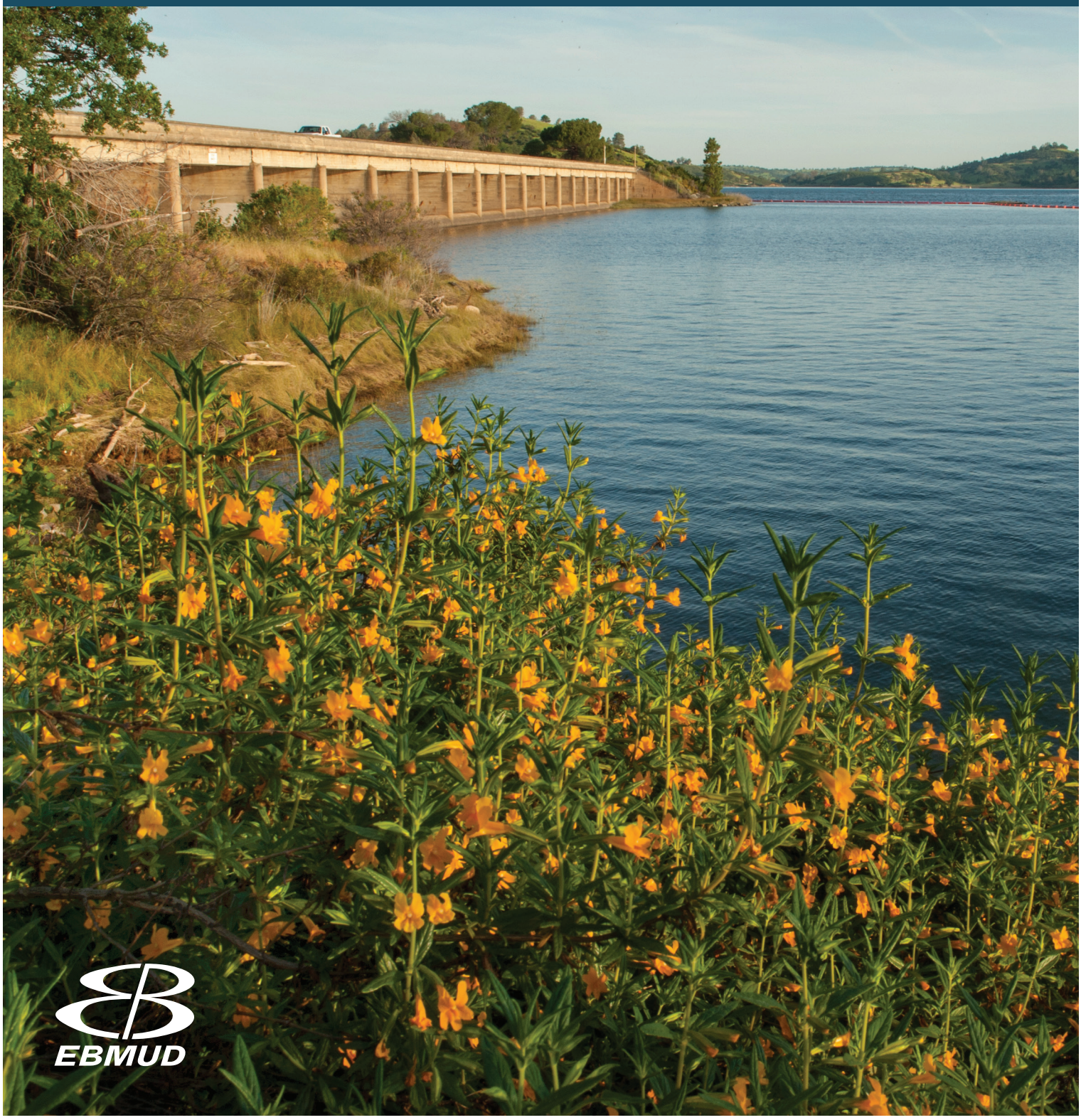
WATER CONSERVATION STRATEGIC PLAN 2021

EAST BAY MUNICIPAL UTILITY DISTRICT



EBMUD

TABLE OF CONTENTS

1 INTRODUCTION

The East Bay Municipal Utility District (EBMUD) provides water to over 1.4 million customers in the eastern San Francisco Bay Area. As a California water utility, EBMUD faces numerous challenges. California is already experiencing the effects of climate change, and the threats are likely to intensify over time, resulting in more wildfires, scarcer water supplies, and impacts to species and habitats. In addition, many of EBMUD's customers face new or increased financial challenges as a result of the COVID-19 pandemic. EBMUD as a public agency has a responsibility to promote equity in its programs and through its interactions with the communities it serves.

Water conservation can be an important tool for addressing many of these challenges. This updated Water Conservation Strategic Plan (WCSP) acknowledges a transformed view of water conservation as offering multiple benefits besides just ensuring a long-term water supply. Water conservation can reduce energy consumption, help customers manage their utility bills, and promote sustainability through the establishment of sustainable landscapes.

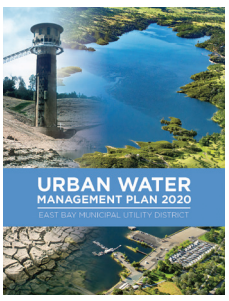
The goal of the updated WSCP is to build on the success of EBMUD's existing robust Water Conservation Program and chart a path for the Program's continued evolution over the next ten years.

1.1. PURPOSE OF PLAN

EBMUD has been promoting water conservation since the 1970s, and it continues to be an important component of EBMUD's overall water supply portfolio. The WCSP serves as a roadmap for helping EBMUD to meet its long-term water supply reliability goals, prepare for droughts, help customers manage their water bills, and comply with regulatory requirements. The WCSP is a second-tier plan to the 2020 Urban Water Management Plan (UWMP). It sets out water conservation goals and details the programs, strategies, and methodologies required to meet those goals. The 2021 Update complements other EBMUD planning documents, including the Water Loss Control Plan, the Urban Water Management Plan, and the Demand Study.

The 2021 WCSP Update covers a ten-year planning horizon, from 2021 through 2030. It builds on previous work and has been developed to meet the water conservation target of 70 Million Gallons per Day (MGD) conserved in the year 2050.

The phased implementation of water conservation measures is based on projected supply and demand, with the understanding that expansion of some programs may be accelerated in order to respond to droughts or regulatory mandates. In developing the 2021 WCSP Update, measures were selected that were cost-effective, appropriate for EBMUD's service area, and that would result in sustained water savings.



The 2021 WCSP Update also takes into consideration the requirements of state and federal regulations. In particular, the California Long-Term Water Conservation Framework, which was in development during the drafting of this document, sets agency targets for water efficiency based on factors such as population, landscape areas, and water loss.

1.2. SCOPE AND ORGANIZATION

The 2021 WCSP provides a background on the Program and its drivers for the future. It describes the methodology used to establish targets for the future and then details an implementation plan for meeting those targets. The 2021 WCSP consists of the following chapters:

Chapter 1: Introduction
This chapter presents the purpose of the 2021 WCSP and provides background on EBMUD's Water Conservation Program.

Chapter 2: Program Development Methodology
This chapter describes how EBMUD developed its current target for future water conservation. It discusses some of the program drivers – such as preparing for future droughts, meeting regulatory requirements, and ensuring equity – and explains how EBMUD used the Alliance for Water Efficiency

(AWE) Tracking Tool to select and evaluate specific water conservation activities. The AWE Tracking Tool was then used to forecast water conservation savings associated with these different activities in order to develop forecasts for the year 2050.

Chapter 3: Program Description
This chapter provides an in-depth discussion of the different water conservation measures that were selected and evaluated in the AWE Tracking Tool. The activities can be grouped into six major strategies: Water Management Services, Education and Outreach, Rebates and incentives, Regulation and Legislation, Supply Side Conservation, and Research and Development. The program includes activities for all the major customer use categories: single-family residential, multi-family residential, commercial, industrial, institutional, and irrigation.

Chapter 4: Program Phasing and Implementation Approaches
This chapter outlines how the activities in Chapter 3 would be phased in or expanded over time. It also introduces the approaches that will be used to encourage customer participation, recognizing the current media landscape may change over time.

Appendices:
5.1. Glossary

5.2. 2050 Water Conservation Forecast Measures

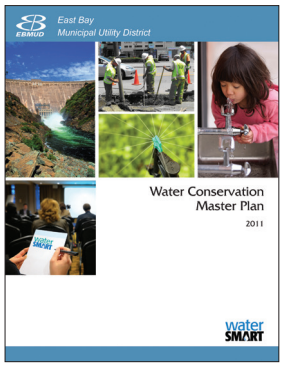
5.3. EBMUD Water Efficiency Regulations and Procedures

1.3. PROGRAM BACKGROUND

Demand management, including water conservation, has been an important element of EBMUD's water supply planning and policies since the 1970s. EBMUD prepared its first Urban Water Management Plan (UWMP) in 1985, which included a list of water conservation efforts designed to save 18 MGD in the year 2005. The Water Conservation Division was established in 1986 to implement the 1985 UWMP water conservation efforts.

EBMUD completed its first Water Conservation Plan in 1994 (referred to at that time as the Water Conservation Master Plan), which helped develop a structure for the program, set goals, and outlined methodologies for program development and tracking. The 1994 Plan set out strategies to meet the water conservation goal, set by the Board of Directors as part of the 2020 Water Supply Management Program (WSMP), of 33 MGD of achieved conservation by the year 2020 (based on a 1990 baseline). At that time, the program focused largely on rebates for toilets and clothes washers. Water budget reports were introduced in the late 1990s along with limited incentives for low-water landscaping.

In 2007, EBMUD undertook the development of the WSMP 2040, which forecasted customer demands out to 2040, and established a portfolio of supplemental supply, water recycling, and water conservation projects to help meet projected future demands. The 2040 Demand Study was finalized in 2009 and the final version of the WSMP 2040, adopted by the Board of Directors in 2012, set a goal of achieving 62 MGD of water conservation by the year 2040.



The Plan was last updated in 2011 to include existing and planned efforts to support meeting the WSMP 2040 water conservation goals. The 2011 Plan also included per-capita demand reduction targets, adopted by EBMUD, as required to meet the requirements of Senate Bill x7-7 (SBx7-7). SBx7-7, adopted by the State legislature in 2009, called for a 20 percent statewide reduction in per capita water use by the year 2020. The 2011 Plan also marked a shift in EBMUD's approach to water conservation, reducing the emphasis on rebate and incentive programs and moving toward programs that leverage information technology to help customers make informed choices in water use.

The 2021 WCSP Update outlines how the Water Conservation Program will help EBMUD meet future demands as projected in the 2050 Demand Study that was completed in 2020. It describes how program drivers including climate change, equity, and emerging regulations lead to the need for Program expansion and evolution. The 2021 WCSP provides the methodology that was used to select and evaluate activities for inclusion in the Program and the development of forecasts for 2050 water savings. The selected activities are described in detail to show how they will help customers save water. Implementation strategies and phasing in of specific measures are also discussed.

2 PROGRAM DEVELOPMENT METHODOLOGY

2.1. PROGRAM DRIVERS

As described in Chapter 1, EBMUD has an extensive history in water conservation, which has played an important role in managing demand since the 1970s. Water conservation activities are typically increased during droughts to help ensure that essential demands are met. There are several drivers for the continued expansion of the Program. These drivers also influence which activities were selected and how they will be implemented.

2.1.1. Droughts and Climate Change

Water conservation continues to be important for ensuring water supply during future droughts. California has variable hydrology with frequent dry periods, and its water resources have historically been stressed by periodic droughts, including some multi-year droughts that significantly reduced the supply of freshwater available to EBMUD. A robust water conservation program helps manage limited water resources, and programs can be scaled up as needed to meet short-term demand reduction targets.

The 2014-2015 drought severely affected EBMUD's water supply. Flows in the Mokelumne River dropped to low levels, triggering the State to curtail EBMUD's water rights. Similarly, EBMUD's allocation of water from the Central Valley Project was reduced to 25 percent due to the statewide drought. During this period of water shortage, EBMUD instituted mandatory 20 percent rationing and set restrictions on water use. EBMUD's conservation activities as established in the WCSP helped meet customer demands. More recently, the state entered a period of drought in 2020-2021, and water year 2021 was the second driest on record for the Mokelumne watershed.

Climate change is predicted to increase the frequency and severity of droughts in California. Climate change could also affect the water supply by causing temporary degradation in water quality (for example, due to forest fires) that renders EBMUD's normal supplies temporarily unavailable. Increases in temperature may also lead to increases in demand. The Water Conservation Program must be designed with these challenges in mind.

2.1.2. Demand Hardening

One issue that water conservation programs must address is demand hardening. Once customers have reached high levels of water efficiency, it becomes more difficult for them to achieve additional, short-term savings during droughts and other water shortage emergencies. In designing the Program, thought was given to activities that could be scaled up as needed in response to water shortages. Furthermore, numerous activities that were not selected could still be implemented if necessary.

In addition, earlier phases of EBMUD's Program focused on activities like rebates for water-efficient fixtures and appliances such as toilets and dishwashers. EBMUD ended some of these rebates as they reached market saturation. As the Program matures, it will need to focus on changing customer behaviors and attitudes towards water use to achieve incremental water conservation results, which may be more difficult.

2.1.3. Emerging Regulations

Meeting new regulatory requirements is an important driver for Program development, and in particular, the Program was designed to comply with the State of California's new water use efficiency regulations.

The State legislature passed the Water Conservation Act of 2009 (SB X7-7, Steinberg, 2009), often referred to as "20x2020," which called for a 20 percent reduction in urban per capita water use statewide by

the year 2020. EBMUD reported on its compliance with this Act as part of the 2020 UWMP. The State allowed agencies to choose from four methods for calculating their 2020 target. EBMUD selected "Target Method 2," which calculated the target based on a per-person indoor residential water use allocation; a 10 percent reduction from the baseline in commercial, institutional, and industrial use; and a water budget for landscaped areas of residential and irrigation accounts equivalent to the Model Water Efficient Landscape Ordinance.

Following the 2014-2015 drought, the State of California adopted a new set of regulations known as "Making Water Conservation a California Way of Life" in 2018, laid out in AB 1668 and SB 606. Collectively known as the Long-Term Water Use Efficiency Framework, these bills build on the Water Conservation Act of 2009 and form a foundation for conservation and drought planning in the state. The Long-Term Framework goals are to promote: using water more wisely, eliminating water waste, strengthening local drought resilience, and improving agricultural water use efficiency.

The Long-Term Water Use Efficiency Framework goals are to promote:

1. *Using water more wisely*
2. *Eliminating water waste*
3. *Strengthening local drought resilience*
4. *Improving agricultural water use efficiency and drought planning*

These four goals have created a framework for water utilities and end-users throughout the State to achieve water conservation today and prepare for future droughts. This legislation replaces the 20 percent reduction in water savings achieved by the Water Conservation Act of 2009, creating a new budget-based approach to conservation wherein water utilities will be given an aggregate maximum water use target that they are required to meet. The target will be based on four components:

- Indoor residential use
- Outdoor residential use
- Outdoor Commercial, Industrial, and Institutional (CII) use with dedicated irrigation meters
- Water loss reduction

This legislation requires the State Water Resources Control Board (SWRCB) and the Department of Water Resources (DWR) to establish standards for each of these four components.

For the indoor residential value, the target is based on population and an indoor water use standard expressed in gallons per capita per day (GPCD). The initial target is 55 GPCD in 2020. In 2025, the target is reduced to 52.5 GPCD or a different standard as recommended by the SWRCB and DWR. In 2030, the target is further reduced to 50 GPCD or a different standard as recommended by the SWRCB and DWR.

The standard for outdoor residential consumption is based on the community's climate and the total amount of landscaped area, using a methodology similar to the "Target Method 2" utilized by EBMUD for demonstrating compliance with the Water Conservation Act of 2009. The standard for outdoor CII landscaped areas with dedicated meters is currently under development; as of the time of publication of this document, the State is scheduled to issue that standard in October 2021.

The standard for water loss reduction is also still under development. The SWRCB is developing a volumetric reduction standard for each agency based on real water loss per connection per day as required by a separate piece of legislation, SB 555, which was passed in 2015.

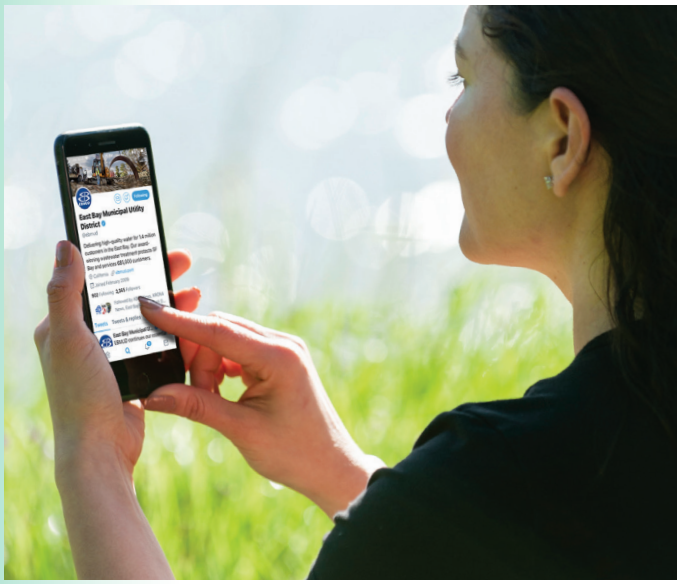
Although the State is still working on developing the goals and requirements for each of the four categories, the Program targets and activities outlined in the 2021 WCSP were designed to ensure that EBMUD can meet these regulatory requirements. If the future development of these goals and standards requires EBMUD to make significant changes to its Water Conservation program, then an addendum to this WCSP can be issued.

2.1.4. Communications in the 21st Century

Changes in technology and communications provide challenges and opportunities for the Program. New tools such as social media can help to spread water conservation messaging widely and rapidly; on the other hand, as access to information and

news becomes more prevalent, EBMUD must work to ensure that its communications are noticed by customers who may be overwhelmed by competing messages. Customer expectations about communications are also evolving, meaning that customers may expect EBMUD to provide different information, or may want communications in different formats or with different frequency.

A key issue for EBMUD is finding ways to communicate with customers who use EBMUD's water but do not have an account or pay a water bill directly. This includes residents of apartment buildings, dormitories, HOAs, and other multi-family residences. Social media can help to reach some of these customers. EBMUD will continue to explore other approaches to ensure that these non-billing customers receive important information and tools.



The 2021 WCSP includes new activities that make use of targeted messaging and social media to reach customers. As new communications tools become available, the Program will evaluate their suitability for marketing conservation programs, conducting education and outreach, and communicating with customers.

It is also possible that the communications landscape may continue to evolve over the ten-year timeframe of the WCSP. Incorporating new tools and techniques and adapting to changes will be essential for EBMUD to reach and engage diverse audiences in creative ways and to provide the right information, in the right way, at the right time, to support conservation efforts.

EBMUD WaterLifeline

2.1.5. Equity

The 2021 WCSP Update includes a focus on equity. The concept of equity can be understood as providing different individuals and communities with the resources and tools they need to achieve fairness and equality. In the case of water conservation, this means looking for ways to ensure that EBMUD is offering education, tools, and incentives that support all its customers in using water efficiently. In promoting these programs, EBMUD's marketing and outreach efforts should be designed to be inclusive.

In particular, the Program must provide services to support its low-income customers in order to both conserve water and help these customers lower their utility cost. While some activities, like home surveys, can benefit all customers, other programs may have barriers for low-income customers; for example, some rebate programs may be out of reach for customers who cannot afford the initial program cost. This WCSP makes an effort to identify activities and services that could help low-income customers to save water and money.

These services could be designed to complement existing programs aimed at assisting low-income customers. EBMUD administers a Customer Assistance Program (CAP) that provides reduced water rates for customers below a certain income threshold. EBMUD also offers payment plans to help customers pay their bills, and the Water Lifeline program, administered by local charities, supports customers who cannot pay their bills due to an emergency. EBMUD is redesigning its customer support to be more holistic. This includes embedding water conservation activities to help customers lower

their water use, and thus lower their overall household utility costs. For example, one strategy is to engage new CAP participants with a "Welcome" package that includes a home water survey kit and information about water conservation services. EBMUD could also develop new water conservation activities targeted to CAP participants specifically, such as programs offering leak repair assistance or direct-install of high-efficiency toilets.

Education, outreach, and marketing efforts should reflect the diversity of EBMUD's customers and the many languages spoken in the service area. The Program will look to translate materials into different languages to ensure that more customers are able to participate in water conservation activities, furthering EBMUD's objective of ensuring equity and inclusion.

Marketing and outreach should consider the use of different venues and tools to reach more customers. This may include looking at traditional media like advertisements in newspapers and radio stations or the use of social media. Partnership with nonprofits who work in the community can also help to expand marketing and enable contact with difficult-to-reach customers.

2.2. 2050 DEMAND STUDY

The potential for increasing water conservation savings in EBMUD's service area was evaluated as part of the 2050 Demand Study completed in 2020. The 2050 Demand Study utilizes a land-use-based approach to forecast water demands in the EBMUD service area out to the year 2050. Information including forecasts of the number of dwelling units and employment data was obtained from land-use planning agencies (e.g., cities and counties) and incorporated into a newly developed, econometric water demand model.

To more accurately estimate future water demand, three different forecasts of water conservation savings were developed as part of the 2050 Demand Study. These include the 2050 Water Conservation forecast – used as the basis for this WCSP – as well as high and low estimates. To develop the forecasts, EBMUD used the Water Conservation Tracking Tool (Tracking Tool) developed by the Alliance for Water Efficiency (AWE) to evaluate different conservation activities and develop three water conservation forecast scenarios.

Table 1. Water Conservation Activities Selected for the Demand Study

Residential	Non-Residential	
SINGLE FAMILY	**COMMERCIAL**	**INSTITUTIONAL**
AMI Meter Installation	AMI Meter Installation	AMI Meter Installation
Bath Faucet Aerator	Custom Rebate Level 1	Landscape Pressure Regulator Rebate
Graywater Rebate	Custom Rebate Level 2	Large Landscape Irrigation Controller
High Efficiency Irrigation Nozzle Rebate	Custom Rebate Level 3	Large Landscape Survey
Home Survey Kit	Dipper Well	Large Landscape Turf Replacement
Irrigation Controller	High Efficiency Irrigation Nozzle Rebate	Survey
Kitchen Faucet Aerator	Landscape Pressure Regulator Rebate	**WATER LOSS CONTROL**
Landscape Pressure Regulator Rebate	Large Landscape Irrigation Controller	Water Reports
Residential Surveys	Large Landscape Survey	**IRRIGATION**
Showerhead	Large Landscape Turf Replacement	AMI Meter Installation
Turf Replacement	Pre-Rinse Spray Valve	High Efficiency Irrigation Nozzle Rebate
Water Reports	Survey	Landscape Pressure Regulator Rebate
MULTI FAMILY	Water Reports	Large Landscape Irrigation Controller
AMI Meter Installation	**INDUSTRIAL**	Large Landscape Turf Replacement
Bath Faucet Aerator	AMI Meter Installation	Large Landscape Water Budgets
Common Area Coin-Operated 4.0 Water Factor Washers	Large Landscape Irrigation Controller	
Kitchen Faucet Aerator	Survey	
Residential Surveys	Water Reports	
Showerhead		
Water Reports		

2.2.1. Passive vs. Active Savings

The water conservation forecasts include savings from both active and passive measures. Passive savings include reductions in water demand resulting from codes, standards, and legislation, including EBMUD's own water efficiency regulations, whereas active savings result directly from EBMUD water conservation activities. For example, updates to appliance standards that require greater water efficiency would count as passive savings, whereas a rebate program for new water efficiency measures that are not required by code would count as active savings.

The Tracking Tool adjusts the demand and water conservation savings forecast to take into account the future effects of plumbing code changes and appliance standards. It estimates water savings as customers change older fixtures and hardware (e.g., toilets, showerheads, aerators, clothes washers, etc.) for newer, more water-efficient models.

The Tool calculates passive savings that result from the plumbing code. EBMUD and AWE staff worked together to refine the Tracking Tool to account for the higher implementation of efficient hardware and fixtures resulting from EBMUD rebate and incentive programs, to ensure that the water conservation forecasts were not inflated as a result of double-counting EBMUD investments that later became part of the plumbing code.

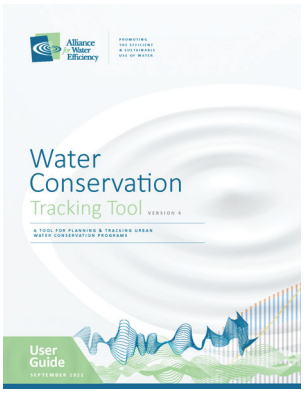
2.2.2. Achieved Water Conservation

An important component of EBMUD's water conservation program is to quantify and track activities and water conservation savings over time. Achieved water conservation is the amount of water saved by EBMUD's customers as a result of updates to codes and regulations, the natural replacement of fixtures, and active savings from EBMUD's own conservation programs. For the 2050 Demand Study to accurately forecast future water conservation potential, it was necessary to quantify achieved savings. The 2050 Demand Study evaluated achieved savings from 1994 – when the first Water Conservation Plan was instituted – through the year 2018. From 1994 through 2004, conservation savings estimates totaled a combined 18 MGD from active and passive activities.

Achieved Conservation from 2005 to 2018 was estimated using the water demand model developed as part of the 2050 Demand Study. The water demand model can be used to estimate achieved conservation because the model can remove the effects of drought and recession from historical water demands, thereby delineating the achieved conservation. The model estimated conservation savings of 28 MGD for this period.

Combining the two periods, a total achieved conservation savings of 46 MGD was established from 1994 through 2018. Going forward, the water demand model may be used at regular intervals to estimate the achieved savings from water conservation as a means of tracking program success.

2.2.3. Water Conservation Forecasting Methodology



The AWE Tracking Tool is an Excel-based model that evaluates the costs, benefits, and water savings of different conservation programs under a standardized, industry-accepted methodology. The AWE Tracking Tool includes a library of standard conservation activities that can be used to build selected programs. EBMUD worked directly with AWE to adapt the Tracking Tool to incorporate EBMUD-specific conservation activities, including past activities and customer adoption rates, for the analysis.

2.2.4. Development and Screening of Program Activities

As a first step, EBMUD developed an initial list of 75 potential water conservation activities to be considered. This list was informed by the Water Conservation Plan 2011 Update. The 75 activities were initially screened based on their appropriateness for EBMUD's service area, the potential ease of implementation, proven savings, and level of market saturation. Based on this initial screening, 64 water conservation activities were prioritized for further evaluation based on the potential for customer participation, cost-effectiveness, the existence of multiple benefits, and staff experience. Ultimately, a

set of 50 water conservation activities were selected to develop the water conservation forecast.

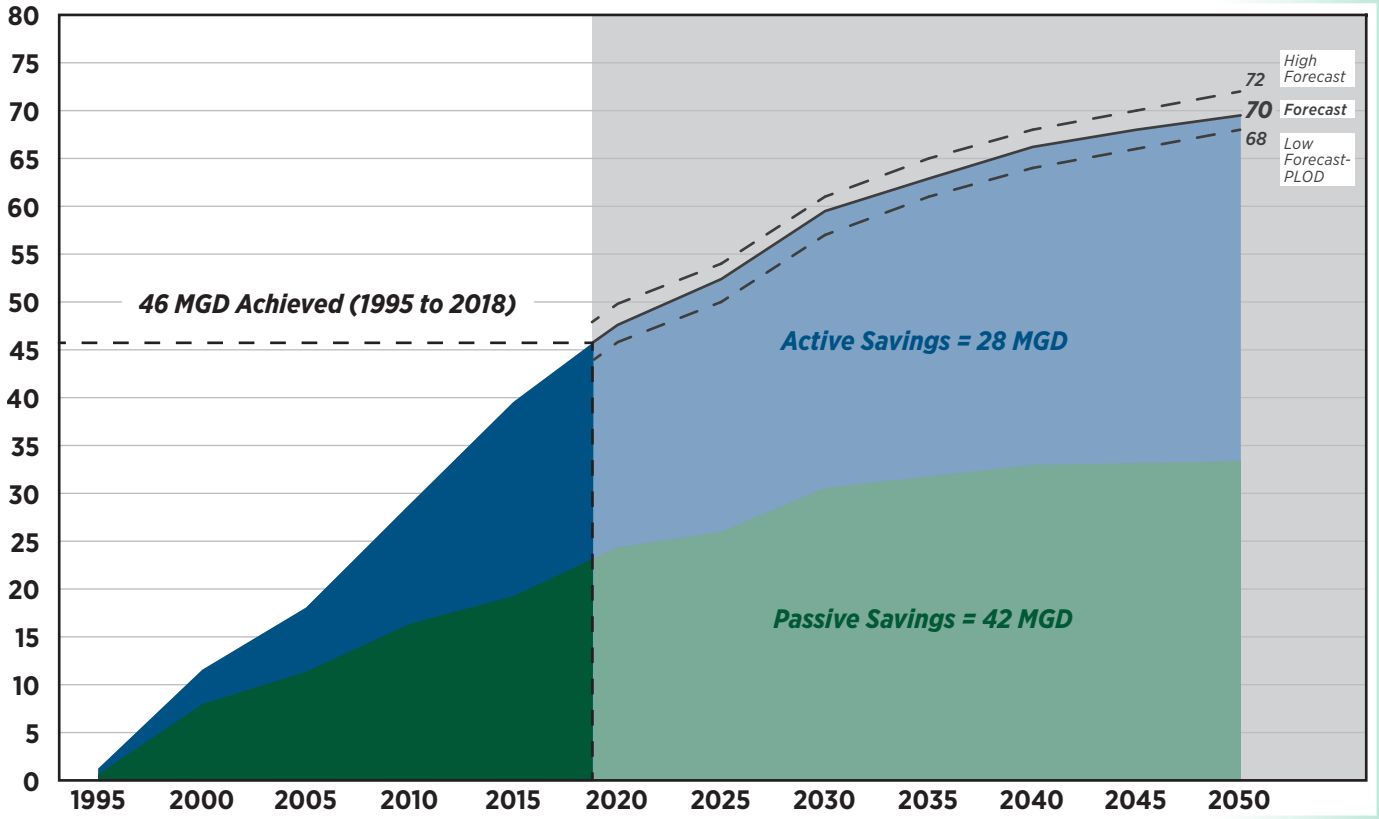
Listed in Table 1, the 50 water conservation activities selected include activities for each of the six customer use categories. Some activities offer incentives to customers to upgrade to more efficient fixtures or replace lawns with drought-tolerant landscaping. Other activities focus on using water management tools like surveys, customized water reports, and landscape water budgets to help customers make informed decisions about their water use. Several of the selected activities focus on the replacement of existing meters with "smart meter" technology, such as Advanced Metering Infrastructure (AMI), which provides customers with real-time data on their water use and identification of potential leaks through analysis of water use patterns. Lastly, the water conservation activities also include supply-side conservation in support of Senate Bill 555 state mandates, through water loss control efforts such as distribution system leak detection, pressure management, and pipeline repair and replacement.

Each of the 50 water conservation activities selected was evaluated for its potential water savings over time. Data used to forecast water conservation savings included demographics, market saturation levels, and calculated water savings. For example, EBMUD estimates the current market saturation and number of (residential and commercial) dwelling units to determine how many customers might still participate in a rebate program. Estimates of participation (activity) levels for each year were then developed and multiplied by the calculated water conservation savings per device or intervention to determine the total water conservation potential of a particular program. Participation level and water savings estimates were determined for each of the 50 water conservation activities using a variety of sources, including past program participation levels, published references, EBMUD research and studies, and staff experience.

2.2.5. Water Conservation Forecasts

Three water conservation forecasts were developed to show the potential range of outcomes based on varying participation levels for the selected water conservation activities. They include achieved conservation as of 2018 as well as the additional future conservation forecasted by the Tracking

Figure 1. Three Water Conservation Forecasts



Tool. All three water conservation forecasts show EBMUD's conservation program making a significant contribution towards offsetting new demand. Figure 1 shows the three forecasts along with the 46 MGD of achieved savings as compared to the 1994 baseline.

The 2050 Water Conservation Forecast was based on what are achievable levels of participation in the 50 water conservation activities. This forecast was designed to allow for the development of alternative methods to respond and adapt to potential changes by increasing levels of participation in some water conservation activities or adopting others that were not initially included. The 2050 Water Conservation Forecast would result in 70 MGD of water conservation savings in 2050. This forecast is the basis for the 2021 WCSP.

High and low water conservation forecasts were also developed by varying participation levels in some programs. The "High" forecast represents a best-case scenario in which EBMUD is especially successful in implementing its programs. It assumes a District-wide rollout of AMI technology and higher customer participation rates. It also assumes a higher level of savings resulting from its supply-side conservation efforts based on higher rates of pipeline replacement. The High-Water Conservation Forecast would result in 74 MGD of savings by 2050.

The "Low" forecast, also called the "Planning Level of Demand" (PLOD), was designed to be more conservative from a water supply planning perspective and was used in the 2020 UWMP to evaluate EBMUD's long-term water supply reliability. It assumed a lower participation rate in AMI programs and reduced supply-side conservation savings. The PLOD water conservation forecast would result in 66 MGD of savings by 2050.

The 2050 Water Conservation Forecast would result in

70 MGD of water conservation savings in 2050.

This forecast is the basis for the 2021 Water Conservation Strategic Plan.

THIS PAGE HAS BEEN INTENTIONALLY LEFT BLANK

3 PROGRAM DESCRIPTION

As described in Chapter 2, achieving the 2050 water conservation goal will require a suite of programs and activities spanning EBMUD's entire service area and across all customer classes. This chapter provides further details on specific activities identified through the 2050 Demand Study. This includes programs that are already in place and will be continued or expanded, as well as new initiatives that are still in development.

Water Conservation Program activities can generally be split into one of six high-level strategies to help meet future demand:

- Water Management Services
- Education and Outreach
- Rebates and Incentives
- Regulation and Legislation
- Supply Side Conservation
- Research and Development

The 2021 WCSP Update continues a general shift towards leveraging existing and new information technology and communications tools to help customers better manage their water use, while still offering traditional rebates and incentives where appropriate. In addition, the program includes a focus on expanding participation and making water savings opportunities available to the entire customer base within EBMUD's service area.

3.1. WATER MANAGMENT SERVICES

3.1.1. Introduction

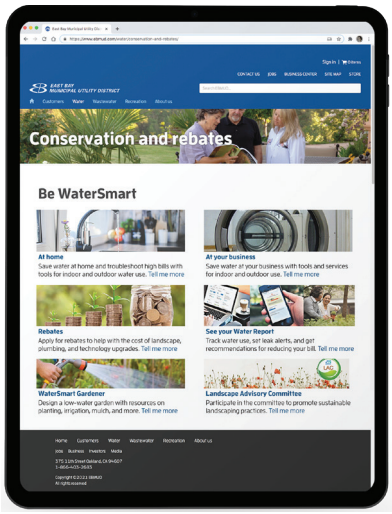
Water management services provide customers with the information needed to make informed decisions about their water use. EBMUD leverages technology to deliver customer access to historical and current water consumption, interactive tools to evaluate and understand water use patterns, and customized water use recommendations based on each property's unique characteristics.

Key initiatives include customized water consumption reports for households and businesses, landscape water budget reports for irrigation accounts and residential parcels, leak and high use notifications, and water use surveys. Timely communications, access to consumption data, and advanced analytics that interpret and contextualize water use patterns help to inform customer choices and behavior regarding water consumption.

Data-driven informational systems support outreach and program development and enable EBMUD to cost-effectively target services and programs where they are most needed and impactful. To reach customers, EBMUD's water conservation program uses advanced analytics, basic email management services, text and voice message communication, and the ability to segment and provide relevant meaningful data-driven information. The database used by EBMUD includes customer account attributes such as past program participation, housing and property characteristics, and census data, as well as information on climate and geography, that can be combined with machine learning to identify water-saving opportunities.

Water use analysis begins with the customer's water meter. Using water use data, staff can look for trends that indicate a leak or higher than normal water use and provide automated alerts to customers. The ability to provide useful analytics tools and alerts to customers is improved with higher resolution water use information.

EBMUD continues to explore the use of Advanced Metering Infrastructure (AMI) – a system of smart meters, communications networks, and data management tools that enables two-way communication between utilities and customers. AMI has increasingly become the industry standard in metering. EBMUD has piloted projects that use AMI technology to improve demand and supply-side conservation. In addition to automating meter reading,



AMI meters provide nearly 1500 times more water use data points per billing period compared to non-AMI meters. This data and the accompanying analytics allow near real-time leak detection, more timely alerts to customers, better troubleshooting for customer leaks, and prevention of costly water bills due to severe leaks on the customers' plumbing.

3.1.2. Online Water Consumption Portal

EBMUD's website provides customers a centralized location to access various educational and informational materials. Customers can obtain technical information, water conservation tips, rebates applications, and step-by-step guidance for assessing water use and identifying leaks in both homes and businesses. It also includes an online store for customers to order and download informational materials, publications, free conservation devices, and self-survey kits.

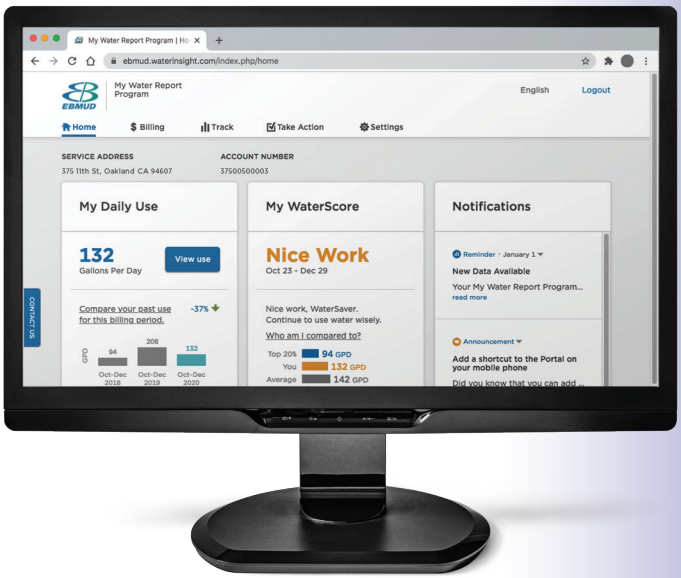
The EBMUD website also provides an online portal that customers can log into for on-demand access to conservation services, both during and after EBMUD business hours. Once logged in, integration with actual consumption data allows customers to compare their water use with site-specific efficiency benchmarks as well as with typical water use in geographic areas similar to their own. When real-time hourly metered water use via AMI is available, the portal provides even more accurate analytics and richly detailed water-efficiency benchmarks.

The water conservation program uses an engagement and data analytics platform to provide the online portal, generate content, deliver efficiency reports, send automated alerts, and engage with customers. The software allows EBMUD to send targeted customer emails, texts, and phone calls, which can also be used for time-sensitive communications such as neighborhood updates on emergencies, main breaks, or construction projects.

Automated leak alerts, detected by machine learning and configurable settings, are one of the most impactful services, especially when near real-time data is available. Leak alerts by email, text, or phone direct customers to a leak resolution tool, an interactive guide that allows them to investigate unusually high-water use, identify potential reasons for such high usage, and report back to EBMUD on findings. Based on responses from customers thus far, the most commonly identified leaks are in outdoor watering systems, which account for 43 percent of confirmed leaks. The alert system helps EBMUD target services and resources accordingly. Currently, most leak alerts are generated based on bi-monthly billing reads, meaning that there may be a delay in detecting the leak and notifying the customer. As AMI data becomes available, leaks can be detected more quickly.

A key component of this software is the internal dashboard for staff to monitor program outcomes, automate and manage communications, and improve operational efficiency with analytics and reports. In the future, EBMUD plans to further integrate the website and online portal with its billing systems to ensure a more seamless experience for both customers and staff.

EBMUD is exploring the best ways to encourage customers to sign up for the web portal and use its tools. As discussed in Section 3.6, research into customer behavior patterns and how to communicate with customers to influence their water use will be a key focus area in the future.

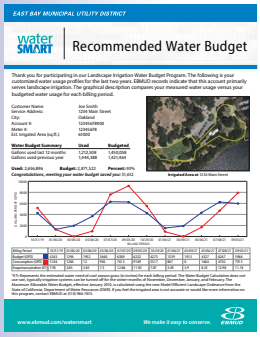


3.1.3. Water Reports

EBMUD provides regular Water Reports to customers to help them understand and contextualize their water use. Single-family customers are given a score based on how their water use compares to similar households to help contextualize their water use. For non-residential customers, water use is compared to past trends at that property. These reports also provide a way to communicate timely and seasonal messages to customers and prompt engagement with the web portal to access more detailed consumption data and recommendations and to track conservation activities.

3.1.4. Water Budget Reports

A water budget report is a benchmark to compare the amount of water needed to irrigate a healthy landscape versus the amount used. Through its Irrigation Reduction Information System (IRIS) program, EBMUD creates water budget reports for each billing cycle for irrigation customers by using consumption data, landscape area measurements, and plant watering requirements adjusted by real-time local weather data. Landscape area measurements come from aerial imagery or field visits. Plant watering requirements are established by weather data that comes from local weather stations maintained by EBMUD. The system then generates and emails individual water budget reports to irrigators.


EAST BAY MUNICIPAL UTILITY DISTRICT

water SMART Recommended Water Budget

Water Budget Reports include a graph of actual water use over a two-year period that is compared to a recommended water budget for the site. They also project actual water cost savings calculated according to set water use targets.

Currently, EBMUD's IRIS Water Budget Program is a targeted informational service for accounts linked to properties with dedicated irrigation, which represent nearly 6,000 acres of land or eight percent of total EBMUD water use. Dedicated irrigators are typically parks, golf courses, cities, counties, homeowner associations, and businesses. In 2020, more than 24,000 landscape water budgets were sent to around 3,950 customers with dedicated irrigation meters. Collectively, the customers in the IRIS program only used 76 percent of their recommended water budgets, resulting in nearly 3.3 MGD in water savings.

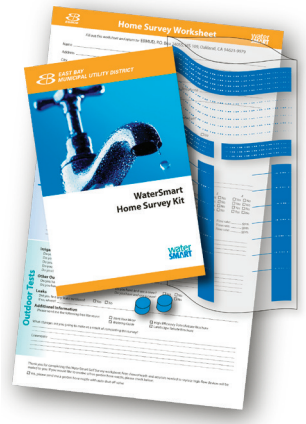
EBMUD is developing an irrigation budget calculator that incorporates imagery of individual parcels and a measurement tool to allow customers to measure irrigated areas and establish landscape water budgets. EBMUD is planning to expand the Water Budget Program to single-family, multi-family buildings, and the mixed-use commercial sector by incorporating these tools into the web portal and eventually into the Water Report program.

3.1.5. Water Wise Consultations

EBMUD water use surveys involve direct interaction with customers to promote water-efficient behavior and hardware installations. Surveys are important educational interventions that include a review and analysis of water consumption and an introduction to other EBMUD conservation services, including technical and financial assistance. EBMUD's water conservation program offers water wise consultations in person, remotely through virtual video meetings or telephone, and through self-service kits.

3.1.6. Self-Survey Kits

Self-survey kits guide customers through a step-by-step self-assessment of their water use. The booklet directs users to check for indoor and outdoor leaks, take inventory of water-using hardware and equipment, and measure fixture flow rates. The kits include toilet dye tabs and a flow meter bag for measuring flow rates from faucets and showerheads. EBMUD maintains a database of kit deliveries for future follow-ups with customers on additional conservation services. Customers can send in their completed surveys and EBMUD will send them free water efficient devices based on their findings.



3.1.7. Single-Family Water Use Consultation

Customers needing additional assistance are referred to EBMUD staff for a detailed consultation to establish concrete recommendations for both saving water and lowering their bills.A site visit typically includes

a meeting with a resident, homeowner, or property manager to review water consumption history, test for leaks, assess indoor plumbing fixture flow rates, and assess outdoor landscape irrigation. For properties with landscapes, a site visit will focus on irrigation scheduling, hardware efficiency, efficient landscape design, and maintenance practices. Landscape consultations are primarily scheduled at sites with high summer water use and automatic irrigation systems.

3.1.8. Multi-Family Water Use Consultation

The term multi-family refers to properties like apartment buildings or condominiums with five or more units and includes the same elements as single-family surveys. At each site, a sample of dwelling units is inspected and assessed for indoor water use efficiency. Outdoor water use is also assessed. Once multi-family properties complete an on-site survey, they may request a bulk distribution of water-saving devices like faucet aerators and showerheads.

3.1.9. Landscape Consultation

Irrigation water use surveys are in-person surveys with additional emphasis on efficient landscape irrigation scheduling, hardware efficiency, automatic irrigation controller programming, and sustainable landscape design and maintenance. These surveys include an evaluation of current and past water use, on-site inspection of irrigation systems, tests for sprinkler uniformity, training for landscape personnel on principles of efficient irrigation, and recommendations for increasing water use efficiency. Irrigation water surveys are targeted to irrigation accounts where landscape irrigation comprises most or all of usage at the site.

Landscape consultations are scheduled at target sites with high dry-season water use and automatic irrigation systems. While available to all customers, most sites that benefit from this service are in communities with lower-density housing, larger lots, and installed mature landscapes with automated irrigation. Homeowners' associations (HOA) continue to represent a large participant sector, along with golf courses, parks, and school athletic fields.

The survey includes evaluation of current and past water use, sprinkler uniformity (or cup) tests, recommendations for lowering water consumption, on-site training in the principles of efficient irrigation, and assistance in developing an irrigation schedule. The survey also serves as an evaluation of eligibility for financial incentives and supports participation in the IRIS program.

3.1.10. Commercial, Industrial & Institutional (CII) Water Use Surveys

CII surveys are designed to help businesses and institutional customers use water more efficiently. CII water surveys consist of on-site visits conducted by EBMUD staff. Staff work with landscape and facility managers and consultants to identify opportunities to increase water use efficiency and achieve benefits in reduced energy use, wastewater discharge, and chemical use in addition to the potential for downsizing treatment facilities. More complex commercial and industrial surveys can include a review of process water use, cooling towers, water treatment, and on-site distribution systems. If the surveyor determines that existing devices are inefficient, a one-time offer of water-efficient devices is provided. Devices include water-conserving showerheads, low-flow faucet aerators, and commercial dishwashing spray valves. Businesses with relatively simple end uses of water have also successfully used EBMUD's Home Survey kits to assess their water use and look for opportunities to save water.

3.1.11. Customer Success Representatives (formerly "Key Accounts")

EBMUD assigns staff to dedicated customer sectors to provide consistent and high-quality information and resources. When a customer requests assistance,

they will be put in touch with the staff that is familiar with their residential or commercial business sector. In many cases, customers reaching out for support over multiple years will be able to speak with the same staff person who is already familiar with their site and specific needs.

Staff also maintain programs that focus on groups with specific conservation needs. This focused support for customers is based on factors such as high water use and those with irrigation. Staff are also able to provide customized communications and recommendations, including water usage reports, water-saving opportunities, and industry-specific updates.

3.1.12. WaterSmart Certification Program and Green Business Program

EBMUD has offered a WaterSmart Business Certification Program to incentivize and recognize CII customers that implement water efficient practices and conserve water. Over the next decade, the program will pivot towards a more inclusive model that will leverage the current partnerships with the Alameda and Contra Costa County Green Business Programs to implement a more robust program model that will reach a larger segment of CII customers. Certified businesses' water consumption will continue to be tracked annually, and businesses will be required to re-certify on a regular basis in order to continue their certification.

The original program was launched in 2009, and its first recognition event was held in June 2010. Since its inception, more than 190 businesses have been certified, varying from office buildings to dry cleaners. Together these businesses have saved more than 100 million gallons annually by increasing their water use efficiency compared to baseline. With this new partnership model approach with the Green Business Network, the program will continue to help CII customers not only to achieve water savings but to contribute towards a greener economy.

3.2. EDUCATION AND OUTREACH

3.2.1. Introduction

EBMUD provides customers with educational services including online resources, publications, newsletters, school curricula, community workshops, and professional training. Utilizing these channels, EBMUD emphasizes the multiple benefits of water conservation, including social, economic, and environmental resiliency. One new concept is the idea of regenerative landscaping that goes beyond sustainability to restore the environment by improving soil health and biodiversity. Residents and businesses are encouraged to take action to save water and energy, improve stormwater management, reduce water and air pollution, build healthy soil, sequester carbon, increase biodiversity, and reduce a site's vulnerability to wildfires. To increase the visibility of conservation programs and services, EBMUD also collaborates with other agencies and organizations for local, regional, and statewide conservation partnerships and educational campaigns.

Over the next ten years, EBMUD will expand education and outreach initiatives to support California's long-term water conservation framework, address climate change, and meet the needs of a growing and changing population. Residents are encouraged to make water conservation a way of life to position themselves for drought and future water shortages. As residential consumption is the

single largest component of total consumption, and residential demand is significantly higher in the summer than winter months due to irrigation, EBMUD will continue to focus on promoting outdoor efficiency improvements.

A new priority will be to develop outreach strategies relevant to multi-family residential properties, as this sector is expected to grow. Additional efforts include developing digital marketing tools, translating materials into the major languages spoken in EBMUD's service area, and focusing on developing and maintaining meaningful partnerships to increase the impact and reach of EBMUD's water conservation programs. EBMUD will pursue opportunities to ensure that educational programming reaches communities that have historically been underserved.

3.2.2. Website and Social Media

EBMUD maintains a strong presence online (***ebmud.com/watersmart***) to serve as a hub for up-to-date conservation resources. The EBMUD website provides a centralized location for customers to access information on rebates, conservation tips, a video library of "how-to" conservation training tutorials, and links to recommended publications. The website provides a link to EBMUD's online conservation store where customers can request free conservation devices and self-survey kits. The Customer Pipeline bill insert, sent to all customers each billing cycle, is featured on the main webpage and frequently highlights timely conservation programs and news.

In recent years EBMUD has develop to develop a presence online through social media. Social media sites allow EBMUD to communicate broadly with customers, receive feedback, and even conduct events and contests. Through social media and tools like email and text, EBMUD communicates directly with customers to disseminate time-sensitive information and to promote workshops and events to a wide audience. Social media posts become immediately visible to any person with online access, inviting individuals to chat, ask questions, and share content. Comments on social media posts provide a perspective into customers' interests and values. Customers can also use social media to communicate issues or concerns back to EBMUD by "tagging" the EBMUD account. During the 2021 drought EBMUD used social media platforms to boost advertisements, promote educational webinars, and share tips on saving water. Currently EBMUD is active on Facebook, Twitter, NextDoor, and Linked In, with plans to join Instagram in the near future. Over time, EBMUD may branch into other social media platforms as they become available.

3.2.3. Marketing

EBMUD plans to expand the use of digital marketing tools to reach its customers, including targeted, direct emails sent to customers based on demographics, seasonal campaigns, and relevant program updates. For example, a targeted email may be sent to property owners with large landscapes to recommend seasonal irrigation adjustments. Likewise, industry-specific newsletters, links, articles, and events can be created and targeted to landscape, commercial, residential, industrial, and institutional customers.

With residents bombarded daily by outside advertisements, emails, and texts, it will be particularly important to refine marketing efforts and find creative ways to engage and educate the EBMUD community. How-to videos, kid and adult-friendly animations, family fun events, and public engagement campaigns will be used to capture attention. In 2018, EBMUD launched its first "I Heart My Garden" photo challenge, inviting customers to submit their own before and after photos of their former lawns transformed into water-efficient gardens. Over 80 customers participated, and prizes were awarded for outstanding projects. EBMUD also participates in state-wide and national water efficiency campaigns, such as the EPA's Fix-A-Leak week in March and the Irrigation Association's Smart Irrigation Month in July.

3.2.4. Community Events and Presentations

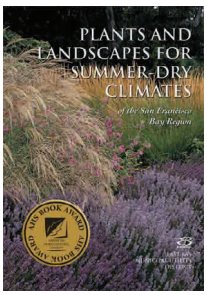
EBMUD sponsors and participates in a variety of community events to communicate conservation messages to a broad audience. Events are often on weekends and may include seasonal festivals, Earth Day events, community workshops, and trade shows. Participation in such events is evaluated annually to identify the most effective venues for enhancing public relations and delivering conservation messages. EBMUD also gives specialized presentations to groups such as sustainability committees, HOAs, landscape irrigation managers, building owners, and property managers to promote water conservation. Content can also be offered digitally via webinars and online workshops, which can allow for more flexible scheduling and be easier for some customers to attend.

3.2.5. WaterSmart Gardener

The WaterSmart Gardener Program promotes sustainable landscapes and irrigation practices to reduce outdoor water use across numerous customer sectors. To support the development of best practices and positive attitudes around conservation, EBMUD hosts workshops and webinars for both home gardeners and landscape professionals on topics such as plant selection for beginners, laundry-to-landscape systems, and irrigation basics. Webinars are promoted throughout the service area and can draw upward of 200 participants. For landscape professionals, EBMUD hosts trainings including the Qualified Water Efficient Landscaper certification, a 20-hour EPA certified

course offered in English and Spanish on irrigation system design, maintenance, and auditing.

Thirty local nurseries and irrigation centers provide additional opportunities for advertising and workshops. Participating nurseries and irrigation centers host outdoor water conservation displays, offer mulch and compost coupons, distribute materials about water-efficient landscape design,



and display copies of EBMUD's award-winning book *Plants and Landscapes for Summer Dry Climates*. EBMUD plans to expand partnerships with nurseries by offering webinars on topics such as displaying, maintaining, and promoting local native plants.

To further educate, inspire, and motivate the public, WaterSmart Garden Grants, ranging from $500-$15,000, are awarded to community groups and organizations to create publicly accessible water-conserving, regenerative landscapes with educational signage. Recent WaterSmart Garden Grants have been awarded to the East Bay Regional Park District, The Chabot Space & Science Center, and the Oakland Zoo. Grants are also available to refresh and update existing gardens and for educational events.

3.2.6. Landscape Advisory Committee

EBMUD engages professionals from the green and landscape industry in trainings, resource development, communication, and peer review. A good example of engagement with professionals is EBMUD's Landscape Advisory Committee (LAC), a partnership between EBMUD and members of the landscape industry created to promote sustainable

landscape design, installation, maintenance, and management practices throughout EBMUD's service area. In order to address the challenges of the severe drought in the 1980s, the EBMUD Board directed staff to work closely with the landscape industry on improving education and water use efficiency. The LAC was formed as a result of this directive and remains active today. EBMUD organizes a Sustainable Landscape Speaker Series, covering topics such as planting for biodiversity, rainwater harvesting, water budgets, and irrigation efficiency. The Sustainable Landscape Speaker Series is approved for continuing education credits with local and national professional landscape organizations. LAC members also serve on project committees to develop new tools and educational resources for professionals and home gardeners including a water efficiency landscape calculator, a sustainable landscape map, a guide to hiring landscape contractors, and a low-water-use plant list.

3.2.7. K-12 Education

Since 1974, school-based education programs have been an important component of EBMUD's overall conservation outreach strategy. EBMUD's kindergarten through high school educational program provides a comprehensive, fun, and engaging program to educate students, customers, and communities about water, wastewater, and environmental stewardship. EBMUD's ongoing school education program includes K-12 classroom materials and curricula available online and free to schools in the EBMUD service area and watershed communities.

EBMUD is in the process of updating its educational workbooks to align with state standards and include new hands-on conservation activities. EBMUD

plans to expand its school program by developing an experiential-based water conservation program for classrooms, partnering with local non-profits to provide in-person and web-based instruction at schools serving disadvantaged communities in the EBMUD service area.

3.2.8. Partnership

EBMUD partners with local nonprofits, regional organizations, and businesses to expand training opportunities, resource availability, and messaging on regenerative landscape practices. EBMUD is working with the California Native Plant Society (CNPS) to develop a webinar for East Bay nurseries on purchasing, maintaining, and marketing local native plants. In addition, EBMUD, CNPS, and Contra Costa County Water District are working together to create a strategy to encourage big box stores to showcase a wide selection of low-water-use plants and attractive regenerative landscape displays. EBMUD continues to strengthen its partnerships with ReScape California by developing a methodology to reevaluate "Rescape Rated" landscapes to ensure water conservation, aesthetic appeal, and landscape maintenance over time. Examples of other partnerships include presenting a webinar on graywater systems with Graywater Action, developing educational programs with the Master Gardeners of Alameda and Contra Costa Counties, and collaborating with the California Landscape Contractors Association and the Association of Professional Landscape Designers.

3.3. REBATES AND INCENTIVES

EBMUD has a long history of providing incentives to help customers improve their water use efficiency. These incentives are financial inducements to adopt and promote consumer acceptance of water-saving technology, and they can take the form of rebates, vouchers, direct installation, free device distribution, grants, and loan programs. EBMUD creates incentive

programs to target both residential and non-residential customers.

EBMUD continually assesses the effectiveness of these programs and adjusts them based on regulations, consumer acceptance, evolving technology, market conditions, product standards, and other factors. If a particular water efficiency feature becomes required by code, and/or reaches a high level of market saturation, EBMUD may retire the related rebate program. For example, EBMUD allowed its rebates for high-efficiency toilets to sunset in 2016. At that time, EBMUD estimated that market saturation for these toilets was greater than 80 percent, and code updates meant that all new toilets purchased by customers would be water efficient. Similarly, EBMUD also discontinued its clothes washer rebate program in 2016 due to improved efficiency standards.

3.3.1. Hardware and devices

EBMUD promotes the installation of water-saving hardware and devices by distributing them to eligible customers for free as a one-time courtesy. These devices can be easily installed using basic tools typically found in most homes and businesses. Upgrading to water-efficient devices can lead to water savings at the home or business without having to change behaviors. With toilets, faucets, and showers being the biggest water users in the home, the most common devices distributed are low-flow showerheads, shower diverters, low-flow aerators for faucets, toilet leak detection dye tablets. For outdoor water use, EBMUD provides garden hose nozzles that regulate spray pressure and allow the user to turn the water on and off without touching the main spigot. Single-family residential customers can request devices by directly contacting EBMUD or by returning a completed WaterSmart Home Survey Kit. Large multi-family residential customers can also receive devices after an audit is conducted by EBMUD staff.

Commercial customers are also eligible to receive the hardware and devices, as well as pre-rinse spray valves used for dishwashing in commercial kitchens. Additionally, some water-efficient hardware and devices may be loaned to customers for testing in their business settings.

3.3.2. Landscape rebates

Due to market saturation of efficient indoor water fixtures and more stringent plumbing code standards, future efforts for cost-effective rebates are primarily focused on reducing outdoor water usage, which annually averages about 28 percent of water usage for residential customers, EBMUD's largest customer sector. Rebates are designed to incentivize community members to make long-lasting, sustainable changes to their landscaping by adopting climate-appropriate landscapes and updating irrigation equipment. In addition to these changes, EBMUD staff use these rebate programs as an opportunity to provide education on designing and implementing a successful landscape transformation and the associated water conservation and environmental benefits. In the future, EBMUD plans to explore programs that make it easier for customers to get started on their water-efficient landscaping projects and ensure that customers invest in high-quality landscaping that will remain in place over time.

3.3.2.1. Lawn Conversion

Lawns have high water needs and are commonly overwatered. EBMUD's lawn rebate program yields great water savings by incentivizing the conversion of lawns to low-water, climate-appropriate gardens.

> "The lawn conversion project was well worth it. I just had to follow their guidelines in replacing my lawn... and VOILA, I have a magical drought tolerant garden where the thirsty lawn once lived! The staff were wonderful to work with and helped me throughout the project. I'm enjoying my new garden every day as well as the drop in my water bill! The financial grant was extremely helpful too. My garden is a lovely respite during the pandemic. It's a 'staycation' right in my own backyard."
>
> *— Cynthia, EBMUD customer*

Customers with actively maintained lawns are eligible for a rebate if they meet the following requirements: have not started their project at the time of application, replace the lawn with low-water plants or edibles, cover all soil with mulch and/or permeable sand/gravel, and replace overhead irrigation with drip irrigation or hand-watering. Customers are given a six-month deadline from the date of approval to complete the project.

During the start and end of the lawn conversion project, Water Conservation staff collaborate with applicants to provide them with helpful resources, answer questions, and ensure that they meet the program's requirements. Rebate amounts are based on the square footage of eligible areas converted.


SELF-ADJUSTING CONTROLLER


HIGH-EFFICIENCY NOZZLE


DRIP IRRIGATION

3.3.2.2. Irrigation Equipment

Complementing the lawn conversion rebate program, incentives for upgrading irrigation equipment encourage sustainable landscape changes that go beyond low-water plants. EBMUD experience shows that many customers' irrigation systems are neglected and may be ten years or more out of date. The intent of rebating irrigation equipment is to encourage what would otherwise be costly updates to reduce water use and improve existing landscaping.

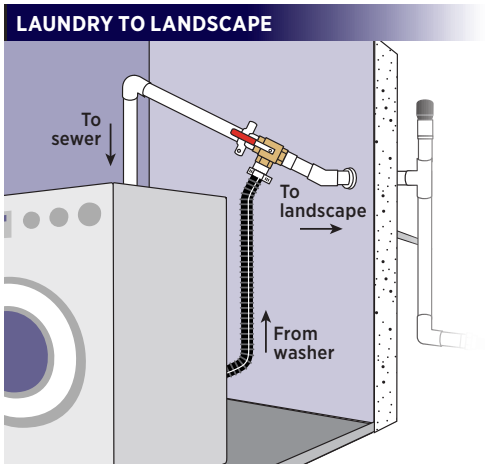
Irrigation equipment upgrades provide numerous benefits. Participants in EBMUD's lawn conversion program often install drip irrigation in their yards as part of the lawn conversion to further reduce water use. High-efficiency sprinkler nozzles with pressure-regulating bodies reduce inefficiencies associated with older sprinkler systems, such as uneven coverage or excessive misting of irrigation water into the air. "Smart" controllers modify irrigation schedules based on broad seasonal variations in solar radiation and precipitation, as well as short-term weather events (for example, by delaying irrigation during periods of rain or high wind).

3.3.2.3. Flowmeter Rebate

In 2019, EBMUD expanded its equipment incentive programs to include flowmeters. The Flowmeter Rebate Program promotes water conservation and water-saving opportunities by encouraging the use of flow measuring devices that give customers information about their water use and can alert them of potential leaks and incidences of high-water use. Participants have provided positive feedback about this new program.

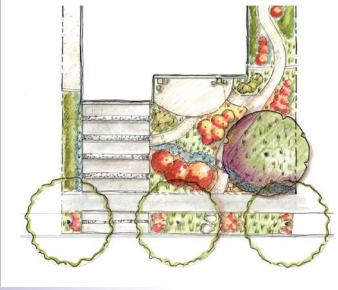
3.3.2.4. Greywater Rebates

EBMUD's graywater rebate encourages the capture and re-use of water from certain specified indoor sources (such as laundry and shower) for outdoor irrigation by partially reimbursing customers for the purchase of a three-way valve that can divert water from the sewer to the landscape.



3.3.2.5. Design Assistance

EBMUD is exploring the development of a Landscape Design Assistance Program to increase participation in the lawn conversion program and to ensure the long-term success of rebated landscapes. The



program would provide a financial incentive for customers to participate in a two-hour consultation with a landscape designer on plant selection, garden design, and irrigation choices prior to beginning their lawn conversion. By ensuring that a high quality landscape is implemented and maintained, the program aims to ensure that the water-efficient landscape is successful into the future and water savings are preserved.

3.3.2.6. Mulch Coupons

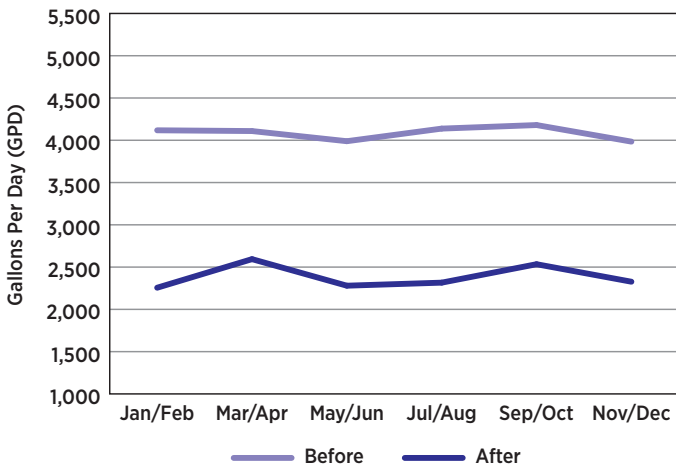
The coupon program promotes the use of mulch and compost. Mulch is a layer of organic material spread over bare soil that benefits soil and plant health and retains water. Compost is decomposed organic matter, often made up of urban plant debris and food waste, that is finer in texture than mulch and applied as a soil amendment. During the planting season, EBMUD joins with Contra Costa Water District, local nurseries, landscape suppliers, and home improvement centers throughout the Bay Area to offer 5 to 25 percent discount coupons toward the purchase of organic mulch and compost. Coupons are available online and honored by participating businesses at the point of purchase.

3.3.3. Custom rebates and on-bill financing

3.3.3.1. Custom Rebate Program

Formerly known as the "Custom Financial Assistance Program," this is an adaptable program designed to help offset the initial cost of many water-saving improvements for businesses, manufacturing facilities, government facilities, and non-profit organizations. This program's strength is in its flexibility; many projects are eligible as long as they include the installation of proven and reliable water-saving hardware or systems. The rebate value is calculated at $0.75 per 100 cubic feet of water saved for up to five years. EBMUD also seeks opportunities to partner with business and industrial customers on joint research to develop new technologies and water management practices that demonstrate and promote cost-effective water savings.

Figure 2. Custom Rebate Program: Before & After Water Use



CASE STUDY: CUSTOM REBATE PROGRAM

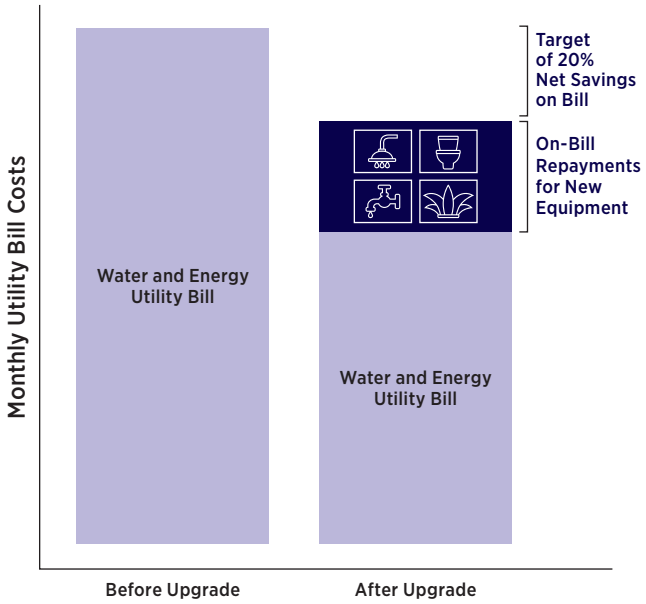
One project involved a laundry service that installed an innovative water reuse technology that recycles up to 35% of its wash water. Customer-driven water reuse initiatives such as graywater or on-site treatment and recycling provide a firm yield that reduces potable water demand and improves water supply reliability. In addition, projects like these reduce the impact of customer rationing required during droughts.

A performance contract with EBMUD is required for each custom project, and customers must achieve a project-defined water budget to be eligible for EBMUD financial assistance. This implementation strategy is more costly than other forms of incentives but can be effective in accelerating the replacement of existing products, especially if it targets market segments with high barriers to rebate program participation. The cost of retrofits can be fully covered through the program.

3.3.3.2. On-Bill Financing Program

On-Bill Financing uses low or no-interest loans to help cover the cost of customer efficiency upgrades. The program establishes a revolving fund that is replenished with loan repayments, enabling cost-effective conservation savings with reduced incentive costs. Multi-family properties, commercial properties, and schools are all eligible for the program. Similar to the Custom Rebate Program, EBMUD conducts an assessment of the property and works with the customer to estimate utility savings and on-bill repayment, and the customer chooses a contractor to

Figure 3. On-Bill Financing Program: Before & After Upgrade



perform equipment installations. Amortized payments are added to the customer's water bill for loan repayment.

The Custom Rebate and the On-Bill Financing programs can often be used in tandem to help a customer realize maximum benefits. As the program evolves, EBMUD may potentially partner with other local governments to offer a regional On-Bill Financing program.

CASE STUDY: ON-BILL FINANCING PROGRAM

Since 2011, EBMUD has successfully financed several On-Bill projects through a pilot program. In 2018, a community housing non-profit used the program to install 50 high-efficiency toilets and 13 bathroom faucet aerators. The non-profit paid for one-third of the upgrades and financed two-thirds of their project via their utility bill. As a result, both water and wastewater usage after the upgrades decreased by an average of 50% from 2012 levels. Additionally, the non-profit saved over $9,400 in 2018 on water, wastewater, and sewer bills.

3.3.4. Programs for low-income customers

EBMUD seeks to develop water conservation tools and programs that help all customers to reduce their water use. One of the ancillary benefits of water conservation is that it can help customers to reduce their water bills, which can be especially important for low-income customers. Some conservation programs may pose barriers to participation; for example, traditional rebate programs require customers to pay costs upfront and only provide a financial incentive for a portion of the total cost, which may make participation cost-prohibitive to some customers.

To ensure that the Water Conservation Program is equitable, EBMUD is evaluating measures that specifically target helping low-income customers to reduce their water use.

As a public, non-profit agency, EBMUD strives to provide water and waste water services at fair and reasonable rates. However, members of the community may still struggle to afford water and waste water services. Since 1987, EBMUD's Customer

Assistance Program (CAP) has provided financial assistance to thousands of eligible customers, reducing their water and wastewater charges. EBMUD is looking for additional opportunities to leverage the CAP program to reach customers about its programs. Additional programs for low-income customers are described below.

- *Leveraging partnerships with other agencies and nonprofits*
  EBMUD can work with community partners to expand its outreach and help customers save water. For example, in 2019 EBMUD partnered with one of the contractors responsible for administering PG&E's Energy Savings Assistance (ESA) program. While conducting ESA residential energy audits within EBMUD's service area, the contractor also performed a simple water efficiency audit that included testing the customer's toilet for leaks.
- *Direct installation*
  EBMUD could pay the full cost of installing water-efficient appliances and fixtures. Although EBMUD's research has shown high market saturation in its service area of high-efficiency toilets, the

abovementioned ESA pilot found that some low-income customers still had inefficient toilets that they were unable to upgrade due to the cost.

- *Leak repair assistance program*
  EBMUD is evaluating options for a program to help residential customers repair their leaks. Several other water agencies have similar programs, like San Antonio Water System's "Plumbers to People" program and "Leak Free Sacramento."

3.4. REGULATION AND LEGISLATION

Over the past decade, regulations at the Federal and State levels were passed to ensure consumers purchase water-efficient fixtures and appliances for residential and commercial applications. As a result, EBMUD projects that approximately 60 percent of future water conservation savings will be achieved through these adopted local, state, and federal water efficiency standards, codes, and regulations. Based on the modeling discussed in Chapter 2, this equates to an additional 14.4 MGD in savings from recent and future regulatory and statutory mandates by the year 2050.

3.4.1. Federal Regulations

The amended Federal Energy Policy Act (FEPA) in 2005 requires that only water-efficient fixtures meeting flow standards be installed in new buildings. Replacement of fixtures in existing buildings is also governed by a federal statute that requires that only devices with a specified level of efficiency be sold. Through these two processes, existing and planned future plumbing code changes ensure that new buildings will be more efficient, and old inefficient fixtures will slowly be replaced with more efficient models.

The 2018 Uniform Plumbing Code, an American National Standard, governs inspections, materials, and technologies of plumbing systems to promote safety and effective installation of plumbing fixtures. In addition to the Plumbing Code, the US Department of Energy's ENERGY STAR program and the Environmental Protection Agency's WaterSense program set efficiency standards and provide buying guides for appliances in the residential and commercial sectors. Regulations to make these appliances more energy efficient have driven manufacturers to dramatically reduce the amount of water these appliances use. For example, horizontal axis washing machines use 30-50 percent less water than conventional models, and new efficient dishwashers reduce water use by 23 percent from the previous standard. Given that these appliances have a life cycle of about 15 years, eventually a majority of these types of appliances will become more efficient as consumers look to save both energy and water.

3.4.2. State Regulations

In California, over the past decade, additional water efficiency laws have gone into effect and are captured in the 2019 California Plumbing Code. Starting in 2014, toilets and urinals installed in buildings were required to

Table 2. Local, State and Federal Water Efficiency Codes

Local, State and Federal Water Efficiency Codes	
FEDERAL WATER EFFICIENCY CODES	**APPLICATION**
Energy Policy Act of 2005	Sets efficiency standards indoor plumbing fixtures for residential and commercial
2018 Uniform Plumbing Code	Governs inspections, materials, and technologies of plumbing systems, safety, and installation of plumbing fixtures
CALIFORNIA WATER EFFICIENCY CODES	**APPLICATION**
SB 606 and AB 1668	Sets conservation targets for indoor and outdoor residential water use, CII water use for dedicated landscaping irrigation, and water loss
MWELO	Sets outdoor landscape efficiency standards for residential and commercial
2019 California Plumbing Code	Sets efficiency standards for indoor plumbing fixtures for residential and commercial
LOCAL WATER EFFICIENCY CODES	**APPLICATION**
EBMUD Water Service Regulations, Sections 2, 3, 28, 29 & 31	New indoor plumbing fixtures and outdoor landscape irrigation, residential, and commercial

meet new efficiency standards of 1.28 gallons per flush (GPF) set by California plumbing code legislation. In January 2016, new Appliance Efficiency Regulations mandated by the California Energy Commission went into effect in the state of California. These new regulations set the maximum flow rate of kitchen faucet aerators at 1.8 gallons per minute (GPM) and 1.2 GPM for lavatory faucet aerators. Additionally, public lavatories now cannot exceed 0.5 GPM. Similarly, in 2018, additional efficiency requirements went into effect for showerheads, setting the standard at 1.8 GPM. EBMUD will continue to support the development of standards and codes to promote the continued adoption of water-efficient technology and practices. See Table 2 below for a list of relevant Federal, State, and local regulations.

3.4.2.1. Model Water Efficient Landscape Ordinance (MWELO)

The Model Water Efficiency Landscape Ordinance (MWELO) is a California law that requires all new landscape installed or retrofitted to be designed efficiently for minimal water requirements. In 2015 the ordinance was updated through the Governor's Executive Order B-29-15. The new standard requires commercial landscapes not to exceed 45 percent of the reference evapotranspiration and residential landscapes not to exceed 55 percent of the reference evapotranspiration. Together, these two efficiency levels continue to help EBMUD improve its overall landscape water efficiency through the application of this requirement.

3.4.2.2.Making Conservation a Way of Life

As described in Chapter 2, in 2018 a new long-term water conservation framework for California was passed via a pair of bills: AB 1668 and SB 606. These companion bills support increased water use efficiency in both the urban and agriculture sectors. Together the Department of Water Resources and the State Water Board are working with stakeholders, including EBMUD, on the development of new standards for the following areas

- Indoor residential water use
- Outdoor residential water use
- Commercial, industrial, and institutional (CII) water use for landscaping irrigation with dedicated meters
- Water loss

Through this legislation, urban water suppliers will be required to stay within annual budgets that will be developed based on the standards above. The timeline for implementation has the State Water Board adopting the standards in 2021, suppliers calculating their targets and beginning reporting in 2022, and the State requiring suppliers to meet their target by 2026.

3.4.3. EBMUD Water Service Regulations

EBMUD maintains its Water Service Regulations that include water efficiency requirements. These regulations are updated regularly to ensure compliance with any new State laws or other water efficiency developments. Following is a discussion of several sections of the Regulations that pertain to water use efficiency..

3.4.3.1. Section 2 - Individual Metering

In January 2009, EBMUD required that each new multi-family residential or multi-occupancy commercial/industrial unit in a structure of three stories in height or less be individually metered whenever EBMUD determines it is feasible to do so. The State of California in January 2018 implemented a new law that requires all multi-family residential customers to be sub-metered regardless of the building height, thus expanding EBMUD's previous requirement. The purpose of individual meters is to allow the customer to manage and understand their water consumption and identify leaks. Individual metering is an effective water conservation tool and can also reinforce equity since multi-family customers only pay for the water they use.

3.4.3.2. Section 3 - Irrigation Meeting

EBMUD requires a separate irrigation meter for all new (residential and non-residential) irrigated landscaping covering an area of 5,000 square feet or more, except in certain circumstances. EBMUD also requires individual metering for separate structures in most cases, to support the management of water use and monitoring for leaks.

3.4.3.3. Section 28 - Water Use During Water Shortage Emergency Conditions

Section 28 goes into effect when EBMUD's Board of Directors declares a water shortage emergency. It identifies water use rules, provides guidance to customers on reducing water use, and determines specific provisions that can be tailored to the severity of the water shortage. Section 28 defines water

use allocations and reduction goals based on the customer account type, prohibits certain types of water uses, provides guidelines on efficient water use, provides for enforcement measures, and may include drought rates. It may also include restrictions on annexations and new connections in conjunction with Section 31 on Water Efficiency Requirements for new water services.

3.4.3.4. Section 29 - Prohibiting Wasteful Use of Water

Section 29 describes ongoing actions that residential and non-residential customers must observe to eliminate wasteful use of water. Under normal water conditions, the provisions of Section 29 are enforced through customer education. Under this program, EBMUD responds to customer and field staff reports of over-watering and water waste. Water conservation and field services personnel apprise the responsible customer of the wasteful conditions and provide recommendations on repairing leaks or using water more efficiently. If the customer cannot be located, and the water loss is significant, staff may turn off the water at the meter until the customer is contacted or the problem is resolved to prevent damage from excessive leaks or runoff.

3.4.3.5. Section 31 - Water-Efficiency Requirements

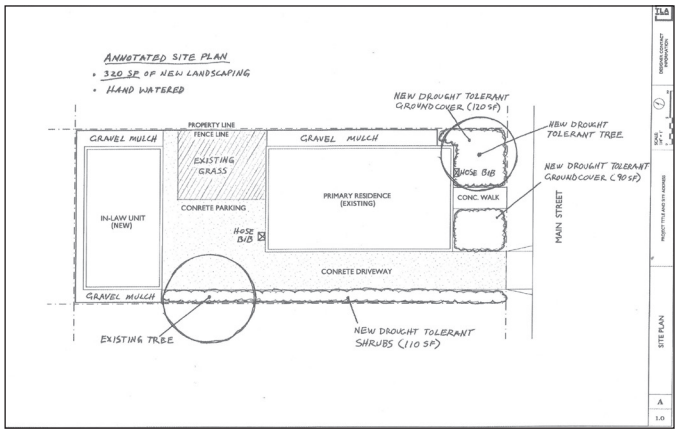
First adopted in July 2007, Section 31 establishes minimum indoor and outdoor water-efficiency standards as a condition of service. Section 31 is updated over time as new water-use-efficiency standards are developed. The requirements apply to all new applicants and customers requesting new meters and meter upgrades or for any change in customer classification such as an end-user change from residential to commercial. EBMUD will not provide water service to any applicant for new or expanded service unless all the applicable water efficiency measures described in this regulation are installed at the applicant's expense. Required water efficiency standards include plumbing fixtures, appliances, landscaping, food service equipment, cooling systems, and other products or practices that meet efficiency and eligibility criteria. Applicants for expanded service may be required to retrofit existing water service facilities or uses to comply with these requirements.

EBMUD's Section 31 program complements the Department of Water Resources (DWR)'s 2015 Updated MWELO. EBMUD works with cities and counties within its water service area to support local and state landscape ordinances through landscape plan review requirements and services for all new water service accounts. EBMUD also provides

Table 3. Distribution Water Loss and Raw Water Loss Accounting

Distribution Water Losses	Raw Water Losses
APPARENT LOSSES	**APPARENT LOSSES**
Unauthorized Consumption (e.g. Theft – illegal taps, unauthorized fire hydrant use by unmetered construction crews, illegal hydrant openings)	Unauthorized Use
Customer Metering Inaccuracies (e.g. Meter error adjustments)	Metering Inaccuracies (e.g. Meter error adjustments)
Systematic Data Handling Errors (e.g. Errors that occur anywhere from the time the meter reading is registered to the final reporting and use of the consumption data)	
REAL LOSSES	**REAL LOSSES**
Leakage on Mains (e.g. Transmission and distribution pipeline leakage and breaks)	Leakage On Aqueducts And Raw Water Pipelines (e.g. Aqueduct leakage and breaks, real losses in the water treatment plants)
Leakage and Overflows at Storages (e.g. Losses from open-cut reservoirs, storage tanks, and terminal storage reservoirs	Leakage at Water Treatment Plants (e.g. Real losses at the water treatment plants)
Leakage on Service Connections up to Customer Metering (e.g. Losses on laterals from District main to customer meter)	

voluntary plan reviews for existing customers upon request. All plans are reviewed for irrigation system efficiency and scheduling if provided and for plant selection and planting design. Details on EBMUD water efficiency requirements are included in Appendix 5.3.



3.5. SUPPLY SIDE CONSERVATION

In addition to its programs to support customers in reducing their water use, EBMUD also administers an active program to conserve water by reducing losses within its distribution system. EBMUD's water distribution system includes approximately 4,200 miles of pipe, and EBMUD implements best practices to manage water losses in the distribution and raw water systems. The supply-side management program is integral to operating and maintaining the water system and is critical to ensuring efficient management of EBMUD's water supply.

3.5.1. Distribution and Raw Water System Loss Accounting

Modeled after the American Water Works Association (AWWA)'s M36 (AWWA M36) manual on Water Audits and Loss Control Programs, EBMUD's Procedure 900 (See Appendix 5.3) defines a protocol for identifying and assessing treated and raw water losses. Procedure 901 is a separate but related procedure for Recycled Water. These standardized procedures account for all losses in the distribution, raw, and recycled water systems to help EBMUD understand the nature of those water losses so that it can take appropriate actions to reduce them. The procedure also designates workgroups to measure, collect, assess, retrieve, validate, and report data on EBMUD's water supply losses.

The difference between the volume of water produced at the treatment plants (also called Distribution System Input) and the sum of all billed and unbilled authorized consumption (also called Authorized Consumption) is termed Distribution Water Losses. Distribution Water Losses consists of all apparent losses and all real losses in the distribution system. Apparent losses are the total losses of treated water from unauthorized consumption (theft), inaccuracies associated with customer metering, and systematic data handling errors. All real losses are the total physical losses of treated water from storage system overflows or draining, main and service line breaks, and background leakage.

Raw water is all water in EBMUD's network of aqueducts, tunnels, pumping plants, transmission lines, and water treatment plants prior to entry into a water distribution system. Raw water losses consist of apparent losses and real losses in the raw water system. Apparent water losses are the total losses of raw water due to raw water meter errors, unauthorized use from theft, and transmission line blow-offs, and flushing. Real water losses are the total physical losses of raw water that include overflows and leakage up to and at the water treatment plants, such as leaks and breaks from aqueducts, transmission lines, or other parts of the raw water distribution system, and water treatment plant losses. Table 3 summarizes several examples of both distribution water losses and raw water losses.

California Senate Bill 555, passed in October 2015, requires all urban water retailers to submit validated annual water loss audits using the AWWA methodology and report their audit results to the State. In October 2017, EBMUD established an internal Water Loss Committee and a procedure for preparing the audit each year.

3.5.2. Water Loss Control Plan

EBMUD's comprehensive water loss control program addresses apparent and real losses and is based on AWWA M36. In 2020, EBMUD and its water loss control consultant began the preparation of EBMUD's first Water Loss Control Plan. Using EBMUD's existing data from its water loss control activities such as data from new technology pilot projects, the plan will

result in recommendations to reduce apparent and real losses to economically optimal levels and comply with SB 555. The plan and its recommendations will be updated in 2023 and 2025 to account for new findings from evaluations of EBMUD's future water loss control efforts.

A summary of EBMUD's water loss control program is given below. Additional details of EBMUD's supply-side conservation activities will be provided in the Water Loss Control Plan, which is planned for completion in 2021 subsequent to the SWRCB's completion of rulemaking for SB 555.

3.5.2.1. Leak Detection

Techniques used to locate leaks include visual inspections, manual and automated acoustic leak detection, satellite leak detection, and customer reports. EBMUD's maintenance staff have leak detection vans equipped with hand-held acoustic leak detection equipment to pinpoint leaks in the field.

As of 2021, EBMUD had an inventory of over 2,000 automated acoustic leak detection devices operating through cellular networks allowing for daily monitoring of pipelines with high consequences of failure. Some devices are installed permanently in the distribution system and others are deployed temporarily in response to specific suspected leak events such as seismic activity, landslides, and pipe bursts. Most of the devices are installed on EBMUD's smaller diameter pipelines. However, EBMUD also utilizes specialized leak detection devices for large diameter pipelines.

3.5.2.2. Pressure Management

Pressure management is used to reduce water system pressure to optimal levels and reduce pressure transients. This strategy extends the life of the existing infrastructure, minimizes impacts to the environment and customers associated with pipe breaks, and reduces water loss. EBMUD's pressure management strategies include pressure transient identification and reduction, pressure reduction, and pressure stabilization. EBMUD's pressure management methods include pressure stabilization and reduction at pressure regulating valves and implementation of District Metered Areas (DMAs).

3.5.2.3. Pipe Replacement

Leaking pipes can be a source of supply-side water loss. Many conditions affect the rate of deterioration of pipelines in the distribution system, including pipe type and size, pressure, soil conditions, and ground movement.

EBMUD's average pipe replacement rate between the late-1990s and the mid-2000s was 8.6 miles per year. In 2015, EBMUD formed a team to increase the pipeline replacement rate. EBMUD is increasing its pipe replacement in a step-wise manner and with the goal of replacing 20 miles per year by FY21 and 25 miles per year by FY25. So far, EBMUD has been successful in increasing the rate of pipeline replacement: 25.9 miles were replaced in FY21, exceeding EBMUD's goal for that year.

EBMUD uses multiple risk models to prioritize pipes for replacement and to maximize the benefits of its investment. The risk models are based on parameters such as a pipe's leak history and proximity to faults, landslide areas, and liquefaction zones. EBMUD uses a machine learning product to help prioritize which pipes to replace.

3.5.2.4. Speed and Quality of Pipe Repairs

EBMUD's goal for speed and quality of repairs is to quickly respond and effectively repair reported and unreported leaks. This strategy extends the life of the existing infrastructure, minimizes the environmental and customer impacts associated with water main breaks, and reduces water loss. Once a leak is identified, interventions must be taken to repair and/or reduce the leakage. The interventions should be timely, reliable, cost-effective, and well-documented.

EBMUD prioritizes leaks from distribution pipes according to five categories with Priority 5 (P5) being the highest priority and Priority 3 (P3) being the lowest priority. Leaks within the P5, P4, and P3

categories are targeted for repair within one day, seven days, and twenty-one days respectively.

3.5.2.5. Corrosion Control

The installation and upgrading of cathodic protection systems can extend the useful life of pipelines. EBMUD initiated its corrosion control program in 1923. The program, covering the Mokelumne Aqueducts and distribution piping and facilities, effectively reduces corrosion and related deterioration of EBMUD's infrastructure, resulting in substantial leak reduction and reduced loss of water

3.5.2.6. Meter Testing

Meter error is the largest component of apparent water loss. While some meter error is unavoidable, it is important to accurately estimate meter error to properly calculate real water loss and thus cost-effectively target real loss reduction. EBMUD has a program to regularly test and repair meters. In 2019, EBMUD tested over 1,700 small and medium meters and plans to test 300 meters annually for the purposes of tracking meter accuracy.

In 2020, EBMUD hired a consultant to conduct verification meter testing on its in-service water treatment plants, which are the source of EBMUD's treated water. This will ensure accurate water supply calculations used in the audits. The consultant will also conduct verification testing on EBMUD's largest customer meters.

3.6. RESEARCH AND DEVELOPMENT

EBMUD actively supports research and technical studies to enhance understanding of water use patterns, conservation potential, customer behavioral response, and the impacts of conservation measures and programs. EBMUD stays abreast of developing technology and trends which may affect water consumption or provide conservation tools. EBMUD also participates in pilot tests to investigate how new tools might be beneficial or applied to conservation projects even if they were not intended solely for conservation purposes.

3.6.1. History of Research and Development

EBMUD has a long history of leading and participating in research aimed at finding new ways to conserve water, measuring savings from specific conservation activities, and verifying the effectiveness of conservation programs. In addition to initiating numerous studies on water conservation, EBMUD also participated in studies led by organizations like the Water Research Foundation (WRF) and the California Water Efficiency Partnership (CalWEP, formerly the California Urban Water Conservation Council). EBMUD has also been successful in seeking state and federal grant funding to support these activities.

Historically, EBMUD has participated in research targeting both demand-side and supply-side conservation. On the demand side, EBMUD received a grant from the California Department of Water Resources (DWR) in 2007 to pilot the installation of self-adjusting weather-based irrigation controllers. EBMUD also participated in a 2011 DWR Prop 50 grant-funded study, led by Irvine Ranch Water District, focused on determining the indoor and outdoor end uses of water in single-family residences in California. Supply-side conservation research has focused on improving metering technology; studies have evaluated individual metering for multi-family units and quantified unmetered flow through traditional meters.

Recent studies have focused heavily on the use of Advanced Metering Infrastructure Technology (AMI) and its multi-faceted benefits. After a series of smaller pilots with older drive-by automatic meter reading technology, EBMUD launched a study in 2008 that was funded by grants from DWR and USBR, involving 4,000 high-water use customers who utilized state-of-the-art AMI technology.

EBMUD partnered with CalWEP to survey and measure the perceived barriers and benefits to a specific behavior change by replacing front lawns for a target audience - in this case, high water users. This first phase of the Community Based Social Marketing (CBSM) approach combined the principles of behavioral science with applied research methods to provide a practical framework for campaigns to promote behavior change across diverse settings. Results from this first survey help

to design effective messaging and communication strategies and the type of services and incentives that will be incorporated in an iterative process for future program design.

In the past, EBMUD has also conducted numerous residential and commercial end-use and market saturation studies to quantify the use of water by sector, water-using technology, and climate and consumer demographics. These studies helped quantify current demand and future potential conservation savings from applied technology retrofits and behavioral change.

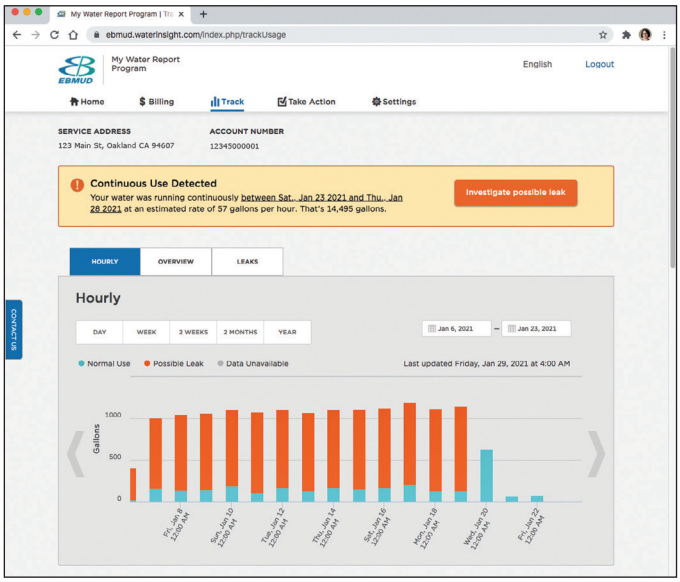
3.6.2. Current Efforts

Currently, EBMUD is conducting two pilot studies evaluating the water and energy savings associated with AMI and web-interface technology. EBMUD is partnering with Pacific Gas and Electric (PG&E) and the University of California at Davis (UC Davis) on a study focused on residential customers. EBMUD also received a $1 million grant from the US Bureau of Reclamation to install 3,000 AMI meters for customers with high water use to monitor associated water and energy savings.

The PG&E and UC Davis project studies the effect of offering customers online water use information via a portal and water reports where customers can see usage by the hour, day, month, and year. The study includes 10,000 randomly selected representative customers, half of which were placed in a treatment group and the other half in a control group. The Treatment customers receive email updates if they have continuous hourly usage (likely leaks), higher than expected daily usage, or are on track for high bills. The control group customers only receive traditional messaging offered to non-AMI customers and do not have access to AMI-derived data. This research not only focuses on the water savings aspect of offering this portal but also the energy savings aspect of customers using less water overall, using less hot water, and reducing usage of appliances that use both water and electricity. Some of these energy savings can be attributed to reduced water and wastewater pumping and treating, but some can be attributed to water heating and direct electricity use.

At the completion of the first year of the above study, EBMUD sent out a survey to evaluate the customer's use of the portal and which communications were successful in increasing engagement that led to savings. EBMUD will also conduct experiments in additional outgoing messages to boost participation rates. EBMUD will use this data to refine portal features and messaging that will lead to broader use of the portal as more customers are converted to AMI starting with the Control group.

The USBR study uses the same portal as the PG&E study. However, in this study, all customers are offered and encouraged to use the portal. The customers in this study are in a wide variety of business classes with varying demand profiles and needs. Many of these customers require individual attention from conservation staff to maximize the water and energy savings, but because of their large water use demand, the potential savings are more significant than with the typical residential customer in the PG&E study.



3.6.3. Future Efforts

EBMUD anticipates that in the next few years, conservation research efforts on the demand side will focus less on customer-purchased plumbing devices and rebates and more on behavioral science, information sharing, and data analytics – putting the power of information and choice into the hands of customers. This is based on the understanding that market and regulations have driven products to a much more efficient level and will continue to do so. However, should new more efficient products become available, EBMUD will participate in evaluating these new products.

On the supply side, research will focus more on developing tools in measurement, leak detection, predictive modeling, and analytics. Current research trends are looking at the use of "Big Data" to investigate areas of concern. New tools combine operational inputs such as real-time pressure and flow sensors, AMI demand data, and storage levels to identify anomalies that might indicate water loss. EBMUD will continue using AMI data to conduct District Meter Area (DMA) audits to compare hourly supply and hourly demand to identify water loss in specific areas.

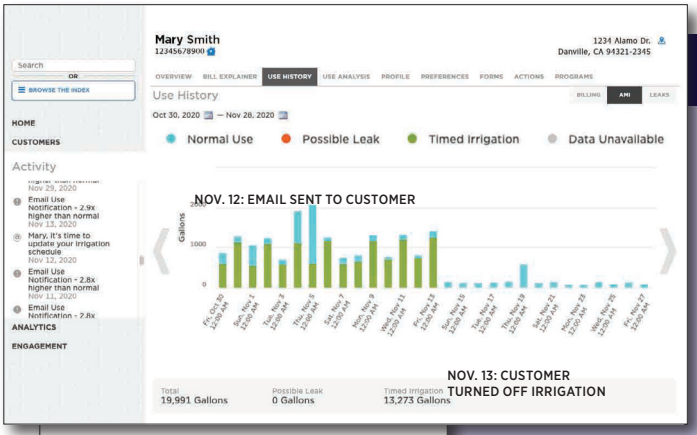
Research and development are keys to EBMUD's strategy to maintain viable and state-of-the-art conservation services for its customers as well as to advance the adoption of water-efficient standards and codes to promote cost-effective conservation solutions. There are four areas of research that EBMUD will focus on:

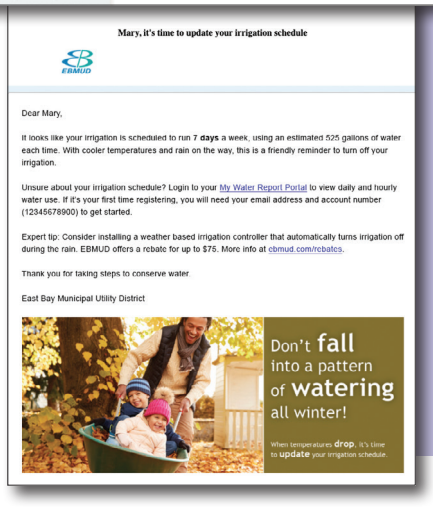
- Water use behavior: customer behavior and discretionary use of water, including end-use studies, customer surveys, billing, and use benchmarking;

- Landscape water efficiency;
- Metering, measurement, and collection technology
- Pipeline leak detection and supply-side conservation.

3.6.3.1. Water Use Behavior

EBMUD actively supports research and technical studies to enhance understanding of water use patterns, conservation potential, and the impacts of conservation measures and programs. In the past, EBMUD has relied on customer surveys and outreach to estimate program savings. With the advent of AMI and end-use studies, EBMUD now has the ability





CASE STUDY: BETTER TECHNOLOGY LEADS TO CHANGES IN CUSTOMER BEHAVIOR

AMI, a state-of-the-art technology, offers customers water use information via an online portal where they can view usage by hour, day, month and year. EBMUD Water Conservation staff also monitors the portal and notifies customers about leaks, potential high bills and seasonally abnormal usage. In 2020, EBMUD staff observed that a customer was regularly irrigating, even after the rainy season had begun (see green bars in portal image on top left). They contacted that customer on Nov. 12 (see email image on bottom left), and within two days the customer had turned off their irrigation system. This action saved the customer money and contributed to water conservation.

to measure responses and understand behaviors more directly.

With AMI data, real-time water consumption can be related to outside factors such as current weather conditions, EBMUD outreach, landscape area, and even pricing. The research will be focused on influencing water demand, taking into account these outside factors. Usage and water use behavior is expected to be influenced by engagement with water-use portals, traditional water conservation services, and incentives, targeted messages through social media and direct messaging, and other educational outreach.

EBMUD employs a number of different types of messaging including printed letters, emails, texts, website information, and phone calls. It notifies customers about leaks, daily high usages, potential high bills, and seasonally abnormal usage. Research activities will focus on which outreach provides the largest conservation benefit under different circumstances, is most appealing to customers, and is most cost-effective. EBMUD will evaluate customer response measured by its AMI system as well as targeted surveys to customers.

3.6.3.2. Landscape Water Efficiency

EBMUD has a long history of supporting research for the improvement of landscape water efficiency. Currently, there is less industry focus on researching irrigation equipment, except for some studies being conducted on soil moisture sensors; but if opportunities arise, EBMUD may partner with other agencies or third parties for the further advancement of efficiency improvement for other irrigation equipment such as irrigation controllers, spray heads, and drip systems.

Currently, EBMUD's active research efforts are focused on GIS landscape measurement and providing accurate landscape aerial photos and infrared imagery when establishing landscape budgets. EBMUD is partnering with the California Department of Water Resources (DWR) on components of the Long-Term Framework, including a Landscape Area Measurement project to refine techniques for defining landscape areas and types such as irrigated, irrigable, and natural landscapes. Additional research involves determining evapotranspiration coefficients to be applied to the calculated landscape area measurements. This work also involves finding an appropriate landscape efficiency target for residential landscape efficiency.

3.6.3.3. Metering Measurement and Collection Technology

EBMUD is conducting research on more accurate, higher resolution, and more functional customer metering technology to be used with its AMI systems. EBMUD may also conduct research related to distribution and transmission flow meters, as well as other measurement equipment in the distribution system. Possible areas of focus may include meter accuracy, meter resolution, operating range of existing, and developing meter technology. EBMUD may also research new functionality that becomes available in meters – including remote shutoff, pressure, water quality, and other sensory information now available.

EBMUD is continuing to expand its use of AMI to read not only water meters but also other field instrumentation. AMI can also transmit information such as system pressure, leaks, and equipment operational status. AMI deployment will occur over many years. EBMUD anticipates that additional benefits and capabilities will evolve as the technology improves and becomes more widespread.

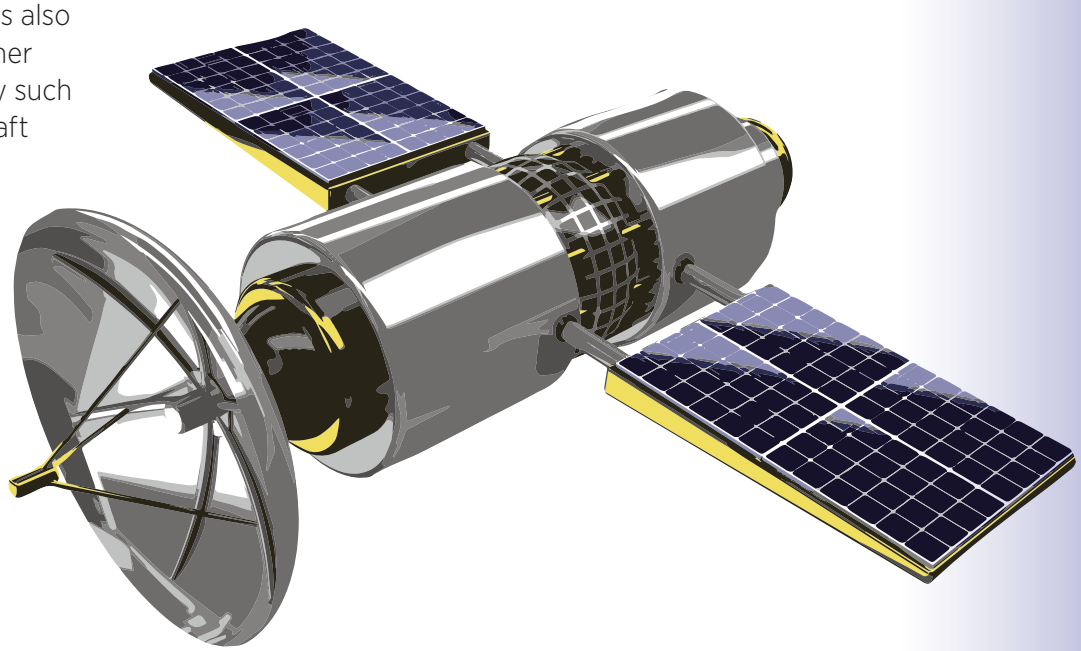
Another area of interest is on-site flow meter technology, both for commercial and residential purposes. EBMUD has been offering rebates on a pilot basis for customer purchased and operating flowmeter technology that provides customers real-time high-frequency flowmeter monitoring, leak detection, and automatic shutoff. Even though EBMUD's AMI system provides customers with hourly data, these technologies are still beneficial because they can provide more granular data more frequently to customers and can provide a higher level of accuracy in identifying specific water uses such as various irrigation-timers stations. While not all customers will need to deploy these technologies, they may be particularly useful for customers interested in assessing their water use on a more granular basis.

These pilot programs may be transferred from pilot studies to full integrated rebate programs once the benefit analysis is completed. A side benefit of these studies is to provide high-frequency

granular information on water use from participating customers.

3.6.3.4.Pipeline Leak Detection Technology

EBMUD continues to operate numerous acoustic leak detection devices to monitor pipeline leakages and collect data on the success of these technologies. This technology continues to advance in the areas of cellular data backhaul, leak detection accuracy, and ease of use. EBMUD is also researching the use of other leak detection technology such as satellite and local aircraft overhead leak detection as well as statistical analysis to determine areas of possible leaks. More information can be found in the Water Loss Control Plan.

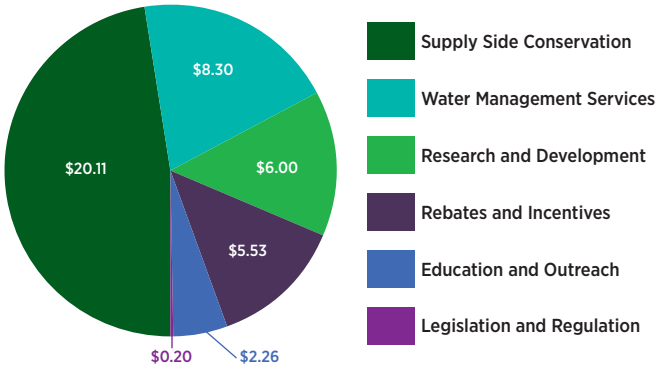


4 PROGRAM PHASING AND IMPLEMENTATION APPROACHES

4.1. PROGRAM PHASING

The adopted water conservation program described in Chapter 3 includes a mix of existing and new activities. In the case of existing activities, EBMUD may look for new ways to expand participation through targeted outreach and marketing, or to increase associated water savings. For new programs, the timing of implementation depends on factors like cost, available technology, and the availability of staff resources.

Figure 4. Total Spending Planned (FY22-31) in Millions



One significant variable is the timeline for District-wide implementation of Advanced Metering Infrastructure (AMI) technology. For the 2050 Water Conservation Forecast, it was assumed that AMI would ultimately be rolled out to the entire service area starting in 2025 and ending in 2030. As of the end of 2020, several thousand customers already have AMI meters and access to associated tools. Most of these meters were installed as part of pilot studies conducted by EBMUD, but in some cases, AMI meters have been installed if the meter location is inaccessible or otherwise difficult for traditional meter reads. The 2050 Water Conservation Forecast assumes that a broader installation of AMI meters would be undertaken beginning in 2025; if this is not the case, other conservation measures can be accelerated or increased to achieve the necessary savings.

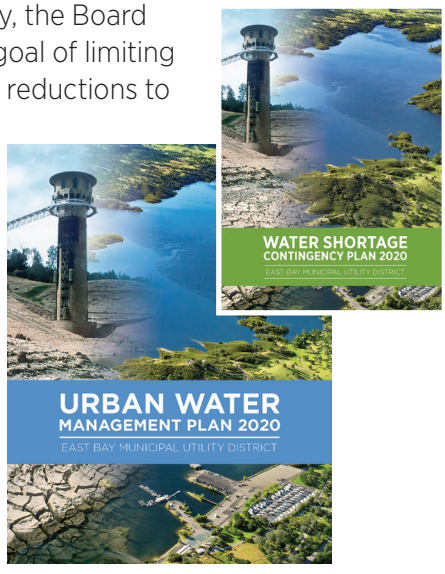
The planned program phasing is based on the best information currently available, but many variables can affect which programs are implemented and when. Changes in technology and expected costs can cause an activity to become more or less feasible. New regulatory requirements may also affect when and how activities are implemented. Also, droughts or other water shortage emergencies might cause EBMUD to speed up the implementation of certain measures like lawn rebates or leak detection. Thus the planned program phasing is a guide. Reaching program goals over time will require flexibility and adaptation to actual conditions in any given year.

Table 4. Expected Conservation Savings (2020-2050) in MGD

YEAR	2020	2025	2030	2035	2040	2045	2050
ACTIVE	24	26	30	32	33	33	33
PASSIVE	23	26	29	31	33	35	36
TOTAL	48	52	59	63	66	68	70

4.2. RESPONDING TO FUTURE DROUGHTS

The ability to reduce customer water demand during droughts is an important part of EBMUD's water supply planning. Water conservation programs can lead to "demand hardening" wherein it is difficult to achieve additional short-term reductions in water demand during droughts or other water shortage emergencies. EBMUD's Board of Directors periodically sets policies aimed at limiting the customer demand reductions that would be necessary during droughts. Currently, the Board has established a goal of limiting customer demand reductions to fifteen percent. The water conservation program described herein would still allow flexibility to obtain additional savings during droughts by increasing



EBMUD's spending and outreach and implementing new short-term measures.

EBMUD's UWMP and Water Shortage Contingency Plan, most recently updated in 2020, outline how EBMUD plans for and responds to drought and other water shortage emergencies. During water shortage emergencies, additional water savings could be achieved by increasing the participation level in certain activities by increasing incentives and implementing additional activities targeting short-term customer actions that save water. For example, during past droughts, EBMUD has enacted temporary regulations that limit water use for irrigation or other activities, implemented Drought Communications Plans to change customer behavior, and activated drought surcharges and rates.

Depending on the drought, EBMUD may partner with other regional water agencies on its messaging. In cases where the drought is significant and statewide, EBMUD may also benefit from "earned media" as State agencies take on outreach activities and the media focuses on drought. This was the case in 2014 and 2015 when the historic, statewide drought was a focus of significant media attention.

4.3. IMPLEMENTATION APPROACHES

As described in Chapter 3, Water Conservation Program activities can generally be split into one of six high-level strategies to help meet future demand:

- Water Management Services
- Education and Outreach
- Rebates and Incentives
- Regulation and Legislation
- Supply Side Conservation
- Research and Development

EBMUD has identified several approaches for implanting these activities. These implementation approaches cut across the different strategies identified above. Marketing and outreach can help to promote customer-facing programs like rebates and incentives and educational offerings. Partnerships can include EBMUD's work with other water agencies and nonprofits to expand its program offerings, and collaborations with academic institutions for research and development. Grant funding can help to make all the programs more cost effective. Technological developments can lead to new programs in the areas of water management services and supply-side conservation. More details on these implementation strategies are provided below.

4.3.1. Marketing and Outreach

Marketing and outreach will be crucial in expanding participation in water conservation activities. They can help to educate customers about water conservation, promote participation in the program, and gain feedback from customers that can be used to further refine program offerings.

The current media and communications landscape creates new opportunities for engaging with customers, as well as new expectations. While some traditional advertising venues still exist, there is an increasing shift to digital communications. Utility newsletters are no longer the main source of communications with customers. Instead, customers use a variety of social media and other electronic-based platforms to help them stay informed.

In the era of social media, customers expect more interaction with agencies that provide service. Customers are more "connected" digitally than in the past. To best position itself to take advantage of the new communications landscape, EBMUD is planning to hire a consultant in 2021 to help develop a modern marketing and outreach plan for water conservation. This plan will consider what types of messages most resonate with customers and will detail new options for communicating with customers in the 21st century.

An important component of any marketing initiative will be to ensure that EBMUD is reaching its target audience. In the case of residential programs, this may mean ensuring that marketing is conducted widely and in multiple languages to ensure coverage across the service area. For programs targeting specific industries or commercial sectors, it will be important to learn where these customers get their information, possibly engaging with organizations like trade associations to help with outreach and education.

A current challenge for EBMUD is reaching residents who consume EBMUD's water but do not hold an account, known as "non-billed customers." This can include residents in multi-family properties like apartment buildings, students in dormitories, and some renters. Broad-based media campaigns utilizing radio, billboards, and other advertisements can help to reach these individuals when EBMUD does not have direct contact information. Finding new and innovative ways of communicating with non-billed customers is an important objective for EBMUD.

4.3.2. Partnerships

Partnerships – whether with community organizations, other water agencies, or industry and professional organizations – will continue to be an important part of expanding EBMUD's water conservation program.

Community partnerships continue to be an important element of how EBMUD interfaces with its customers. Partners can help to expand program outreach and may provide valuable feedback about program design and customer needs. For example, EBMUD's Landscape Advisory Committee provides an important venue for exchanging ideas with landscape professionals. The group can help to vet ideas for new programs and conduct outreach and promotion. Working with community partners can also help EBMUD to reach customer populations who are traditionally underserved. For example, EBMUD works with several community partners on programs for customers who are having trouble paying their water bills, such as the Water Lifeline Program.

EBMUD also partners with other water agencies to implement regional programs. In 2020 EBMUD partnered with ten other water agencies to obtain state grant funding for a Regional Water Conservation Program. As part of this effort, EBMUD may also partner with nearby water agencies to provide QWEL training to landscape professionals who work across water agency service area boundaries.

EBMUD is also an active member of several organizations working to advance water conservation, like the California Water Efficiency Partnership (CalWEP) and the Alliance for Water Efficiency (AWE). Participation in these organizations provides training and networking opportunities for staff, collaboration on research, and the ability to influence state and federal policy and regulations through a broad coalition

4.3.3. Grant Funding

EBMUD has a long history of using state and federal funding, including grants and loans, to help finance its most innovative programs. Grant funding can help to advance research or implement new programs more quickly with reduced impact to ratepayers. It can also offer opportunities to partner with other water utilities or with state and federal funding agencies to advance conservation initiatives.

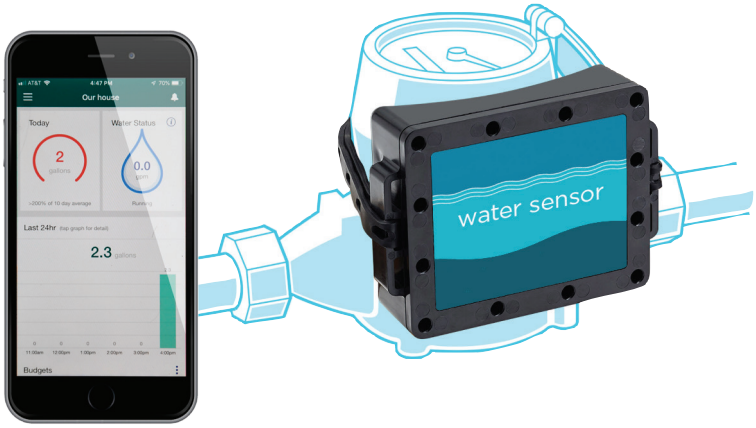
EBMUD's water conservation program has been particularly successful in obtaining grants. Some of the more recent grants include the following:

- EBMUD received $1 million from the U.S. Bureau of Reclamation WaterSmart grant program in 2016 to study water and energy savings associated with the installation of AMI on large accounts.
- In 2020, EBMUD received a Prop 1 Integrated Regional Water Management (IRWM) grant from the Department of Water Resources for a Regional Water Conservation Program. EBMUD is administering the total $4 million grant on behalf of eleven Bay Area water agencies, which includes approximately $1 million for EBMUD rebate, education, and other programs.

Over the next ten years, EBMUD hopes to continue to utilize grant funding to help make its programs more cost-effective. The water conservation program will continue to track state and federal funding opportunities and look for situations where grant funding can help accelerate projects.

4.3.4. Technology

EBMUD has a long history of embracing new technologies. EBMUD will continue to invest in and utilize new technology as it presents itself as an implementation tool to achieve water savings for its customers. This can include both external platforms and technologies, and those developed in-house.



For example, during the writing of the 2011 Water Conservation Plan, customized home water reports that were tailored for individual customers did not yet exist. Since then EBMUD has adopted this technology as an informational service to provide to customers. Similarly, EBMUD began a pilot rebate program in 2019 for flowmeters. EBMUD is also monitoring the development of irrigation technology like soil moisture sensors that can help to reduce water use. Over the next decade, as new technologies present themselves, EBMUD will evaluate based upon customer needs and long-term water conservation goals.

5 APPENDICES

5.1. GLOSSARY

5.1.1. Acronyms

AB	Assembly Bill
AMI	Advanced Metering Infrastructure
AWWA	American Water Works Association
AWE	Alliance for Water Efficiency
CAGBN	California Green Business Network
CalWEP	California Water Efficiency Partnership
CAP	Customer Assistance Program
CBSM	Community Based Social Marketing
CII	Commercial, Industrial, and Institutional
CNPS	California Native Plant Society
DMA	District Metered Area
DWR	(State) Department of Water Resources
EBMUD	East Bay Municipal Utility District
EPA	Environmental Protection Agency
ESA	Energy Savings Assistance
FEPA	Federal Energy Policy Act of 1992, amended 2005
GIS	Geographic Information System
GPCD	Gallons per Capita per Day
GPF	Gallons per Flush
GPM	Gallons per Minute
HOA	Homeowners Association
IRIS	Irrigation Reduction Information System
IRWM	Integrated Regional Water Management
LAC	Landscape Advisory Committee
MGD	Million Gallons per Day
MWELO	Model Water Efficiency Landscape Ordinance

PG&E	Pacific Gas & Electric
PLOD	Planning Level of Demand
SB	Senate Bill
SBX7-7	Senate Bill x7-7 (Water Conservation Act of 2009)
SWRCB	State Water Resources Control Board
USBR	United States Bureau of Reclamation
UWMP	Urban Water Management Plan
WCSP	Water Conservation Strategic Plan
WRF	Water Research Foundation
WSMP	Water Supply Management Program

5.1.2. Definition of Terms

Acoustic Leak Detection	The detection of water leaks by listening for sounds characteristic of water leaks either in the water column or on pipeline appurtenances. This can either be done manually with microphones or through electronic equipment that automatically monitors noise levels in pipes.
AMI	Advanced Metering Infrastructure. Integrated system of meters, communications network, and data management that allows for real time, remote collection of water consumption data
Apparent Losses	The total losses of treated water from unauthorized consumption (theft), inaccuracies associated with customer metering, and systematic data handling errors.
Authorized Consumption	The sum of all billed and unbilled authorized consumption.
Cathodic Protection Systems	The installation of devices on pipelines which stop the electrolytic process which causes corrosion.
Community Based Social Marketing	A form of marketing that seeks to achieve behavior change by emphasizing direct contact among community members and the removal of barriers to action.
Compost	Decomposed organic matter that is often applied as a soil amendment.
Consumption	Metered water use by customers.
Demand Hardening	Reduction in the ability to achieve additional water conservation savings due to previous implementation of water use efficiency measures.

Distribution System Input	The volume of water produced at the treatment plants.
Distribution Water Losses	Sum of apparent and real water losses in the distribution system.
EBMUD 2050 Demand Study	Study that projected demands for the EBMUD service area out to the year 2050 based on information from land use planning agencies.
Equity	The delivery of equal outcomes across diverse groups. The ability to identify inequities and address them when identified.
Flowmeter	Flow measuring device installed by a customer to help measure and monitor their water use.
Graywater	Household wastewater from clothes washer, showers, baths, and bathroom sinks directly used for landscape irrigation or other non-potable purposes. Graywater does not include wastewater that has come into contact with food or sanitary waste.
Landscape Water Budget	An efficiency benchmark for landscape irrigation usage based on landscape area, plant water needs, weather data, and irrigation efficiency.
Making Conservation a California Way of Life	Pair of bills (AB 1668 and SB 6060) passed in 2018 that set water use efficiency targets for urban water agencies.
Meter Resolution	The smallest unit of water that is recorded by a meter. Higher resolution allows for more accurate leak and other end use identification in an AMI system.
Microclimate Zones	Distinct local climates with varying weather patterns, temperature ranges, and solar radiation.
Mixed-Use Accounts	Commercial, industrial and Institutional water services that serve both indoor and outdoor water use.
Mulch	A layer of organic material spread over bare soil that benefits soil and plant health and retains water.
MWELO	Model Water Efficient Landscape Ordinance. A California law that requires all new landscape installed or retrofitted to be designed efficiently for minimal water requirements.
Natural Replacement	Replacement of standard water using fixtures, appliances, and equipment with high efficiency products that occurs regardless of water conservation program implementation.
Passive Conservation	Water saving which results from codes and standards and changes in water use practices that are not directly influenced by active water conservation program implementation.
Raw Water Apparent Losses	The total losses of raw water due to raw water meter errors, unauthorized use from theft, and transmission line blow-offs and flushings.
Raw Water Losses	Consists of apparent losses and real losses in the raw water system.

Raw Water Real Losses	The total physical losses of raw water that include overflows and leakage up to and at the water treatment plants, such as leaks and breaks from aqueducts, transmission lines, or other parts of the raw water distribution system, and water treatment plant losses.
Real Losses	The total physical losses of treated water from storage system overflows or draining, main and service line breaks, and background leakages.
Regenerative Landscapes	Landscaping designed to restore the environment by promoting soil health and biodiversity.
Supply-side Conservation	Conservation resulting from the agency's programs to reduce water loss within its own raw water and distribution systems.
Target Method 2	Compliance option for SBX7-7 which calculates an agency's target based on a per capita indoor residential use, a water budget for landscaped areas of residential and irrigation accounts, and a ten percent reduction in CII water use.
Uniform Plumbing Code (UPC)	A model code developed by the International Association of Plumbing and Mechanical Officials to govern the installation and inspection of plumbing systems as a means of promoting the public's health, safety, and welfare.
Water Audit	An annual assessment of water use and losses from the treated or raw water system.
Water Budget	A benchmark for efficient water use calculated for individual water services or groups of water services.
Water Wise Consultation	Direct interaction with a customer to help them understand and manage their water use and look for opportunities to conserve. Can include the use of surveys, audits, and a review of the customers' water consumption and billing history.
WSMP	Water Supply Management Program

5.2. 2050 WATER CONSERVATION FORECAST MEASURES

5.2.1. Active Water Conservation Measures List

Customer Category	Measure Name	Measure Description	Outreach/ implementation
SFR	Residential Surveys, SF	Provide water use audits for single-family residential customers; includes measuring and assessing indoor and outdoor uses of water, checking for leaks, and offering customized recommendations on how to use water more efficiently. Audits can be in person or remote by telephone/computer.	• Advertise via web, social media, one on one customer contacts • Maximize water savings by targeting high use customers • Continue to develop "remote audits"
MFR	Residential Surveys, MF	Provide water use audits for multi-family residential customers; includes measuring and assessing indoor uses of water, checking for leaks, and offering customized recommendations on how to use water more efficiently. Audits can be in person or remote by telephone/ computer.	• Targeted to apartment buildings, condos, etc. • Advertise via web, social media, one on one customer contacts • Maximize water savings by targeting high use customers
SFR	Residential Showerhead, SF	Free device giveaway. Offer efficient showerheads to single-family residential customers (single retrofit per fixture per customer).	• Devices sent to customers who complete Home Self Survey Kit or as part of audit • Based on current code, showerheads with efficiency of 1.8 gallons per minute or less are provided"
MFR	Residential Showerhead, MF	Free device giveaway. Offer efficient showerheads to multi-family residential customers. Showerheads offered in bulk, one retrofit per fixture.	• Devices sent to customers following completion of audit • Based on current code, showerheads with efficiency of 1.8 gallons per minute or less are provided
SFR	Residential Bath Faucet Aerator, SF	Free device giveaway. Offer faucet aerators to single-family residential customers to improve bathroom faucet efficiency (single retrofit per fixture per customer).	• Devices sent to customers who complete Home Self Survey Kit or as part of audit • Based on current code, showerheads with efficiency of 1.2 gallons per minute or less are provided
MFR	Residential Bath Faucet Aerator, MF	Free device giveaway. Offer faucet aerators to multi-family residential customers. Aerators offered in bulk, one retrofit per fixture.	• Devices sent to customers following completion of audit • Based on current code, showerheads with efficiency of 1.2 gallons per minute or less are provided

Customer Category	Measure Name	Measure Description	Outreach/ implementation
SFR	Residential Kitchen Faucet Aerator, SF	Free device giveaway. Offer faucet aerators to single-family residential customers to improve kitchen faucet efficiency (single retrofit per fixture per customer).	• Devices sent to customers who complete Home Self Survey Kit or as part of audit • Based on current code, showerheads with efficiency of 1.8 gallons per minute or less are provided
MFR	Residential Kitchen Faucet Aerator, MF	Free device giveaway. Offer faucet aerators to multi-family residential customers. Aerators offered in bulk, one retrofit per fixture.	• Devices sent to customers following completion of audit • Based on current code, showerheads with efficiency of 1.8 gallons per minute or less are provided
MFR	4.0 WF Washer, MF Common Area (MF, coin op)	Rebates for installation of high efficiency washing machines in apartment buildings with common area laundry facilities. Rebates will remain consistent with state and federal water use efficiency standards.	• Advertised via website and through audits • For upgrade to multi-load/use clotheswashers with a Water Factor of 4.0 or less
SFR	Residential Irrigation Controller, SF	Rebates for upgrade of existing controller to weather-based, self adjusting model. Customers are provided assistance with proper irrigation controller programming/ system scheduling.	• Continue to provide online information on proper selection and programming • Ongoing outreach and communications with manufacturers and retailers • Coordinate in-store promotional displays
SFR	Residential Turf Replacement	Rebates for removing single-family residential lawns and replacing them with water efficient landscaping. Provide information and support on plant selection, landscaping best practices, design, and maintenance.	• Advertise via web, targeted direct mail and email, and through home garden tours, photo contests, etc. • Coordinate with nurseries and NGOs to ensure availability of appropriate plants • Advertising and outreach through nurseries, irrigation supply stores, and "big box" retailers • Future program developments could offer incentives for design, maintenance, and/or implementation of higher water efficiency projects

Customer Category	Measure Name	Measure Description	Outreach/ implementation
SFR	Residential High Efficiency Irrigation Nozzle Rebate, SF	Rebates for single-family residential customers to upgrade sprinkler nozzles.	• May be combined with other outdoor rebates (e.g., irrigation controllers) • Continue to provide online information on proper selection and installation • Ongoing outreach and communications with manufacturers and retailers • Coordinate in-store promotional displays
Comm	Non-Residential High Efficiency Irrigation Nozzle Rebate, Comm	Rebates for commercial customers to upgrade sprinkler nozzles.	• Continue to provide online information on proper selection and installation • Ongoing outreach and communications with manufacturers and retailers • Coordinate in-store promotional displays
IRR	Non-Residential High Efficiency Irrigation Nozzle Rebate, IRR	Rebates for customers with dedicated irrigation meters to upgrade sprinkler nozzles.	• Continue to provide online information on proper selection and installation • Ongoing outreach and communications with manufacturers and retailers • Coordinate in-store promotional displays
SFR	AMI Residential Meter Installation, SF	Upgrade single-family residential meters to Advanced Metering Infrastructure "smart meters" that provide hourly data. This includes providing customers with a web portal where they can view hourly consumption, set leak alerts, and receive water budgets. EBMUD can also target programs and communications based on high data resolution.	• Outreach to customers on benefits of new meters, how to log on to the portal and set up and use features • Future programs to monitor customer data and develop target outreach based on high data resolution • Potential for improved operations based on analytics and data • Potential future research on customer water use behavior and otpimizing water savings

Customer Category	Measure Name	Measure Description	Outreach/ implementation
MFR	AMI Residential Meter Installation, MF	Upgrade multi-family residential meters to Advanced Metering Infrastructure "smart meters" that provide hourly data. This includes providing customers with a web portal where they can view hourly consumption, set leak alerts, and receive water budgets. EBMUD can also target programs and communications based on high data resolution.	• Outreach to customers on benefits of new meters, how to log on to the portal and set up and use features • Future programs to monitor customer data and develop target outreach based on high data resolution • Potential for improved operations based on analytics and data • Potential future research on customer water use behavior and otpimizing water savings
Comm	AMI Non-Residential Meter Installation, Comm	Upgrade commercial customer meters to Advanced Metering Infrastructure "smart meters" that provide hourly data. This includes providing customers with a web portal where they can view hourly consumption, set leak alerts, and receive water budgets. Staff can work with commercial customers to link accounts and better incorporate data into their operations.	• Outreach to customers on benefits of new meters, how to log on to the portal and set up and use features • Future programs to monitor customer data and develop target outreach based on high data resolution • Potential for improved operations based on analytics and data • Potential future research on customer water use behavior and otpimizing water savings
Instit	AMI Non-Residential Meter Installation, Instit	Upgrade institutional customer meters to Advanced Metering Infrastructure "smart meters" that provide hourly data. This includes providing customers with a web portal where they can view hourly consumption, set leak alerts, and receive water budgets. Staff can work with insitutional customers (e.g., cities, schools) to link accounts and better incorporate data into their operations.	• Outreach to customers on benefits of new meters, how to log on to the portal and set up and use features • Future programs to monitor customer data and develop target outreach based on high data resolution • Potential for improved operations based on analytics and data • Potential future research on customer water use behavior and otpimizing water savings

Customer Category	Measure Name	Measure Description	Outreach/ implementation
Indust	AMI Non-Residential Meter Installation, Indust	Upgrade industrial customer meters to Advanced Metering Infrastructure "smart meters" that provide hourly data. This includes providing customers with a web portal where they can view hourly consumption, set leak alerts, and receive water budgets. Staff can work with industrial customers to link accounts and better incorporate data into their operations.	• Outreach to customers on benefits of new meters, how to log on to the portal and set up and use features • Future programs to monitor customer data and develop target outreach based on high data resolution • Potential for improved operations based on analytics and data • Potential future research on customer water use behavior and otpimizing water savings
IRR	AMI Non-Residential Meter Installation, IRR	Upgrade dedicated irrigation meters to Advanced Metering Infrastructure "smart meters" that provide hourly data. This includes providing customers with a web portal where they can view hourly consumption, set leak alerts, and receive water budgets.	• Outreach to customers on benefits of new meters, how to log on to the portal and set up and use features • Future programs to monitor customer data and develop target outreach based on high data resolution • Potential for improved operations based on analytics and data • Potential future research on customer water use behavior and otpimizing water savings
Comm	Pre-Rinse Spray Valve, Comm	Free device giveaway. Offer high efficiency pre-rinse spray valves to restaurants and other commercial customers (single retrofit per fixture per customer).	• Targeted outreach to eligible customers • Monitor and participate in future product research and development
Comm	Dipper Well, Comm	Rebates for commercial customers to upgrade their dipper well fixtures (single retrofit per fixture per customer).	• Targeted outreach to eligible customers • Monitor and participate in future product research and development
Comm	Large Landscape Surveys, Comm	Conduct water audits for commercial customers with large landscapes - irrigation only customers and mixed use customers with irrigation.	• Could result in upgrades to landscaping and irrigation equipment • Promote water budgets
Instit	Large Landscape Surveys, Instit	Conduct water audits for institutional customers with large landscapes - irrigation only customers and mixed use customers with irrigation.	• Could result in upgrades to landscaping and irrigation equipment • Promote water budgets

Customer Category	Measure Name	Measure Description	Outreach/ implementation
IRR	Landscape Water Budgets, IRR	Develop landscape water budgets for customers with dedicated irrigation accounts. Include weather and parcel data to provide customized water budgets and comparison with actual water use.	• Provide information online and through targeted outreach to key accounts • Follow up with participating customers to assess their performance relative to their water budgets and provide additional services
Comm	Large Landscape Irrigation Controller, Comm	Rebates for commercial customers with large landscapes for upgrade of existing controller to weather-based, self adjusting model. Customers are provided assistance with proper irrigation controller programming/ system scheduling.	• Continue to provide online information on proper selection and programming • Ongoing outreach and communications with manufacturers and retailers • Coordinate in-store promotional displays
Instit	Large Landscape Irrigation Controller, Instit	Rebates for institutional customers with large landscapes for upgrade of existing controller to weather-based, self adjusting model. Customers are provided assistance with proper irrigation controller programming/ system scheduling.	• Continue to provide online information on proper selection and programming • Ongoing outreach and communications with manufacturers and retailers • Coordinate in-store promotional displays
Indust	Large Landscape Irrigation Controller, Indust	Rebates for industrial customers with large landscapes for upgrade of existing controller to weather-based, self adjusting model. Customers are provided assistance with proper irrigation controller programming/ system scheduling.	• Continue to provide online information on proper selection and programming • Ongoing outreach and communications with manufacturers and retailers • Coordinate in-store promotional displays
IRR	Large Landscape Irrigation Controller, IRR	Rebates for customers with large landscapes on dedicated irrigation accounts for upgrade of existing controller to weather-based, self adjusting model. Customers are provided assistance with proper irrigation controller programming/ system scheduling.	• Continue to provide online information on proper selection and programming • Ongoing outreach and communications with manufacturers and retailers • Coordinate in-store promotional displays

Customer Category	Measure Name	Measure Description	Outreach/ implementation
Comm	Large Landscape Turf Replacement, Comm	Rebates for removing turf at commercial sites and replacing them with water efficient landscaping. Provide information and support on plant selection, landscaping best practices, design, and maintenance. For irrigation only meters and mixed use CII customers with irrigation.	• Advertise via web, targeted direct mail and email, and through home garden tours, photo contests, etc. • Coordinate with nurseries and NGOs to ensure availability of appropriate plants • Advertising and outreach through nurseries, irrigation supply stores, and "big box" retailers • Future program developments could offer incentives for design, maintenance, and/or implementation of higher water efficiency projects
Instit	Large Landscape Turf Replacement, Instit	Rebates for removing turf at commercial sites and replacing them with water efficient landscaping. Provide information and support on plant selection, landscaping best practices, design, and maintenance. For irrigation only meters and mixed use CII customers with irrigation.	• Advertise via web, targeted direct mail and email, and through home garden tours, photo contests, etc. • Coordinate with nurseries and NGOs to ensure availability of appropriate plants • Advertising and outreach through nurseries, irrigation supply stores, and "big box" retailers • Future program developments could offer incentives for design, maintenance, and/or implementation of higher water efficiency projects
IRR	Large Landscape Turf Replacement, IRR	Rebates for removing turf at commercial sites and replacing them with water efficient landscaping. Provide information and support on plant selection, landscaping best practices, design, and maintenance. For irrigation only meters and mixed use CII customers with irrigation.	• Advertise via web, targeted direct mail and email, and through home garden tours, photo contests, etc. • Coordinate with nurseries and NGOs to ensure availability of appropriate plants • Advertising and outreach through nurseries, irrigation supply stores, and "big box" retailers • Future program developments could offer incentives for design, maintenance, and/or implementation of higher water efficiency projects
SFR	Residential Landscape Pressure Regulator Rebate, SF	Rebates for single-family residential customers for installation of pressure regulators on the irrigation system.	• Continue to provide online information on proper selection and programming • Ongoing outreach and communications with manufacturers and retailers

Customer Category	Measure Name	Measure Description	Outreach/ implementation
Comm	Non-Residential Landscape Pressure Regulator Rebate, Comm	Rebates for commercial customers for installation of pressure regulators on the irrigation system.	• Continue to provide online information on proper selection and programming • Ongoing outreach and communications with manufacturers and retailers
Instit	Non-Residential Landscape Pressure Regulator Rebate, Instit	Rebates for institutional customers for installation of pressure regulators on the irrigation system.	• Continue to provide online information on proper selection and programming • Ongoing outreach and communications with manufacturers and retailers
IRR	Non-Residential Landscape Pressure Regulator Rebate, IRR	Rebates for customers with dedicated irrigation accounts for installation of pressure regulators on the irrigation system.	• " Continue to provide online information on proper selection and programming • Ongoing outreach and communications with manufacturers and retailers"
SFR	Residential Water Reports, SF	Provide "Home Water Reports" to single-family residential customers comparing their actual water use to appropriate benchmarks. Reports may include targeted messaging on conservation programs and incentives, tips, and seasonal communications.	• Can be delivered to customers by mail or email • Used to promote other District programs and messages • In the future, home water reports may be upgraded to include customized water budgets that can be tailored based on specific customer information (number of residents, landscaped area, etc.)
MFR	Residential Water Reports, MF	Provide "Home Water Reports" to multi-family residential customers comparing their actual water use to appropriate benchmarks. Reports may include targeted messaging on conservation programs and incentives, tips, and seasonal communications.	• Can be delivered to customers by mail or email • Used to promote other District programs and messages • Targeted messaging for property managers as well as for tenants
Comm	Non-Residential Water Reports, Comm	Provide regular water reports to commercial customers comparing their actual water use to appropriate benchmarks. Reports may include targeted messaging on conservation programs and incentives, tips, and seasonal communications.	• Can be delivered to customers by mail or email • Used to promote other District programs and messages

Customer Category	Measure Name	Measure Description	Outreach/ implementation
Instit	Non-Residential Water Reports, Instit	Provide regular water reports to institutional customers comparing their actual water use to appropriate benchmarks. Reports may include targeted messaging on conservation programs and incentives, tips, and seasonal communications.	• Can be delivered to customers by mail or email • Used to promote other District programs and messages
Indust	Non-Residential Water Reports, Indust	Provide regular water reports to industrial customers comparing their actual water use to appropriate benchmarks. Reports may include targeted messaging on conservation programs and incentives, tips, and seasonal communications.	• Can be delivered to customers by mail or email • Used to promote other District programs and messages
SFR	Graywater Rebate, SF	Rebates for diverter valves to install "laundry to landscape" graywater reuse systems for single-family residential customers.	• Continue to provide educational materials on graywater including webinars, workshops, online information, and other resources • Partner with outside organizations that promote graywater reuse
Instit	Water Loss Control/ Supply Side Conservation	Achieve reductions in real water losses from District distribution system through (a) quicker response times; (b) accelerated pipe repair/ replacement; and (c) pressure management.	• 2021 Water Loss Control Plan will detail programs and projects to reduce distribution system water loss • Annual water loss audit to monitor results • Potential future research on measurement, leak detection, predictive modeling, and analytics
CII	Custom Rebate Level 1	Provide custom rebates to commercial, industrial, and institutional customers. Can apply to any fixture, equipment or device that achieves a low level of savings annually (approximately 5,000 gallons per year).	• Targeted outreach to eligible customers • Monitor and participate in future product research and development
CII	Custom Rebate Level 2	Provide custom rebates to commercial, industrial, and institutional customers. Can apply to any fixture, equipment or device that achieves a medium level of savings annually (approximately 10,000 gallons per year).	• Targeted outreach to eligible customers • Monitor and participate in future product research and development

Customer Category	Measure Name	Measure Description	Outreach/ implementation
CII	Custom Rebate Level 3	Provide custom rebates to commercial, industrial, and institutional customers. Can apply to any fixture, equipment or device that achieves a high level of savings annually (approximately 15,000 gallons per year).	• Targeted outreach to eligible customers • Monitor and participate in future product research and development
CII	Commercial survey	Offer basic survey to commercial customers focused on simple fixtures such as toilets and faucets. No landscaping. Commercial includes offices, hotels, restaurants etc.	• Maximize water savings by targeting high use customers • Outreach through chambers of commerce and trade assotiations • Targeted outreach to specific customers • Audits can include promotion of other rebates and services • Availability of AMI data allows for enhanced data analysis
Instit	Institutional Survey	Offer basic audit to institutional customers focused on simple fixtures such as toilets and faucets. May also include cooling and heating and kitchen use. Insitutional audits include schools and gov buildings. Mainly buildings over 25,000 sq ft. No landscaping.	• Maximize water savings by targeting high use customers • Outreach to cities, schools, and other government agencies • Audits can include promotion of other rebates and services • Availability of AMI data allows for enhanced data analysis
Indust	Industrial Survey	Offer basic audit to industrial customers focused on simple fixtures such as toilers and faucets. May also include cooling and heating and kitchen use. Industrial audits include buildings with process water for manufacturing. No landscaping.	• Maximize water savings by targeting high use customers • Outreach through chambers of commerce and trad associations • Facilities with significant use of process water may require specialized knowledge or consultants • Audits can include promotion of other rebates and services • Availability of AMI data allows for enhanced data analysis
SFR	Home Survey Kit	Development and distribution of "Home Water Survey Kit" that allows residential customers (and some small businesses) to perform a self-audit of their water use.	• Completion of Home Self Survey Kit can be tied to other programs like delivery of free devices • Future initiative to develop online version of self-survey

5.3. EBMUD WATER EFFICIENCY REGULATIONS AND PROCEDURES

5.3.1. Procedure 900

EBMUD

Procedure 900

EFFECTIVE	24 MAR 21
SUPERSEDES	17 MAY 18
LEAD DEPARTMENT	WNR

WATER CONSUMPTION ACCOUNTING AND REPORTING

PURPOSE – To establish a consistent District-wide protocol for storing, retrieving, reporting and publishing consumption data for internal and regulatory purposes.

General Provisions

This procedure applies to all District employees directly or indirectly engaged in measuring, collecting, storing, retrieving, validating, reporting, or publishing District raw water use, treated water production, water consumption, and water demand projections data.

Limitations

This procedure provides only a general overview of water consumption accounting and reporting procedures. Operating manuals developed by departments for their internal use provide details on methodologies; however, they do not constitute District policy or adopted procedures.

Definitions

Customer Account

Account - Accounts can be classified into seven major use types, as defined by Business Classification Code (BCC) Categories[1]. One customer can have multiple accounts. BCC Categories include Single-Family, Multi-Family, Commercial, Industrial, Petroleum, Institutional, and Irrigation. For a complete list of BCC Categories or BCC Types (which is the grouping of BCCs into similar type of end users and it is more granular than the BCC Categories) visit http://waterconsumptiondata/glossary.php.

Account Status - For billing purposes, accounts can have one of the following statuses:

- *Active* - a customer is currently responsible for service at a premise[2].
  - Charged – a price/rate has been applied to an account component, i.e., water flow, wastewater flow, and meter size; the account is "statemented" after being "charged".
  - Billed/Statemented – after the account is "charged", the statement or bill is generated.
- *Closed* - an off order has been completed and the account has been charged; the statement may or may not have been generated at this point. The official closed date is the last day the customer is responsible for service.
- *Inactive* - an order has been created for a customer who will be responsible for service at a premise.
- *Landlord* - Active - customers having Intervening Water Service Agreement become responsible for service when a tenant moves out.
- *Landlord* - Inactive - customers having Intervening Water Service Agreements but the tenant is responsible for service.

[1] BCC Categories are mapped to "Dwelling Description" within Customer Watch. For billing purposes accounts can also be differentiated into Revenue Classes which include Residential, Commercial, Industrial and Public. Note that Revenue Classes do not necessarily correspond to BCC Categories.
[2] A premise is the physical location/address where the water use is taking place.

Water Consumption Accounting and Reporting

NUMBER: 900
PAGE NO.: 2
EFFECTIVE DATE: 24 MAR 21

Account Type[3] - There are six types of water service available:

- Standard (Water) = Standard Water Service including irrigation services; potable (treated) drinking water and does not include Fire Services and Hydrant uses.
- Fire Service[4] = Private Fire Service.
- Hydrant = Hydrant Meter Service; Hydrant meters borrowed by contractors are accounted for in the Water Consumption Data Hub (WCD Hub).
- Wastewater = No Water (Wastewater only).
- Untreated (Water Non-Potable) = Non-Potable Water Service; untreated – raw water used by such accounts as golf courses.
- Water Recycled = Recycled Water Service
  Recycle Secondary
  Recycle Tertiary

Metered Consumption Data: Storage

The District stores metered water consumption data in two databases - Customer Watch and Water Consumption Data Warehouse.

Customer Watch (CW) - A utility billing and customer information application used to manage customer contacts, meter readings, charge calculations, statements and correspondence, equipment inventory, service orders, etc.

Most meters are read bimonthly except meters for large commercial and industrial customers which are read monthly. The majority of meters are read manually and entered into handheld units. The reads are then transferred to CW to calculate the Water Flow Charge.

In CW, the data remain in a billing cycle format. CW stores what was charged to individual customers. Because of cancel rebills or delayed reads, the billing period on a statement could be less or much more than the standard billing cycle.

Managed by the Customer Information System (CIS) Control Group, CW replaced the CIS in 2011, which replaced the Customer Billing System in 1987. Data in CW is only available from September 2011 to the present.

Water Consumption Data Warehouse (WCDW) - The database stores water consumption data in monthly, seasonally adjusted monthly, and billing cycle formats, for accounts that have been charged in CW. Metered accounts, both billed and unbilled, are transferred and/or converted from CW to the WCDW on the second Tuesday of every month.

[3] Intertie meter data are not accounted for in the WCD Hub.
[4] It is not feasible for the District to accurately estimate a potentially significant portion of fire service consumption as fire departments are not required to report their usage to the District.

Water Consumption Accounting and Reporting

NUMBER: 900
PAGE NO.: 3
EFFECTIVE DATE: 24 MAR 21

Monthly Normalized Aggregate

Within the WCDW, the billing data is converted into a monthly format and archived. WCDW contains data from 1975 to present. Due to the differences in timing of the billing cycles, data in WCDW is available about two months prior to the current month. This ensures that the data presented for a given month represents all of the District's active accounts.

Since 1975, the District has utilized an algorithm to redistribute billing cycle data into monthly data - equally distributing the data across each month. The algorithm for the conversion can be found via the WCD Hub's Glossary page (http://waterconsumptiondata/glossary.php).

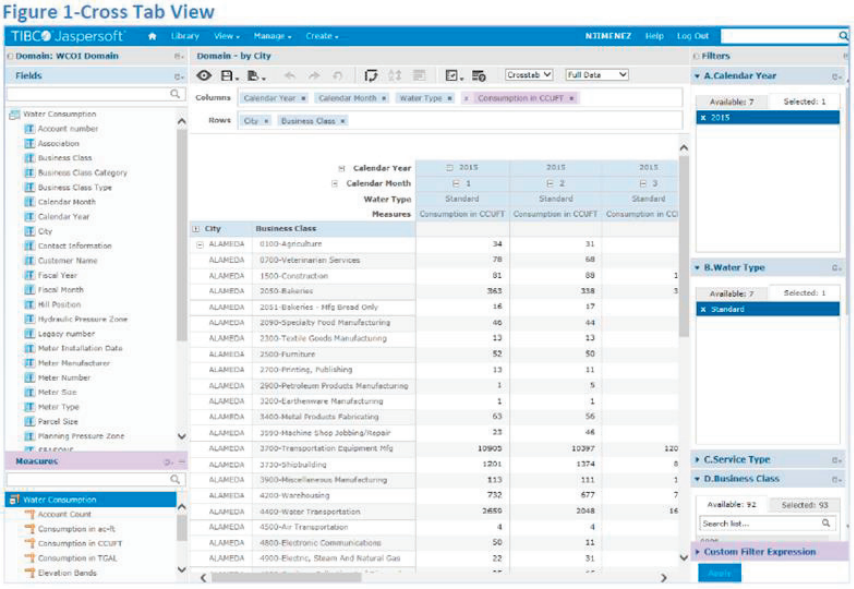
Seasonally Indexed Monthly Format Algorithm

In January 2014, the District began keeping water consumption data based on a seasonally adjusted algorithm. This data is available for calendar year 2013 to the present. For publishing purposes, if the Seasonally Adjusted Monthly Aggregate data is used, that needs to be clearly indicated on any report, chart, or table created.

The seasonally indexed monthly format algorithm refines the monthly format algorithm by accounting for the seasonal nature of water consumption, attributed to irrigation in the warmer months. The refinement improves the accuracy of the monthly consumption calculation by prorating consumption based on historical monthly water consumption trends by BCC Category. The Seasonal Indices (SI) that are used in the algorithm will be updated approximately every 10 years by the Water Distribution Planning Division.

The algorithm for the conversion can be found via the WCD Hub's Glossary page (http://waterconsumptiondata/glossary.php).

Figure 1-Cross Tab View



Water Consumption Accounting and Reporting

NUMBER: 900
PAGE NO.: 4
EFFECTIVE DATE: 24 MAR 21

Metered Consumption Data: Retrieval/ Reporting

Historical and reproducible metered water consumption data can be retrieved and reported using the following:

- Water Consumption Data Hub
  - Jasper Reports
  - Jasper Analytics Tool
  - Data Query Request
- Customer Watch

Water Consumption Data Hub - CW water use data is translated into normalized monthly aggregate consumption values when it is loaded into the WCD hub. This is a portal in which District staff can query and view water consumption data, obtain a reference for standardized consumption related terms, and access relevant policies and procedures in reporting data. The WCD Hub helps to ensure consistent, accurate, reproducible water consumption data is used throughout the District. The WCD Hub can be accessed via http://waterconsumptiondata. Definitions of BCC and corresponding types and categories, and seasonal indices for west and east of hills by BCC category are published on the WCD Hub's Glossary page. These can be accessed at http://waterconsumptiondata/glossary.php.

Metered Consumption Data: QA/ QC

The accuracy and integrity of water consumption data are maintained through a Quality Assurance/ Quality Control (QA/ QC) process in CW.

In CW, to assure correct billing, exceptions reports are produced daily as "Special Handling" when anomalies are noted in the data. Some of the criteria for triggering an exception flag in CW include:

- High/Low - Consumption values calculated from meter reads uploaded by the Meter Reading & Maintenance Division are compared with historical data. Customer Services Support Division, Field Services, Water Conservation Division and Meter Reading & Maintenance Division staff review consumption values that are higher or lower than the historical range, and take appropriate actions such as requesting service order, confirming the read, etc., before the consumption is released for charge calculation.

- High Charge - a type of service (water, wastewater, or fire service) and the corresponding revenue class has a dollar amount assigned to it that triggers a high charge flag. Customer Services Support Division reviews all accounts that exceed the high dollar amount before releasing the account for statement.

Accuracy of the meter reads provided to the CW application is maintained by the Meter Reading & Maintenance Division.

Department and Committee Responsibilities

Departments are responsible for assisting and supporting other groups and committees to assure that reporting of water supply and use information is consistent with this procedure. Attachment A provides a list of standard publications that report the information produced by the District.

Water Consumption Accounting and Reporting

NUMBER: 900
PAGE NO.: 5
EFFECTIVE DATE: 24 MAR 21

Water and Natural Resources Department (WNR)

The Water Resources Planning Division (WRPD) of the WNR is responsible for assessing and reporting District water supplies and use, including historical, current, and future assessments as required by District policy; California State Water Code; water rights, contracts, and agreements; state and regional planning agencies; legislative initiatives; and legal matters. WRPD is also responsible for calculating the water savings estimates for inclusion in the State Water Regional Control Board (SWRCB) Annual Report. WRPD reports/publishes water consumption data in the District's Urban Water Management Plan to meet the State's and Federal regulatory requirements. WRPD oversees the WCD Hub and Procedure 900.

The Office of Water Recycling of the Water Supply Improvements Division, which is located within the WNR, is responsible for assessing recycled water production and use from wastewater sources, as well as potable supplement and customer raw water use. The District recycled water use is reported annually with the potable supplement and other non-potable values to be retrieval through the Hub. The District's recycled water accounting terms and reporting responsibilities are defined in Procedure 901.

Operations and Maintenance Department (OMD)

OMD is responsible for measuring, collecting, retrieving, recording, validating, reporting, and making available metered water supply production and use data from the District's water treatment facilities.

Customer and Community Services Department (CUS)

The Customer Services Support Division of the CUS is responsible for storing metered water readings, calculating usage and charges from metered water readings, as well as accuracy of CW data, as described in the Data QA/QC section of this procedure. The Customer Services Support Division is also under contract to bill for other public agencies.

The Water Conservation Division (WCD) of the CUS is responsible for water conservation service, assessment and reporting current and projected water conservation savings by customer type and land use. The District's water conservation accounting terms and reporting responsibilities are defined in Procedure 902.

Information Systems Department (ISD)

The Applications Division (AD) of ISD is responsible for developing and maintaining the repositories of the water consumption data. The AD development the WCD Hub that centralizes and meets water consumption query needs of District staff.
AD is also responsible for implementing quality control procedures on the data. To ensure accuracy and consistency, all metered water consumption data to be released to the public should be retrieved via the sources listed in this Procedure. (See Metered Consumption Data: Retrieval/ Reporting section of this procedure).

Water Consumption Accounting and Reporting

NUMBER: 900
PAGE NO.: 6
EFFECTIVE DATE: 24 MAR 21

Finance Department (FIN)

Treasury Operations in the FIN is responsible for tracking billed water use and revenue, including classification by customer and service area region for use in the District's financial planning and reporting. The water use reported by FIN is taken directly from CW and reflects the billed metered water consumption that was printed for customer statements during the reporting period. These consumption reports do not correspond to the monthly water consumption in the WCDW. Treasury Operations develops their short-term water consumption projections data that is reviewed by the Demand Projections Committee (DPC). FIN reports on water consumption and revenue to the Board of Directors on a monthly basis.

The Controller's Office of the FIN gathers information about water production for the District Annual Report "comparative highlights" section.

Wastewater Department (WWD)

The Environmental Services Division of the WWD is responsible for developing and assessing capacity fees, rates, and charges associated with wastewater services. The Environmental Services Division is responsible for determining wastewater flow for billing and verifying wastewater flows for facility planning and billing purposes. The WWD is also responsible for coordinating with the Office of Water Recycling to ensure non-potable and potable water served within the District's recycled water systems is properly reviewed and stored.

Engineering and Construction Department (ENG)

The Water Distribution Planning Division (WDPD) of the ENG is responsible for preparing the District's Demand Study Updates that forecast water use over a 30-year planning horizon by land use categories and census tracts; and for preparing Water Supply Assessments and Written Verifications of Sufficient Water Supply as required by the State Water Code. The WDPD chairs the DPC that is responsible for reviewing and approving demand projections that are reported by District staff.

Office of the General Manager (OGM)

The Communications Office of the OGM is responsible for ensuring consistent data on current and past water use that is provided to the media, and used in publications and at community events attended by the District's Board of Directors, management and staff. Consistent data helps maintain customer and stakeholder confidence in the District; therefore the Communications Office should coordinate with the Project Management Office of the ADD on all metered water consumption data released to the public.

Demand Projections Committee (DPC)

The DPC members are representatives from each Department in the District described above. The DPC is chaired by WDPD. It is an inter-departmental committee that reviews and provides oversight of any short-term or long-term demand projections as well as providing feedback and guidance to Departments that are performing water use analysis.

Water Consumption Accounting and Reporting

NUMBER: 900
PAGE NO.: 7
EFFECTIVE DATE: 24 MAR 21

Acronyms

AD – Applications Division
BCC – Business Classification Code
CIS – Customer Information System
CUS – Customer and Community Services Department
CW – Customer Watch
DPC – Demand Projections Committee
EBMUD – East Bay Municipal Utility District
ENG – Engineering and Construction Department
FIN – Finance Department
ISD – Information Systems Department
OGM – Office of the General Manager
OMD – Operations and Maintenance Department
QA/QC – Quality Assurance/ Quality Control
SI – Seasonal Index
SWRCB – State Water Resources Control Board
USBR – United States Bureau of Reclamation
WCD – Water Conservation Division
WCDW – Water Consumption Data Warehouse
WNR – Water and Natural Resources Department
WRPD – Water Resources Planning Division
WWD – Wastewater Department

References

Procedure 146 – Water Conservation Accounting and Reporting
Procedure 708 – Facilities: Metering Water Consumption
Procedure 901 – Recycled Water Accounting and Reporting
EBMUD Urban Water Management Plan (2015)
EBMUD Water Management Plan (2018)
EBMUD Water Conservation Master Plan (2011)
EBMUD Recycled Water Master Plan (2020)

Water Consumption Accounting and Reporting

NUMBER: 900
PAGE NO.: 8
EFFECTIVE DATE: 24 MAR 21

Attachment A
STANDARD REPORTS AND PUBLICATION DATES

Dept	Report	Board Action	External Action	Frequency	Month	FY[1]	CY[2]
	Water Rights Reports *Annual reports submitted to the SWRCB summarizing the District's water use characteristics.*		Submitted to SWRCB	Annually	June		•
	Urban Water Management Plan *A comprehensive report of water supply sources, production, usage, wastewater, recycled water and conservation. It is submitted to the California Department of Water Resources (DWR) and the U.S. Bureau of Reclamation.*	Adoption with a Resolution	Submitted to DWR	Every 5 years	July	•	•
	Monthly Volumes Delivered *As a requirement of the District's CVP Contract, the District shall inform the USBR and the DWR in writing by April 30 of each year of the monthly volume of surface water delivered within the District's service area during the previous contract year (February-March).* *A report that provides current information on the District's service area, supply and usage. It is submitted to the USBR as a requirement of the District's Central Valley Project (CVP) Contract.*		Submitted to USBR	Annually	April	•	
	Municipal & Irrigation Use *As a requirement of the District's CVP Contract the District shall inform USBR on or before the 20th of each month of the quantity of CVP water taken during the previous month.*		Submitted to USBR	Monthly (after CVP water takes only)	All		•
	Monthly Consumption/Production Values *As a requirement of the SWRCB, monthly values are required to be submitted by the 15th of each month for the water use in the prior month. Information on DMP measures implemented are required during drought periods*						
OMD	**Water Loss Audit Report** *As a requirement of SB-555, the District produces a validated annual report on water use that must be certified by the GM. OMD compiles and produces the report, and WNR submits it.*		Submitted to DWR	Annually	Oct		•

Water Consumption Accounting and Reporting

NUMBER: 900
PAGE NO.: 9
EFFECTIVE DATE: 24 MAR 21

Dept	Report	Board Action	External Action	Frequency	Month	FY[1]	CY[2]
	Water Supply Operations Plan *The Plan describes the actual and projected water supply operations for the water year from October 1 to September 30 for the Mokelumne and the East Bay systems.*			Annually	May		•
	Water Supply Engineering Statistical Report *The Report provides an annual record of operation for the water supply system.*			Annually	Nov	•	
ENG	**Demand Study Update** *A study using a land-use based methodology to forecast water distribution system demand for a 30-year planning horizon.*			Every 5-10 years	Varies		•
FIN	**Financial and Statistical Report** *A Blue Book that provides separate financial statements, flux analyses and water consumption for Water and Wastewater.*			Semi-Annually	Dec		•
	Comprehensive Annual Financial Report *The report represents the District's financial position and results of operations, and demographic and statistical information.*			Annually	Jun	•	
OGM (Public Affairs)	**EBMUD Report on the Biennial Budget** *External report representing District-wide activities and focus for two fiscal years. The report provides a summary of water programs and projects that are completed and underway.*		Public Distribution	Annually	Dec-Jan	•	
	All About EBMUD *A report describing EBMUD's system.*		Public Distribution	Biennially (last update 2018-2019)	Dec	•	
	Reponses to Media Inquiries *Disseminates fiscal and calendar year information about water use in response to media inquiries, which are sometimes very time-sensitive and require prompt response.*		Public Distribution	Annually	Varies		

[1]/ Fiscal Year
[2]/ Calendar Year

5.3.2. Procedure 901

EBMUD

Procedure 901

EFFECTIVE 23 JUN 21
SUPERSEDES 23 APR 19
LEAD DEPARTMENT WNR

RECYCLED WATER ACCOUNTING AND REPORTING

PURPOSE – To define recycled water accounting terms, specify the authorized source of recycled water use data, and describe departmental responsibilities for measuring, assessing, and reporting recycled water data.

General Provisions

This procedure applies to all District employees who are directly or indirectly engaged in reporting on District recycled water supplies, consumption, system loss, and supply and demand projections.

Limitations

This procedure provides a general overview of recycled water accounting and reporting procedures. Operating manuals developed by departments for their internal use provide details on methodologies.

Recycled Water Accounting Terms and Definitions

<table>
<tr><td rowspan="9">Recycled Water 1</td><td colspan="3">Billed Metered Use 2</td><td rowspan="2">Revenue Water 14</td></tr>
<tr><td colspan="3">Contract Operations Use 3</td></tr>
<tr><td colspan="3">Unbilled Metered Use 4</td><td rowspan="7">Non-Revenue Water 15</td></tr>
<tr><td colspan="3">In-Plant Use 5</td></tr>
<tr><td rowspan="5">Water Losses 6</td><td rowspan="3">Apparent Losses 7</td><td>Unauthorized Use 8</td></tr>
<tr><td>Customer Metering Inaccuracies 9</td></tr>
<tr><td>Systematic Data Handling Errors 10</td></tr>
<tr><td rowspan="2">Real Losses 11</td><td>Leakage on Mains 12</td></tr>
<tr><td>Leakage on Service Connections up to Customer Meter 13</td></tr>
</table>

1. Recycled Water – Treated wastewater meeting Title 22 Water Recycling Criteria set by the State Water Resources Control Board (SWRCB) that is used beneficially and reduces the demand for potable water supply.

2. Billed Metered Use – Sum of all metered recycled water use.

3. Contract Operations Use – Sum of recycled water provided by contract operations and delivered directly to customers.

4. Unbilled Metered Use – Non-revenue water that is metered but unbilled such as truck filling deliveries, pipe flushing, and other uses.

5. In-Plant Use – Recycled water that is used by the District within the wastewater treatment and/or recycled water treatment plant for irrigation, facility processes, or other applications. The exact use of the water, and the amount of potable water that it offsets, varies from project to project. Information on in-plant use should be obtained from the plant manager.

6. Water Losses – Sum of Apparent Losses and Real Losses.

Recycled Water Accounting and Reporting

NUMBER: 901
PAGE NO.: 2
EFFECTIVE DATE: 23 JUN 21

7. Apparent Losses – Sum of recycled water losses resulting from unauthorized use, customer metering inaccuracies, and data processing errors.

8. Unauthorized Use – Sum of all recycled water loss from theft, including illegal taps.

9. Customer Metering Inaccuracies – Sum of recycled water losses due to inaccurate or failed meters, and incorrect meter readings.

10. Systematic Data Handling Errors – Sum of recycled water losses due to data processing inaccuracies and accounting errors.

11. Real Losses – Sum of Leakage on Mains and Service Connections up to Customer Meter, and overflows and leakage from recycled water reservoirs.

12. Leakage on Mains – Sum of all losses due to transmission and distribution pipeline leaks and breaks in the recycled water distribution system. This category does not include leaks on laterals and service connections.

13. Leakage on Service Connections up to Customer Meter – Sum of estimated and measured recycled water losses on laterals from District main to customer meter.

14. Revenue Water – Sum of Billed Metered Use and Contract Operations Use.

15. Non-Revenue Water – Unbilled Metered Use. Sum of all recycled water output from the system that is not billed (i.e., metered District use, in-plant use, plus apparent and real losses).

Other Definitions:

16. Non-Potable Water – Non-drinking water including treated recycled and untreated raw water supplies.

17. Standard Non-Potable Water Rate – Water rate charged by District for non-potable water use except for customers with special contracts or agreements.

18. Recycled Water Supplies – Secondary and tertiary treated recycled water produced and delivered from all wastewater effluent sources.

Data Retrieval and Reporting

Data retrieval to follow protocol as outlined in Procedure 900 – Water Supply and Consumption Accounting and Reporting to ensure consistency.

Data reporting should follow the relevant District procedures 466 and 900. Reporting of data is subject to supervisory approval. Refer to the enclosed table for listing of standard reporting requirements.

Department and Committee Responsibilities

In addition to the primary departmental responsibilities outlined below, each department is responsible for assisting and supporting other departments and District committees to assure that reporting of recycled water use information is consistent with this procedure. Attachment A provides a list of standard publications that report recycled water use information produced by various District departments.

Recycled Water Accounting and Reporting

NUMBER: 901
PAGE NO.: 3
EFFECTIVE DATE: 23 JUN 21

Finance Department (FIN)

The FIN is responsible for updating the standard non-potable water rate, assessing billed recycled water use and revenue, including classification by customer and service area region, for use in District financial planning and reporting. The FIN is responsible for invoicing and collections for contract operations for recycled water.

The FIN is responsible for developing and maintaining the repositories of the recycled water use data and assisting the Water and Natural Resources Department (WNR) in developing and maintaining the Water Consumption Data Hub. The FIN is responsible for implementing quality control procedures on the data as requested.

Water and Natural Resources Department (WNR)

The Water Supply Improvements Division (WSID) of the WNR is responsible for developing and reviewing rate schedules associated with non-potable water services including recycled and raw water if there are special agreements in place that deviate from the standard non-potable water rate; verifying and keeping track of the District's recycled and raw water use to date; assessing recycled water production, including contract operations, use from treated wastewater sources, and tracking target and future deliveries to achieve the recycled water goal as established by the District's Urban Water Management Plan (UWMP). WSID, in coordination with the Wastewater Department (WWD) and Operations and Maintenance Department (OMD), also prepares annual reports for the District's recycled water projects to the SWRBC and the Regional Water Quality Control Board (RWQCB) to meet state funding and permit regulatory requirements.

The Water Resources Planning Division (WRPD) of the WNR is responsible for reporting District recycled water supplies and use, including historical, current, and future assessments as required by District policy; California State Water Code; water rights, contracts, and agreements; state and regional planning agencies; legislative initiatives; and legal matters. WRPD is also responsible, in coordination with the Water Conservation Office, for overseeing the Water Consumption Data Hub. Every five years, WRPD files an update of the District's UWMP, reporting on recycled and non-potable water use, to the California Department of Water Resources (DWR).

Wastewater Department (WWD)

The Wastewater Engineering Division and the Treatment Division of the WWD are responsible for providing assistance to the WNR in verifying wastewater and recycled water flows for facility planning and billing purposes; providing and assessing data on recycled water production, water quality, and use from treated wastewater sources; providing historical data including potable make-up deliveries; and assisting in data reporting. WWD, in coordination with WSID, prepares annual reports for the District's recycled water projects to the SWRCB and the Regional Water Quality Control Board (RWQCB) to meet state funding and permit requirements.

Office of the General Manager (OGM)

Public Affairs is responsible for managing the preparation of key publications that report on water supply, including recycled water, to meet the District's need to communicate with the public. The District's Report on the Biennial Budget reviews District-wide activities and programs for a two fiscal year period, and includes a discussion of recycled water programs and the amount of recycled water deliveries.

Recycled Water Accounting and Reporting

NUMBER: 901
PAGE NO.: 4
EFFECTIVE DATE: 23 JUN 21

Customer and Community Services Department (CCS)

The Water Conservation Division (WCD) within the CCS Department supports reporting recycled water use data needed to meet state and federal regulatory requirements and voluntary data sharing surveys with utility membership organizations. WCD is also responsible for preparation of recycled water customer budgets and associated tracking of use; assisting WNR with customer education, recommendations and follow ups.

The CCS Department is responsible for coding and ensuring the implementation of the latest rates and the timely billing of accounts, and maintains all meter readings accurately for both billed and unbilled recycled water accounts.

Operations and Maintenance Department (OMD)

OMD is responsible for maintaining billed and unbilled recycled water meters and District owned infrastructure including replacements and repairs; and reporting unauthorized uses. Once reported, main and service
leaks should be repaired in a timely manner. Main and service leaks are reported by the Regulatory Compliance Office (RCO) to the RWQCB and other regulatory agencies in accordance with regulations, District's Master Recycled Water Permit, and District reporting procedures for waterline breaks that result in the release of recycled water. There are no known unauthorized uses of recycled water. If an unauthorized use is discovered, it shall be disconnected immediately.

Office of General Counsel (OGC)

OGC is responsible for ensuring that the established District protocols, and customer and agency agreements, follow state and federal regulations and statutes.

Demand Projections Committee (DPC)

The DPC is made up of representatives from several departments within the District. The DPC is chaired by the Water Distribution Planning Division (WDPD). The DPC is an inter-departmental committee that reviews potable and recycled water demand and makes recommendations for any short-, mid-, or long-term demand projections.

Glossary of Terms

DWR – California Department of Water Resources
RWQCB – Regional Water Quality Control Board
SWRCB – State Water Resources Control Board
UWMP – Urban Water Management Plan

References

Policy 9.05 – Non-Potable Water
Procedure 900 – Water Consumption Accounting and Reporting
Urban Water Management Planning Act – California Water Code Division 6 Part 2.6
EBMUD Urban Water Management Plan (2015)

Procedure 901 – Recycled Water Accounting and Reporting
Attachment A

STANDARD REPORTS AND PUBLICATION DATES

Dept	Report	Board Action	External Action	Frequency	Month	FY[1]	CY[2]
WNR	**Water Rights Reports** *Annual reports submitted to the State Water Resources Control Board (SWRCB) summarizing the District's water use characteristics.*		Submitted to SWRCB	Annually	June		•
	Urban Water Management Plan *A comprehensive report of water supply sources, production, usage, wastewater, recycled water and conservation. It is submitted to the California Department of Water Resources (DWR).*	Adoption with a Resolution	Submitted to DWR	Every 5 years	Dec		•
OGM (Public Affairs)	**East Bay Water Report** *A water supply and demand management report that provides information on current and projected water demand and supply, including an update on the water conservation and the water recycling programs.*		Public Distribution	Biennially	Nov	•	
	District's Report on the Biennial Budget *External report representing District-wide activities and focus for two fiscal years. The report includes a brief summary of recycled water programs, including a description of projects completed and underway, status, amount of expected recycled water deliveries, and types of customers.*		Public Distribution	Annually	Dec-Jan	•	
ENG	**Demand Study Update** *A study using a land-use based methodology to forecast water demand for a 30-year planning horizon. Demand includes adjustments for conservation and non-potable recycled water use projections.*	Adopted		Every 5-10 years	Varies		•
WWD	Statewide General Permit for Recycled Water Use Monitoring Report *Annual reports submitted to the State Water Resources Control Board (SWRCB) summarizing the District's recycled water use characteristics.*		Submitted to SWRCB	Annually	April		•

1/ Fiscal Year
2/ Calendar Year

5.3.3. Procedure 904

EBMUD

Procedure 904

EFFECTIVE	24 MAR 21
SUPERSEDES	NEW
LEAD DEPARTMENT	WNR

WATER LOSS AUDIT ACCOUNTING AND REPORTING

PURPOSE - To establish procedures for collecting and validating data related to the District's annual water loss audit report and to describe the associated Departmental responsibilities.

Regulatory Requirements

Senate Bill 555 (SB 555), passed in October 2015, requires the state's urban retail water suppliers to complete an annual water loss audit report on their water distribution systems and submit a validated water loss audit report to the California Department of Water Resources (DWR) by October 1st of each year, starting in 2017. SB 555 requires water audits to be conducted according to American Water Works Association (AWWA), Water Audits and Loss Control Programs, M36 Manual (AWWA M36) and AWWA's free Water Audit software which can be accessed via AWWA's website: http://www.awwa.org. (Data source: AWWA).

The water loss audit report must be validated by a certified expert attested by the utility executive and include steps taken to increase data validity, reduce apparent loss volume, and reduce real loss volume. Senate Bill 1420 established that urban water suppliers submit a report that quantifies water system losses with their urban water management plans.

By July of the 2021 calendar year, the State Water Resources Control Board (SWRCB) plans to adopt rules requiring urban retail suppliers to meet performance standards for the volume of real water losses. The District will comply with these rules when they are adopted.

Water Audit Terms and Definitions

<table>
<tr><td rowspan="9">Water Sources</td><td rowspan="9">Distribution System Input (i.e. production)</td><td rowspan="4">Authorized Consumption (e.g. customer demand)</td><td rowspan="2">Billed Authorized Consumption</td><td>Billed Water Exported</td><td rowspan="2">Revenue Water</td></tr>
<tr><td>Billed Metered Consumption</td></tr>
<tr><td rowspan="2">UnBilled Authorized Consumption</td><td>Unbilled Metered Consumption</td><td rowspan="5">Non-Revenue Water</td></tr>
<tr><td>Unbilled Unmetered Consumption</td></tr>
<tr><td rowspan="5">Distribution Water Losses</td><td rowspan="3">Apparent Losses</td><td>Unauthorized Consumption</td></tr>
<tr><td>Customer Metering Inaccuracies</td></tr>
<tr><td>Systematic Data Handling Errors</td></tr>
<tr><td rowspan="3">Real Losses</td><td>Leakage on Mains</td></tr>
<tr><td>Leakage and Overflows at Storages</td></tr>
<tr><td>Leakage on Service Connections up to Customer Metering</td></tr>
</table>

Distribution system Input component terms, adopted from AWWA International Water Association Audit Components, provide an overview of the connection between the components and how they are defined. For specific definitions of each term shown in the table above, a comprehensive list is available through DOCS at https://docs/doc/2847286.

Water Loss Audit Accounting and Reporting

NUMBER 904
PAGE NO.: 2
EFFECTIVE DATE: 24 MAR 21

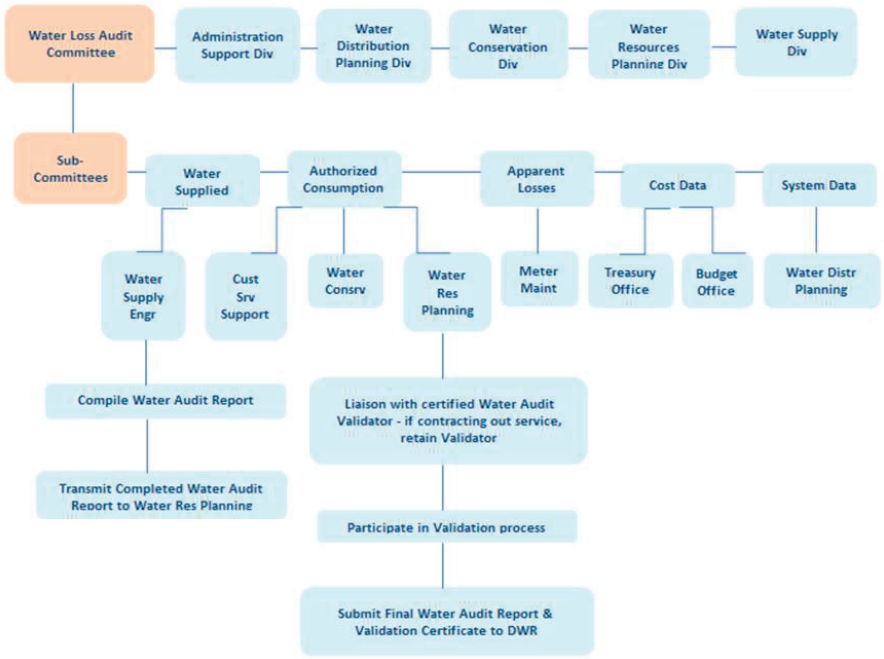
Responsibilities

District divisions with primary responsibility for providing data to complete the water loss audit report are Administration and Support, Water Resources Planning, Water Supply Engineering, Water Conservation, Treasury Office, Budget Office, Water Distribution Planning, Facilities Maintenance and Construction, and Maintenance Support.

The water loss audit report is presented in the form of a worksheet that details the variety of consumption and losses that exist in a public water system. The District is required to enter water system information into the water loss audit worksheet to calculate water balance and determine the apparent and real losses that occurred in the previous calendar year.

Past water loss audit reports are accessible at http://wiki/water_ops/index.php5/Water_Supply_Engineering Reports_%26_Graphics#Water_Audit_Reports.

Figure 1 below provides a visual representation of the District's organizational Chart for water audit coordination.



The Water Loss Audit (WLA) Committee coordinates the District WLA activities, roles and responsibilities; including a review of each component of the District's WLA as defined by AWWA, and recommends improvements to the process to meet District and state regulatory requirements.

The subcommittees are comprised of stakeholders that support the WLA Committee to perform tasks related to water loss audit and make contributions based on each subcommittee's subject matter expertise to complete the annual water audit report. The subcommittees were established based on the required Water Loss Audit components as defined in AWWA's guidance (Reference: AWWA Free Water Audit Software v5.0 Definitions).

Water Loss Audit Accounting and Reporting

NUMBER 904
PAGE NO.: 3
EFFECTIVE DATE: 24 MAR 21

Water Loss Audit Timeline

- In March, sub-committees began to meet to compile data, discuss new developments and progress of implemented recommendations, and establish recommended grades per the AWWA grading matrix.
- In mid-June, each sub-committee prepares a memo that contains the water loss audit components' data and submits it to Water Supply Engineering (WSE) work unit. WSE compiles the data and produces the Water Loss Audit Report and transmits it to the Water Resources Planning (WRP) work unit.
- In July, WRP coordinates with internal certified validator (currently residing in Water Distribution Planning Division), or if contracting out service, WRP retains the service of a certified validator to validate the water audit report.
- By September, WRP completes the validation process and submits the validated water audit report together with the validation certificate through the WLA committee to request General Manager's approval and signature on the validation certificate.
- By October 1, WRP uploads the validated water audit report and the signed validation certificate onto DWR's web portal.

References

American Water Works Association Manual 36 - Water Audits and Loss Control Programs (Fourth Edition)
American Water Works Association Free Water Audit Software (Version 5)
EBMUD Urban Water Management Plan (2015)

Procedure 900 – Water Consumption Accounting and Reporting

5.3.4. Section 28

REGULATIONS GOVERNING WATER SERVICE
TO CUSTOMERS OF THE EAST BAY MUNICIPAL UTILITY DISTRICT

PAGE NUMBER: 28-A

SECTION 28
WATER USE DURING WATER SHORTAGE EMERGENCY CONDITION

Drought conditions require that all customers reduce individual and collective use of EBMUD water supplies until further notice to ensure availability of the public water supply for critical uses. This regulation specifies the water uses that are prohibited during the drought and provides guidelines on effective water use practices to help customers conserve. It also defines the exceptions and enforcement provisions should customers fail to comply with the prohibitions.

A. EMERGENCY REGULATIONS AND RESTRICTIONS ON WATER USE

During the water shortage emergency condition declared by the Board of Directors, all customers must comply with prohibitions on water uses described below to conserve the public water supply to meet critical needs. In addition, customers are asked to follow the water saving guidelines below.

1. Potable Water Uses Prohibited During the Water Shortage Emergency

    a. Using potable water for decorative ponds, fountains and other water features that do not recirculate water is prohibited.

    b. Washing cars, boats, trailers, aircraft or other vehicles with potable water by hose without a shutoff nozzle is prohibited.

    c. Washing sidewalks, driveways or hard surfaces with potable water, or applying potable water to any surface or material that results in excessive use and runoff is prohibited.

    d. The application of potable water to outdoor landscapes in a manner that causes runoff such that water flows onto adjacent property, non-irrigated areas, private and public walkways, roadways, parking lots, or structures is prohibited.

    e. Irrigating turf and ornamental landscape is only permitted no more than two days each week, not on consecutive days, and before 9 a.m. and after 6 p.m., except for potted plants.

    f. Irrigating turf and ornamental landscaping with potable water during and within 48 hours following measurable precipitation is prohibited.

    g. Using potable water for irrigating ornamental turf on public street medians is prohibited.

    h. Flushing sewers or hydrants with potable water are prohibited, except in cases of emergency and for essential operations.

    i. Use of potable water for construction, street cleaning, soil compaction and dust control is prohibited if a feasible alternative source of water is available. All water use for construction, soil compaction and dust control will require a permit issued by EBMUD.

EFFECTIVE DATE: 07/01/21 *AUTHORITY-RESOLUTION NUMBER:* 35225-21

SECTION 28

WATER USE DURING WATER SHORTAGE EMERGENCY CONDITION

j. The serving of drinking water other than upon request in eating or drinking establishments, including but not limited to restaurants, hotels, cafes, cafeterias, bars, or other public places where food or drink are served and/or purchased is prohibited.

k. Operators of hotels and motels are required to offer patrons the option of not having towels and linens washed daily. The hotel or motel shall prominently display notice of this option in each guestroom using clear and easily understood language.

l. Use of hydrant water outside the EBMUD service area is prohibited.

2. Water Savings Guidelines

a. Conserve water indoors. Efficient indoor water use is 45 gallons and super-efficient indoor use is 35 gallons per person daily. Most customers can achieve this by shortening showers and using less bath water, running only full loads of laundry and dishes, and keeping a close eye on faucet use. Additionally, customers are encouraged to reduce use of kitchen garbage disposals through composting or curbside green waste collection and not to use toilets as wastebaskets. Customers also may want to consider upgrading to more water-efficient plumbing fixtures and appliances.

b. Promptly repair leaks indoors and outside. Measureable leaks should not be turned on until repairs have been completed.

c. Use covers on swimming pools and home spas (hot tubs) and avoid draining, refilling and topping off.

d. Encourage gyms, spas and similar facilities to ask patrons to conserve water while showering and using wash basins.

e. Encourage all food preparation establishments, such as restaurants and cafeterias, to install and use high-efficiency pre-rinse spray nozzles in kitchens.

f. Irrigate less outdoors. Most customers can cut outdoor watering 30% without affecting long-term plant health by irrigating before dawn or at dusk, no more than two days per week.

B. EXCEPTIONS

1. Written applications for exceptions from the regulations and restrictions on water use set forth in this Section shall be accepted, and may be granted, by the Customer & Community Services Department.

5.3.5. Section 29

EBMUD

REGULATIONS GOVERNING WATER SERVICE
TO CUSTOMERS OF THE EAST BAY MUNICIPAL UTILITY DISTRICT

PAGE NUMBER: 28-C

SECTION 28
WATER USE DURING WATER SHORTAGE EMERGENCY CONDITION

2. Grounds for granting such applications are:

    a. Failure to do so would cause an unnecessary and undue hardship to the applicant, including, but not limited to, adverse economic impacts, such as lose of production or jobs; or

    b. Failure to do so would cause a condition affecting the health, sanitation, fire protection or safety of the applicant or the public.

3. Denials of applications may be appealed as set forth in subdivision D, below.

C. ENFORCEMENT

1. The District may, after one written warning, order that a special meter reading or readings be made in order to ascertain whether wasteful use of water is occurring. Charges for such a meter reading or readings or for follow-up visits by District staff are fixed by the Board from time to time and shall be paid by the customer.

2. In the event that the District observes that apparent excessive water use is occurring at a customer's premises, the Manager of Customer and Community Services may, after a written warning to the customer, authorize installation of a flow-restricting device on the service line for any customer observed by District staff to be willfully violating any of the regulations and restrictions on water use set forth in this section. Charges for installation of flow-restricting devices may be fixed by the Board from time to time and shall be paid by the customer.

3. In the event that a further willful violation is observed by District staff, the District may discontinue service. Charges for restoring service may be fixed by the Board from time to time and shall be paid by the customer.

4. The District may immediately revoke a permit to use water from an EBMUD hydrant when water is observed being used in violation of the emergency regulations or restrictions on water use.

D. APPEALS

Consideration of written applications for appeals regarding exceptions from the regulations and restrictions on water use set forth in this Section, and regarding application of the enforcement actions set forth in subdivision C, above, shall be as follows:

1. Written applications for appeals shall be accepted, and may be granted, by the Customer & Community Services Department.

2. Denials of applications may be appealed in writing to the Manager of Customer and Community Services.

EFFECTIVE DATE: 07/01/21 *AUTHORITY-RESOLUTION NUMBER:* 35225-21

EBMUD

REGULATIONS GOVERNING WATER SERVICE
TO CUSTOMERS OF THE EAST BAY MUNICIPAL UTILITY DISTRICT

PAGE NUMBER: 29-A

SECTION 29

WATER USE RESTRICTIONS

A. REGULATIONS AND RESTRICTIONS ON WATER USE

The Board of Directors declares that in order to conserve the District's water supply for the greatest public benefit and to reduce the quantity of water used District customers shall observe the following regulations and restrictions on water use except where necessary to address an immediate health and safety need or to comply with a term or condition in a permit issued by a state or federal agency.

1. The following potable water uses are prohibited:

    a. The application of potable water to outdoor landscapes in a manner that causes more than incidental runoff such that water flows onto adjacent property, non-irrigated areas, or hardscapes (private and public walkways, roadways, parking lots, or structures);

    b. The application of potable water to outdoor landscapes during and within 48 hours after measurable rainfall;

    c. The irrigation with potable water of landscapes outside of newly constructed homes and buildings in a manner inconsistent with the irrigation requirements set forth in Section 31 of these Regulations Governing Water Service to Customers or other requirements established by local ordinances and/or state regulations.

    d. The application of potable water to sidewalks and driveways; or applying potable water to other hard surfaces or materials that results in excessive use and runoff;

    e. The use of a hose that dispenses potable water to wash a motor vehicle, boat, trailer, aircraft or other vehicles except where the hose is fitted with a shut-off nozzle or device attached to it that causes it to cease dispensing water immediately when not in use;

    f. The use of potable water in an ornamental fountain or other decorative water feature, except where the water is part of a recirculating system; and

    g. Use of potable water for construction, street cleaning, soil compaction and dust control is prohibited if a feasible alternative source of water is available. All water use for construction, soil compaction and dust control will require a permit issued by EBMUD.

2. All Customers shall:

    a. Reduce other interior or exterior uses of water to minimize or eliminate excessive runoff; and

    b. Repair leaks wherever feasible. Irrigation or plumbing with measurable leaks such that water flows onto adjacent property, non-irrigated areas, or hardscapes (private and public walkways, roadways, parking lots, or structures) shall not be turned on or restored to service until repairs have been completed.

5.3.6. Section 31

REGULATIONS GOVERNING WATER SERVICE
TO CUSTOMERS OF THE EAST BAY MUNICIPAL UTILITY DISTRICT

PAGE NUMBER: 29-B

SECTION 29
WATER USE RESTRICTIONS

3. Nonresidential Customers shall:

    a. Use systems that recycle water where feasible; single pass cooling systems in new connections, and non-recirculating systems in all new conveyer car wash and commercial laundry systems shall be prohibited.

    b. Limit sewer flushing or street washing with potable water as much as possible, consistent with public health and safety needs; and

    c. Operators of hotels and motels are required to offer patrons the option of not having towels and linens washed daily. The hotel or motel shall prominently display notice of this option in each guestroom using clear and easily understood language.

4. Water Savings Guidelines

    a. Conserve water indoors. Efficient indoor water use is approximately 45 gallons and super-efficient indoor use is approximately 35 gallons per person daily. Most customers can achieve this by shortening showers and using less bath water, running only full loads of laundry and dishes, and keeping a close eye on faucet use. Additionally, customers are encouraged to reduce the use of kitchen garbage disposals through composting or curbside green waste collection and not to use toilets as wastebaskets. Customers may also consider upgrading to more water-efficient plumbing fixtures and appliances. Customers are also encouraged to check and watch for potential indoor and outdoor leaks.

    b. Use covers on swimming pools and home spas (hot tubs) and avoid frequent draining, refilling and topping off.

    c. Irrigate less outdoors. Most customers can cut outdoor watering without affecting long-term plant health by irrigating before dawn or at dusk, and not on consecutive days. Customers also may want to consider upgrading to more water-efficient irrigation methods and low-water use plants more appropriate and adaptable to the local summer-dry climate.

    d. Gyms, spas and similar facilities should request patrons to conserve water while showering and using wash basins.

    e. All food preparation and eating establishments, including restaurants, hotels, cafes, cafeterias, bars, or other public places where food or drink are served and/or purchased are encouraged to install and use high-efficiency pre-rinse spray nozzles in kitchens where applicable.

    f. Ensure existing trees remain healthy and do not present a public safety hazard. Trees and other non-turf vegetation within street medians may continue to be watered efficiently.

EFFECTIVE DATE: 07/01/21 *AUTHORITY-RESOLUTION NUMBER:* 35225-21

SECTION 29
WATER USE RESTRICTIONS

B. EXCEPTIONS

Consideration of written applications for exceptions regarding the regulations and restrictions on water use set forth in this Section shall be as follows:

1. Written applications for exceptions shall be accepted, and may be granted, by the Manager of Water Conservation.

2. Denials of applications may be appealed in writing to the Manager of the Customer and Community Services Department.

3. Grounds for granting such applications are:

    a. Failure to do so would cause an unnecessary and undue hardship to the applicant, including, but not limited to, adverse economic impacts, such as loss of production or jobs; or

    b. Failure to do so would cause a condition affecting the health, sanitation, fire protection or safety of the applicant or the public.

C. ENFORCEMENT

1. The District may, after one written warning, order that a special meter reading or readings be made in order to ascertain whether use of water in violation of these regulations is occurring. Charges for such a meter reading or readings or for follow-up visits by District staff shall be fixed by the Board from time to time and shall be paid by the customer.

2. In the event that the District observes that water use in violation of these regulations is occurring at a customer's premises, the General Manager or the Manager of Customer and Community Services Department may, after a written warning to the customer, authorize installation of a flow-restricting device on the service line for any customer observed by District personnel to be willfully violating any of the regulations and restrictions on water use set forth in this section.

3. In the event that a further willful violation is observed by District personnel, the District may discontinue service. Charges for the installation of flow-restricting devices or restoring service may be fixed by the Board from time to time.

REGULATIONS GOVERNING WATER SERVICE
TO CUSTOMERS OF THE EAST BAY MUNICIPAL UTILITY DISTRICT

SECTION 31
WATER EFFICIENCY REQUIREMENTS

These regulations identify the types of water efficiency requirements for water service and the procedure for notification to Applicants that water efficiency measures are required. Applicants shall be subject to the most current and most water-efficient requirements in effect on the date the District receives payment for new or upgraded service, whether specified by EBMUD or other local, state, or federal regulations.

A. DETERMINATION OF FEASIBILITY OF WATER EFFICIENCY MEASURES

The District will review applications for new standard services and determine the applicability of, and compliance with, water-efficiency requirements. Applicants for increased or expanded service shall be required to meet the water-efficiency requirements for all new water service facilities and may be required to retrofit existing water service facilities or uses to comply with all requirements. Applicant shall maintain design documents and construction and installation records and furnish a copy of said documents and records to the District upon request. The District may inspect the installation of indoor and outdoor water efficiency measures to verify that the items are installed and performing to the required water efficiency levels. The Applicant or their representative may be present during any District inspection.

B. WATER EFFICIENCY REQUIREMENTS FOR NEW DEVELOPMENT OR EXPANDED SERVICE

Water service shall not be furnished to any Applicant for new or increased or expanded service, or for any change in customer classification (such as a change from industrial to commercial, residential to commercial, or the like) that includes new or retrofitted water using equipment, unless all the applicable water-efficiency measures hereinafter described in this Section 31 and required by applicable local, state and/or federal law have been reviewed and approved by the District. All the applicable and required water-efficiency measures shall be installed at Applicant's expense.

All applicants applying for new water service for multi-family residential structures or mixed-use residential and commercial structures shall comply with all applicable local and/or state submetering regulations. Applicants shall submit site and plumbing plans including location, accessibility, and specifications for submeters. See Sections 2 and 3 of EBMUD Regulations for additional requirements.

C. INDOOR WATER USE

a. All Applicants shall comply with these regulations and those required by applicable local, state and/or federal law including the California Green Building Standards Code (CAL Green).

b. Toilets shall be high-efficiency or dual flush models rated and third party tested at a maximum average flush volume of 1.28 gallons per flush (gpf), and be certified as passing a 350 gram or higher flush test as established by the U.S. Environmental Protection Agency WaterSense Specification or other District-accepted third party

SECTION 31
WATER EFFICIENCY REQUIREMENTS

testing entity. Pressure-assisted type toilets shall be high-efficiency rated at a maximum 1.0 gpf. No flush or conversion devices of any other kind shall be accepted.

c. Wall mounted urinals shall have a maximum rated flow of 0.125 gpf or less, or be zero water consumption urinals.

d. Floor mounted urinals shall have a maximum rated flow of 0.5 gpf or less.

e. Single showerheads shall have a maximum flow rate of 1.8 gallons per minute (gpm) at 80 pounds of pressure per square inch (psi).

f. Multiple showerheads serving a single shower enclosure shall have a combined flow rate of not more than 1.8 gpm at 80 psi or shall be designed to allow only a single showerhead to be operated at one time.

g. Residential lavatory faucets shall have aerators or laminar flow control devices (i.e., orifices) with a maximum rated flow of 1.2 gallons per minute or less.

h. Public lavatory faucets shall have aerators or laminar flow control devices with a maximum rated flow of 0.5 gallons per minute or less.

i. Wash fountains shall have a maximum flow rate of not more than 1.8 gpm per wash station.

j. Metering faucets shall not deliver more than 0.20 gallons per cycle.

k. Kitchen faucets shall have aerators or laminar flow control devices (i.e., orifices) with a maximum rated flow of 1.8 gallons per minute or less with optional temporary flow of 2.2 gpm.

l. Clothes washing machines shall be front loading horizontal axis or top loading models with a water factor rating of 4.5 or less. A water factor rating of 4.5 means a maximum average water use of 4.5 gallons per cubic foot of laundry.

m. Residential dishwashers rated as standard size (i.e. 307 kWh/year) shall use less than or equal to 5.0 gallons/cycle. Dishwashers rated as compact size (i.e., 222 kWh/year) shall use less than or equal to 3.5 gallons/cycle.

n. Cooling towers not utilizing recycled water shall be equipped with recirculating systems and operate at a minimum of five (5) cycles of concentration. Newly constructed cooling towers shall be operated with conductivity controllers, as well as make up and blowdown meters.

o. Food steamers in all food service facilities shall be boiler-less or self-contained models using ≤ 3.0 gallons per hour where applicable.

SECTION 31
WATER EFFICIENCY REQUIREMENTS

p. Ice machines shall be air-cooled and use no more than 20 gallons of water per 100 pounds of ice and shall be equipped with a recirculating cooling unit or water-cooled on a closed loop system.

q. Commercial refrigeration shall be air-cooled or if water-cooled, must have a closed looped system. No once through, single pass systems are permitted.

r. Pre-Rinse dishwashing spray valves shall have a maximum rated flow of 1.28 gpm or less.

s. Food disposers shall modulate the use of water to no more than 1 gpm when the disposer is not in use and shall automatically shut off after no more than 10 minutes of inactivity. Disposers shall use no more than 8 gpm of water.

t. Commercial dishwashers or ware washing equipment shall be currently labeled an EnergyStar rated water efficient model meeting the maximum water consumption limits as specified in the table below:

Machine Type	High Temp Requirements	Low Temp Requirements
Under Counter	≤ 0.86 GPR	≤ 1.19 GPR
Stationary Single Tank Door	≤ 0.89 GPR	≤ 1.18 GPR
Pot, Pan, and Utensil	≤ 0.58 GPSF	≤ 0.58 GPSF
Single Tank Conveyor	≤ 0.70 GPR	≤ 0.79 GPR
Multiple Tank Conveyor	≤ 0.54 GPR	≤ 0.54 GPR
Single Tank Flight Type	≤ GPH ≤ 2.975x + 55.00	≤ GPH ≤ 2.975x + 55.00
Multiple Tank Flight Type	≤ GPH ≤ 4.96x + 17.00	≤ GPH ≤ 4.96x + 17.00

*GPR (gallons per rack); GPSF (gallons per square foot); GPH (gallons per hour)

u. Conveyor and in-bay vehicle wash facilities shall reuse a minimum of 60% of water from previous vehicle rinses in subsequent washes.

v. Self-service vehicle wash facilities shall use spray nozzles with a flow rate of 3.0 gpm or less.

w. Swimming pools and spas shall be covered when not in use, unless public health and safety concerns exist.

D. OUTDOOR WATER USE

a. All Applicants shall comply with all District water service regulations and those required by applicable local, state and/or federal law including the Model Water Efficient Landscape Ordinance (MWELO).

SECTION 31
WATER EFFICIENCY REQUIREMENTS

b. Applicants shall submit, at a minimum, a scaled site plan that identifies the property address, parcel boundaries, building footprints, hardscape, softscape, meter location, and location of each hose bib. If an application for service is submitted without a detailed landscape plan for the entire premises, the District will estimate the new irrigable landscape area to determine the potential irrigation demand (default demand) for inclusion in the total domestic water demand calculation. Projects subject to MWELO shall also provide a compliant landscape documentation package as required by the ordinance.

c. All premises with 500 square feet or more of new irrigable landscape area shall install a modular weather-based smart controller with rain or soil moisture sensor, an irrigation connection with a manual shutoff valve, a backflow prevention device, a pressure regulator where pressure exceeds the operating range of system components, and sleeves allowing irrigation to extend to all landscape areas.

d. All non-residential premises with 500 square feet or more of new irrigable landscape shall also install a flow sensor with master shutoff valve.

e. All residential premises with more than 5,000 square feet of new irrigable landscape area shall also install a flow sensor with master shutoff valve.

f. As provided in Sections 1 and 3 of the Regulations, unless determined by the District that a District-dedicated irrigation meter is required, a private dedicated irrigation meter shall be required for residential premises with an irrigable landscape area of 5,000 square feet or more.

g. As provided in Sections 1 and 3 of the Regulations, unless determined by the District that a District-dedicated irrigation meter is required, a private dedicated irrigation meter shall be required for non-residential premises with an irrigable landscape area of more than 1,000 square feet but less than 5,000 square feet.

h. As provided in Sections 1 and 3 of the Regulations, a District dedicated irrigation meter shall be required for non-residential premises with an irrigable landscape area of 5,000 square feet or more.

E. NONCOMPLIANCE

The District will review applications for new and expanded services for water efficiency features as described in this Section. If an application does not meet the water efficiency requirements, the District may require the Applicant to resubmit a revised water service application and water efficiency plan at the Applicant's expense. The District may withhold water meter(s) and account activation until the District determines the application complies with the requirements of this Section.

THIS PAGE HAS BEEN INTENTIONALLY LEFT BLANK

EBMUD

East Bay Municipal Utility District
375 11th Street, Oakland, CA 94607

1-866-403-2683
ebmud.com

December 2021