a WSCP, including accounting for anticipated revenue shortfalls due to demand curtailment by customers.

Key Takeaways

1. Messaging and enforcement are viewed as best practices and essential components of a successful drought response.
2. WSCPs should include all of these components: messaging, enforcement, irrigation day-of-week and/or time-of-day restrictions, drought surcharges, and implementation strategies.
3. To be effective, WSCPs need codified rulemaking to include provisions that are enforceable on non-compliant customers.
4. The level of messaging and enforcement employed across the case studies was quite different.
5. In two case studies, drought surcharges linked with customer-specific water budgets were found to be highly effective in achieving desired demand reductions.

During times of drought, what can water suppliers do to maximize effectiveness of outdoor restrictions?

The results from this study suggest water suppliers can undertake many actions to improve the effectiveness of their outdoor restrictions. Here are some recommendations:

1. **In the planning process, the design of irrigation restrictions should be specific to the local region.** Determine what level of weekly irrigation is normal for an area given its weather patterns (evapotranspiration, rainfall) and what landscape choices best fit the local environment. Only with this understanding can a water provider set effective, progressively tighter irrigation restrictions to achieve the level of demand reduction required. For example, limiting irrigation to just 3 days/week is only mildly constraining in most of California. Similarly, in Texas, 2 days/week restrictions are only mildly constraining because Texas water providers receive more frequent rainfall in a more evenly distributed pattern. Neither of the two Texas case study participants would have found 3 days/week restrictions to be effective at all since 2 days/week was only moderately effective.
2. **Voluntary conservation alone did not generate significant compliance in this study.** Thus, water suppliers should consider strengthening provisions in their local municipal codes to target water waste, such as irrigation runoff and violation of water restrictions, and to enable the use of surcharges. As drought conditions emerge, increased enforcement of these code provisions can supplement activation of the first stage of a WSCP, which may be voluntary in nature. Of course, suppliers also may consider adding more mandatory drought measures to the first stage of their WSCPs. The mandatory measures in the first stage need not necessarily be day-of-week

irrigation restrictions. They could include prohibitions on water waste and irrigation runoff, time-of-day limits on irrigation, prevention of installation of new landscapes, and so forth. In addition, earlier adoption of drought surcharges should be stressed as that is often the most effective tool for achieving water savings. It also may be useful to be flexible regarding when and how drought surcharges are separately adopted as part of a multi-layered approach to drought-stage declaration. Without mandatory measures, either in the municipal water code or the first stage of a WSCP, it is difficult to enforce pro-conservation behavioral change among residents and businesses throughout the community.

3. **The water provider is an important source of reliable information during a drought.** Effective outreach and messaging programs should educate residents about emerging drought conditions, offer tips about how to reduce demand in the short-term, and guide residents toward resources that can help them lower demand in a more direct and hopefully permanent way. This can be accomplished in many ways, such as tailored customer water-use information readily available with new AMI technology, promotion of higher-efficiency fixtures and appliances through rebates, and landscape transformation programs.

Case Study Finding – RWA

During the recent California drought, the Regional Water Authority (RWA) Water Efficiency Program (WEP) in Sacramento implemented a public outreach campaign that catered to two audiences: local water suppliers and the general public.

For local water suppliers, the regional program provided templates for talking points for communicating with customers, social media posts, weekly editorial calendars, and customer newsletter text. The program also shared a photo gallery, "top ways to save" tips with associated water savings estimates, sample bill inserts, and tabletop informational cards for restaurants. Finally, the WEP also provided staff support for informational booths at a variety of public outreach events throughout the region, including Harvest Day and the Home and Garden Show.

For the general public, RWA maintains a website (www.bewatersmart.info) which includes an interactive drought map featuring outdoor watering guidelines, water waste hotlines, and rebates for all member water suppliers. This website received heavy traffic during the drought. In 2015, the program partnered with local ABC News and their Chief Meteorologist to provide viewers with water conservation tips during her weather segments (Figure 4-19). WEP also partnered with the Sacramento River Cats, the region's semi-professional baseball team, to post advertising in season programs and on the back of restroom stall doors in the stadium to take advantage of a "captive audience" (RWA, 2015).

Key Takeaways

1. Design restrictions according to local conditions and ensure that what is planned for will actually constrain demand.
2. Voluntary conservation alone did not generate significant compliance in this study. Water suppliers should have strong provisions in their local municipal codes to target water waste, such as irrigation runoff and restriction violations, and to enable the use of surcharges.
3. The water provider is an important source of reliable information during a drought and should keep residents informed and educated with regard to emerging conditions; suggest ways to reduce demand in the short-term; guide residents toward resources that can help them lower demand; and leverage peer pressure through social media to discourage water waste.

What is the longevity of demand reductions after the end of a drought?

Per capita water demand has been declining in most parts of North America because of long-term investments in water use efficiency and the accumulating effects of water pricing and plumbing and appliance efficiency standards. As a result, while demand still rebounds after a drought, it rebounds toward a long-term downward trendline, not back to pre-shortage levels. In addition, if suppliers undertake specific actions to change the status quo during or after a drought episode, such as making irrigation restrictions permanent (e.g., Austin, LADWP), there may be little or no rebound. Permanent actions also can change the distribution of water demand by end-uses: This needs to be evaluated and factored into planning for a future drought.

Key Takeaways

1. Per capita water use has declined across North America since the 1990s because of pricing, plumbing codes and standards, and investments in long-term efficiency.
2. Due to declining demand trends, demand rebounds after a drought toward a long-term declining trendline, not the pre-drought level.
3. In two case studies, demand reductions achieved during the drought were maintained with little rebound through the on-going implementation of restrictions.

Case Study Finding – Demand Rebound

After the end of the recent California and Texas droughts, several case study participants made irrigation restrictions permanent (Austin, LADWP, Sacramento, and Visalia), while others lifted them (Hayward, Plano, SSWD, Santa Cruz). Austin and LADWP exhibited very low levels of rebound. So did Santa Cruz, even though restrictions had been lifted, perhaps because rationing in Santa Cruz has generated longer-lasting residual effects. Visalia's demand rebound is a little higher than Sacramento's in spite of comparable per capita demand because Visalia adopted 3 days/week permanent restrictions compared to Sacramento's 2 days/week permanent summer restrictions.

What are the different forms of mandatory and voluntary irrigation restrictions typically implemented by North American water providers?

A 4-stage WSCP seems to be the most common configuration that water suppliers follow in the west and southwestern United States. A few may have 3-, 5-, 6-, or even 7-stage plans, but a 4-stage format is more prevalent. Among the 4-stage WSCPs, over two-thirds rely on voluntary conservation in the first stage of their WSCP. By the second stage, this picture quickly changes with almost 60% adopting mandatory day-of-week irrigation restrictions. In the highest stage of drought response, outdoor irrigation is often banned except in designated high-value areas or by permit. None of the utilities participating in this study reached the highest stage of response.

Research Finding – Water Shortage Contingency Plans – On-line Utility Survey

Utility survey results from this study show that the most common configuration is a WSCP with 4 shortage stages. Over 95% of respondents reported having between 3 and 5 stages. None reported having fewer than 3 stages. One respondent reported having 7 stages.

Out of 29 retail water supplier respondents with WSCPs, 6 reported having adopted permanent restrictions. Often denoted as Stage 0, this stage is not included in the total number of stages in a WSCP reported above. Most of these permanent restrictions involve prohibitions on water waste and irrigation runoff, as well as time-of-day limits on irrigation. Only 1 of the 6 respondents reports having day-of-week irrigation restrictions on a permanent basis.

Approximately 30% of retail water supplier respondents, all from Texas, include triggers in their WSCPs for dealing with excessively high water demand conditions (in addition to the traditional supply-shortage stages).

Recommendations for Water Providers

Before a Drought or Water Shortage

- Prepare a water shortage response plan which includes response tiers, messaging, and enforcement, and which reflects local conditions and values.
    - The study found that the design of day-of-week restrictions should be specific to the region in which it is being implemented.
    - The tighter the level of irrigation restrictions, the greater the savings, especially during summer months when irrigation is typically at its highest. Within this study, the evaluation of restrictions on water demand indicated that mandatory conservation generates statistically significant savings, but voluntary restrictions do not.
- Prepare and pass ordinances necessary to implement and enforce the plan when the time comes. This study found that plans need codified rulemaking to include provisions that are enforceable on non-compliant customers and to target water waste, such as irrigation runoff and excessive use.
- Educate the community. In this study, statistically significant savings were only detected in the presence of effective and persistent messaging and enforcement programs.

During a Drought or Water Shortage

- All droughts are different. Monitor conditions closely leading up to and during a drought.
- Adopt surcharges early. Increasing rates is often the most effective tool for achieving water savings. In addition, it may be useful to be flexible regarding when and how drought surcharges are separately adopted as part of a multi-layered approach to drought-stage declaration.

- Effective outreach and messaging programs must educate residents about emerging drought conditions, offer suggestions for reducing short-term demand, and provide residents the resources needed to help them reduce demand in a more direct and permanent manner.
- Adapt the drought response as necessary. Water providers should be prepared to respond as required to changes in conditions.

After a Drought or Water Shortage

- Publicly announce and clearly communicate to the public the end of the drought or shortage event and the lifting of restrictions.
- Lift any surcharges imposed promptly.
- Thank the community for participation and compliance.
- Monitor demand trends, but don't be surprised if demand doesn't fully rebound. This study found that while demand does rebound after a drought, because of ongoing long-term efficiency investments, it rebounds toward a long-term downward trendline, not back to pre-shortage levels.

Get the Full Report/Join the Alliance for Water Efficiency

Don't miss out on all the detailed findings and analysis from this research. The full 200-page research report is available to AWE members as a member-only benefit. Copies can be requested at https://www.allianceforwaterefficiency.org/impact/our-work or by emailing info@a4we.org.

Use and Effectiveness of Municipal Irrigation Restrictions During Drought Executive Summary

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www.allianceforwaterefficiency.org

WATER COMMISSION
INFORMATION REPORT

DATE: 2/27/2020

AGENDA OF: March 2, 2020

TO: Water Commission

FROM: Rosemary Menard, Water Director

SUBJECT: Updated Water Commission Meeting Schedule for 2020

RECOMMENDATION: Approve the updated Water Commission meeting schedule for 2020.

BACKGROUND/DISCUSSION: All meetings are scheduled for the Santa Cruz City Council Chambers unless otherwise noted. Schedule updates for the Water Commission's approval are notated with an asterisk*.

January 2020
(01-06-20)

February 2020
(02-03-20)

March 2020
(03-02-20)

April 2020
(04-06-20)

May 2020
(05-04-20)

June 2020
(06-01-20)

July 2020
(07-06-20) *(Cancel)**

August 2020
(08-03-20) *(Reschedule to 8/24/20 or 8/31/20)**

September 2020
(09-07-20) *Labor Day (Cancel)**

October 2020
(10-05-20)

November 2020
(11-02-20)

December 2020
(12-07-20)

FISCAL IMPACT: None

PROPOSED MOTION: Motion to approve an alternate meeting date for August 2020 and motion to approve the updated Water Commission meeting schedule for 2020.

ATTACHMENTS: None

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WATER COMMISSION
INFORMATION REPORT

DATE: 02/27/20

AGENDA OF: March 2, 2020

TO: Water Commission

FROM: Heidi Luckenbach, Deputy Director/Engineering Manager

SUBJECT: Presentation of Capital Investment Projects

RECOMMENDATION: Accept the information and presentation of capital investment projects.

BACKGROUND/DISCUSSION: To provide context for upcoming budget discussions at the Water Commission, this recurring annual item focuses on progress made on capital projects in fiscal year (FY) 2020, as well as a look ahead of anticipated project activity in FY 2021. In May, the draft FY 2021 Operating and Capital Budgets and Pro Forma will be on the Water Commission's agenda, and in June, the final action on FY 2021 Operating and Capital Budgets and Water Commission recommendation to City Council.

Attachment 1 is the single line schedule for the majority of the projects in the Department's 10-year capital investment program (CIP), showing the various activities through FY2030. Note that there is a small subset of capital projects that do not appear on this schedule. These include annually occurring projects such as main replacements, and relatively small projects like upgrades to pressure regulating stations. The schedules and costs for these projects are tracked at a higher level and accounted for under a common grouping in the CIP, Facility and Infrastructure Improvements.

The Commission will hear brief updates from staff on the majority of the projects shown in Attachment 1, focusing on those with construction-related activities in the current, or next, fiscal year, as well as the Department's main replacement program.

ATTACHMENTS:
1. Capital Investment Program Single Line Schedule

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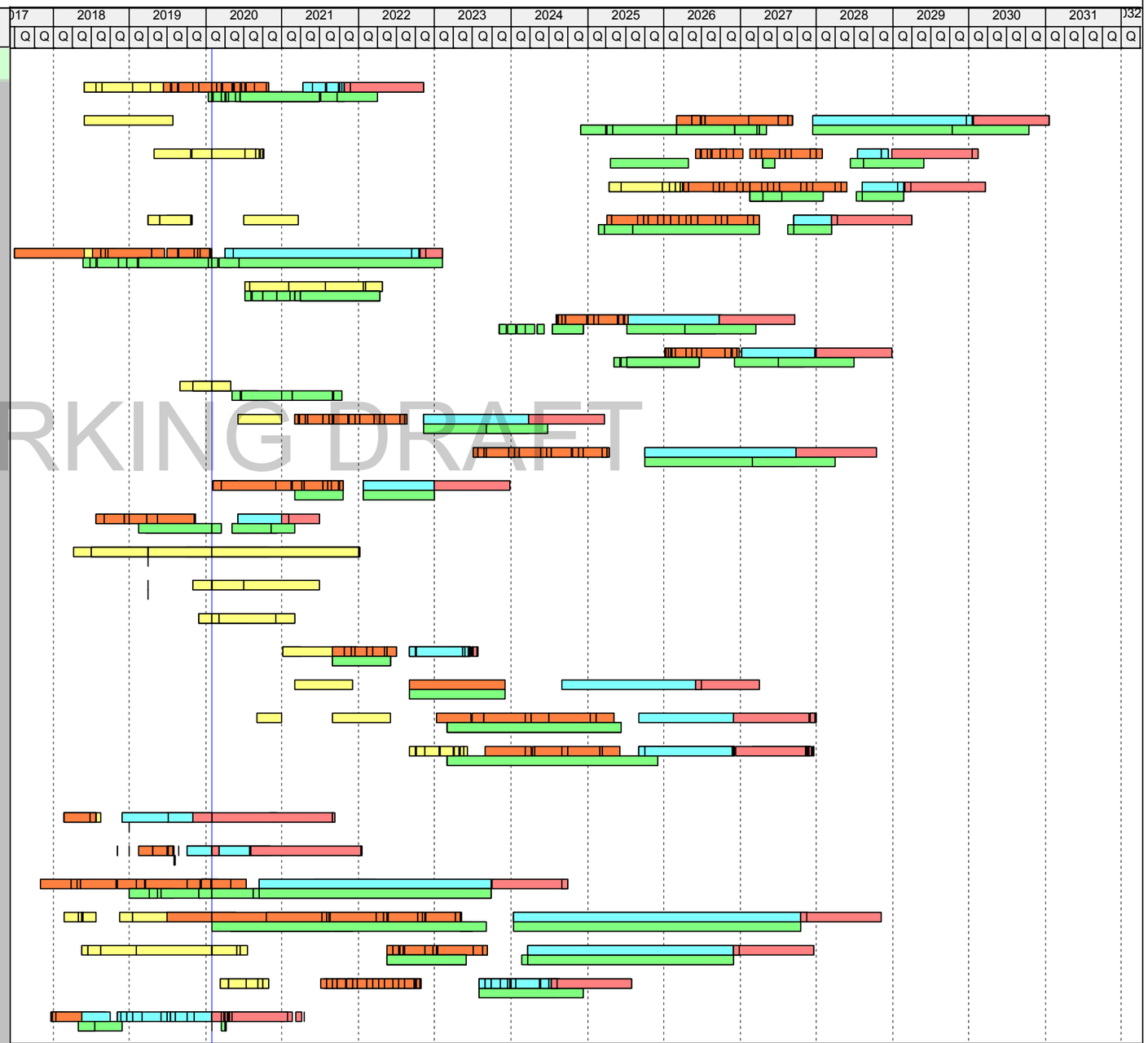
CITY OF SANTA CRUZ WATER DEPARTMENT

Project Management Services

Activity ID	Activity Name
	Project Management Services - CITY OF SANTA CRUZ WATER
	1.1 - Laguna Creek Diversion Retrofit Project
	1.2 - North Coast System Majors Diversion Rehab
	1.3.1 - Tait Diversion Rehab/Replacement Project
	1.3.2 - Coast Pump Station Rehab/Replacement
	1.4 - Felton Diversion and Pump Station Assessment
	1.5 - Newell Creek Dam Inlet/Outlet Replacement Project
	2.1 - North Coast System Repair and Replacement Project
	2.1.1 - North Coast Repair Ph4 Des and Const
	2.1.2 - North Coast Repair Ph5 Des and Const
	2.2. - Newell Creek Pipeline Rehab / Replacement (WIFIA Funding)
	2.2.1 - Newell Creek Pipeline Felton/Graham Hill
	2.2.2 - Newell Creek Pipeline Felton/Loch Lomond
	2.2.3 - Newell Creek Pipeline Brackney
	3 - Coast Pump Station 20-inch Raw Water Pipeline Replacement
	3.1 - Water Supply Augmentation
	3.2 - Recycled Water Feasibility Study
	3.3 - ASR Planning - New
	3.3.1 - ASR Mid County Existing Infrastructure New
	3.3.2 - ASR Mid County New Wells
	3.3.3 - ASR Santa Margarita Groundwater
	3.3.4 - ASR Pipeline New
	3.6 - In-Lieu Transfers & Exchanges
	4.1 - Graham Hill WTP Tube Settlers Replacement
	4.2 - Graham Hill WTP Flocculator Rehab / Replacement
	4.3 - Graham Hill WTP Concrete Tanks Project (ALT 4)
	4.4 - Graham Hill WTP Facilities Improvements Project
	4.5 - River Bank Filtration Study
	6.1 - University Tank No.4 Rehab / Replacement
	6.2 - University Tank No.5 Replacement



5.2

Planning | Design | Environmental | Construction | Post Construction

PROGRAM SINGLE LINE SCHEDULE

Mid Month Update: February 25, 2020

WATER COMMISSION
INFORMATION REPORT

DATE: 2/27/2020

AGENDA OF: March 2, 2020

TO: Water Commission

FROM: Benjamin Pink, Environmental Programs Analyst

SUBJECT: Home Water Use Report Program Evaluation

RECOMMENDATION: Receive a presentation and information on future program implementation.

BACKGROUND: One of the new programs identified for implementation in the City's Water Conservation Master Plan is that of home water use reports. This program targeted high using single-family residential customer accounts and involved sending monthly water use reports by mail or email during the peak season. The Water Department issued an RFP in May 2018 and selected the firm WaterSmart Software (WaterSmart) to run an initial one year program for the provision of water reports and an accompanying customer web portal. WaterSmart has been under contract since August 2018 and has been working with the Department to initiate the program. The cost of the contract was $77,000.

During the Water Supply Advisory Committee (WSAC) process in 2014 and 2015, there was significant discussion around the water use reports program and whether the program would achieve success in terms of lasting water savings. WaterSmart provides its own efficiency study as part of the services it offers. However, it was decided that in order to definitively answer the question of whether or not sending water reports would result in water savings for the Santa Cruz water service area, it would be best to conduct an independent evaluation of the program. Accordingly, the Department hired Dr. Wesley Shultz, a social science researcher and statistician, to conduct a rigorous evaluation of the City's WaterSmart program.

DISCUSSION: The WaterSmart program for the City consisted of sending monthly water use reports to single-family customers along with the option for customers to sign up for access to additional information through a customer web portal. The portal provides water usage information presented in useful ways that are not available through the utility bill. The program began in February 2019 with the mailing of an introductory welcome letter, followed by monthly reports starting in March and proceeding through November. WaterSmart was initially sent customer data for approximately 10,000 single-family residential customers, corresponding roughly to the top half of customers from a usage perspective. From this pool of data, customers were randomly selected into a treatment group to receive the services (water reports and web portal) and a control group of customers who received no services. The total number of

customers who received services was approximately 4,600 and the control group was approximately 2,300. Due to the experimental program design, it was necessary to send WaterSmart data for more customers than were eventually targeted, in order to have flexibility in selecting customers for each group. For this reason, not all customers who were in the treatment group were necessarily very high users.

The independent evaluation performed by Dr. Shultz addressed the following three key questions:

1) Are there differences in water consumption between households that received the home reports and households that did not receive the reports?
2) Are there differences in water consumption for customers with high levels of engagement, compared to customers who received the report but who do not engage with the online portal?
3) How satisfied and engaged are customers with the home water reports and the customer web portal?

The findings of water savings analysis were that:

- Although there were significant decreases in water consumption during the summer months of 2019 compared to the summer months in 2018, the decreases occurred throughout all households in the pilot and there were no significant differences between households in the treatment group compared to the households in the control group.
- Households in the treatment group with the highest levels of consumption during the peak season were more likely to register for the customer web portal.
- Households in the treatment group that registered for the web portal were found to have a higher level of water savings in the peak season compared to households in the control group.

In addition to the water savings analysis, the study also looked at customer satisfaction and engagement with the Water Department, the water use reports, and the customer web portal. This part of the study was addressed via a customer survey. The survey was sent to customers in both the treatment and the control groups; the surveys that the control group customers received were more general in nature and did not refer to the WaterSmart program specifically.

The findings of the customer survey were that:

- Households that received the home water reports rated them favorably, easy to understand, memorable, and motivating.
- Satisfaction with the online website was high; month over month comparisons were rated as the most valuable feature and respondents expressed interest in assistance with leak detection, real-time and utility-specific water use, more detailed neighbor comparisons, and email alerts for high usage.

The Water Conservation section is continuing discussions with WaterSmart on further program implementation. The most likely scenario for a continuing program is that the number of water reports that will be sent will be decreased to three times per year and only sent to the very highest users. Additionally, it is likely that the customer portal will be offered to all customers. The benefits of having a web portal available for customers to analyze their water usage in ways not previously available are important in the current climate of high and rising water rates. There

are other benefits of the strong analytics platform offered by WaterSmart that the Department can take advantage of, such as the ability to easily determine accounts with zero consumption which may indicate a stuck water meter, as well as different ways to communicate to customers that they may have a leak.

PROPOSED MOTION: None

ATTACHMENTS:
1. WaterSmart Customer Engagement Pilot Program Evaluation Report
2. Sample Home Water Use Report

WaterSmart Customer Engagement Pilot Program Evaluation

Report prepared by Wesley Schultz, Ph.D.

Final, 2020

Table of Contents

Table of Figures

Table of Tables

Executive Summary

The Water Department at the City of Santa Cruz conducted a pilot program to evaluate the potential of the WaterSmart customer engagement platform as a tool to promote residential water conservation. Households selected for the pilot were high water consumers (*N*=6,945), and were randomly assigned to either receive monthly customized home water reports, or to a randomized control group. After receiving home water reports for eight consecutive months, households were evaluated on their water consumption and on their responses to a survey.

The evaluation was conducted following the completion of the reports in November 2019, and addresses three key areas:

- Differences in water consumption between households that received the home reports and households that did not receive the reports.
- Differences in water consumption for customers with high levels of engagement, compared to customers who received the report but who do not engage with the online portal.
- Customer satisfaction and engagement with the Water Department, reports, and WaterSmart web portal.

Monthly Water Consumption

- Yearly seasonal trends were evident, with consumption peaking during the summer months.
- Water consumption was lower in 2019 than 2018 across both the treatment and control groups.
- There was no evidence for reductions in water consumption associated with the home water reports, and households that received the monthly water reports did not differ significantly from households in the control condition.
- Over the course of the 8-month pilot program, 18% of households that had access to the WaterSmart online portal signed in to create an account.
- Households with higher water consumption during the peak season were more likely to register through the online portal.
- Households that registered through the web portal showed significant reductions in water consumption during the peak season in 2019 from 2018, compared to households in the control condition.
- For households that did not register for the portal, there were no significant differences in water consumption, when compared to households in the control condition.

Customer Engagement Survey

- The survey response rate was 37%.
- Overall, respondents to the survey indicated high knowledge about general household water use, and especially about the cost of water use in their home.
- A majority of respondents expressed interest in an app used to monitor water usage at different times of the day, as a way to control the cost of water their bills.

- Satisfaction with the Water Department was moderate, and respondents acknowledged its efforts to save residents money.
- Households that received the home water reports rated them favorably, as easy to understand, memorable, and motivating.
- Satisfaction with the online website was high; month over month comparisons were rated as the most valuable feature and respondents expressed interest in assistance with leak detection, real-time and utility specific water use, more detailed neighbor comparisons, and email alerts for high usage.

1. Background

The Water Department at the City of Santa Cruz conducted a pilot program to evaluate the potential of the WaterSmart customer engagement platform as a tool to promote residential water conservation. Through the pilot program, the City engaged WaterSmart to send printed and emailed home water reports to selected residents on a monthly basis during the spring and summer of 2019 (a total of 8 monthly reports, sent April through November 2019). The reports were sent to high-consuming households and additional high-consuming households served as a randomized control. The primary focus was a comparison of water consumption for households that receive the printed report and households in the randomized control group. Additional analyses were conducted using survey data to assess feedback from residents about the reports and software, differences in customer satisfaction that can be connected with the WaterSmart platform, and the level of customer engagement with the WaterSmart web platform.

1.1 Project Description

This project was an independent evaluation of residential water consumption and customer response to the WaterSmart printed reports and associated online software. The evaluation was conducted following the completion of the reports in November 2019. This evaluation report addresses the following areas:

- Differences in water consumption patterns between households that received the home reports, those that received the home water reports and accessed the accompanying web portal, and those households that were randomly assigned to a control condition.
- Customer engagement with the WaterSmart web portal.
- Differences in water consumption for customers with high levels of engagement (i.e. households that registered for an online account) compared to customers who received the report but who do not engage with the online portal.
- Survey data about customer satisfaction, and perceptions of the WaterSmart reports and online portal.

Water consumption data was obtained using monthly billing reads for each of the residential accounts included in the pilot. Account-level water consumption was obtained for 1-year prior to and through the end of the pilot (January-2018 through November-2019). In addition, a list of the accounts included in the pilot was provided by the City of Santa Cruz, the assignment of these accounts to the treatment (received the reports) or the control groups, and email addresses for available accounts. Data was also obtained about the level of engagement with the online WaterSmart web portal, including a list of accounts that accessed the site, the date of account registration, and the number of access points.

2. Residential Water Consumption

Monthly billing reads from January 2018 throughout November 2019 were obtained for all households in the pilot. The data were analyzed to examine and compare differences in water consumption for households in the report and control conditions. Households in the report condition received a series of eight monthly printed reports reflecting their household water

consumption. Some of these households chose to register through the WaterSmart web portal where they could access more detailed information about their water use; these households that registered were coded separately in the dataset. Lastly, households in the randomized control group did not receive reports and did not have access to the online web portal.

2.1 Water Report Distribution

A welcome letter introducing the WaterSmart program was sent to the residential accounts assigned to receive monthly water reports. In addition to introducing the program, this letter encouraged all recipients to view their water use through the WaterSmart portal and sign up to receive the monthly reports by email.

Accounts with an existing email address on file were defaulted to receive the welcome letter and monthly reports by email (*N*= 3,399), whereas accounts without an email on file were sent printed reports and encouraged to sign up to receive the reports online (*N*= 3,679). Overall, approximately 62% of the reports were printed and delivered in the mail. The Figure below shows the number of reports of each type sent in each month, and the exact counts are shown in Table 1.

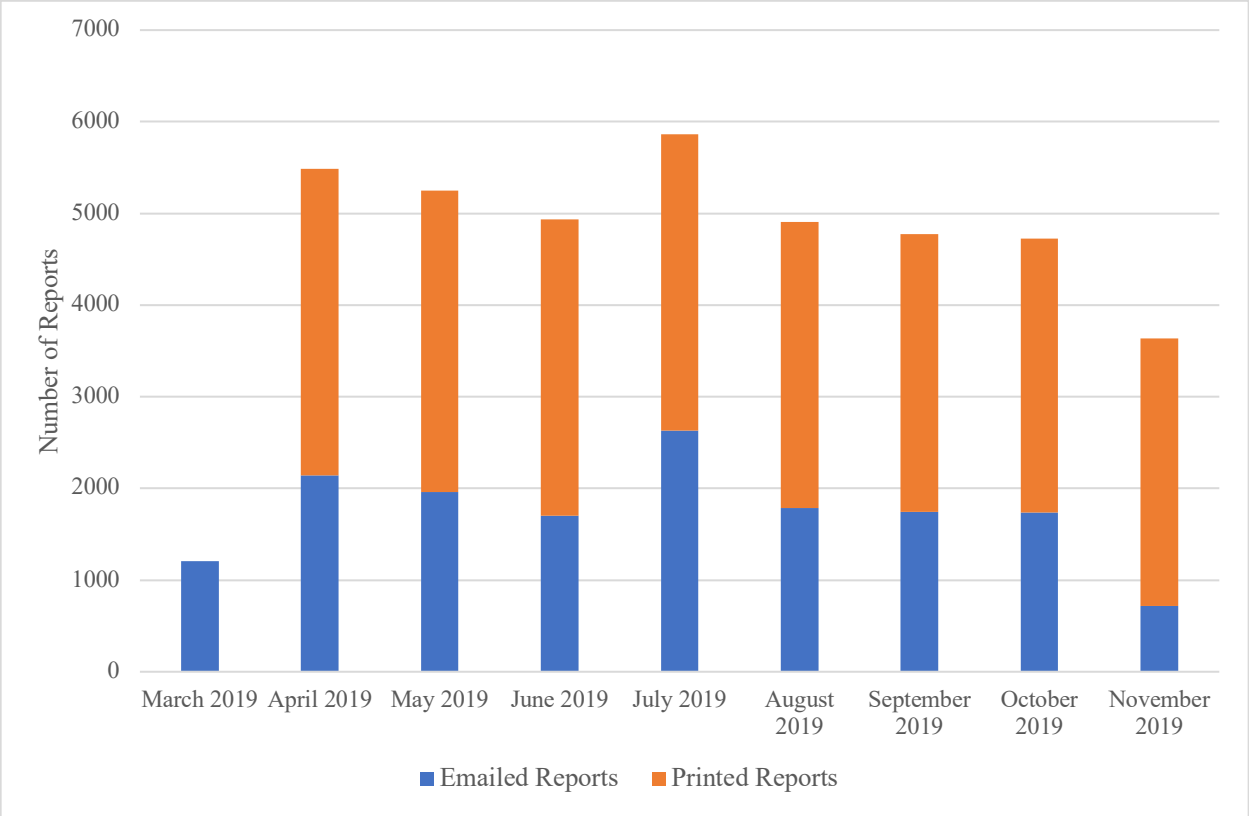


Figure 1. Water report distribution by month and delivery type.

Due to differences in delivery methods (email or print) and billing cycle, monthly reports were sent to residents are various times throughout the month. To examine distribution patterns, the

number of delivered reports were aggregated by month, and shown in Table 1. In addition to the pilot sample, there were 92 residential accounts that received the monthly reports but did not have available water consumption data. This is likely a result of accounts that opted out of the study or residents that own multiple accounts. These accounts were excluded from subsequent analyses.

Table 1. Monthly distribution of emailed and printed water reports.

	Emailed Reports	Printed Reports	Total Reports
March 2019	1,204	0	1,204
April 2019	2,141	3,346	5,487
May 2019	1,958	3,291	5,249
June 2019	1,701	3,237	4,938
July 2019	2,633	3,233	5,866
August 2019	1,785	3,121	4,906
September 2019	1,742	3,029	4,771
October 2019	1,739	2,985	4,724
November 2019	718	2,921	3,639
Grand Total	**15,621**	**25,163**	**40,784**

Note. Distribution numbers include 92 accounts that are not included in the pilot analyses.

2.2 Account Level Data

A starting sample of 7,636 residential accounts was included in the pilot. Of these, 118 were removed because they closed prior to the completion of the pilot. An additional 573 accounts had incomplete data and were also removed from the analyses (See Table 2). Incomplete data occurred when an account had more than one billing read in a month, with a missing billing read for the prior and/or subsequent month(s). Because it was not possible to clearly attribute the water consumption to a month, accounts with such instances were excluded from the analyses.

The final sample included 6,945 accounts with complete monthly readings for all 23 months. Of these, 4,617 were randomly assigned to receive monthly water reports, and 2,328 were randomly assigned to the control group.

Table 2. Account data availability and eligibility.

Description	Number of Accounts
Starting accounts	7,636
Closed accounts	118
Accounts with incomplete data	573
Accounts with complete data	6,945
Control group	2,328
Report group	3,779
Registered group	838
Final sample	**6,945**

2.3 Data Integrity

The consumption data were first aggregated into monthly reads and converted into gallons of water. Examination of the distribution of monthly water consumption readings revealed several instances of extreme outliers, reaching up to 205,952 gallons in a single month. To reduce the bias of these outliers on the statistical analyses, the extreme scores were winsorized. In this process, the outliers were identified as consumption values larger than the monthly average by more than 4-times the monthly standard deviation. These extreme values were recoded to the maximum allowable value of the monthly average + 4 * (monthly standard deviation). Winsorizing these outliers retained the data while reducing the skew of the distribution (see Figure 2 for a histogram).

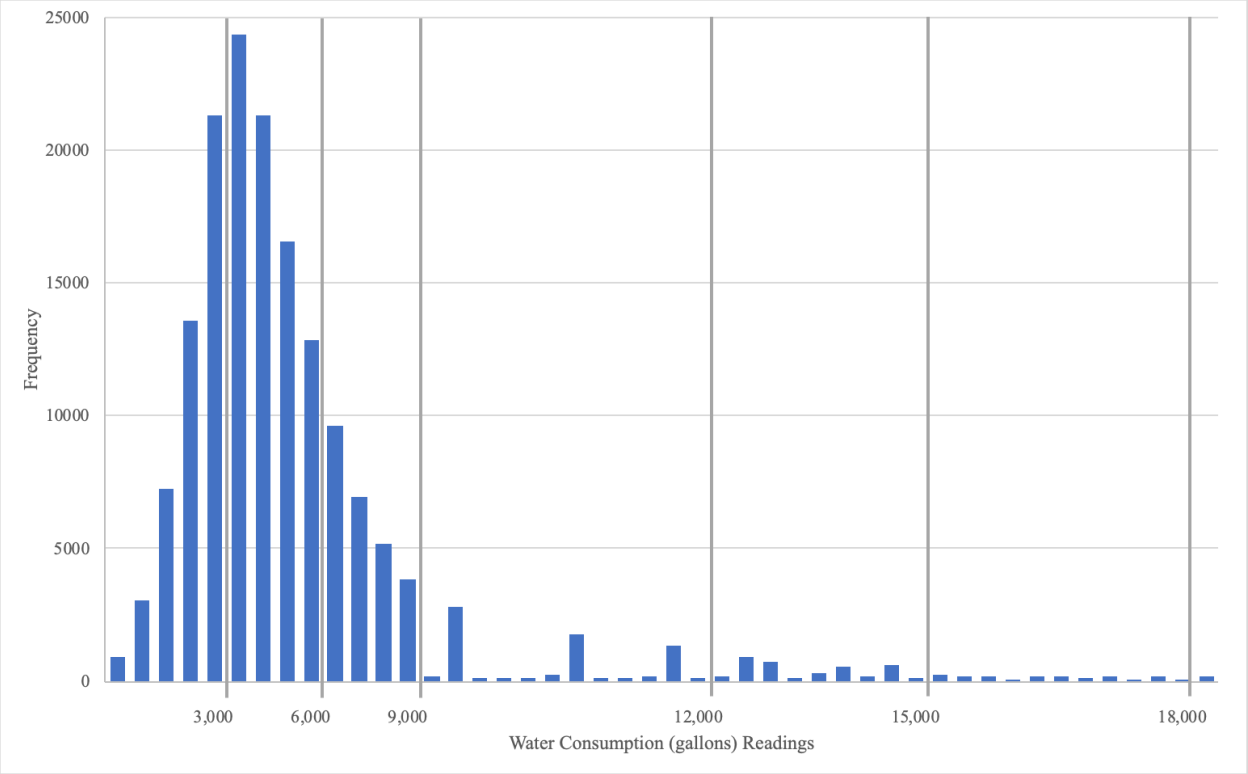


Figure 2. Distribution of water consumption readings (in gallons).

2.4 Monthly Water Consumption

Overall, households used an average of 5,790.93 (*SD*= 1,862.03) gallons of water per month throughout the 23-month examination period. This corresponds to approximately 183 gallons per day, across all months. Figures 3 shows a clear seasonal trend, such that average water consumption peaked during the summer months. The seasonal trends resulted in a 29% increase in water consumption during the summer months of 2018 and 2019 (increases of ~1,535.88 and ~1,445.28 monthly gallons, respectively).

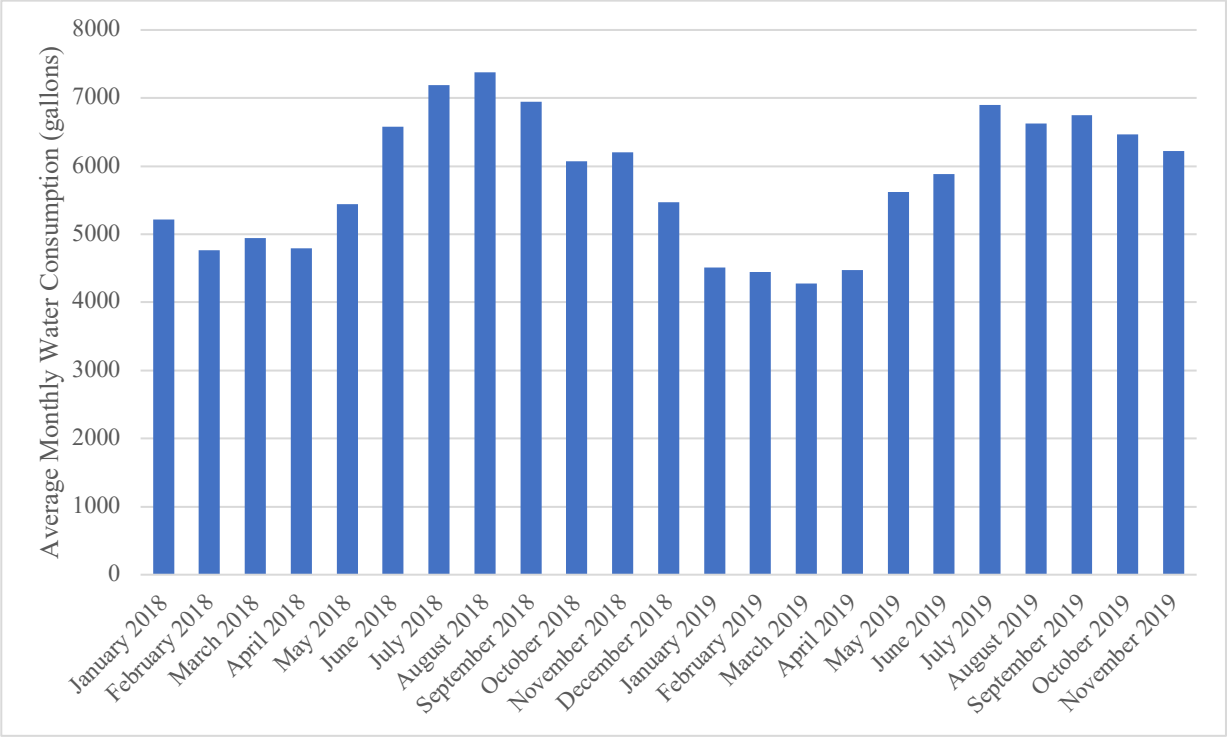


Figure 3. Overall monthly water consumption patterns from January 2018 – November 2019.

Although the seasonal trends are apparent in both 2018 and 2019, with peak water consumption occurring during the summer months, the results did evidence a reduction in the amount of monthly water consumption from 2018 to 2019. The change in consumption is illustrated by calculating the change in water consumption from individual months in 2019 from these same months in 2018. Figure 4 displays these changes, such that average water consumption was lower in 2019 compared to 2018 for a majority of months. There were exceptions for May, October, and November of 2019, which showed higher levels of consumption in 2019, compared to 2018.

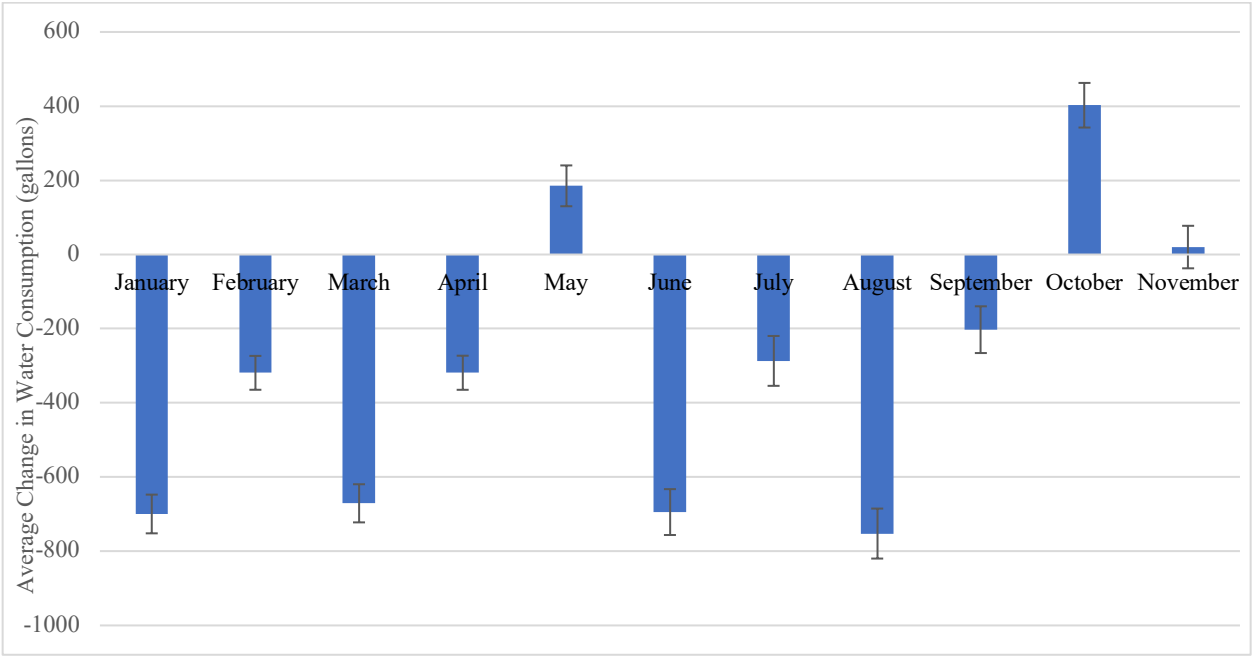


Figure 4. Overall average change in monthly water consumption from 2018 to 2019. Note. Error bars represent 95% confidence intervals. Negative scores indicate that less water was used in 2019 than in the same month of 2018.

Although seasonal trends are apparent in both years, this analysis of differences shows an overall decrease in water consumption, even during the peak seasons. The raw monthly differences in water consumption are shown below in Table 3. On average, households used 303 fewer gallons in 2019 than in 2018, a reduction of 5%.

Table 3. Average change in monthly water consumption from 2018 to 2019.

	2018 Monthly Average	2019 Monthly Average	Monthly Average Change	95% CI [lower, upper]
January	5212	4513	-699 (27)	[-752, -647]
February	4769	4450	-319 (23)	[-365, -273]
March	4946	4275	-671 (26)	[-722, -619]
April	4791	4472	-319 (23)	[-365, -273]
May	5439	5625	186 (28)	[130, 240]
June	6581	5887	-694 (33)	[-756, -633]
July	7188	6901	-287 (34)	[-354, -220]
August	7379	6627	-752 (34)	[-820, -685]
September	6948	6745	-203 (32)	[-266, -140]
October	6069	6471	402 (31)	[342, 463]
November	6206	6227	21 (29)	[-37, 77]

Note. The fourth column represents 95% confidence intervals for average change scores. Standard errors for monthly average change are presented in parentheses. Sample size across all months = 6,945.

2.5 Home Water Reports

The seasonal trends in water consumption reported above were found for households in the control and for those in the report condition (Figure 5). The launch of the WaterSmart pilot in March 2019 is also represented in the Figure.

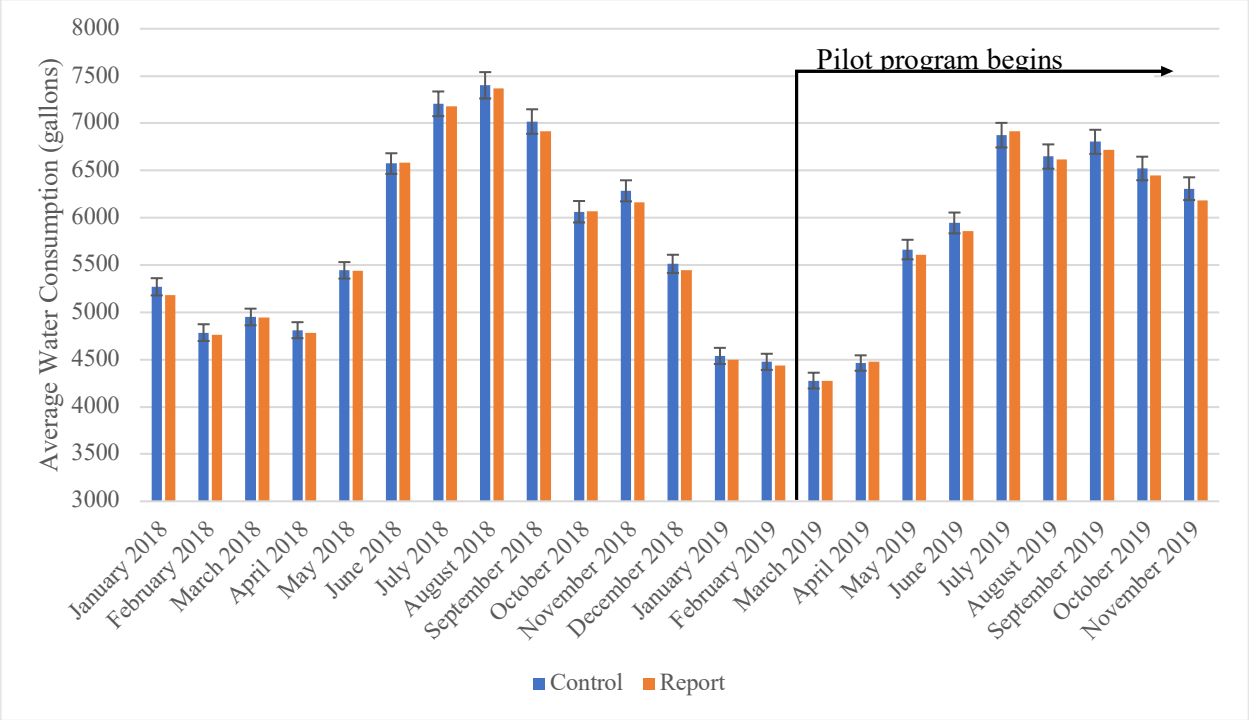


Figure 5. Average monthly water consumption for all households that received monthly water reports, compared to control households. Note: error bars represent 95% confidence intervals for the control condition.

Table 4 below displays the average monthly consumption for both groups, as well as the difference between the two. This difference score represents, on average, how much more or less water households in the report group used compared to the control group. Thus, a negative difference score represents less water consumption in the report group, whereas a positive score represents more water consumption.

Although the households in the report condition showed a trend toward less water consumption than households in the control condition, these differences failed to reach statistical significance. As shown in the Table below, the one month where water report households did differ significantly from the control occurred in November. However, the difference appeared in both November 2018 and November 2019, suggesting that the difference is due to features of the household, and cannot be attributed to the home water reports themselves.

Table 4. Comparison of average monthly water consumption for control and report accounts.

	Control		Report	Difference
January 2018	5270	[5180, 5360]	5183	-87
February 2018	4785	[4699, 4871]	4761	-24
March 2018	4950	[4863, 5038]	4944	-7
April 2018	4810	[4726, 4895]	4780	-30
May 2018	5444	[5356, 5532]	5437	-6
June 2018	6573	[6463, 6684]	6585	11
July 2018	7206	[7076, 7336]	7179	-27
August 2018	7402	[7262, 7541]	7368	-33
September 2018	7018	[6890, 7147]	6912	-106
October 2018	6064	[5951, 6176]	6071	7
November 2018	6285	[6174, 6396]	6167*	-118
December 2018	5513	[5417, 5608]	5449	-64
January 2019	4538	[4453, 4623]	4500	-38
February 2019	4476	[4390, 4562]	4437	-39
March 2019	4277	[4192, 4362]	4274	-3
April 2019	4463	[4381, 4545]	4476	13
May 2019	5664	[5560, 5767]	5605	-58
June 2019	5945	[5836, 6054]	5857	-88
July 2019	6874	[6744, 7004]	6915	41
August 2019	6648	[6520, 6775]	6617	-31
September 2019	6804	[6679, 6929]	6716	-88
October 2019	6522	[6399, 6645]	6445	-76
November 2019	6308	[6189, 6427]	6186*	-122

Note. 95% confidence intervals for control means are displayed in brackets. The difference values represent the difference in average consumption for the report group compared to the control group (report mean – control mean = difference). Report means that are smaller than the control's lower 95% CI (left) are statically significant and indicated by an asterisk. Details are available in Appendix A.

In addition to a direct comparison of monthly water consumption reported above, an additional analysis was conducted using a difference-in-difference approach. In this analysis, year-over-year monthly change in consumption was calculated for each household by subtracting 2018 water usage from 2019 for each account.

In Figure 6 below, the bars represent the increases and decreases in the average amount of water consumption for households in the pilot. First, these results display significant decreases in water consumption during the summer months of 2019, compared to the summer months in 2018. However, these decreases occurred throughout all households in the pilot and there were no significant differences between households that received monthly reports and households in the control condition.

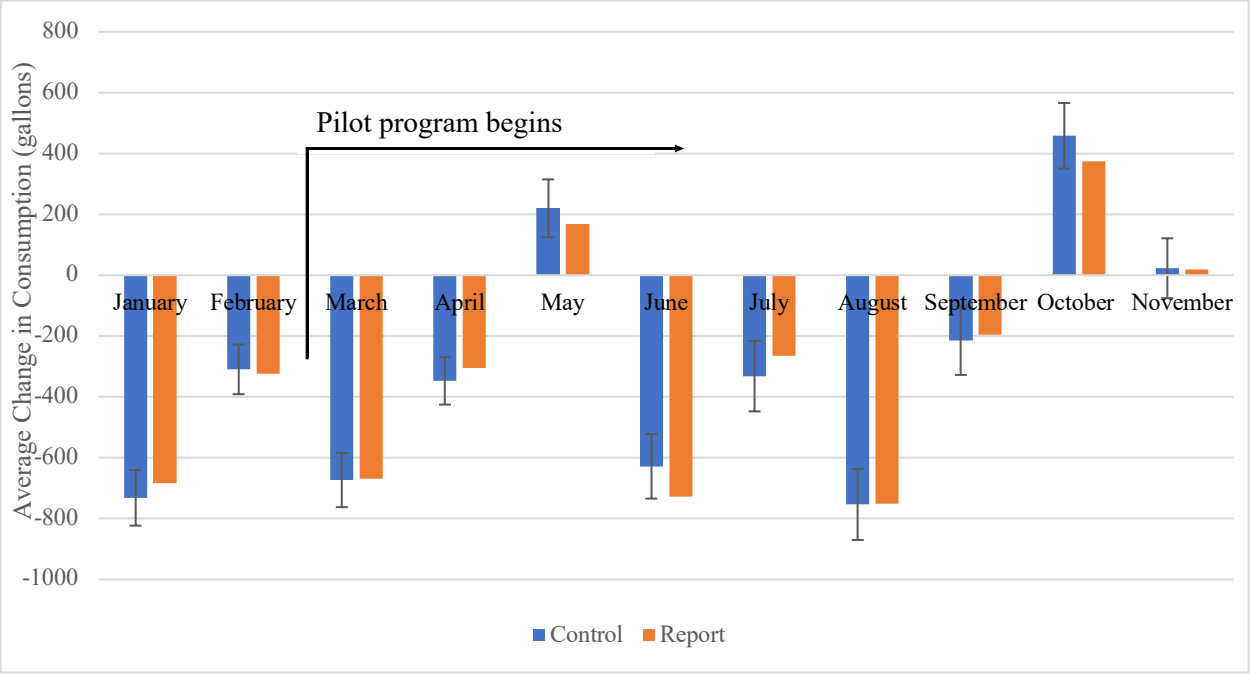


Figure 6. Changes in gallons of water consumption from 2018 to 2019 for households that received monthly water reports, compared to households that did not receive reports. Note: error bars represent 95% confidence intervals for the control condition.

To get an aggregated comparison of the program, average water consumption was compared during the 8-month pilot intervention period (April – November 2019) and the same 8-months of baseline in the year prior (April – November 2018). Although the results evidenced significant decreases in average water consumption across both conditions, the decreases were not significantly different between conditions (Table 5).

Table 5. Comparison of average water consumption during baseline and intervention reporting periods.

	Control	Report	Difference
Baseline	6350 [6260, 6440]	6312	-38
Intervention	6154 [6060, 6246]	6102	-52

Note. 95% confidence intervals for control means are displayed in brackets. The difference values represent the change in average consumption from 2018 to 2019 for the report group compared to the control group (report mean – control mean = difference). Details available in Appendix A.

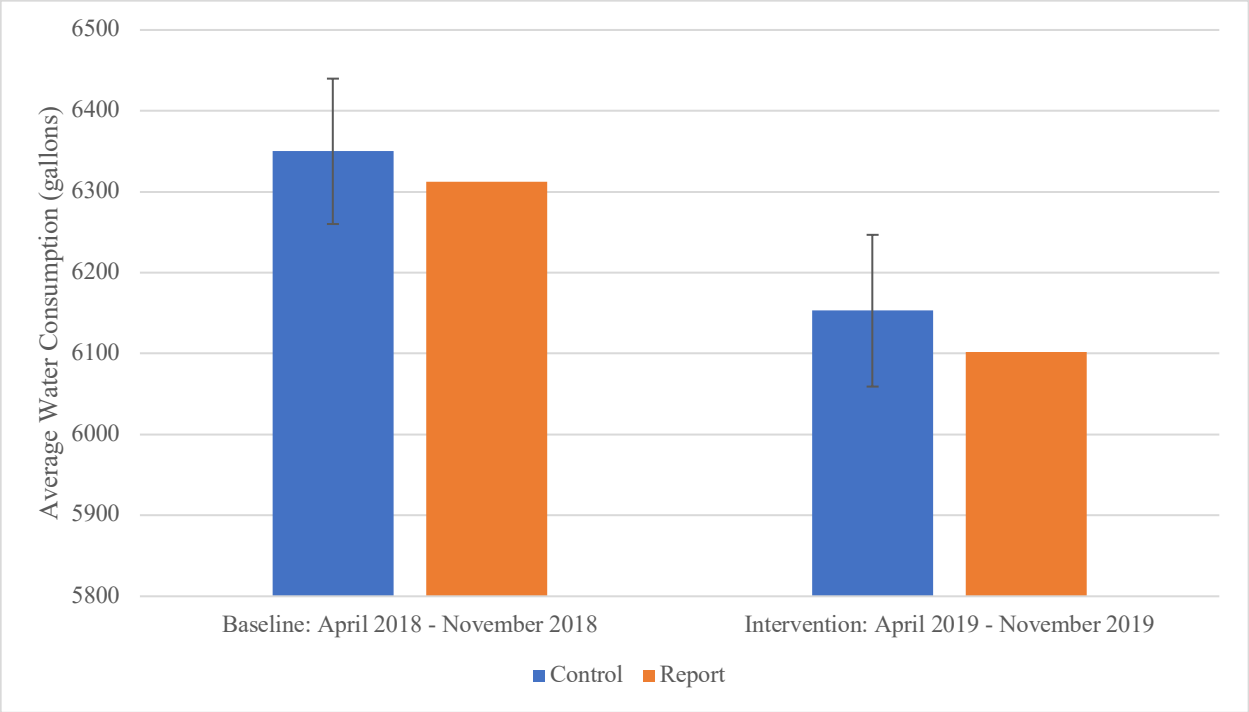


Figure 7. Average water consumption during 8-month reporting period at baseline and intervention. Note. Error bars represent 95% confidence intervals.

2.6 Highly Engaged Accounts

All residents receiving the monthly water reports were given the option to register online through the WaterSmart portal to receive their reports via email, rather than printed through postal mail. Residents that accessed the online portal were given additional water conservation materials and were thus categorized as more engaged. This next section of the report distinguishes between households that received printed monthly reports (report condition) and households that registered to receive the reports online (registered condition), in comparison to households from the control condition.

Of the 4,617 households that received monthly water reports, 838 registered online to receive their reports through the WaterSmart website during the course of the pilot program. This represents an 18% sign-up rate. Figure 8 below displays the pattern of monthly sign ups. As shown in the Figure, the largest number of signups occurred in the first month (more than 300), with smaller numbers of signups continuing throughout the program.

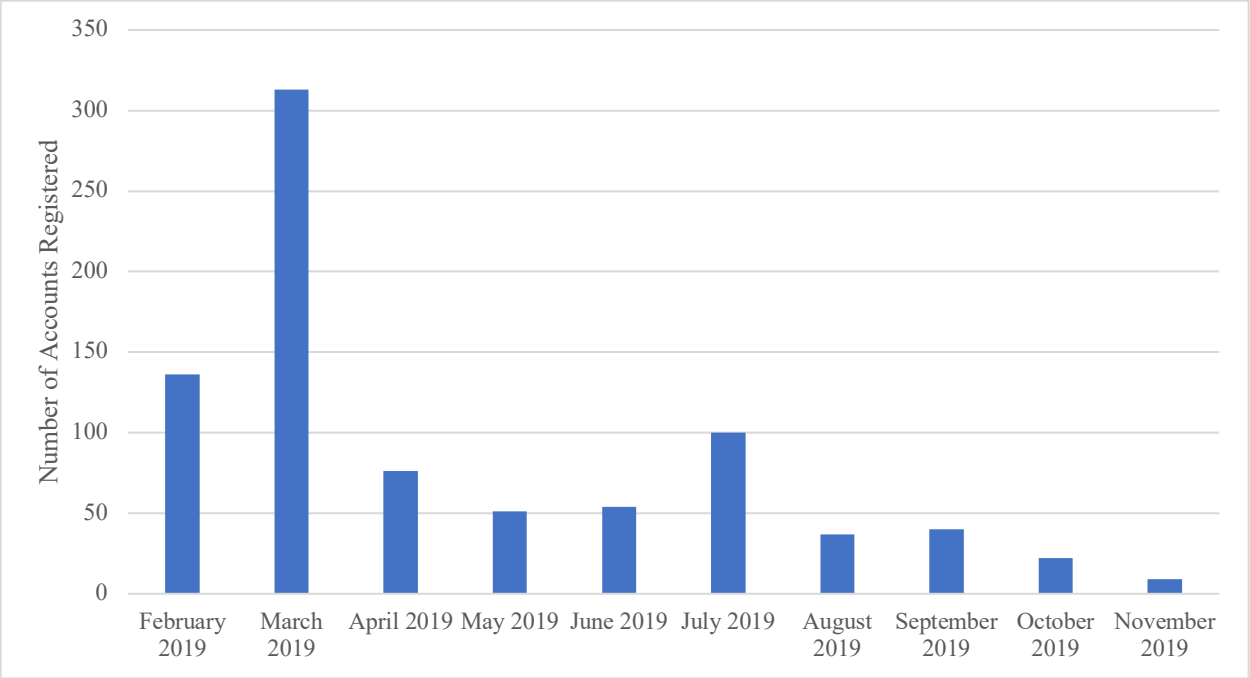


Figure 8. Number of accounts registered online each month.

Most of the accounts that registered online did so using a desktop (78%) rather than a mobile device (22%). In addition, most of the accounts only accessed the online portal one time and did not sign in again after initially registering (Figure 9). For the accounts that did sign-in after initially registering, the sign-in average was low (*M*= 1.67 times). This suggests that after the initial account registration, most account owners didn't access the online portal a second time.

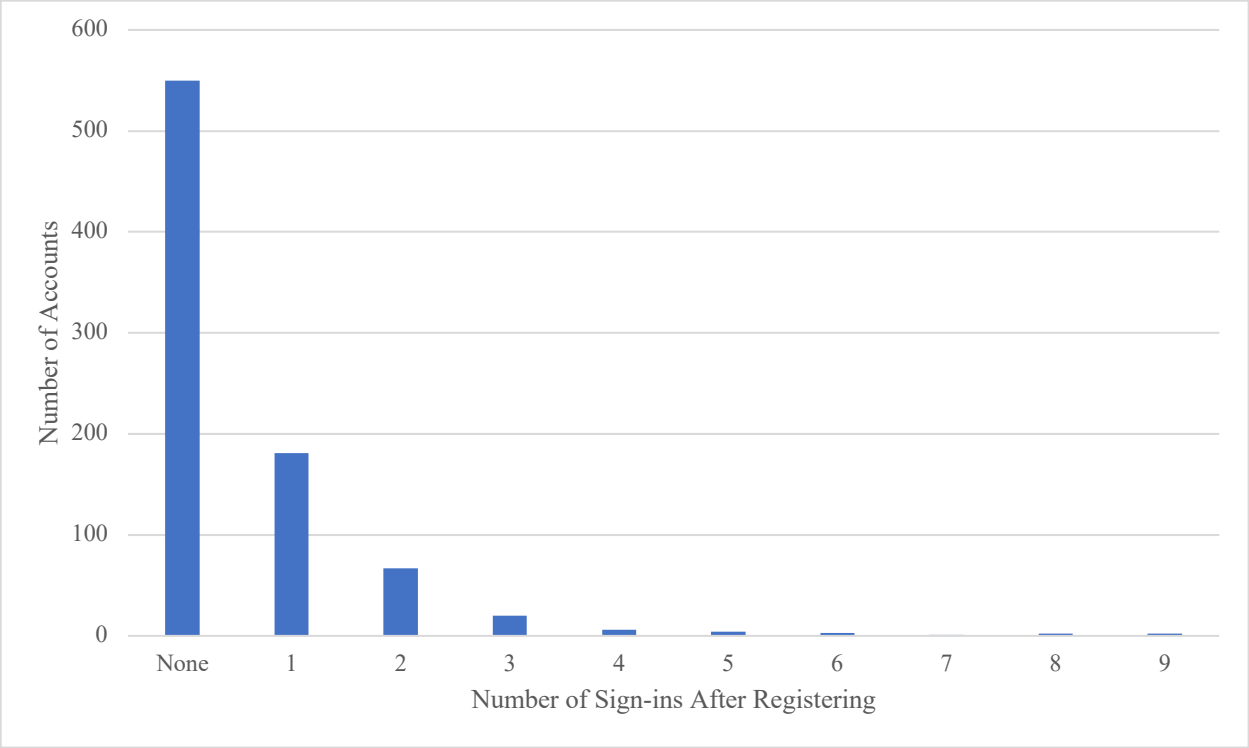


Figure 9. Frequency of sign-ins after initial account registration.

Figure 10 (and Table 6) displays the overall patterns of monthly water consumption across all three conditions. As shown in the figure, households with higher levels of water consumption during the summer months were more likely to register for the WaterSmart portal. Interestingly, these households also used the least amount of water during the winter and fall months.

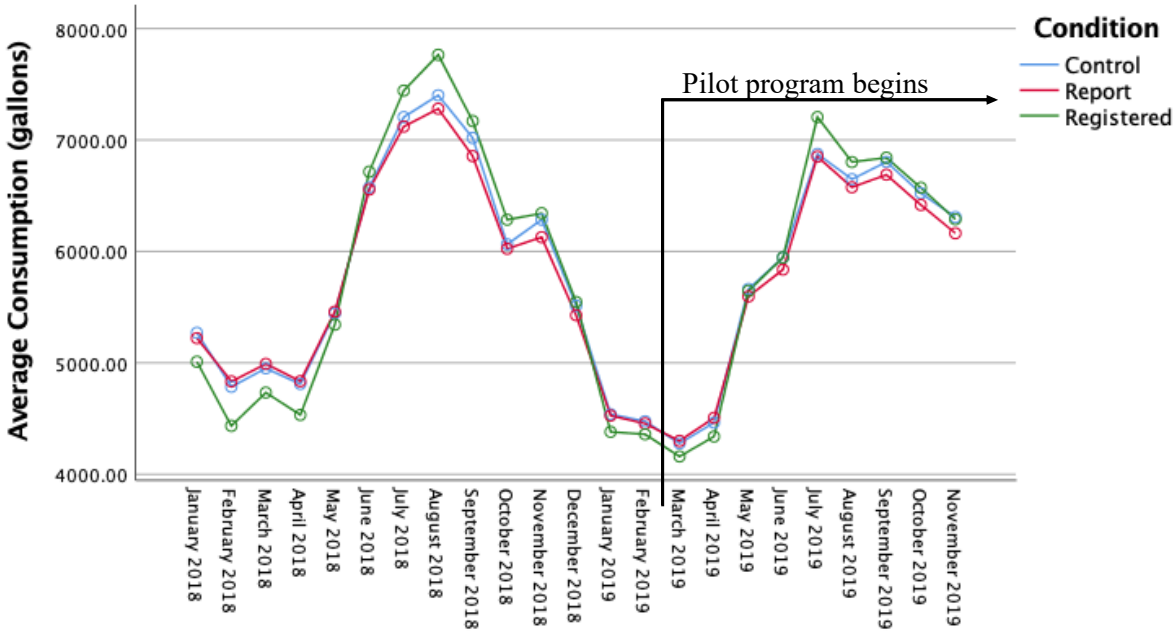


Figure 10. Patterns of average monthly water consumption by condition.

Table 6. Patterns of average monthly water consumption across all three conditions.

	Control		Report	Registered
January 2018	5270	[5180, 5360]	5222	5010*
February 2018	4785	[4699, 4871]	4833	4435*
March 2018	4950	[4863, 5038]	4990	4733*
April 2018	4810	[4726, 4895]	4835	4533*
May 2018	5444	[5356, 5532]	5458	5343*
June 2018	6573	[6463, 6684]	6556	6715
July 2018	7206	[7076, 7336]	7120	7443
August 2018	7402	[7262, 7541]	7280	7764
September 2018	7018	[6890, 7147]	6855*	7170
October 2018	6064	[5951, 6176]	6024	6285
November 2018	6285	[6174, 6396]	6128*	6343
December 2018	5513	[5417, 5608]	5427	5547
January 2019	4538	[4453, 4623]	4526	4381*
February 2019	4476	[4390, 4562]	4455	4359*
March 2019	4277	[4192, 4362]	4300	4160*
April 2019	4463	[4381, 4545]	4506	4339*
May 2019	5664	[5560, 5767]	5596	5646
June 2019	5945	[5836, 6054]	5837	5946
July 2019	6874	[6744, 7004]	6850	7206
August 2019	6648	[6520, 6775]	6575	6802
September 2019	6804	[6679, 6929]	6688	6841
October 2019	6522	[6399, 6645]	6418	6571
November 2019	6308	[6189, 6427]	6163*	6288

Note. 95% confidence intervals for control means are displayed in brackets. Significant differences ($p < .05$) are indicated by an asterisk. Details available in Appendix B.

An additional analysis was conducted using a difference-in-difference approach, based on changes in monthly water consumption from 2018 to 2019 (Figure 11). These results showed that overall, households across all three conditions used less water in 2019 compared to their consumption levels in 2018. Figure 11 shows the differences between conditions across the 11-month period, with households in the report and registered conditions receiving their first report in March.

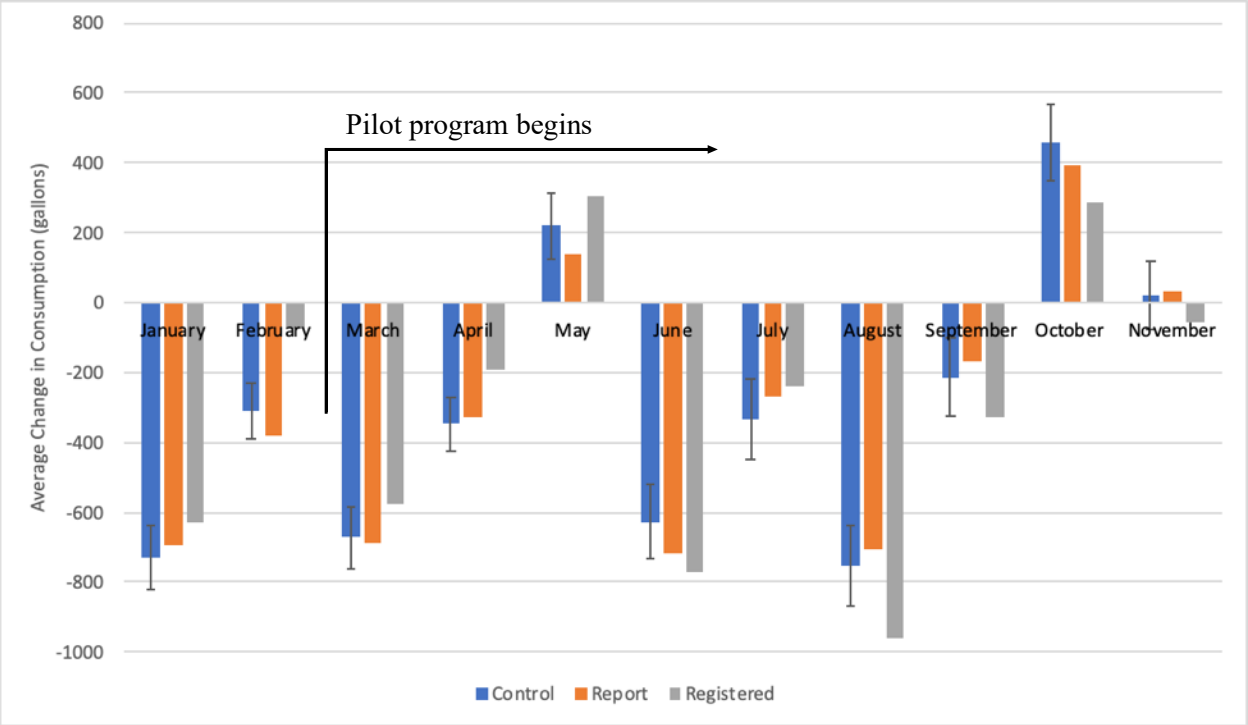


Figure 11. A comparison of changes in gallons of water consumption across all three conditions. Note: Error bars represent 95% confidence intervals.

The results in Figure 11 (above) show that during the first two months in which the reports were sent (March and April), there was a stronger decrease in consumption for households in the control condition compared to the registered condition. However, the results showed significantly less water consumption among the registered households in June, August, September, and October 2019, compared to households in the control condition.

To get an aggregated comparison of the program, average water consumption during the 8-month pilot period (April – November 2019) and the same 8-months in the year prior (April – November 2018) were compared to examine any pre- and post-intervention differences between conditions. The results showed significant decreases in average water consumption across time, with less water use in 2019 than in 2018. However, there were no significant differences in consumption between the three groups (control, water report, registered). (Figure 12).

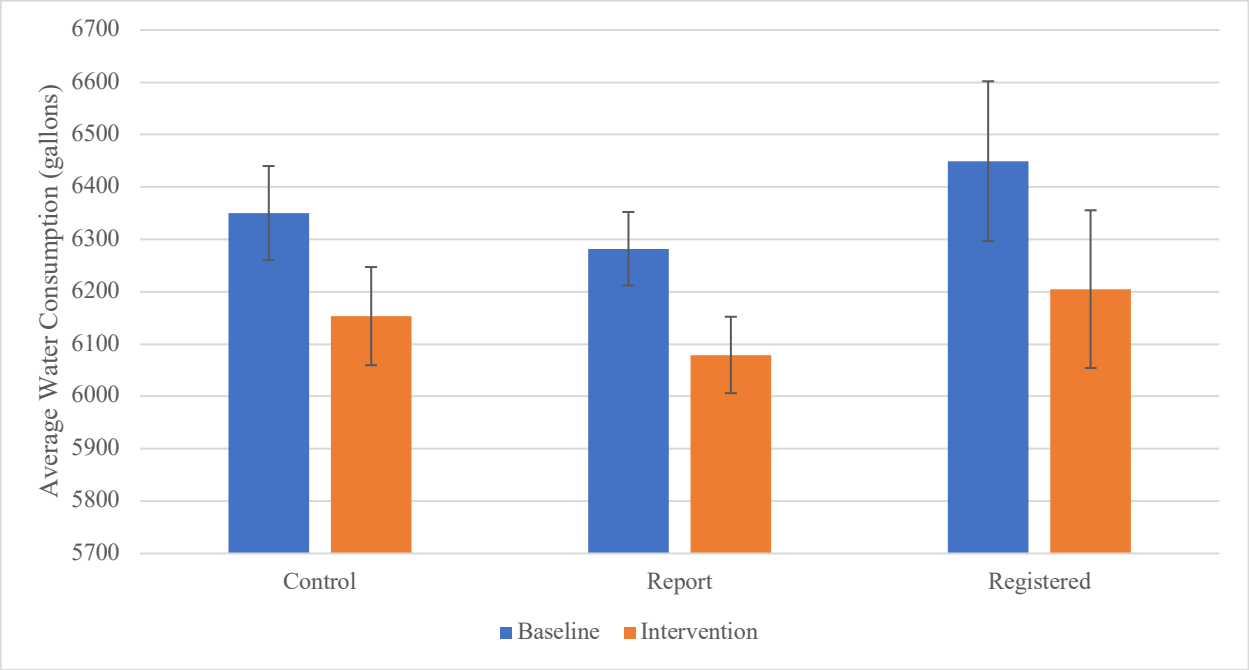


Figure 12. Comparison of average water consumption during baseline and intervention reporting periods. Note. Error bars represent 95% confidence intervals.

When comparing the baseline and intervention periods, the results showed an average 3% decrease in water consumption for the overall sample, with the strongest decreases for households that registered through the online platform (Figure 13). However, the differences were not statistically significant.

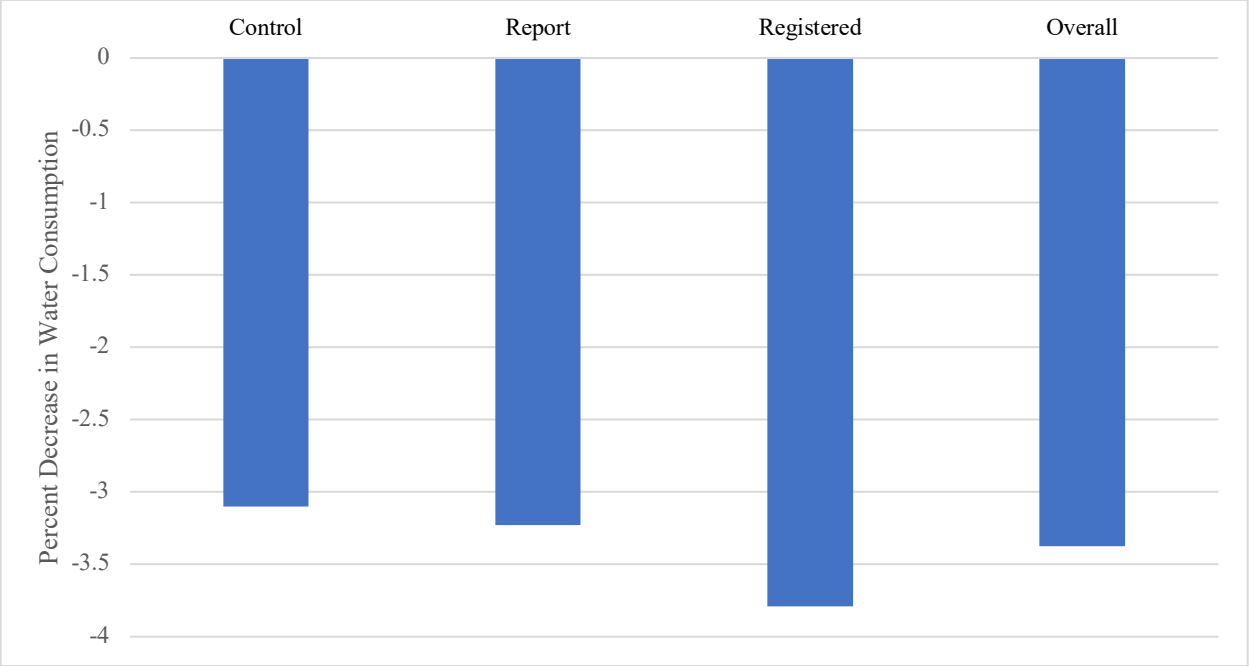


Figure 13. Overall water savings from baseline to intervention periods.

2.7 Water Consumption Summary

Yearly seasonal trends were evident throughout the pilot period, with the residential consumption peaking during the summer months. The pattern of consumption also showed a significant decrease in average consumption during the peak season in 2019, compared to 2018. Additionally, households with the highest levels of consumption during the peak season were more likely to register through the online platform. Further, as a result of this high engagement, these households also had significant decreases in water consumption during the peak season, compared to homes in the control condition. While households receiving the printed reports were trending in a similar direction, their decreases failed to reach statistical significance.

These results suggest that high consuming households may be more motivated to reduce their consumption and as a result are more likely to utilize the online portal. Importantly, these results persist through the summer months, a time when these households usually consume the highest amount of water.

3. Customer Engagement Survey

A short (~7-10 minute) customer engagement survey was used to evaluate customer experiences with the WaterSmart reports and the accompanying web portal. This survey was constructed and distributed through an online platform (Qualtrics), in which customers were contacted by email and provided with a direct link to the survey. This portion of the report summarizes the construction, outreach and distribution, and results of this survey.

3.1 Survey Outreach and Distribution

The survey was conducted following the last report distribution during late November – early December 2019. The survey was implemented using the Tailored Design Method, including a pre-notification, survey, and three follow-up contacts (Dillman, Smyth, & Christian, 2016). All survey communications were tailored to the assigned condition and distributed to account owners using 2,914 email addresses provided by the City.

A pre-notification email was sent to inform residents that they would soon receive a survey from the City of Santa Cruz Water Department. For accounts in the control condition, this brief message informed residents that they would receive a survey about residential water use and their opinions of the City of Santa Cruz Water Department. Accounts that received monthly reports were sent an identical communication, with mention about the monthly water reports.

From the pre-notification communication, 125 emails bounced and were not contacted again. Two days after the pre-notification, the survey was distributed to all available accounts, followed by a series of three emailed reminders that were sent to accounts that had not yet started the survey. The reminder emails prompted the account owners to participate in the survey using the link embedded in the text. Follow-up reminders were sent on the 3rd, 5th, and 10th days following the initial survey launch. The survey response pattern is shown below (Figure 14). Overall, the protocol achieved a 37% response rate.

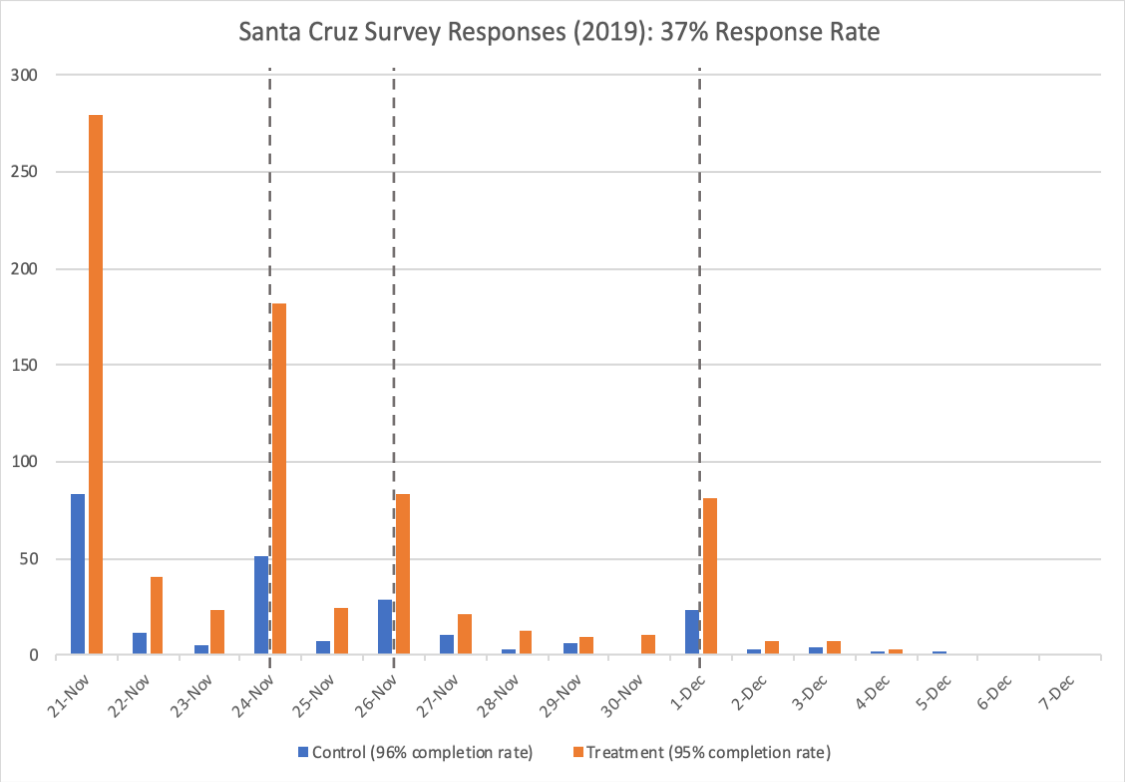


Figure 14. Survey response patterns. Note. The survey was first distributed on November 21st, followed by 3 survey reminders (indicated by vertical dashed lines).

Of the 2,789 successful survey distributions, responses were obtained from 1,025 accounts. Any surveys that were less than 50% complete were removed, resulting in survey responses from 905 accounts (see Table 7).

Table 7. Overall distribution of surveys by condition.

	Control	Report	Registered	Total
Initial sample	853	1,178	883	2,914
Bounced emails	62	37	26	125
Successful emails	791	1,159	839	2,789
Account responses	240	332	453	1,025
< 50% complete	35	49	36	120
Partial	9	23	13	45
Complete	196	260	404	860
Final Survey Count	**205**	**283**	**417**	**905**

Note. The survey analysis for the number of bounced and successful emails was unable to distinguish between the report and registered conditions, thus the numbers were estimated based on the ratio of registered accounts to report accounts.

3.2 Survey Construction and Results

The customer engagement survey was a brief 7-10 minute survey that was available to access through both desktop and mobile devices (including tablets). The survey consisted of eight subsections that assessed knowledge about water usage, overall satisfaction with services provided by the Water Department, feedback about the printed reports (for those who received it), and feedback about the web portal (for those who accessed it).

The survey was developed in a way that provided questions tailored to each account based on the assigned condition. Specifically, questions about the water reports were only presented to accounts that received either printed or online water reports; questions about the online WaterSmart platform were only presented to accounts that registered to receive their reports online. A complete list of survey materials is available at the end of this report (Appendix C).

Section 1: Knowledge of Water Use in Your Home

This first section of the survey assessed knowledge and patterns of household water use. Respondents were asked about the amenities at their house (e.g., 'Do you have a pool?' and 'Do you have an automatic irrigation system?'). Residents were then asked to approximate specific water use activities in their home, such as washing cars, doing laundry, the duration of showers, leak occurrences, and how often and when they typically water their lawns. Respondents were provided with a list of typical household water activities and were asked to estimate the average occurrence of these activities in their home.

The results from this section showed similar responses across conditions, thus, the reported results are reflective of the entire respondent population. Most survey respondents reported not having a pool (94%) and just over half reported having an automatic irrigation system (60%). Reported water consumption activities are shown in Figure 15 below.

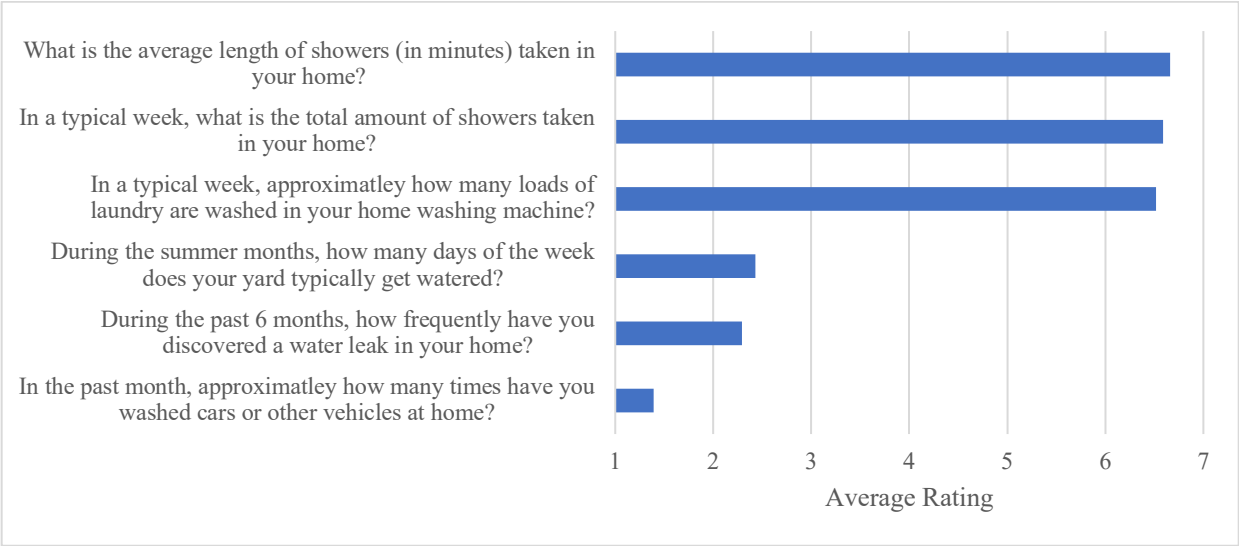


Figure 15. Average ratings for the occurrence of household water consumption activities.

Respondents who indicated having discovered a water leak in their home within the past 6 months were given a follow up question asking how they discovered the leak(s). The most common way in which leaks were discovered was by seeing pooling water (73%), followed by hearing the leak (12%), seeing a large increase in the monthly water bill (12%), or being notified by the city's water department (3%).

This section of the survey also asked about the typical time of day in which residents watered their yard during the summer months. The respondents were given a set of time frames throughout the day and were asked to select multiple timeframes if they watered their yard more than once in a day. The survey found that during the summer months, residents typically watered their yards in the early mornings or evenings. About 10% of the respondents reported not having a yard to water (Figure 16).

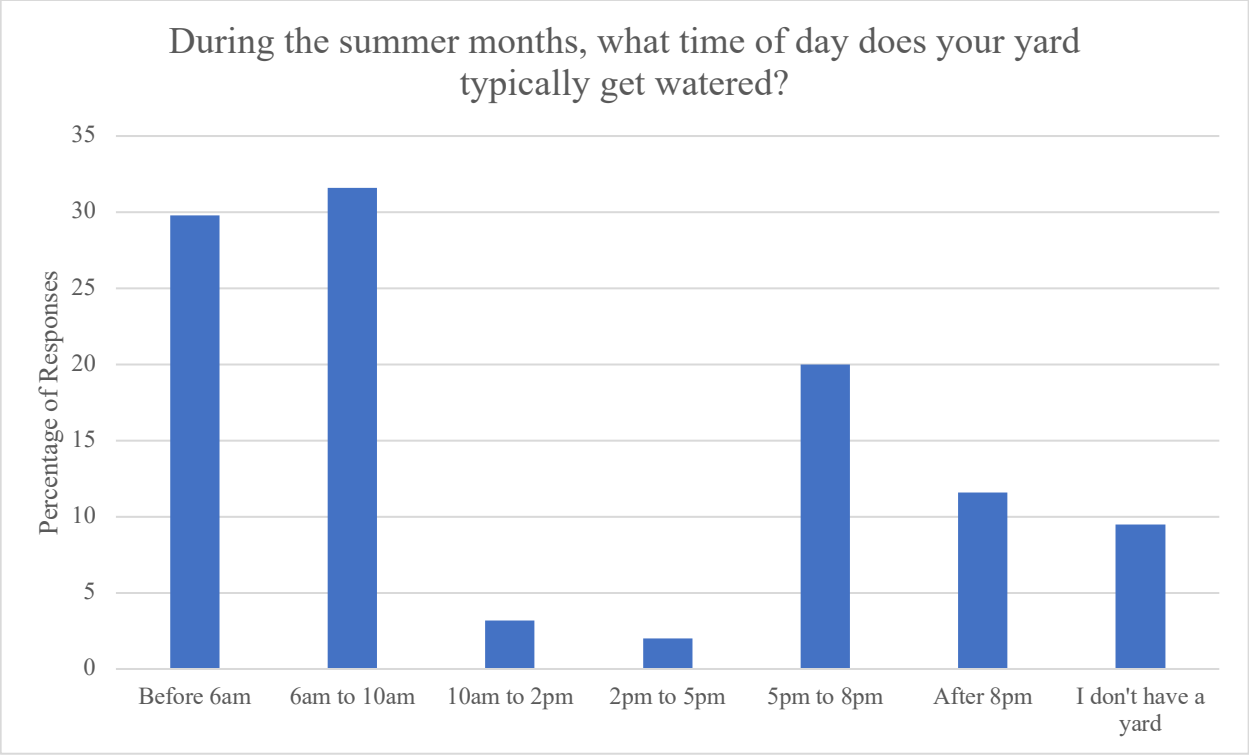


Figure 16. Typical time of day for respondents to water their yards. Note. Respondents had the ability to select more than one time of day in which their yard is typically watered.

Section 2: Knowledge of General Water Use

The second section of the survey asked residents about their knowledge of water use in their home. Respondents were provided with six questions and asked to indicate their knowledge about each of them using a 7-point Likert scale ranging from 1 (very little) to 7 (a great deal). These questions included knowledge about 'water use in your home', 'the cost of water use in your home', 'how water use in your home compares to other similar households', 'where your local water supply comes from', etc.

Overall, respondents reported having a high amount of knowledge about water use in general (Figure 17). Respondents were most knowledgeable about the cost of water use in their home and least knowledgeable about the sources of the water provided by the City, or the state of the local water supply.

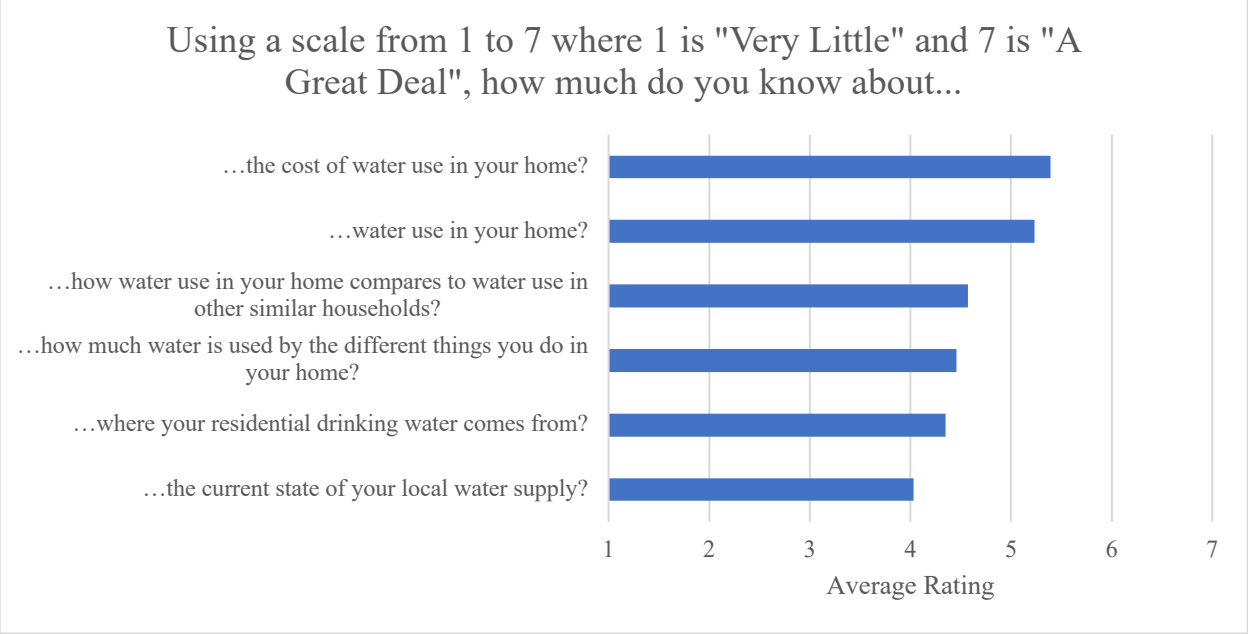


Figure 17. Average knowledge of general water use.

Section 3: Water Saving Activities

The third section of the survey examined engagement in household water saving activities. The respondents were presented with a list of 11 water saving activities and asked to indicate the activities that they had engaged in within the last six months, or if they had done any of the activities prior to the last six months. For each water saving activity, respondents were able to indicate 'Yes' if they had engaged in that activity within the last 6 months, 'No' if they had not engaged in that activity in the last 6 months, 'Previously' if they had done it longer than 6 months ago, or 'N/A' if the activity was not applicable to them.

Of the water saving activities that respondents reported engaging in within the last 6 months, reducing the amount of grass lawn in their yards, repairing dripping faucets, stopping a leaky toilet, and taking shorter showers were the most common. For each of these 4 activities, 25% or more of the respondents reported recently engaging in these behaviors (Figure 18).

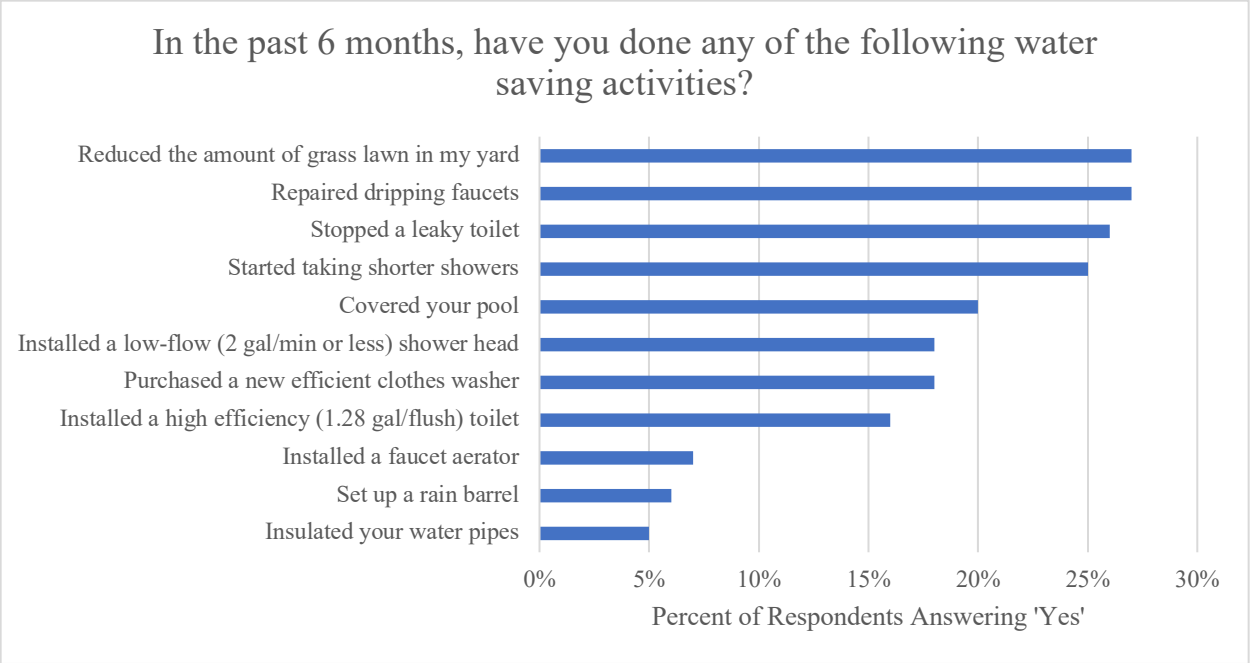


Figure 18. Percent of respondents recently engaging in water saving activities.

A breakdown of the reported engagement in these water saving activities is provided in Table 8. There were also many water saving activities that respondents reported engaging in more than six months ago. In fact, the most common activities that respondents reported already engaging in were those that involved upgrading to more efficient equipment such as a toilet, showerhead, or clothes washer. The least commonly engaged in activities included setting up a rain barrel, insulating the water pipes, and covering the pool.

Table 8. Engagement in household water saving activities.

Activity	'Yes'	'No'	'Previously'	'N/A'
Reduced the amount of grass lawn in my yard	27%	29%	44%	0%
Installed a high efficiency (1.28 gal/flush) toilet	16%	26%	53%	5%
Stopped a leaky toilet	26%	18%	30%	26%
Repaired dripping faucets	27%	19%	28%	25%
Installed a faucet aerator	7%	48%	31%	14%
Started taking shorter showers	25%	39%	30%	6%
Installed a low-flow (2 gal/min or less) shower head	18%	28%	49%	5%
Insulated your water pipes	5%	63%	24%	9%
Purchased a new efficient clothes washer	18%	31%	47%	3%
Set up a rain barrel	6%	76%	13%	5%
Covered your pool	20%	60%	20%	0%

In this section, respondents were also given a list of options for controlling the cost of their water bill and asked to indicate which options they thought were the best strategies. Respondents were able to select more than one option and were also given a free response space to list a strategy that was not already listed. The percentage of responses to the listed strategies are displayed in Figure 20 and a complete list of the free response strategies are listed at the end of this report (Appendix D).

As shown in Figure 19, the results suggest that more than half of the respondents indicated that receiving information about the amount of water use at different times of the day and being able to monitor their water usage through an app as the most favorable strategies for controlling the cost of their water bill. These best strategies were followed by 40% of the respondents in favor of being able to access their water account online. Having the water automatically shut off when usage reaches a pre-determined limit was the least favorable strategy, with only 6% of the respondents in favor of it.

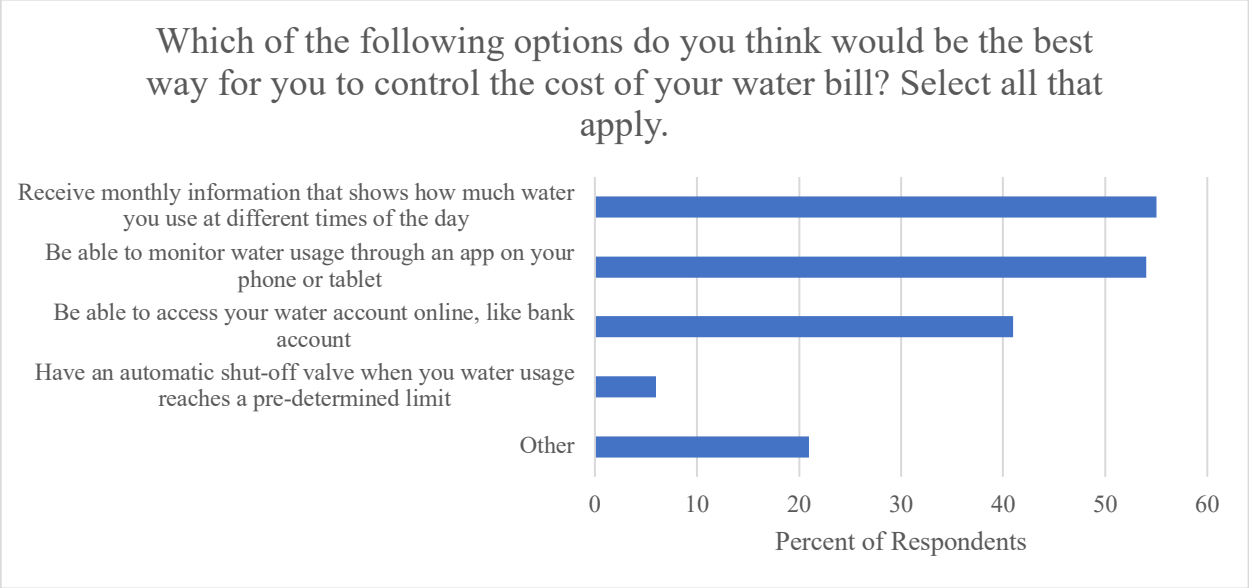


Figure 19. Preferred strategies for controlling the cost of water bills. Note. Bars represent the percentage of respondents that selected each strategy. Respondents were given the ability to choose more than one strategy. A list of other suggested strategies is available in Appendix D.

Section 4: Opinions of the Santa Cruz Water Department

In this section of the survey, respondents were provided with five statements about the City of Santa Cruz Water Department and asked to rate each using a 7-point Likert scale ranging from 1 (strongly disagree) to 7 (strongly agree). These statements included: The Water Department's effort to save residents money, the usefulness of the information the Water Department sends to residents, the justifications for the increases in water rates over the years, and overall satisfaction with the Water Department.

Figure 20 displays the average satisfaction rating for each of the five statements regarding the City of Santa Cruz Water Department. As shown in the Figure, respondents were moderately

satisfied with the City of Santa Cruz Water Department (*M*= 4.8) and acknowledged the Water Department's efforts to save residents money (*M*= 4.3). Both of these average responses were above the mid-point of 4, on the 7-point scale. Further, ratings were high for the information the Water Department sends residents. Respondents had lower satisfaction ratings for the justifications for the increases in water rates over the years (*M*= 3.8), which was below the mid-point of the scale (4).

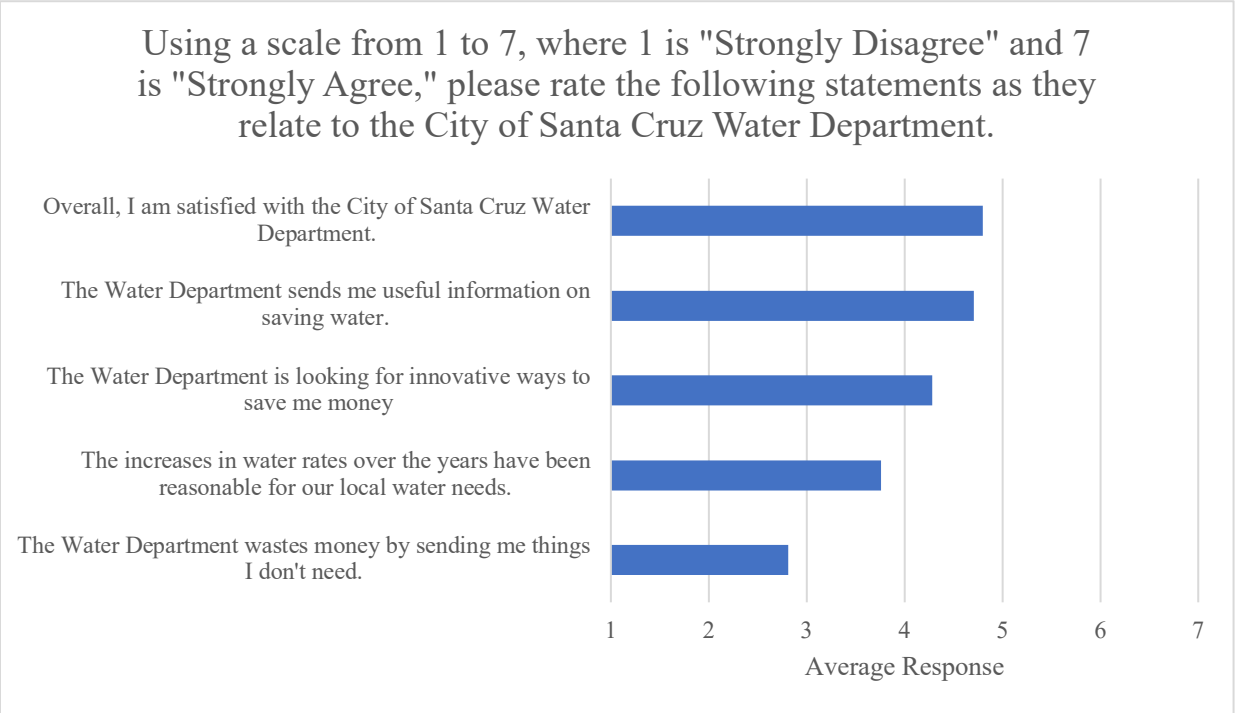


Figure 20. Average ratings for the opinions of the Santa Cruz Water Department. Note. Ratings above 4 are considered satisfied with the Water Department, and ratings below 4 are considered low satisfaction.

Upon completion of this section, respondents in the report conditions were directed to sections five and six of the survey, whereas respondents in the control condition were directed to the last section of the survey. A screening process was used to determine which respondents would have access to sections 5 and 6 of the survey (see Table 9).

Table 9. Screening questions for report recipients.

	Yes	No	No response
[a] Do you remember receiving the water reports?	612	79	9
[b] Did you register through the online website to receive the reports via email?	330	270	12
[c] Did you access the website?	231	446	23

Note. The screening questions are presented in a sequential order and only respondents who answer 'yes' have access to questions about the reports [a] and the online website [b,c].

Section 5: Opinions of the WaterSmart Home Reports

This section of the survey asked about thoughts and opinions regarding the home water reports. This section was only available to accounts that were assigned to received either mailed or online WaterSmart reports. Respondents were first asked if they remembered receiving the water reports. If they indicated that they did remember receiving the reports they continued on to the remaining questions in this section. However, if they indicated that they did not remember receiving the reports they were not asked the remining questions in section five and skipped to the end of the survey (section 7). The remainder of this section asked respondents to rate their opinions of the content of the reports, what they did with the reports after receiving them, their participation in water conservation programs as a result of the reports, and their interests in receiving future reports.

Of the 700 survey respondents that were sent monthly water reports, 13% indicated that they did not remember receiving the water reports or failed to answer the question and were redirected to section 7. The 612 respondents that remembered the reports were asked to rate a series of statements as a reflection of their opinions of the reports (Figure 21).

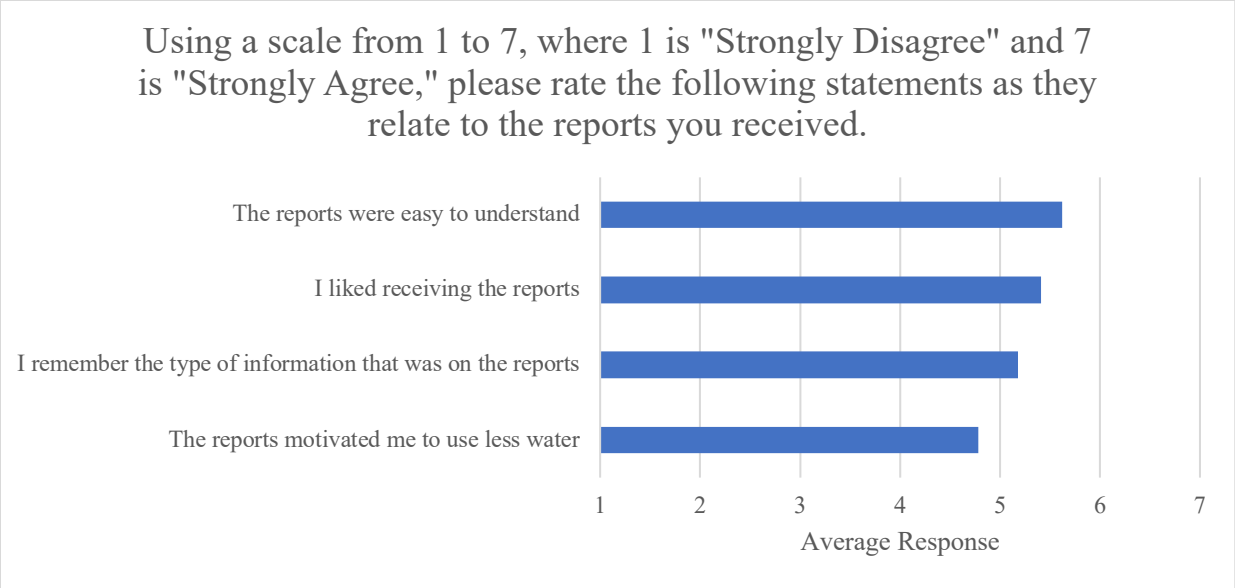


Figure 21. Average ratings for the opinions of the water reports.

Overall, the respondents had favorable ratings for their opinions of the water reports, and respondents liked receiving them (M= 5.4). As shown in Figure 21, the respondents thought the information presented on the reports was easy to understand (M= 5.6), memorable (M= 5.2), and motivating (M= 4.8).

Respondents were also asked to indicate what they did with the reports after receiving them. They were able to choose one of the 4 listed responses, or to select the free response space if none of the listed responses applied to them. Figure 22 shows the percentage of responses.

A majority of the respondents reported reading the reports and discarding them. About 10% of the respondents posted their reports in a common area; mostly in the kitchen or near the washing machine. In the free response category, respondents most commonly reported that they used the reports to spark discussion with the other people living in their home, or that they filed them away for later reference.

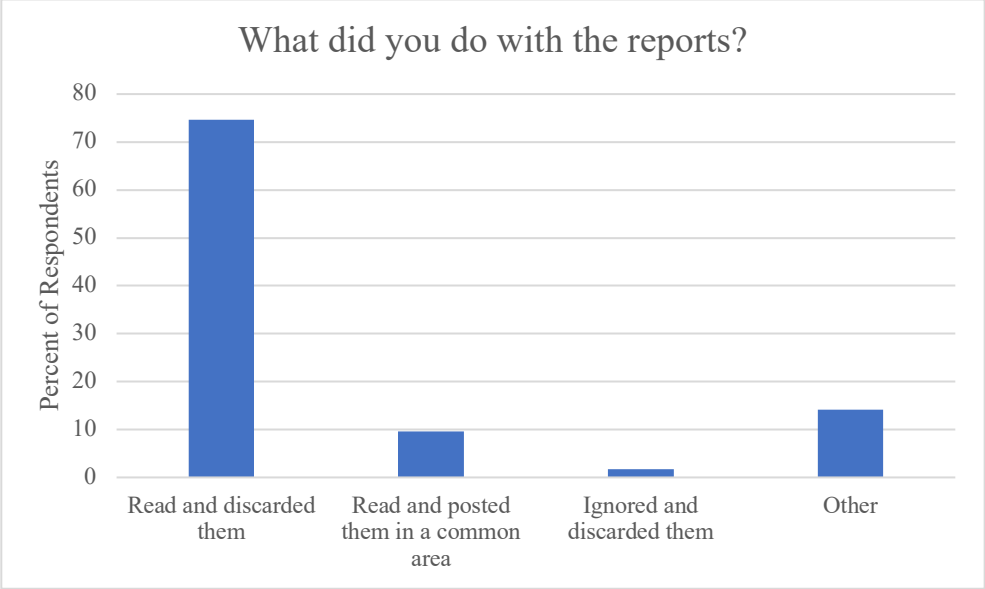


Figure 22. After receiving the reports.

Respondents were also asked if they had participated in any water conservation action as a result of a suggestion on the home water report. The reports motivated 18% of respondents to participate in a water conservation program, most of which were household water saving activities such as taking shorter showers, fixing a leak, or upgrading to water efficient equipment.

The last question in this section stated that the Water Department is considering sending more of these reports in the future, and asked respondents to indicate how often they think the reports should be mailed (Figure 23). According to the Figure, most respondents favored monthly reports and 25% of respondents favored reports every 3 months.

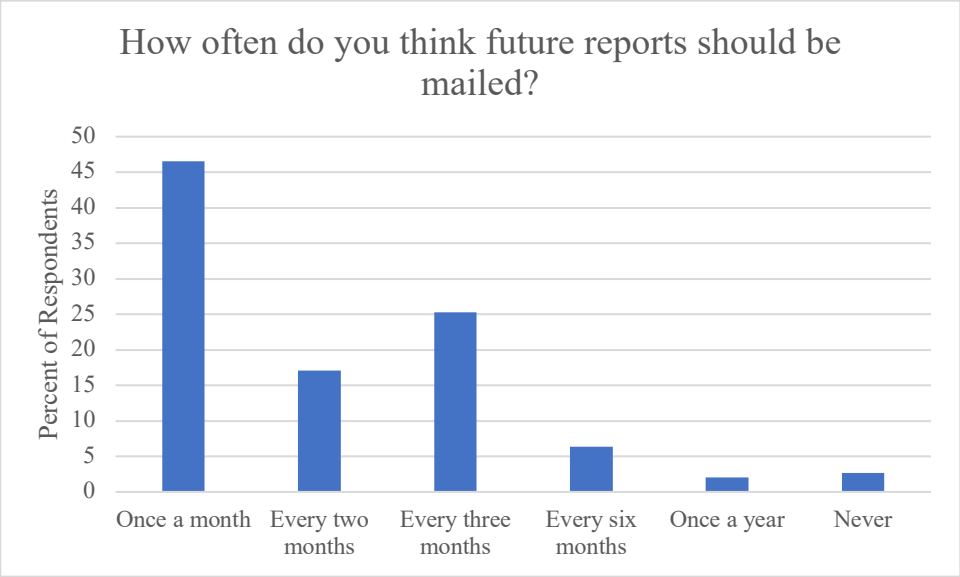


Figure 23. Preferences for the frequency of future reports.

Section 6: Opinions and Access to the Online Website

Section six of the survey asked about the experiences and opinions of the online web portal, from residents that signed in and created an online account. Early on, respondents were asked if they registered through the online website to receive the monthly reports via email. Only the 55% that indicated registering online were able to access the questions in this section. The first question in this section was used to screen out accounts that may have registered but never actually accessed the website. Again, respondents that indicated accessing the website continued to the remaining seven questions in this section, while those who indicated not accessing the website were redirected to section 7.

The remaining questions in this section asked respondents to rate different aspects of the website using a 7-point Likert scale ranging from 1 (not very valuable) to 7 (highly valuable). Lastly, respondents were asked about additional features they would find useful for the website and the degree to which they agree that the online features would be beneficial to more customers in the future.

Most respondents reported using a computer to access the website (88%) and only few accessed it on a mobile device (12%). On average, respondents rated the features of the website as valuable, with month over month comparisons as the most valuable feature, followed by the occurrence of a leak, and customized recommendations for ways to use less water (see Figure 24). Respondents were also given a free response section to indicate valuable website features and the most common responses were billing and payment, neighbor comparisons, and ability to customize household occupancy.

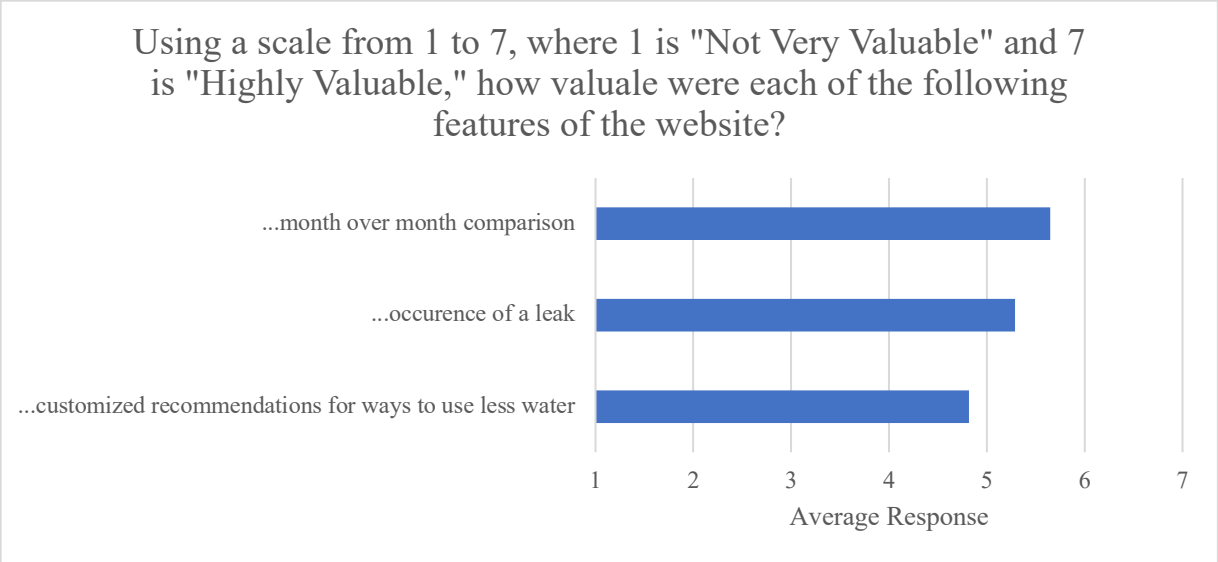


Figure 24. Average ratings for the features of the website.

A final free response section was provided where respondents could indicate other features or information that they would find more useful on the website. The most common responses included, assistance with leak detection, real-time water use, utility specific water use, more specific neighbor comparisons, and email alerts for high usage.

Section 7: Classifications

Section seven of the survey was used to determine the basic demographics and characteristics of the sample such as length of residency, number of individuals living in the household, and approximate size. This section was optional, and respondents had the ability to continue the survey without responding to some or all of the questions in this section.

On average, respondents have lived in their current address for 13 years, have 3 people living in their household (1 of which is under 18 years old), and have 3 bedrooms and 2 bathrooms (see Table 10).

Table 10. Average response to classifications.

Demographic	Average Response
How many years have you lived at your current address?	13
Including yourself, how many people live in your household?	3
How many children under 18 years of age live in your household?	1
How many bedrooms are in your home?	3
How many bathrooms are in your home?	2

3.3 Key Comparisons of Households that Received Reports Compared to Control Households

While the survey results were examined for all survey respondents as a whole, comparative analyses were conducted to examine differences in responses to key sections of the survey across the three conditions (home water reports, water reports and registered through the online portal, or randomized control).

Key Comparison: Household Water Saving Activities

Figure 25 displays the percent of respondents that reported engaging in various water saving activities within the past 6 months, and a detailed breakdown across the three conditions is listed in Appendix E. Surprisingly, households in the registered condition were the least likely to report engaging in water saving activities that involved upgrading to more efficient equipment.

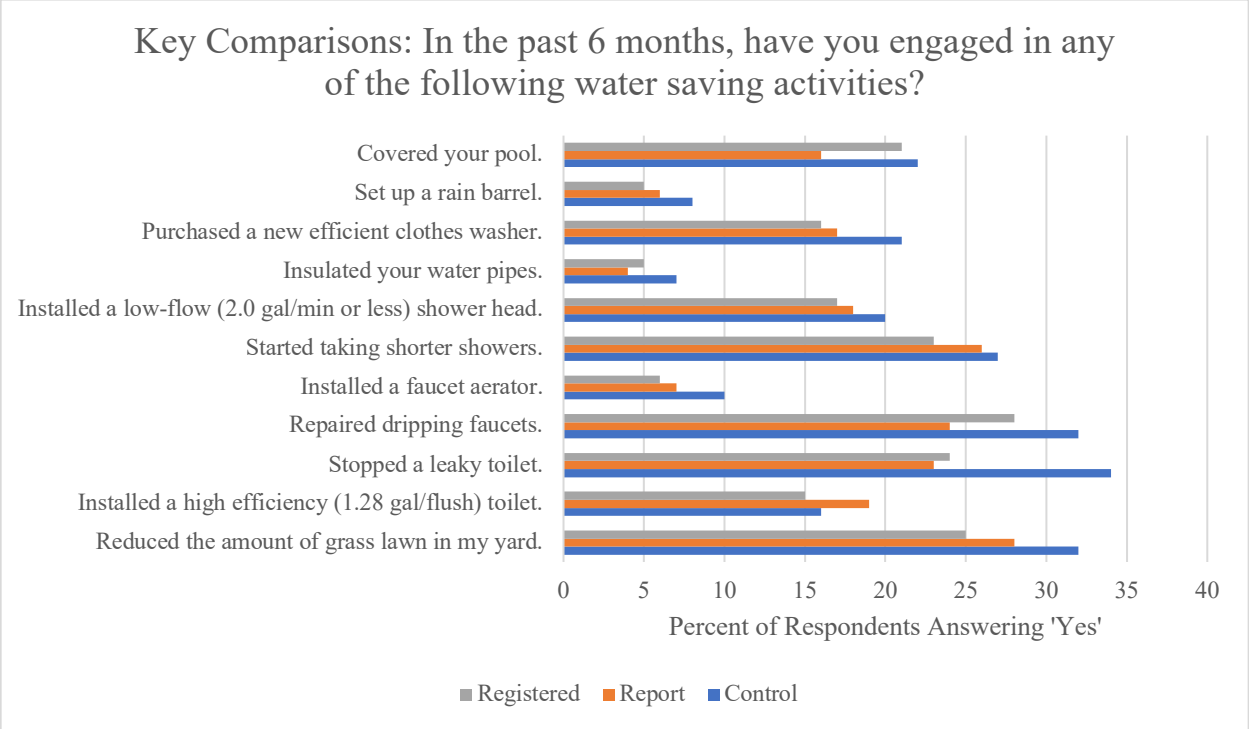


Figure 25. Percent of respondents, by condition, recently engaging in water saving activities. Note. A detailed breakdown of engagement is listed as Appendix E.

Key Comparison: Opinions of the Santa Cruz Water Department

A comparison of opinions across the three conditions is presented in Figure 26. The Figure displays the average rating for each of the 5 statements as they relate to the Santa Cruz Water Department.

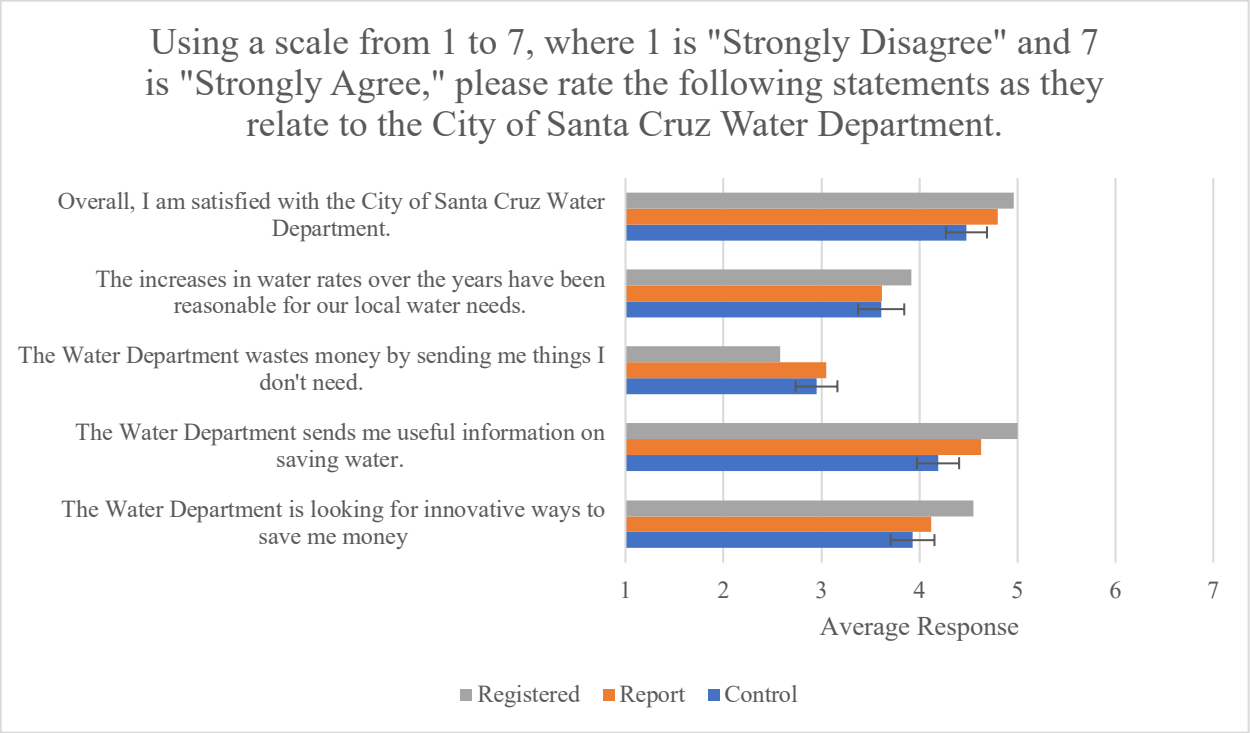


Figure 26. Average ratings, by condition, for the opinions of the Santa Cruz Water Department. Note. Error bars represent 95% confidence intervals.

As shown in Figure 26, respondents that registered online had significantly more positive responses to all statements relating to the Water Department, compared to respondents in the control conditions. Respondents in the report condition showed similar trends in positive ratings, however these ratings were not statistically different than the ratings of the control conditions. While the results are encouraging, the results should be interpreted with caution because of the self-selected nature of registering for the online portal. While it is possible that receiving the reports and registering through the portal could have caused an increase in customer satisfaction, it may also be the case that participants who were originally more satisfied were more likely to try out the new online system and register through the portal. With this caveat in mind, the results do suggest that the WaterSmart reports and web portal may help to cultivate more positive sentiments regarding the services provided the water department.

3.4 Survey Summary

This survey yielded a very high 37% response rate, with the highest percentage of responses coming from registered accounts. On average, respondents reported that taking showers and using the washing machine were the most frequent household water consumption activities, and that their lawns are typically watered in the mornings and evenings during the summer months.

Overall, respondents reported having a high amount of knowledge about general household water use, specifically about the cost of water use in their home. But, they were least knowledgeable about the sources of the water provided by the City, or the state of the local water supply.

The most common water saving activities were reducing the amount of grass lawn in their yards, repairing dripping faucets, stopping a leaky toilet, and taking shorter showers. The least common water saving activities were setting up a rain barrel, insulating water pipes, and covering the pool. To help control the cost of their water bill, residents were most interested in receiving information about their water usage at different times of the day, and being able to monitor it through an app. Having the water automatically shut off when their usage reaches a pre-determined limit was by far the least favorable strategy.

Respondents were moderately satisfied with the City of Santa Cruz Water Department and acknowledged the Water Department's efforts to save residents money. Satisfaction ratings were high for the information they receive from the Water Department and were lowest for the Water Department's justifications for increasing rates over the years.

Overall, satisfaction ratings for the water reports and the online website were high. The respondents liked receiving the reports and rated them as easy to understand, memorable, and motivating. And on average, respondents rated the features of the website as valuable, with month over month comparisons receiving the highest ratings. Assistance with leak detection, real-time water use, utility specific water use, more specific neighbor comparisons, and email alerts for high usage were the most common suggestions for additional information that respondents would like to see on the website.

APPENDIX A

Comparison of average monthly water consumption for control and report accounts (A1)

	Control		Report	
January 2018	5270	[5180, 5360]	5183	[5119, 5247]
February 2018	4785	[4699, 4871]	4761	[4700, 4822]
March 2018	4950	[4863, 5038]	4944	[4881, 5006]
April 2018	4810	[4726, 4895]	4780	[4721, 4840]
May 2018	5444	[5356, 5532]	5437	[5375, 5500]
June 2018	6573	[6463, 6684]	6585	[6506, 6663]
July 2018	7206	[7076, 7336]	7179	[7087, 7271]
August 2018	7402	[7262, 7541]	7368	[7269, 7467]
September 2018	7018	[6890, 7147]	6912	[6821, 7004]
October 2018	6064	[5951, 6176]	6071	[5991, 6151]
November 2018	6285	[6174, 6396]	6167*	[6088, 6246]
December 2018	5513	[5417, 5608]	5449	[5381, 5517]
January 2019	4538	[4453, 4623]	4500	[4440, 4560]
February 2019	4476	[4390, 4562]	4437	[4376, 4498]
March 2019	4277	[4192, 4362]	4274	[4214, 4334]
April 2019	4463	[4381, 4545]	4476	[4418, 4534]
May 2019	5664	[5560, 5767]	5605	[5532, 5678]
June 2019	5945	[5836, 6054]	5857	[5780, 5935]
July 2019	6874	[6744, 7004]	6915	[6823, 7007]
August 2019	6648	[6520, 6775]	6617	[6526, 6707]
September 2019	6804	[6679, 6929]	6716	[6627, 6805]
October 2019	6522	[6399, 6645]	6445	[6358, 6533]
November 2019	6308	[6189, 6427]	6186*	[6101, 6270]

Note. Lower (left) and upper (right) bounds of 95% confidence intervals are displayed in brackets.

Average water consumption during 8-month reporting period at baseline and intervention (A2).

	Baseline	Intervention
Control	6,350 [6,260, 6,440]	6,153 [6,060, 6,246]
Report	6,312 [6,249, 6,376]	6,102 [6,036, 6,168]

Note. Lower (left) and upper (right) bounds of 95% confidence intervals are displayed in brackets.

APPENDIX B

Patterns of average monthly water consumption across all three conditions.

	Control	Report	Registered
January 2018	5270 [5180, 5360]	5222 [5151, 5293]	5010 [4860, 5161]
February 2018	4785 [4699, 4871]	4833 [4766, 4901]	4435 [4291, 4578]
March 2018	4950 [4863, 5038]	4991 [4922, 5059]	4733 [4587, 4879]
April 2018	4810 [4726, 4895]	4835 [4769, 4901]	4533 [4392, 4673]
May 2018	5443.70 [5356, 5532]	5458 [5389, 5527]	5342.83 [5196, 5489]
June 2018	6573 [6463, 6684]	6556 [6469, 6643]	6715 [6531, 6700]
July 2018	7206 [7076, 7336]	7121 [7019, 7222]	7443 [7226, 7659]
August 2018	7402 [7262, 7541]	7280 [7171, 7390]	7764 [7531, 7997]
September 2018	7018 [6890, 7147]	6855 [6754, 6956]	7170 [6956, 7385]
October 2018	6064 [5951, 6176]	6024 [5935, 6112]	6285 [6097, 6472]
November 2018	6285 [6174, 6396]	6128 [6041, 6215]	6343 [6158, 6528]
December 2018	5513 [5417, 5608]	5427.36 [5352, 5502]	5547 [5388, 5706]
January 2019	4538.20 [4453, 4623]	4526 [4460, 4593]	4381 [4239, 4522]
February 2019	4476 [4390, 4562]	4455 [4387, 4522]	4359 [4216, 4502]
March 2019	4277 [4192, 4362]	4300 [4233, 4366]	4160 [4019, 4301]
April 2019	4463 [4381, 4545]	4506.47 [4442, 4571]	4339 [4203, 4476]
May 2019	5664 [5560, 5767]	5596 [5515, 5677]	5646 [5474, 5818]
June 2019	5945 [5836, 6054]	5837 [5752, 5923]	5946 [5764, 6127]
July 2019	6874 [6744, 7004]	6850 [6748, 6952]	7206 [6989, 7422]
August 2019	6648 [6521, 6775]	6575 [6475, 6675]	6802 [6590, 7015]
September 2019	6804	6688	6841

	[6679, 6929]	[6590, 6786]	[6633, 7049]
October 2019	6522 [6399, 6645]	6418 [6321, 6514]	6571 [6367, 6776]
November 2019	6308 [6189, 6427]	6163 [6070, 6256]	6288 [6090, 6486]

Note. Lower (left) and upper (right) bounds of 95% confidence intervals are displayed in brackets below corresponding means.

Appendix C

Survey Pre-Notification (C1)

Dear Santa Cruz Resident,

In the next few days, you will be receiving an email with a unique link to an online survey, which is being conducted on behalf of the City of Santa Cruz Water Department. The survey is about residential water use, the home water use reports, and your opinions of the Water Department. The survey will take approximately 5-7 minutes to complete and your responses will be completely confidential.

Please keep an eye out for the survey. Thank you in advance for your assistance and we look forward to hearing from you.

Survey Launch Communication (C2)

Dear Santa Cruz Resident,

On behalf of the City of Santa Cruz Water Department, I'm pleased to invite you to participate in a survey about residential water use and the home water reports you have recently received. You are one of a small number of Santa Cruz residents being asked to complete this important survey. You will be asked to answer questions about residential water use, the home water use reports, and your opinions of the Water Department. This short survey will take approximately 5-7 minutes to complete and all of your responses are strictly confidential.

To access and complete the survey, please follow the unique link provided below. Thank you in advance and we look forward to hearing from you.

Survey Reminder (C3)

Dear Santa Cruz Resident,

You recently received an email containing a link to a survey that is being conducted on behalf of the City of Santa Cruz Water Department. This is a reminder to complete the survey using the unique link provided. This short survey consists of questions about residential water use, the home water use reports, and your opinion of the Water Department. Follow this link to take the survey.

Again, thank you in advance and we look forward to hearing from you.

Customer Engagement Survey: Condensed Version (C4)

Thank you for taking the time to complete this survey, which is being conducted on behalf of the City of Santa Cruz Water Department. This short survey will take approximately 5-7 minutes to complete and all of your responses are confidential. Please take your time to answer all of the following questions honestly and to the best of your knowledge.

→ Block 1. Knowledge of general water use in your home.

These questions are about general water use in your home.

- Do you have a pool?

- Do you have an automatic irrigation system?
- In the past month, approximately how many times have you washed cars or other vehicles at home?
- In a typical week, approximately how many loads of laundry are washed in your home washing machine?
- In a typical day, what is the total number of showers taken in your home?
- What is the average length of these showers (in minutes)? (free response)
- During the past six months, how frequently have you discovered a water leak in your home?
- How did you discover the leak? (free response)
- During the summer months, what days of the week does your yard typically get watered? Please select all that apply.
- During the summer months, what time of day does your yard typically get watered? Please select all that apply.

→ Block 2. Knowledge of general water use.

This first set of questions is about water use in general.

Using a scale from 1 to 7 where 1 is "Very Little" and 7 is "A Great Deal", how much do you know about...

- ...water use in your home?
- ...the cost of water use in your home?
- ...how water use in your home compares to water use in similar households?
- ...how much water is used by the different things you do in your home?
- ...where your residential drinking water comes from?
- ...the current state of your local water supply?

→ Block 3. Water saving activities.

This section is about water saving activities that you may or may not have done in your household.

In the past six months, have you done any of the following water saving activities? If you did an activity more than six months ago, please select "Previously". If an activity does not apply to you, select "N/A".

- Reduced the amount of grass lawn in my yard.
- Installed a high efficiency (1.28 gal/flush) toilet.
- Stopped a leaky toilet.
- Repaired dripping faucets.
- Installed a faucet aerator.
- Started taking shorter showers.
- Installed a low-flow (2.0 gal/min or less) shower head.
- Insulated your water pipes.
- Purchased a new efficient clothes washer.
- Set up a rain barrel.
- Covered your pool.

Which of the following options do you think would be the best way for you to control the cost of your water bill? Please select all that apply.

- Receive monthly information that shows how much water you use at different times of day
- Be able to monitor water usage through an app on your phone or tablet Be able to access your water account online, like a bank account
- Have an automatic shut-off valve when your water usage reaches a pre-determined limit
- Other (please explain)

→ Block 4. Opinions of the Santa Cruz Water Department.

The following section asks your opinions of the City of Santa Cruz Water Department.

The City of Santa Cruz Water Department is the local agency that is responsible for your water. Using a scale from 1 to 7, where 1 is "Strongly Disagree" and 7 is "Strongly Agree," please rate the following statements as they relate to the City of Santa Cruz Water Department.

- The Water Department is looking for innovative ways to save me money.
- The Water Department sends me useful information on saving water.
- The Water Department wastes money by sending me things I don't need.
- The increases in water rates over the years have been reasonable for our local water needs.
- Overall, I am satisfied with the City of Santa Cruz Water Department.

→ Block 5. Opinions of mailed WaterSmart home reports.

Over the past six months, you should have received water reports by email or postal mail. These next questions are about those reports.

Do you remember receiving the water reports?

Yes No

Did you register through the online website to receive the reports via email?

Yes, I preferred to receive them via email No, I preferred to receive mailed reports

Using a scale from 1 to 7, where 1 is “Strongly Disagree” and 7 is “Strongly Agree,” please rate the following statements as they relate to the reports you received.

- I remember the type of information that was on the reports.
- I liked receiving the reports.
- The reports were easy to understand.
- The reports motivated me to use less water.

What did you do with the reports?

Read and discarded them Read and posted them in a common area (where?)
Ignored and discarded them Other (please explain)

Have you participated in any water conservation program that you otherwise would not have, as a result of a suggestion on the home water report?

Yes (please explain) No

The City of Santa Cruz Water Department is considering sending more of these reports in the future. How often do you think they should be mailed?

Once a month Every two months Every three months
Every six months Once a year Never

→ Block 6. Opinions and access to the online website.

This next set of questions is about the website that was available to access more information from your water report.

Did you access the website?

Yes No

How did you typically access the website?

Computer Mobile (android, iOS, etc..) Other

Using a scale from 1 to 7, where 1 is “Not Very Valuable” and 7 is “Highly Valuable,” how valuable were each of the following features of the website?

- month over month comparison.
- occurrence of a leak
- customized recommendations for ways to use less water.

What other information on the website was valuable to you? (free response)

The City of Santa Cruz Water Department is considering making the website features available to more customers in the future. Using a scale from 1 to 7, where 1 is "Strongly Disagree" and 7 is "Strongly Agree," how much do you agree that this data is useful to other customers?

What other features or information would you find more useful on the website? (free response)

→ Block 7. Classifications

The questions in this final section are for classification purposes only.

- How many years have you lived at your current address?
- Including yourself, how many people live in your household?
- How many children under 18 years of age live in your household?
- What is the approximate square footage of your home? (free response)
- How many bedrooms are in your home?
- How many bathrooms are in your home?

→ Block 8. Voluntary future participation

The City of Santa Cruz Water Department is continuing to improve our services to customers. Occasionally, we ask residents like you for feedback. If you would be willing to be contacted for future interviews or focus groups about household water usage please provide your contact information below.

- Name:
- Phone:
- Email:

APPENDIX D

Suggestions for controlling the cost of water bills.

` I installed rain barrels a year ago, I have efficient washing machines, I take two minute showers, I go this!
1. Be able to detect leaks by having a real-time indicator of usage (more accessible then under a concrete cover, that requires tools to access) 2. Have information re. water usage and cost of various activities (much like energy usage labels)
70% of our water use goes to grow food. We don't water our "yard". It is not fair that farmers get free or heavily subsidized water and we pay full retail.
9 person house with lots of guests so we doing great
a smarter meter with home automation would be fantastic! Let me set Alexa to alert me or even take action.
A text alert when daily water usage noticeably exceeds the normal pattern.
access real-time water usage online - computer not phone or tablet app - to see when partial and full CCF units are reached.
Actual daily usage would be very useful information to know how much water my irrigation system is using
Already get monthly info and have on=line account access.
Am about to pay for comprehensive eval of my watering system.
Automatic shut off would be a BAD idea. Knowing when a certain level is hit would be helpful. For instance we had an irrigation issue which we found b/c of the increase in our water bill.
Be able to capture my water meter reading electronically at any time without having to go out to the sidewalk, lift the concrete lid, clean out the gopher dirt, and lay on my belly to read the meter.
Be able to measure water usage by activity
Be able to monitor water COSTS (as opposed to usage) in near real-time.
Be able to view water usage per day and receive warnings of high water usage per day, not a month too late.
Be alerted when there is an unexplained increase in water usage.
Be aware of when & how water is used; monitor water usage on bills.
Be evaluated for the correct amount of people living in our home.
Better understanding of how much water is used for each activity. ie. shower vs washing clothes, hand dish washing vs dish washer etc. Also, if I collect rain water runoff, how much storage would I need to really make a difference
Charge users who is less water less money. My usage is far less than my neighbors
check to verify no leaks
City of Santa Cruz provide better quality water containing lower mineral content thereby eliminating the need for a water softener. Resulting in significant reduction in water consumption.
Compare with others with 5 people living in a home and 9,000 sq.ft. lot.
Contact us if water bill is higher than normal
convince my renters to take shorter showers and use laundry less often.
Cut down showering times
Def not an automatic shut off valve! With young children can’t have days without water especially!
determine water consumption by appliance or use
Develop new water sources. No new sources since the 1960's. The only activity has been to increase my water bill and do studies.

Discussion about water use among all five members of our household, 4 adults and one adolescent.
Don't even water lawns or wash cars yet our water usage seems like its always in a higher tier. Impossible. Our lawns died a long time ago, and what was left the gophers ate.
establish leak alerts by email. Using EyeOnWater app where available
explanations of how much water is used for different activities - like dishwasher, clothes washing machine, etc.
Find the leak in my yard but no one has been able to find it
follow my demencia suffering partner around, to police her water wasting habbits.
Freeze enrollment at UCSC, improve agricultural and industrial conservation, and make commercial use of water more energy efficient, so residential customers would have less stress. I am saving as much water as I can at this time.
Get credit for re-charging the acquifer
Get my son to take fewer and shorter showers. We have lawns/garden with drip and sprinklers but have not used them in ages. Mostly gophers and weeds now. Would like to replace some of the lawn with new and dog friendly garden and drip irrigation.
get rid of guests and tenants who are not water aware, take long showers, leave faucets running, etc
Get you guys to build reservoirs, so rainfall doesn't just run off into the ocean. Get you guys to build a desailination plant and convert sea water to usable water, like Israel's.
Greywater system Large rainwater storage tanks
Have a way to collect a significant amount of rainfall, as a rain barrel is insufficient...fills up quickly
Have an app with an alert when the water usage increases drastically compare the the average consumption. An allergic will make the owner search and understands why and shut off the leakage.
Have an in home visit to assess water savings opportunities
Have better ways to detect leaks sooner in the pipes and pumps.
Have H2o dept. do inspections when called like all other utilities. We are retired & on fixed incomes. Can't call plumber to check. Water pressure changed last year. Went to you. Said call a plumber!!!!!!!!
have kids get older and go to college, ha, ha
Have some explanation of all the different charges I'm paying for on my monthly bill. Is my meter actually being read? What is the reading each month?
Have the amount of water usage on bill so I can calculate how many cons like you use too.
Have the water company lower prices. You're really gauging us.
Help with the pond
how much does water cost at different times of day what days of week is water cheaper
I already had a new monitor installed on my water meter that will let me do all of the above except automatic shut off valve. I have not yet begun to use it, so to this point, my monitoring is just reviewing my water bill each month.
I am a renter like many others in this town, we have little control over our toilets and shower heads and landscaping.
I am aware of the water usage concern and make an effort on a daily basis to help not contribute to wastefulness
I do not think about things I cannot control

I don't like any of these. I attempted to adjust my account info to accurately reflect the number of people living here and we have continued to get monthly reports that don't reflect our household. Using an app is intrusive from the point of view of privacy. An automatic shut off valve? How would that affect toilets, cooking, etc.? We have timers on our exterior faucets.

I don’t like the idea of an automatic shut off valve

I don’t want this.

I feel I am penalized for growing my own food and having a tiered rate system that does not take that into consideration thus discouraging folks from having a garden or backyard food forest due to the dramatic increase in my water bill because I have a large garden.

I feel I'm able to get the information I need off bills and the website

I have a Buoy system. It could alert me when my usage is higher or lower and give me an idea of why (e.g. Congrats! You’ve saved 20% by taking shorter showers!)

I have a hot tub here & rarely change the water

I have a studio apt linked to my water bill so we are 4 adults. Also have a hot tub which I recently filled up for the first time. I think my usage is skewed according to your reports.

I may have a leak somewhere, but don't know how to find it.

I think it’s insane that we have to worry about the most important thing we need next to air to breathe I fucking forfeit showers to give my dogs and plants water!

I use very little water in the winter months. Most water use is during the summer as I have a large yard with drought resistant plants, veggies and fruit trees. What I am planning to do next year is upgrade my drip system and install timers so I don't forget to turn off the system.

I use WaterSmart

i would encourage SCMU not to adopt any new, expensive technologies (IOT or whatever else) that won't really deliver as promised but will eventually result in rate hikes for customers. Keep it simple.

I would like an auto shut off for my kids showers!

I would like us to be given credit for having six adults in a home and still using less water than the average four person household.

I'd like to see how my water usage is broken down in terms of different applications: bathing, garden, laundry, kitchen, etc.

I'd love to know how much water certain appliances use, such as my dishwasher and washing machine.

I’m always conscious of water use and appreciate every drop. As a result of storms we’ve repairing considerable damage and construction workers use water freely, maybe for good reason, but very freely

if I could know when I am using the water I could know what was using the most water (showers, washing machine vs watering the yard)

If I had the funds to purchase and install a cistern or larger-than-rain barrel collection system, and/or grey water laundry diversion, I could reduce my water usage 1/3-1/2.

In fairness to larger households, (ours is 7 persons), allocate water at the basic rate per person, before moving to the higher rates.

Install more barrels for irrigation

install recirculating pump for instant hot water.

Installed a rain capture system and use it for yard watering instead of town water.

It's very difficult to regulate water usage because everyone living here is an adult housemate. We all have laundry and shower needs. An automatic shutoff is a terrible idea though, for the record. How would that even work, water is a basic need? Another difficulty in being a renter is that we have little to no control over what appliances our landlords buy, or what systems they put in place to save water. We have done our best to update toilets and get leaks fixed. But we can't do much else ourselves, yet we pay the cost of higher water usage.

It’s mostly dishes, laundry and showers 5 person household The letter sent to us with water usage only compares “similar households” it’s nit a proper comparison.

Leak alerts when baseline usage doesn't drop below a set threshold

Lower prices.

lower the damn cost

make it easier to water garden with grey water.

Map water surge costs to family size We call water surge charges the anti family act I have 5 daughters so my normal is not your normal

maybe all of the above except the automatic shut off valve

Mechanisms for renters to communicate with their landlords who control things like sprinklers and other water use around the property.

Monitor water usage through website (not just phone app) and be able to setup email alerts when use is higher than usual for a day. This will allow us to know of over use or leaks before the bill.

Moratorium on new construction

More community info available on water reclamation & other ways to conserve

More detail comparing me to other typical users and provide information on how the other users are determined

More meeters

most of my overuse of water is due to power outages, which effects my sprinkler timer. when I notice the power has been interrupted...(not alway easy to determine) I need to reprogram drip system.

My bill is high because of all the added recovery charges.

My water bill has very little to do with the amount of water I use on the margin. The overall bill is largely made up of fixed fees associated with infrastructure projects.

N/A

n/a we do not abuse or waste water.

Need more information to understand the options.

No f'ing way should there be an automatic shutoff valve.

none

None

None of the above

None of the above. I am all ready pretty conscious of my water usage. I plan to in the future remodeling bathrooms that will include water saving fixtures.

None of these apply and frankly they sound strange, expensive, and not helpful. During the drought it helped to have info re if we were "rock stars" at conserving.

None of these...if there was that much of a shortage of water stop building the high density housing and stop the growth.

None, we have genetic, chronic conditions which make hot showers a form of physical therapy for us. There re five of us living in a three bedroom. We do the best we can.

None. We already use as little as possible for a family of 5 people

Not have crazy high prices compared to the rest of the state..
Not interested in cost saving ideas
Not really sure. When I stopped watering my yard several years ago, when the rates went up, it completely died and we barely went below the limit. I have not put a yard back in the last 4 years and my neighbors love looking at dirt, but I fear that no matter what I put in, we will jump above the limit again. I simply don't think a family of 4 with two teenage kids, can meet the goal set for us.
Not sure which is best
notifications when thresholds are reached
obtain more sophisticated plumbing fixtures such as shower valves that can fine-tune flow and temperature, easily pause flow while soaping up, etc. Also, toilets are so antiquated. In this day and age there should be smarter toilets that never leak and use just the right amount of water...
Obviously we need to build more reservoirs or dams and we do not see anything like that being done the amount of people that live in this house two years ago you had a rate structure that was set up to accommodate what happened to that plan. Because the more water I use based on the amount of people that live in the house is where it needs to be justified
Offer better incentives for lawn removal.
Ok as is
open to all these
options for grey water system
Our house has been under renovation for the past nine months so it would be helpful to know why our water usage has been high since we are not there.
our water bill is "high" because there are a lot of people in our household, not because we use very much water per person. Thus we almost always go into the 2nd or 3rd pricing tier, because our needed is assessed as though we are fewer people than we are. Please consider pricing options which account for such efficiency measures.
Our water use has decreased over the past years but your rates continue to rise. If you'd stop raising the rates and fees, that would definitely help to control our monthly cost.
Owner of rental installing new energy efficient/water efficient applications. Don't want to ask for this as I don't need rent raised again.
Personal discipline
PLEASE do not make me go on line or monitor my water use via app or on line account
Please do not waste resources like PGE to mail monthly comparisons. We are a conservation minded household in an old home - we do what we can and what we can afford to do to conserve resources.
Plus special support to help detect leaks. E.g. alarm if my water usage dramatically changes (crosses a relative threshold, not an absolute one). Unexpected increases: I turned off irrigation for the fall; my usage should have dropped, did it? I'm out of town, why is there usage at my house at 2 AM? (Nice security double-check, could help with adoption of usage monitoring by customers.) Finally I have automated drip irrigation. Is there a flow meter I can install on that isolated system? If so, make that part of your monitoring app please, if possible? Also, I reduced drip to use less water last season, how can I know if I can reduce it further without killing our wonderful landscaping? Any ideas? (Thanks)

Provide gal/min gauges (for user) to see consumption amounts and try new ways/methods to reduce consumption, for: Shower Heads, faucets. ALSO: - Have the City water dept create alliances with larger Tank manufacturers, shippers and installers, to promote use of these larger tanks for Rain Water Recovery (for use in lawns, toilets, car washing, pool, etc) and REDUCE these initial costs for Consumers. This in return will bring significant long term savings to everyone, while reducing the effect of the worsening droughts.

Provide me with a no-interest home loan to remodel my 1930s kitchen and bathroom, so I can update the plumbing and appliances to high-efficiency ones, please.

Quarterly or semi annual information

Re-education about the need to still conserve. I grew up in the drought, so I wasn't very water conservative. I heard we are no longer in a Statewide drought, so I am less conservative now.!

really, i just landscaped so will be using much more water than usual for about a year. then i'll go back to low use again. you all do fine with instilling water use consciousness in your customers

Receive an alert when the water use goes up significantly

Receive helpful information on home gardening. We need to know when/if having a vegetable garden is too expensive or too extravagant a use of water.

receive real-time water consumption (flow rate) and daily usage via a website, also with an avail phone/tablet app. This would have saved me over $1k the two times I have had leaks, and prevented water waste.

Recently sold my house and moved to Soquel hills...so good luck!

Recycle grey water for nonpotable use Use fraught tollarant plants

Refer us to trusted contractors who can fix leaks and do other repairs to save water.

remotely monitoring consumption in real time would be great especially if useage was expressed in understandable terms like "gallons per minute" instead of "units"

Remove the pool, hands down. However, since we are renters and our rental contract stipulates that we must maintain the pool, this is not an option. We cannot afford to make an offer on the house, either; if we could purchase, we would remove the pool. We have three adults and three kids living in the household with water and environmental awareness, and we're not big fans of the cost (both dollars and water waste) that comes with managing a pool.

See how much irrigation is using and recommended reductions

Semi-real time water usage monitoring to be able to better correlate activities with usage

Send emails when the bill reaches a certain level- I.e. your water bill is now $50, $75, $100 or your are reaching higher level of water use than previous

Stop all new building in the city until we have a much better storage facility or alternate water supply!

stop charging us for waste water that comes from rain.

stop raising our water bill. We pay some of the highest water rates in the state. Stop making money off of the people who live in this city.

Stop the Santa Cruz water company from gouging it's customers with "infrastructure fees" to replace the rediculous per connection "drought fees". Change pricing to a tiered system. As a landlord, I am no longer paying for water/sewer that went from $46/mo to $140/mo. Where are these infrastructure projects? How much of this money is sitting in the general fund?

Suggest real time water use monitoring with an alarm limit to catch any significant leaks.

Survey feedback: This survey did not allow for taking a daily bath

The automatic shut off valve idea is terrible! Omg does it get any more totalitarian? Communist, at best. Aquifer education for all would be a better approach to appreciating the value of our water supply. The Scarcity model is not the only perspective in water resources management, but of course those who are made to work under it are doing their best in that context. Good luck to you if that is you.

The automatic shut off would be a good feature in the event of a burst pipe when no one is home. This Summer-my irrigation system broke and water was gushing out. Luckily I was home and able to shut off water. I left the next day on vacation and have wondered what would have happened if the pipe burst while I was away. This may be more for insurance for a home owner on an occasional basis in the event of an emergency, but this is what came up for me.

The best way would be for the water company to not charge such insane rates. We pay way too much for water when other communties pay a fraction of what I have to pay. You raped us during the drought and never have given us a break as customers since then.

The currently billing info is fine

The rain will reduce thee need to irrigate. We receive welcome and adequate information from water district, and we adjust watering accordingly.

track sources of leaks

Understand how much water is being used by what means. We only get how much water is being used not how or where it is being used

understand the breakdown between irrigation water use and household water use

Water billing measures and reports units to 1 or 2 decimal points

Water use by source (washing machine, toilet, hose, etc)

We are doing quite well and use less water than was allowed during periods of rationing even now!

We are trying to save as much water as we can. We are a family of 8. We cook. Our plants have not been watered in a month. We are concerned of the reason why we are wasting more water than last year. Thank you

we have 7 rain barrels. it is our source of plant watering. we use buckets so one must be strong and willing. our driveway is a crumbling disaster so we hope and intent to install a sistern.

We have a large, fully developed, with many trees, back yard. We water as little as possible to keep them alive. Small potted plants have been eliminated and large ones are watered with captured shower water.

We have a well.

We installed Flo to monitor our water use - and have LOVED it. We are quite concerned about the mineral or quality of water in Santa Cruz.

We tend a large backyard organic garden which is where most of our water is used. We are aware of climate change, live simply, ride our bikes as much as possible, eat low on the food chain, and are mindful of water usage.

We try.

We use as little water as I think we could use

we use as little water as possible My son, daughter-in-law and grandson had to move in with us - saving water is very important to all of us - we're doing our best

with five to six people residing here, I would like to understand what is perceived as appropriate use on a per person basis including laundry but without landscaping. This would help to set a goal for usage among all the residents.

Would be awesome to see each sink & shower I individually 2 sinks 2 showers 2 toilets

Would be cool if there was a way to know exactly what you used the most water on in your home

Would like more information on a system such as "water cop" which can be installed to detect water leaks in your home and if detected shuts off water automatically
Would like the city to provide a credit or rebate towards water encatchment systems. Would like to receive automatic alerts if a leak is suspected. We discovered a leak recently my YouTubing what time look for at the meter and learned about the leak detector. Why can't that info be captured remotely...
would like to know where the water is coming from for all of the hotels, motels, and apartment units being built in SC. Either there is not a water shortage or you are allowing more building without letting us know where the water is coming from to accommodate all of the new construction. Hopefully you will let me know the answers.
Your publications are good and helpful. Making them even more attractive and explanatory might engage my house-mates.

APPENDIX E

Details of water saving activities across conditions.

	Control				Report				Registered			
	Yes	No	Previously	N/A	Yes	No	Previously	N/A	Yes	No	Previously	N/A
Reduced the amount of grass lawn in my yard.	32%	31%	37%	0%	28%	36%	36%	0%	25%	23%	52%	0%
Installed a high efficiency (1.28 gal/flush) toilet.	16%	28%	50%	5%	19%	35%	43%	4%	15%	19%	62%	5%
Stopped a leaky toilet.	34%	15%	30%	21%	23%	23%	26%	28%	24%	17%	32%	27%
Repaired dripping faucets.	32%	17%	26%	25%	24%	24%	27%	25%	27%	17%	31%	25%
Installed a faucet aerator.	10%	53%	21%	16%	7%	58%	22%	13%	6%	38%	42%	14%
Started taking shorter showers.	27%	38%	29%	7%	26%	45%	22%	6%	23%	36%	36%	5%
Installed a low-flow (2.0 gal/min or less) shower head.	20%	30%	45%	5%	18%	36%	42%	5%	17%	23%	56%	4%
Insulated your water pipes.	7%	62%	22%	11%	4%	68%	22%	6%	5%	60%	26%	9%
Purchased a new efficient clothes washer.	21%	28%	46%	5%	17%	38%	43%	2%	16%	27%	54%	3%
Set up a rain barrel.	8%	74%	9%	8%	6%	81%	10%	4%	5%	74%	17%	4%
Covered your pool.	22%	61%	17%	0%	16%	61%	23%	0%	21%	60%	19%	0%

APPENDIX F

Contacts for Voluntary Participation: 314 respondents (Block 8)

Submitted as separate password protected file, for confidentiality.

APPENDIX G

Email Responses to Survey

Responses to Survey Pre-notice Email:
Build a desalination plant! Stop doing NOTHING.
Will it ask me to register a high opinion of people like Chris Berry and Rosemary Menard?
Look forward to the survey. We definitely been getting higher rates and we need adjustments based on the amount of people that live in the house plus we are senior citizens.
Responses to Survey Launch Email:
Rec'd and completed the survey. As it lacks a place to provide narrative feedback, I offer the following. Please pass the following on to your senior staff. Newsletter: The SCWD newsletter has been dumbed down and is now so simplistic it is of very little value to the reader. Santa Cruz water customers are pretty sophisticated; we have been through multiple droughts and water restrictions. We are well aware that local water supplies are limited and must be carefully managed, thus, such low per capita water usage and keen interest in all things water related. We want real information, not simple summaries of what the water dept. is doing, or planning on doing. The newsletter now seems written to appeal to about the 8th grade level. Please. And drop the 'cute' photos of kittens and dogs, they take up valuable print space. And are insulting to your customers who deserve better. For example, the newsletter no longer contains annual water quality data, showing the analytic results of annual water quality testing. This is the kind of info customers want!! It is not enough to mention that this data is available on-line; as customers, we have the right to access this data in the newsletter. We have a right to know what is in our drinking water. To exclude this data from the newsletter shows a lack of transparency. This kind of data is what we expect and pay for; timely, clear information, not simplistic discussions of 'the status of city water'.
Is there compensation for my time?
Just completed the survey. I kept waiting for a place for “other” to express general concerns or issues. I think you have a well run utility and expressed that on the survey, but I have one area of low marks in regards to how happy I am with you…. that being the more expensive water rates for Live Oak residents. Please adjust this! Make it fair for all your users.
Just wanted to let you know there was nowhere to respond about watering my garden. The survey only asked about a yard, not a garden. Our back yard is all a garden with irrigation.
Hey Ben, I just spent 5 min answering survey questions. I intentionally left one blank as neither choice was true for me. The survey kept redirecting me to that question instead of allowing me to send what I answered. It was the question about whether I signed up to get information online. I can't answer no as the only "no" answer contains a qualifier that would have me also state that I prefer to get this info in mail - which isn't the case, and I don't recall if I consciously signed up to get emailed information. Since this is my second or third reminder to complete the survey, I thought I'd let you know that it won't let me bypass that poorly (and in my case inaccurately) worded question to submit it. Good try, but please rethink allowed choices or allow questions to be skipped.
I no longer live in the district.
Please remove me from email list.
It would not be appropriate for me to take the survey so I am opting out of the survey.
Please stop asking me for this.

Go to hell.
Please remove me from your list.
Please take me off your mailing list. I’m not interested at all in taking your survey.
Please stop asking me for this.

WaterSmart Program
212 Locust St. Suite B
Santa Cruz, CA 95060

YOUR HOME WATER REPORT

THIS IS AN INFORMATIONAL REPORT AND NOT A BILL.

SERVICE ADDRESS: 20 CALIFORNIA ST, SUITE 200
ACCOUNT NUMBER: 123-4567-89

GO PAPERLESS. SEE ALL INFO & PRODUCTS AT:
santacruz.watersmart.com

831-420-5230 conservation@cityofsantacruz.com

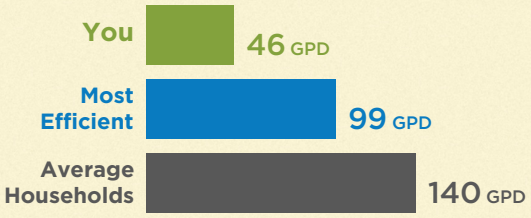
<RecipientID>santacruz-1</RecipientID>

Your WaterScore

JAN 11 TO FEB 11, 2020

Way to go, WaterSaver!
You ranked in the top 20%.

Gallons Per Day (GPD)
2 CCF = 46 GPD



Your water use is compared to homes in SCMU service area with 3 occupants and a similar yard size.

Do we have your occupancy?

Thanks for caring about your water use, Karene.

Do you have **3 occupants** and a **greater than 6,001 sq. ft.** yard? If not, correct us by completing your profile at: **santacruz.watersmart.com**. Your comparisons and recommendations will be adjusted in future reports.

A big thank you

Karene, we appreciate your efforts. **Thank you** for reading your home water report and using water efficiently.

Help us track our community's success. **Log on** to share the actions you've taken.

Your personalized plan

Selected based on your household characteristics, yard size, and historical water use.

Log on to update your profile

Save money and protect your home with the following actions:

Reduce shower to 5 minutes

11 GALLONS PER DAY
$53 DOLLARS PER YEAR

Install faucet aerators

6 GALLONS PER DAY
$31 DOLLARS PER YEAR
FREE!

Fill up the clothes washer

5 GALLONS PER DAY
$19 DOLLARS PER YEAR

Log on

Get your full list of recommended actions, and see:

- Where you're using the most
- Your progress over time
- Efficient products for purchase

santacruz.watersmart.com

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WATER COMMISSION
INFORMATION REPORT

DATE: 2/26/2020

AGENDA OF: March 2, 2020

TO: Water Commission

FROM: Rosemary Menard

SUBJECT: Community Engagement for 2020 Water Rate and Charges Study

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RECOMMENDATION: That the Water Commission accept the report on planned Community Engagement Activities for the 2020 Water Rates and Charges Study.

BACKGROUND: The purpose of this item is to familiarize the Water Commission with the community engagement effort that is planned as part of the upcoming work on developing water fees and charges, as well as to describe the plan and timeline for the Water Commission's work on water fees and charges.

Preparing a Cost of Service Analysis and a System Development Charge/Water Impact Fee Analysis requires a significant amount of technical analysis and the rates and fees resulting from these analyses impact property owners, ratepayers and developers for multiple years. This year, as the Water Department is beginning its rate and fee development work it is also undertaking an effort to more actively engage the community in the process in order to better understand community and customer questions and issues. The goal of the planned community engagement activities is to learn from the community as the work is completed and to integrate community feedback into the development of recommended rates and fees to the degree possible.

DISCUSSION: During the early February kick-off meeting for the Raftelis rate and fee study, key Water Department staff participated in a workshop to complete an environmental scan, identify goals for the strategic communication and engagement effort and key stakeholders, and plan out the work of the customer panels that will be developed as part of the community engagement process. Attachment 1 provides a summary of the work done as well as a schedule for the engagement of the customer panels, Water Commission and City Council in various rate-making steps.

The planned first interaction of the Water Commission with the project team is in May when the Commission will participate in an exercise to prioritize pricing objectives. Attachment 2 provides a slide that shows all the pricing objectives and a second slide that shows the pricing

objectives as prioritized by the Water Commission and the City Council during the 2016 water rate development process.

FISCAL IMPACT: None.

PROPOSED MOTION: Motion to accept the report on the planned community and Water Commission engagement for work on the 2020 update to water fees and charges.

ATTACHMENTS:
1. Summary of the Community Engagement Scope
2. Water Pricing Objectives

Attachment A: Community Engagement in Support of Water Rates, Fees and Charges Development

Raftelis' Strategic Communications Team will support the City with:

- Development of a strategic communications and community engagement plan
- Provide as-needed support for development of communications materials
  - The City has an existing relationship with a graphic artist who will develop the majority of pieces, but there will likely be a need for Raftelis to design infographics.
- Facilitate customer panels to provide public input into the rate study
  - Four panels were identified; each will be composed of between 9-15 individuals:
    - Residential
    - Multi-family
    - Commercial
    - Irrigation
  - The City will use a two-pronged approach to seat the panels – both by contacting/inviting individuals and publicizing a call for volunteers. The goal will be to have approximately 50/50 split of participants from each selection method.
  - Meeting schedule
    - The first meeting will invite members of each panel to learn about the process and their role.
    - Panels will meet separately for meetings 2-5
    - All panel participants will be invited to the second open house.
- Develop a web-based customer feedback community
  - The vision is to solicit a broad cross-section of participants from all stakeholder groups and gather feedback from those who the City does not typically hear from.
  - Raftelis will collect demographic information and screen using this data, but the City will remain blind to protect participant anonymity.
  - A participation incentive may be explored, but bill credits are not possible.
  - Volunteers who are not selected to sit on the customer panels will be offered this outlet as a way to contribute.
- Facilitate two open houses
  - Open houses will be broadly publicized and open to the public.
  - One will be scheduled before the Proposition 218 notice is mailed and a second will be scheduled after the notice is mailed.

Goals for Strategic Communications and Engagement

- To establish and maintain the legitimacy of the process; stakeholders should feel comfortable that it was not flawed, that views from many perspectives were gathered and all options were considered.
- To understand the range of perspectives among a broad and inclusive set of stakeholders.
- To garner support from the public who feel they were properly engaged and informed during the process.
- To give City Council political support from among their constituents to confidently support adoption of study recommendations.

Environmental Scan

Items discussed that may impact the success of the study and public process include:

- Affordability
- Growth
- Construction
- Capacity Fees and Development
- Council
- Tourism
- Emerging Technologies
- Inside/Outside Customers

Key Stakeholders

- A stakeholder mapping exercise was conducted.

Existing Communication Channels

- Existing communication channels were identified and included:
- Website, Bill and Envelope, Bill Snipe, E-newsletter, Payment Walk-ins, Bill Calculator, Events, Social Media (not Twitter), Presentations, Direct Mail

Key Dates / Public Engagement Schedule

Study: City of Santa Cruz Water Rate Study

Legend:

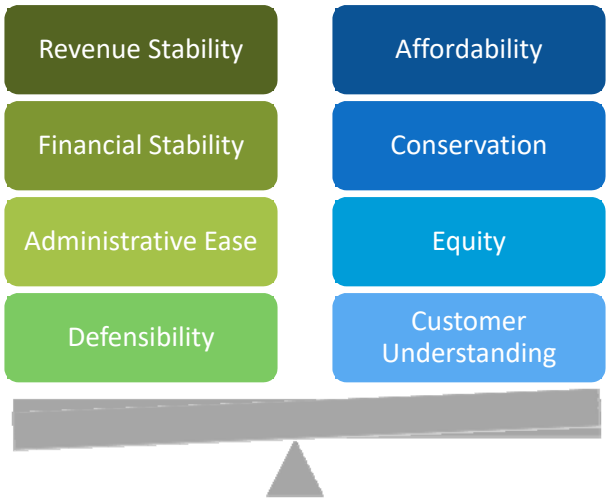
PINK	Customer Feedback Community (Online Engagement)
YELLOW	Water Commission Meetings
GREEN	Customer Panel Meetings
BLUE	City Council

Customer Feedback Community	Month	Date	Project Team Leads	Activity	Notes
DEVELOP	MAR 2020		E. Cross, M. Elliott, M. Wittern	Prep for Engagement/Communication	Develop Strategic Communication & Engagement Plan, Solicit for Panels and CFC, Confirm dates/logistics for meetings
	APR 2020	1	E. Cross, M. Elliott, M. Wittern	Communication & Engagement Plan Draft Due	
	APR 2020	21, 22 or 23	R. Menard, E. Cross, M. Elliott	Customer Panel Meeting #1	All four panels meet at one time: welcome, introductions, overview of process, Q&A
	MAY 2020	4	R. Menard, S. Gaur	Water Commission #1	Pricing Objectives
	MAY 2020	12, 13 or 14	E. Cross, M. Elliott	Customer Panel Meeting #2	Four panels meet separately. Seeking input on customer understanding of current rate structure and perceptions of value for service received. Customer understanding on need for water system investment.
	MAY 2020	26	R. Menard, S. Gaur	City Council Meeting	Pricing Objectives
	JUN 2020	9, 23, 24, or 25	E. Cross, M. Elliott	Customer Panel Meeting #3	Four panels meet separately. Use pricing objectives received from WC to get input on customer understanding/concurrence. Seek indications of issues and concerns that can help provide input into the rate study.
	JUL 2020	NO MEETINGS			
	AUG 2020	24 or 31	R. Menard, S. Gaur	Water Commission #2	Rate Structure Alternatives
	SEP 2020	1, 2 or 3	E. Cross, M. Elliott	Customer Panel Meeting #4	Four panels meet separately. Seek input and preferences for rate structure alternatives.
	OCT 2020	5	R. Menard, S. Gaur	Water Commission #3	Drought Rate Structure Alternatives
		13, 14 or 15	E. Cross, M. Elliott	Customer Panel Meeting #5	Four panels meet separately. Seek input and preferences for drought rate structure alternatives.
	NOV 2020	2	R. Menard, S. Gaur	Water Commission #4	Rate Structure Recommendations

	NOV 2020	10	R. Menard, S. Gaur	City Council Meeting	Rate Structure Recommendations
	JAN 2021	20, 26, or 27	R. Menard, E. Cross, S. Gaur, M. Elliott (plus city staff as needed)	Open House #1	Open House to cover all the water system with a focus on infrastructure investments. All customer panels meet together and are thanked for their input, customer feedback community invited.
	FEB 2021	23	R. Menard, S. Gaur	City Council Meeting	Rate Structure Recommendations
	FEB 2021	24	R. Menard, E. Cross, S. Gaur, M. Wittern	Proposition 218 Mailed	Need 45 days, Feb. 27 is 45 days before April 13.
	MAR 2021		R. Menard, E. Cross, S. Gaur, M. Elliott (plus city staff as needed)	Open House #2 (if needed)	
	APR 2021	13 or 27	R. Menard, E. Cross, S. Gaur	City Council Public Hearing	Adopt Rate Structure Recommendations
	MAY 2021			Implementation Work Begins on billing system, other internal work	
	JUL 2021	1		Changes are Implemented	
	AUG 2021	1		Consumption Charged	

7.5

Balancing Competing Pricing Objectives



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Pricing Objectives

Rankings	Pricing Objectives
Most Important	Revenue Sufficiency
Very Important	Promotes Efficiency
	Revenue Stability
	Perceived to be Fair to the Public
	Affordability for Essential Use
	Customer Understanding
	Promotes Conservation
	Rate Stability

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