

Business Water Savings Audit and Efficiency Rebates Program

2015–2016 Summary Report
Tucson Water



Year in Summary

This year, the Business Water Savings Audit and Efficiency Rebates Program provided 71 free water savings audits to commercial, industrial, and institutional (CII) customers in Tucson. Though the program targets large water users, audits are provided to CII customers of any size. The program helps customers achieve water and cost savings, builds awareness about potential future drought declarations, offers rebates, and promotes best practices. The overall goal of the program is to save water and to help Tucson businesses, industries, and institutions practice responsible water stewardship and sustainability. These figures cover the program's first year, from October 2015 through July 2016.

In 2015-2016, program audits identified the following savings opportunities:

115M gal

in total annual water savings

\$930K

in total annual water cost savings

On average, that equates to:

1.6M gal

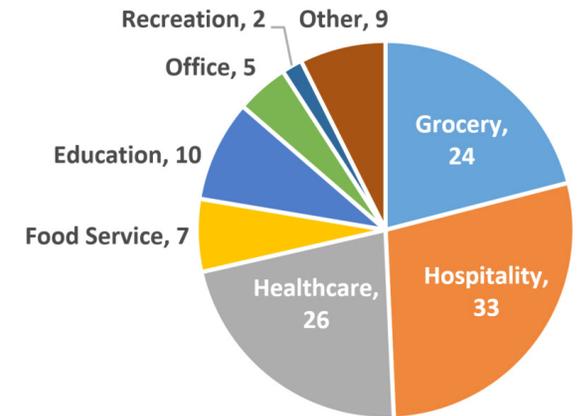
in annual water savings per audit

\$13K

in annual water cost savings per audit

26%

in annual water water savings per audit



Identified Savings, by Sector
in 1 million gallons per year



Local grocery chain improving and saving



Our visit with Fry's Food Stores was a complete success. The water savings audit at one location found large savings opportunities related to updating aging equipment and improving cooling tower management. Two of the report's recommendations combined for a total estimated savings of 3.8 million gallons per year (gpy). Making additional miscellaneous repairs at seven locations, Fry's stores can continue to build on their achievements to lead commercial water savings in Tucson.

12M gal

annual water savings

\$82K

estimated annual water bill savings

Water Savings Audits

Audit Process

Tucson Water worked with a team of water audit and customer outreach staff to sign up businesses for the water savings audits to identify opportunities for saving water and costs. Any commercial or industrial customer was eligible to receive an audit. Prior to the audit, the business was asked to complete a short questionnaire about facility water use. During the audit, the building or facility manager(s) accompanied our auditors throughout the facility, sharing insights, established practices, schedules, and processes. The auditors looked at fixtures, water-using appliances and processes, coolers, and any other water uses. After the audit, an efficiency recommendations report was provided to the business. Tucson Water staff followed up with audited businesses to distribute free low-flow showerheads and aerators and to assist with rebate applications for other water-saving equipment and upgrades.



1. Pre-Audit

Scheduling and initial questionnaire



2. Site Audit

Walk-through of site and examination of indoor and outdoor water use



3. Audit Analysis

Site information, metering, and analysis of historic water use



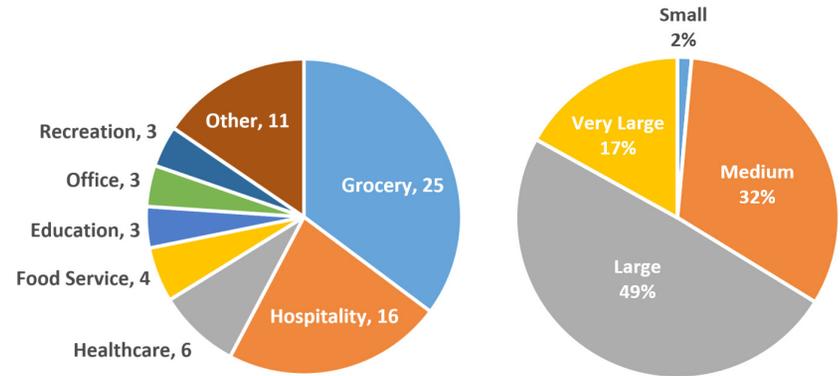
4. Report & Incentives

Water efficiency recommendations report with audit results and incentives package



5. Follow-up & Tracking

Implementation, free fixture delivery, and continued outreach



Completed Audits, by Sector and Size
(Large and Very Large represent customers using over 325 ccf/month)

Audits by the Numbers

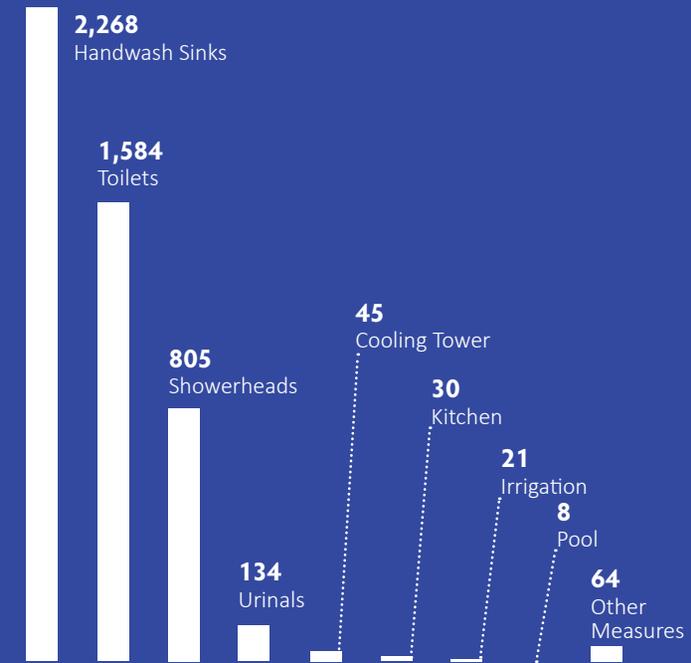
132 **71**

business contacted

audits conducted

Total Recommended Measures

(in number of recommended units)



Enthusiasm and dedication to conservation

The Riverpark Inn in downtown Tucson offers a resort-style atmosphere with a large outdoor pool, tennis courts, and jogging and biking paths on a scenic 8-acre property. The Inn's Water Savings Audit identified nearly 1.5 million gallons per year in water savings, for annual cost savings of \$17,000. The payback period for the recommended measures—toilet improvements, irrigation upgrades, water-efficient showerheads, spa leak repairs, and hand-wash sink aerators—is estimated at less than one year.

1.5M gal

identified annual water use savings

\$17K

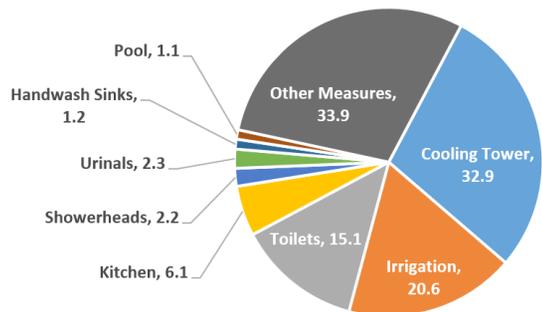
estimated annual water bill savings



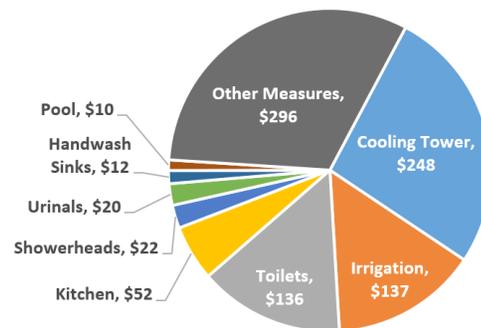
Water Savings

By the Numbers

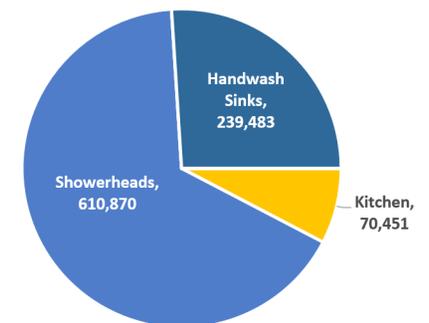
The program identified 115 million gallons and \$930,000 of annual water and cost savings, respectively. The program distributed low-flow showerheads, faucet aerators for hand-wash sinks, and low-flow spray valves for kitchens at no cost to participants, resulting in an estimated 921,000 gallons of savings per year. Implementation of these and other identified measures will continue into the 2016-2017 program year. Many of the other measures shown below involve identifying and fixing leaks or upgrading or replacing swamp coolers; a list of other measures is included on page 9 in Appendix A.



Identified Water Savings, by Measure
in 1 million gallons per year



Identified Cost Savings, by Measure
in 1 thousand dollars per year



Installed Savings To-Date, by Measure
in estimated gallons per year

Recommendations

What changes can most businesses make?

Improvements to toilets, cooling towers, and hand-wash sinks were among the most common identified measures—and toilets and cooling towers were also among the top five water-saving measures.



Toilets

1,584 units identified for upgrade at 40 facilities, for an estimated 15 million gpy savings



Cooling tower improvements

45 units identified for improvements at 36 facilities, for an estimated 33 million gpy in savings



Hand-wash Sinks

2,268 units identified for upgrade at 34 facilities, for an estimated 1.2 million gpy in savings

What other changes represent a large opportunity, where applicable?

Irrigation systems, kitchen equipment improvements, and showerhead upgrades were also among the top five identified water-saving measures.



Irrigation recommendations

18 facilities had irrigation opportunities, totaling an estimated 21 million gpy in savings



Kitchen water conservation measures

16 facilities had kitchen improvement opportunities, totaling about 6 million gpy in savings



Showerheads

805 units identified for upgrade, for an estimated savings of nearly 2.2 million gpy



Health, wellness, and environmental responsibility

Tucson's Lohse and Ott branches of the YMCA made the extra effort to prioritize water conservation by replacing old equipment with low-flow urinals, dual-flush toilets, low-flow showerheads, and sink aerators. Upgraded swimming pool controllers were also recommended to increase water efficiency.

940K gal

identified annual water savings

\$8,200

estimated annual water bill savings



Appendix A. Program Details

Program Background

In 2015, Tucson Water launched its new Business Water Savings Audit and Efficiency Rebates Program. The program helps businesses identify money-saving opportunities to reduce water, sewer, and often energy bills, and it helps create a more resilient community. The program conducts water savings audits and provides water efficiency rebates to business customers.

The City of Tucson's 2012 Drought Preparedness and Response Plan states that if Stage 2 drought is declared, all commercial and industrial customers using more than 325 ccf (240,000 gallons) of water per month, on average, need to conduct a self-audit of facility water use and develop a conservation plan. The City is currently in Stage 1 drought, and Stage 2 is possible in 2018 depending on Colorado River flow. To help prepare for the future, in advance of these requirements, Tucson Water is offering water savings audits free of charge to business customers. The program targets the top 10% of commercial, industrial, and institutional users and is available to any CII customer.

What is a Water Savings Audit?

An audit involves review of water use data from billing records and on-site examination. Prior to the site audit, the program provides a brief questionnaire about facility water use for the business to complete. During the on-site audit, the building or facility manager typically accompanies the program's auditors throughout the facility to provide information about established practices, schedules, processes, and other insights. The water auditors examine fixtures, water-using appliances and processes, coolers, and any other water uses. The auditors may install temporary water-metering devices to collect additional data. Following the site visit, the audit team develops an efficiency recommendations report that is provided to the business. The report identifies money-saving opportunities for the company to reduce water, sewer, and energy bills, including any relevant incentives and rebates.

Tucson Water is also launching a Customized Commercial Rebate program for businesses to help offset the initial cost of water-efficiency upgrades.



What is a Water Savings Audit?

These audits will identify money saving opportunities for your company to reduce water, sewer, and energy bills. Prior to the audit, the business will be asked to complete a short questionnaire about facility water use. During the audit, the building or facility manager(s) will accompany our auditors throughout the facility, sharing insights, established practices, schedules and processes. The auditors will look at fixtures, water using appliances and processes, coolers and any other water uses. After the audit, an efficiency recommendations report will be provided to your business.

Who is eligible to receive an audit?

Any commercial or industrial customer in Tucson! Tucson Water is launching a Customized Commercial Rebate program for businesses to help offset the cost of making upgrades to your business or facility.

What if I already had a water audit done?

If you had a previous water audit done by Tucson Water, we likely have it on file and will reference it before conducting your new audit. Your facility is eligible for a water savings audit whether or not you've had an audit previously.

What incentives and rebates are available?

- High efficiency toilet and urinal rebates (set price per fixture)
- Faucet aerators, shower heads, and pre-rinse spray valves (**FREE!**)
- Customized Commercial Rebates for equipment upgrades and facility retrofits are offered based on projected water savings. The custom rebate is calculated at \$10 per 1,000 gallons of projected annual savings or 50% of the equipment cost, whichever is less.

Why is Tucson Water offering this program?

This program targets the top 10% of commercial and industrial users who use a monthly average of over 325 ccf (240,000 gal) of water. The City of Tucson's 2012 Drought Preparedness and Response Plan states in a Stage 2 drought, all commercial and industrial customers using over 325 ccf per month will need to conduct a self-audit of facility water use and develop a conservation plan. We are currently in Stage 1 drought, with Stage 2 possible in 2018 depending on Colorado River flow. Free Water Savings Audits are available now! To get ahead of this requirement, any commercial customer may request an audit.



Questions? Want to sign up for an audit? Contact us!
Candice Rupprecht | Water Conservation Specialist
candice.rupprecht@tucsonaz.gov | 520.837.2181

Business outreach flyer explaining program benefits and how to sign up.

Who is eligible to receive an audit?

Any commercial or industrial customer in the Tucson Water service area is eligible to receive an audit. Even if a facility had a previous water audit completed by Tucson Water, it is still eligible for a new water savings audit. (The previous audit likely remains on file, and the auditors will reference it before conducting a new audit.)

What incentives and rebates are available?

The following incentives and rebates are available to Tucson Water's CII customers:

- High-efficiency toilet and urinal rebates (at a set price per fixture).
- Faucet aerators, showerheads, and pre-rinse spray valves (actual equipment is provided for free).
- Customized Commercial Rebates for equipment upgrades and facility retrofits are offered based on projected water savings. The customized rebate is calculated at \$10 per 1,000 gallons of projected annual savings or 50% of the equipment cost, whichever is less.

Program Activities & Timeline

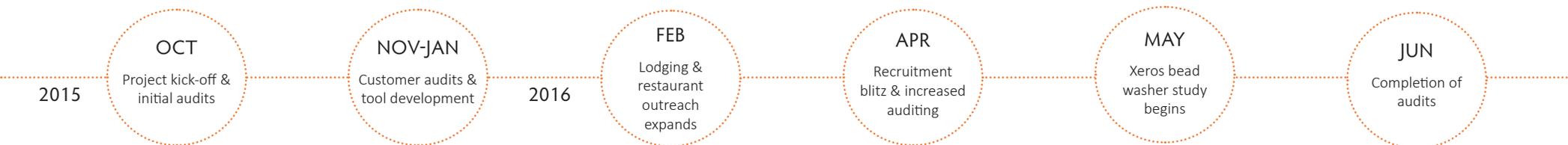
Tucson Water launched the Commercial, Industrial, and Institutional (CII) Water Savings Audit Program in fall 2015. On October 19 to 21, 2015, Tucson Water and Cascadia Consulting Group (Cascadia) convened a kick-off meeting and conducted the first two audits of the program. The initial audits were conducted at one grocery store and one recreational facility, both of which were recruited by Tucson Water.

From November 2015 through January 2016, the majority of work focused on the development and refinement of audit tracking, reporting, and procedural

tools, though some additional customer audits were completed. Several process automation tools were developed, including online customer water use questionnaires, a series of auto-populated spreadsheets and audit report templates, and customer data-tracking systems. These materials were developed using Google Docs to support team-wide collaboration across multiple staff and locations.

In February 2016, Tucson Water partnered with Cascadia to present the audit program to attendees of a Southern Arizona Lodging and Restaurant Association (SALARA) membership luncheon. This effort expanded the customer recruitment process, as connections made through this presentation directly resulted in the recruitment of numerous hotels, motels, and resorts for conducting water audits. Audits for customers in other business sectors also occurred throughout February and into March 2016.

In March 2016, Tucson Water and Cascadia agreed to launch an in-person customer recruitment campaign. The project team pre-selected 126 Tucson Water customers for in-person visits during an outreach effort conducted over three days in early April. Customers visited during this outreach included a wide variety of business sectors and business sizes, and they were geographically scattered around the Tucson area. Candice Rupprecht of Tucson Water and three Cascadia staff members divided responsibilities for the 126 targeted customers and conducted this in-person recruitment blitz to identify customers willing to participate in water savings audits.



Of the 126 customers selected, 28 of businesses (22%) could not be contacted for various reasons, including business closure and inaccessibility. Of the remaining 98 customers that were visited (data as of June 24, 2016):

- 11 business customers scheduled an audit directly with the recruitment team member.
- 17 customers did not schedule audits during the initial visit but subsequently scheduled an audit.
- 53 customers have not yet scheduled an audit but are expected to do so soon.
- 17 customers indicated they were not interested in participating in the audit program.

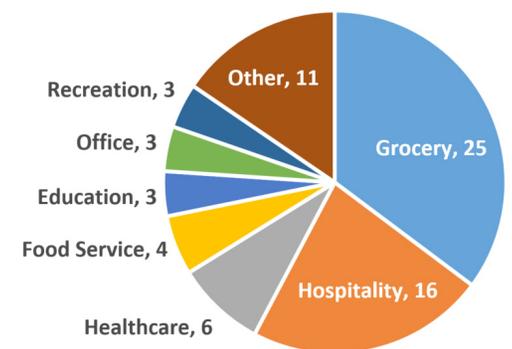
Of those that were not interested in participating in the program, the most commonly stated reasons included being “too busy” to take the time; general skepticism about the program; concerns over working with Tucson City government (such as concerns that conducting a water savings audit would trigger code violations, along with mandated upgrades and repairs—as cited by restaurant owners, in particular); and corporate guidelines that limit individual locations from taking part in such programs. As a result of the recruitment effort, many corporate contacts were obtained, connecting the audit team with the managers who oversee operations for multiple sites.

Although some of the visited customers have not yet signed up for an audit, this effort gives the team an effective case for making follow-up calls and future walk-in visits in an attempt to schedule audits. All unscheduled customers (unless they expressed no interest) were tracked as prospective leads, and the Tucson Water team may continue to contact them to encourage scheduling audits for future dates.

Throughout the project, Cascadia provides monthly activity reports to Tucson Water summarizing the water audit activity for the period. In all, 71 audits were completed from October 2015 through June 2016.

Savings for Standard Measures

Proposed Standard Measures	Units	Calculated Water Savings (gpy)	Estimated Cost Savings (\$/year)	Implemented Savings (gpy)
Cooling Tower	45	32,891,962	\$247,581	0
Irrigation	21	20,621,220	\$136,901	0
Toilets	1,584	15,074,034	\$135,591	0
Kitchen	30	6,066,898	\$51,923	70,451
Showerheads	805	2,161,134	\$21,564	610,870
Urinals	134	2,298,818	\$20,097	0
Handwash Sinks	2,273	1,188,558	\$12,135	239,483
Pool	8	1,132,362	\$9,865	0
Subtotal: Standard Measures	4,900	81,434,986	\$635,656	920,803



Completed Audits, by Sector
(71 total audits)

Savings by Other Proposed Measures

Proposed Standard Measures	Units	Calculated Water Savings (gpy)	Estimated Cost Savings (\$/year)
Investigate possible continuous leak in pool-side underground piping and repair as necessary	1	1,103,760	\$10,207
Swamp cooler repairs/upgrades	2	8,000	unknown
Investigate and repair unidentified flow	1	1,576,800	\$14,582
Repair water heater relief valve	1	2,365,200	\$33,342
Repair batch room bucket washer	1	0	\$0
Pilot Xeros washer	1	unknown	unknown
Investigate unaccounted for water use	1	up to 2,012,400	up to \$18,290
Remove swamp coolers	16	235,685	\$2,180
Remove swamp coolers	22	898,205	\$8,306
Reduce 8 gallon per minute continuous flow of water through the main domestic meter	1	2,102,400	\$18,585
Repair leak in spa	1	64,240	\$906
Reduce flash tank cooling water use	1	16,056,350	\$130,083
Reconnect flowmeter	1	unknown	unknown
Investigate un-accounted for water	1	709,560	\$6,580
Eliminate 1.0 gallon per minute continuous flow of water through the main domestic meter	1	525,600	\$4,819
Replace thermostatic tempering valve for boiler blowdown and pipe cooling tower bleed water to this valve	1	2,102,400	\$13,569
Replace evaporative cooler with mechanical air conditioning	1	1,051,200	\$14,066
Investigate constant flow of water through irrigation line and repair as appropriate.	1	788,400	\$4,849
Eliminate boiler room leaks	3	1,103,760	\$9,985
Install more efficient spray head on main fountain	1	225,257	\$979
Replace malfunctioning automatic fill valve for spa.	1	1,576,800	\$10,830
Replace existing timer controllers on water softeners with "smart" sensor based controllers	2	377,842	\$2,595
Minimize water loss from fire pump seal	1	144,540	\$1,258
Disconnect irrigation meter		unknown	\$143
Service steamer, cooler, and swamp cooler		125,651	\$1,038
Reduce or eliminate constant flow to drain	1	788,400	\$6,875
Subtotal: Other Measures	64	33,930,051	\$295,777
Total: All Recommended Measures	4,964	115,365,037	\$931,432

Audit Process

1. Pre-Audit

- **Initial customer contacts.** The audit team identifies and contacts targeted customers, as described above, to encourage them to participate in water audits.
- **Scheduling.** A business customer decides to schedule an audit and contacts the audit team. The audit team records the scheduled date and time in Google Calendar, and a unique identifier code is assigned to the specific business location. The unique identifier corresponds with Tucson Water’s Customer ID and Location ID for that customer’s water meter(s).
- **Historical billing data.** The auditor will obtain the past four years of water use data for the business from Tucson Water.
- **Questionnaire.** The team member that schedules the audit enters basic customer data (e.g., business name, address, business sector, contact information) into the web-based “New Business Request” form. Submittal of this form automatically establishes the audit entry in the Compiled Audit Tracker, an online spreadsheet, and creates an audit report template for this customer audit location. Additionally, submittal of the form also triggers sending an email to the customer with a link to a web-based “Pre-Audit Questionnaire.” This brief questionnaire requests information that the customer about the site, to be used for water use analysis (e.g., number of restroom fixtures, building square footage, number of employees, operating hours, existence of irrigation, cooling system type). Once the customer submits the completed questionnaire, responses will automatically be entered into the Audit Tracker spreadsheet.
- **Confirmation.** A few days prior to the scheduled audit date, the Water Conservation Engineer who performs the audit contacts the customer to confirm the date, time, and to discuss any other important details about the upcoming visit. The auditor will also confirm the availability of one or more business representatives to participate in the audit walk-through.



1. Pre-Audit

Scheduling and initial questionnaire



2. Site Audit

Walk-through of site, examine indoor and outdoor water use



3. Audit Analysis

Site information, metering, and analysis of historic water use



4. Report & Incentives

Water efficiency recommendations report with audit results and incentives package



5. Follow-up & Tracking

Implementation, free fixture delivery, and continued outreach

2. Site Audit

- Upon arrival, Tucson Water’s auditor will find the business contact with whom the previous appointment was confirmed.
- The auditor will briefly review the customer’s previous four years of Tucson Water billing data in advance. The data are presented in the form of a graph that indicates peak and off-peak water historical water use for the property.
- The auditor will review the planned walk-through and will determine if any particular questions or areas of concern should receive special attention during the audit.
- The business representative will escort the auditor through facility to observe significant points of water use, including cooling towers, kitchen equipment, restrooms, swimming pool equipment, showers, hand-wash sinks, and irrigation.

- The auditor will take measurements, as appropriate, during the walk-through. These measurements typically include flow-bag measurements for faucets, hand-wash sinks, and showers; estimated flush times for toilets and urinals; and estimated flows for pre-rinse spray valves and continuous drains from equipment such as steamer ovens, ice-makers, and swamp coolers.
- Data will be obtained and recorded for any cooling towers, including conductivity logging and review of cooling tower service logs.
- The auditor will walk with the business representative to locate the City's water meter that serves the property. If multiple meters are present, the auditor will attempt to determine which meter serves what portions of the property. The auditor will record meter readings.
- For large or very large water-using facilities, the auditor will typically leave logging equipment, if possible, to record data for a 24-hour period. Comparing daytime and overnight water use at the property can be useful for identifying water savings opportunities, including detecting leaks. An ultrasonic meter is typically used. The auditor will return the next day to retrieve any logging equipment and will download data for use in the audit analysis.

3. Audit analysis

- The auditor will review and chart historical water use and water costs for the business, noting any peculiarities such as unusual spikes in water use that do not correspond to seasonal differences.
- The auditor will summarize observations and data obtained from the audit walk-through in report form.
- The data from 24-hour meter log(s) are graphed and analyzed for unusual spikes—particularly for any overnight water use, when a business may be closed. These results may indicate water leaks that should be investigated further.
- Primary water use for the business is allocated into percentages by source and plotted in a pie chart. These allocations are calculated through consumption records, logged data, and industry-accepted assumptions.

- Quantities of water-using fixtures identified in the facility (e.g., toilets, urinals, swamp coolers, sinks, cooling towers) are summarized in table form.
- Each primary water use is separately analyzed and described in the report, including recommendations for specific actions that will result in water savings.
- All recommendations are summarized in table form, including the estimated water use savings and water cost savings associated with each recommendation. If a Tucson Water incentive is available to the business for a particular recommendation, the incentive will be calculated in the estimated payback period for implementation.
- Once the analysis and draft audit report are complete, the report is sent to another project team member for review and confirmation of calculations, prior to submission to Tucson Water for final review.
- For each site audited, historical water use data, metering data, other data obtained on site, and report recommendations are loaded into the Audit Tracker, which includes cumulative tracking and reporting of desired metrics.



Testing the water flow rate on a kitchen spray valve



A cooling tower chemical feed and monitoring system

4. Report & Incentives

- Once the audit team completes and reviews the draft audit report, the draft is sent to Tucson Water for final review and approval.
- Tucson Water's review of the water efficiency reports involves a review of all sections of the report for consistency in wording, clarity of recommendations and presentation of graphs. Depending on the complexity of the facility, graphs and tables will be referenced against Tucson Water's internal billing and GIS systems. Follow-up questions may address interpretation of ultrasonic logging meters and the water use assumptions used to calculate the water budget.

After reports are approved, a customized list of actions and incentives is prepared for each customer, which is used to guide follow-up with the customer. These action lists typically include two elements: no-cost items that Tucson Water will provide (e.g., efficient showerheads, aerators) and other recommendations that merit discussion with the customer. Upon request, the customized incentive provides itemized and total rebate values the customer can expect for completing the recommendations.

- Once the audit report is approved, Tucson Water provides the report to the customer. Reports are typically emailed to the customer and are printed out by request. The email communication thanks the customer for their participation, requests a read-through of the report, and requests a time to meet with the customer to deliver the free conservation devices that were recommended and to discuss important actions to consider. The email includes a description of how the customized rebate process as well as follow-up in-person meetings.

5. Implementation Follow-up & Tracking

- Tucson Water follows up by distributing free showerheads, aerators, and pre-rinse spray heads, as well as managing equipment upgrade incentive applications.
- Implementation of recommendations and incentives are detailed in the Audit Tracker to allow for cumulative reporting of desired parameters.
- 2015-2016 was the first year of this audit program; additional implementation results are expected in future years.



Examining cooling tower performance to identify inefficiencies



Measuring the flow rate of a commercial kitchen faucet

Xeros Bead Technology Washing Machine Study

Funds were budgeted in this contract for a study of options for reducing commercial laundry water use, which became known as the “Xeros Bead Technology Washing Machine Study.” The study was developed from January through May 2016, and data collection, analysis, and conclusions are scheduled to occur through September 2016.

Tucson Water’s top four commercial/industrial/institutional (CII) customers, by volume, generate laundry, as do six of the top nine. These customers include a university, two medical centers, two prisons, and a casino. Three resort hotels also rank among the top 20 CII customers. Not all customers generating laundry are large water users, and facilities with laundry are diverse, including gyms and spas, restaurants and bars, and dry cleaner/laundries. Washing laundry appears to be a significant and widespread component of CII water demand in Tucson.

While some Tucson Water customers that generate laundry have it washed at off-site facilities, most appear to use on-site laundry facilities. For these customers, water, sewer service, energy to heat water, and detergent and other chemicals used for washing can be major costs. There currently are three technologies that can significantly reduce water used for laundry:

- Continuous batch or “tunnel” washers.
- Systems to treat and recycle wash water.
- Bead technology washers.

Only customers that generate very large quantities of laundry and that can invest significant money and space for laundry facilities are potential candidates for continuous batch, tunnel washers, or systems that treat and recycle wash water. By contrast, bead technology washers leased or sold by Xeros are scalable, providing possible water-conserving solutions for CII customers that have a single small commercial washer as well as for CII customers with major laundry facilities.



Xeros bead technology washing machine (left) and close-up of beads (right)

Analysis of data from conventional and bead technology machines installed in a dry cleaner/laundry in Maricopa County and in a resort hotel in southern California supports company claims of reducing total water demand by 75-80%, hot water by over 95%, and detergent use by half. A pilot study of bead technology machines began at several Tucson Water CII customers in May 2016 and will conclude in September 2016.

A total of three Xeros washers, two with 65-pound capacities and one with a 45-pound capacity, will be installed for 90-day trial periods at a local YMCA, a resort hotel, and dry cleaner/laundry. At each installation, the number and type of loads of laundry and associated hot and cold water use will be logged. Analysis will be conducted to determine if the washers perform as promised. Qualitative information on how well the washers clean various types of laundry and other relevant performance criteria will be gathered from persons using the machines and/or handling the laundry. A phone survey has been conducted to estimate the number and type of CII customers with on-site laundry facilities and the potential for gains in water use efficiency. Depending on the outcome of the pilot study, Tucson Water may elect to offer rebates to CII customers for the lease or purchase of bead technology washers as a part of the customized commercial rebate.

