East Bay Municipal Utility District

Cities, Communities, Counties and States Served

Cities and Communities

Alameda, Alamo, Albany, Berkeley, Castro Valley, Crockett, Danville, Diablo, El Cerrito, El Sobrante, Emeryville, Hayward, Hercules, Kensington, Lafayette, Moraga, Oakland, Orinda, Piedmont, Pinole, Pleasant Hill, Richmond, Rodeo, Selby, San Leandro, San Lorenzo, San Pablo, San Ramon, Walnut Creek

Counties

Alameda, Contra Costa

State

California

United States Bureau of Reclamation

WaterSMART: Water and Energy Efficiency Grants for Fiscal Year 2016

Funding Opportunity Announcement No. R16-FOA-DO-004

Project Title: WATER AND ENERGY CONSERVATION THROUGH ADVANCED METERING INFRASTRUCTURE

Project Location: ALAMEDA AND CONTRA COSTA COUNTIES

Project Applicant: EAST BAY MUNICIPAL UTILITY DISTRICT

Congressional Districts of Applicant: CA-007, 009, 010, 011, 013

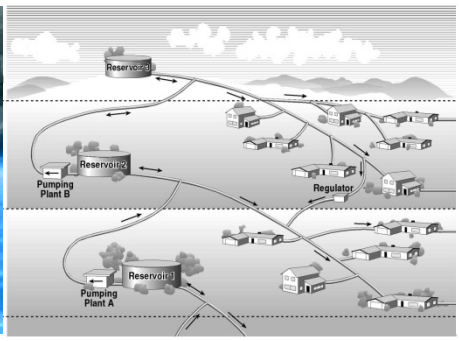
Congressional Districts of Project Area: CA-007, 009, 010, 011, 013

United States Bureau of Reclamation
WaterSMART: Water and Energy Efficiency Grants for Fiscal Year 2016
Funding Opportunity Announcement No. R16-FOA-DO-004

WATER AND ENERGY CONSERVATION THROUGH ADVANCED METERING INFRASTRUCTURE (Funding Group II)

ALAMEDA AND CONTRA COSTA COUNTIES





Submitted By:

East Bay Municipal Utility District

January, 2016

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1.0 EXECUTIVE SUMMARY

1.1. Date and Applicant Information:

January 20, 2016
East Bay Municipal Utility District (EBMUD)
Oakland, Alameda County, California
EBMUD serves communities in Alameda and Contra Costa Counties in California.

1.2. Project Summary:

Under Task A, the primary goal of this project is to install new and expand existing Advanced Metering Infrastructure (AMI) at EBMUD. AMI will allow EBMUD to read water meters, leak detection devices, and other sensors on a real time basis. These systems will: a) enable real time water system data and audits to facilitate water loss control; b) provide customers with real time granular water consumption information available through customized reports and mobile and web based applications; c) provide EBMUD with real time notification of potential pipeline leaks through acoustic sensors and pressure monitors; d) provide additional tools to identify water conservation opportunities including leaks and excessive irrigation patterns; e) allow our commercial and industrial customers/partners to obtain valuable data they can use to facilitate energy and water conservation projects at their facilities; and f) improve water-energy nexus conservation research via AMI and home water report pilot studies.. Grant funds will be used to install the collection network to read meters, meter endpoints and leak devices throughout the service area in order to provide immediate and long term water and energy savings.

This project will provide immediate water conservation benefits for current and future drought response by identifying both customer and distribution water leaks and unintentional or wasteful water uses by customers. It will have longer term benefit by providing tools for customers to develop long term water and energy savings strategies based on better understanding of water volume and time of use demands. An AMI website and some of the infrastructure is already in place at EBMUD such that additional equipment can be utilized shortly after installation.

1.3. Schedule

Installation of the network equipment would commence on receipt of funding and take approximately 36 months to complete. Based on the information in the FOA, EBMUD plans to start the project on or around July 1, 2016. Installation of the meter endpoints and acoustic leak detection devices, currently read in a drive-by manner is ongoing and will continue. As the network is expanded, more of the devices can be read on a real time basis through a collection network. Additional devices installed will be added to the network as funds are available. Work with individual customers will begin as soon as meters are installed in areas with network coverage.

2.0 BACKGROUND DATA

EBMUD is a publicly owned utility formed under California's Municipal Utility District Act of 1921, and headquartered in Oakland, California. EBMUD, a retail water supplier, provides domestic water service to approximately 1.4 million customers and also provides municipal wastewater service to 685,000 customers in the East Bay region of the San Francisco Bay Area in 20 incorporated cities and 15 unincorporated communities in Alameda and Contra Costa counties (see Figure 1). EBMUD captures pristine snowmelt from the Mokelumne River in the Sierra Nevada at Pardee Reservoir. Generally, in water years with normal and above average runoff, EBMUD's primary water supply from the Mokelumne River is sufficient to meet the needs of EBMUD's service area in the San Francisco East Bay region. During droughts and emergencies, water supply reliability is diminished and there is a greater burden placed upon the people and the environment. EBMUD's water supply reliability during normal periods is restricted as well, due to conflicting and/or competing needs of users on the Mokelumne River and its tributaries.

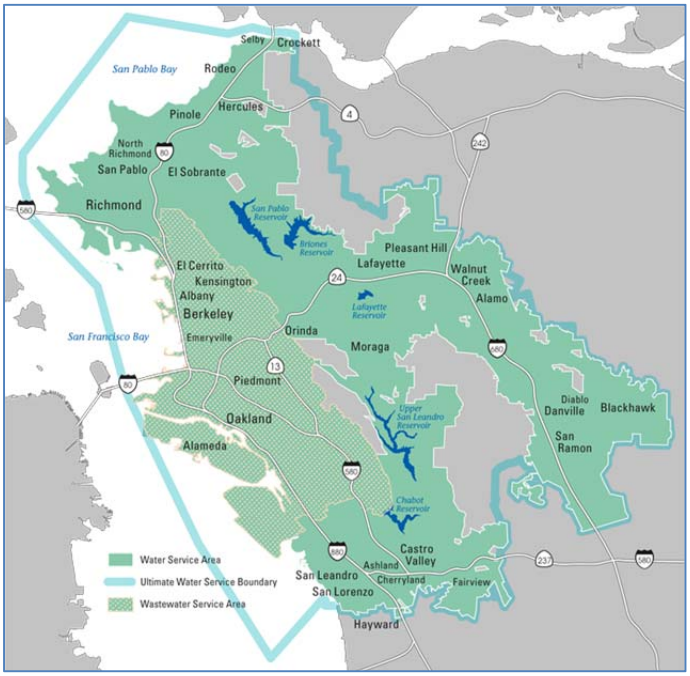


Figure 1: EBMUD Service Area

EBMUD has water rights that allow for delivery of up to a maximum of 325 million gallons per day (MGD) from the Mokelumne River, subject to the availability of Mokelumne River runoff and to the senior water rights of other users, downstream fishery flow requirements, and other Mokelumne River water uses. EBMUD's Mokelumne River supply is expected to be reduced as demands on the Mokelumne River increase from the growing needs from users in Amador, Calaveras, and San Joaquin counties with water rights senior to those of EBMUD's. Several downstream users have water rights to receive allocations from EBMUD only if water is available from storage at EBMUD's Mokelumne Reservoirs. For instance, North San Joaquin Water Conservation District (NSJWCD) and Jackson Valley Irrigation District (JVID), which provide irrigation water for agriculture or also for municipal use in San Joaquin and Amador counties,

typically does not receive any water under their respective agreements with EBMUD when a dry or critically dry years occur.

EBMUD also has an extensive water recycling program that supplies recycled municipal wastewater for irrigation, industrial, and other approved uses. EBMUD operates three recycled water treatment plants and partners with two other agencies for additional recycled water supply. Currently the recycled water program supplies approximately 9 MGD of recycled water, thereby significantly reducing the demand for potable water supplies.

2.1. Applicant's Average Annual Water Supply (In Acre Feet):

EBMUD's average annual water production for the five calendar years from 2009-2013 was approximately 66 billion gallons or approximately 202,000 acre-feet (AF). Total production of 202,000 AF in 2009 was influenced by decreased demand due to EBMUD's implementation of mandatory 15% rationing between May 2008 and July 2009 as part of a drought management program. Annual production during this period was lowest in 2011 at 195,000 AF due to continued post-drought savings and ongoing effects of the economic recession. Annual production in 2013 was at 214,000 AF. In a given normal water year, 90 percent on average of the supply is obtained from the Mokelumne River, a tributary to the California Bay-Delta. On average, ten percent of the supply is obtained from local runoff within the service area.

2.2. Describe Water Use (e,g, Municipal, Irrigation, Etc.):

EBMUD is an urban and suburban water agency and serves approximately 1.4 million customers. EBMUD services 20 incorporated cities and 15 unincorporated communities in Alameda and Contra Costa Counties (See Figure 1). All customers are metered. Residential customers' meters are read bimonthly; commercial and most industrial customers' meters are read monthly. In 2013, the potable consumption was 51% for single family residential, 18% for multi-family residential, 23% for commercial, industrial, and institutional, and 8% for dedicated irrigation accounts.

2016 demand is estimated at 180 MGD, which takes into consideration ongoing record drought conditions, aggressive conservation efforts and 9 MGD of water recycling. This demand is depressed due to the current drought calling for a District-wide 20% mandatory reduction in water use and ongoing recovery from the 2008-10 economic recession. Demand is projected to increase to 230 MGD in the year 2040.

2.3. <u>Water Used For Irrigation</u>

Aside from a few nurseries, privately owned vegetable gardens, and residential vineyards, there are no commercially irrigated crops within the EBMUD service area. In 2013, approximately 8% of EBMUD's water demand was for dedicated irrigation accounts for users such as parks, golf courses, greenbelts, and common-area landscaping.

2.4. <u>Water Delivery System</u>

EBMUD has six water treatment plants (of which one is currently out of service on standby), approximately 4,200 miles of distribution pipeline, 165 neighborhood reservoirs (treated water storage tanks), more than 120 different potable pressure zones. EBMUD also operates a regional wastewater treatment plant and three wet weather facilities – plants which are used to handle surges in wastewater levels due to infiltration of stormwater during storm events - that discharge

to the San Francisco Bay. The Freeport Regional Water Facility in Freeport, California and the Bayside Groundwater Facility in San Lorenzo, California provide dry-year supplemental water supply.

2.5. Energy Sources and Uses

EBMUD uses about 160,000 MWH of power annually. EBMUD receives two-thirds of its power from WAPA and SMUD, and PG&E which is the local energy provider. In addition, EBMUD generates power using a variety of systems. One of the EBMUD water treatment plants has over 60,000 square feet of solar panels generating 640 MWh annually as well as over 1,300 MWH of solar power purchased through five Power Purchase Agreements. Its administrative office operates ten natural gas micro turbine which produce about 1,500 MWh annually. Its wastewater co-generation system collects methane gas from its wastewater treatment digesters which then fuel a 11 MW power generation station generating an average 42,000 MWh annually. EBMUD also operates the hydroelectric plants at Pardee and Camanche Reservoirs, which on average generate about186,000 MWh annually. See Figure 2 for EBMUD energy consumption by key operational categories.

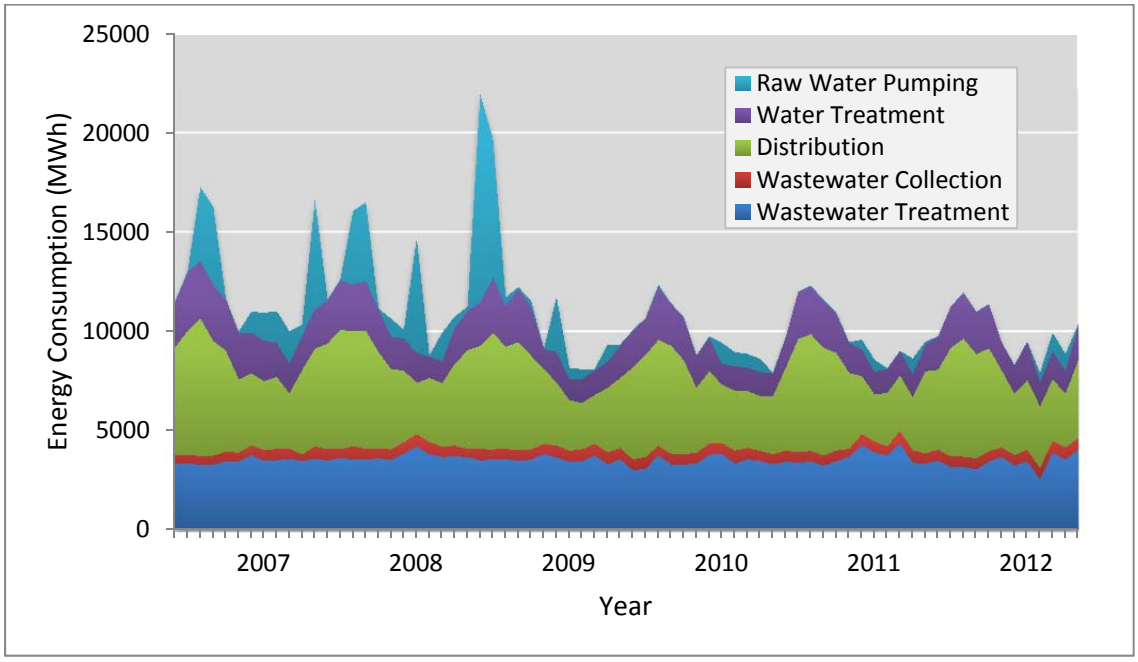


Figure 2. EBMUD Monthly Energy Consumption by Category (June 2006–2012)

2.6. Green House Reduction Goals

EBMUD has been tracking and reporting on greenhouse gas (GHG) emissions since 2005. An objective of EBMUD Policy 7.05, Sustainability, is to identify projects and plans that mitigate climate change impacts and reduce greenhouse gas (GHG) emissions. EBMUD Policy 7.07, Energy, includes the goals to be carbon-free for indirect emissions and achieve a 50 percent reduction in direct emissions compared to 2000 levels by 2040.

2.7. Past Working Relationship with Reclamation

Stemming from its effort to identify additional sources of supply to meet its long-term water demand since the mid-1960s, EBMUD executed a contract in 1970 with the US Bureau of Reclamation (USBR) for delivery of Central Valley Project (CVP) water from the American River. Working together through legal challenges to EBMUD's entitlement to American River water that ensued since 1972, EBMUD and USBR collaborated on publishing a 1997 Draft Environmental Impact Report/Environmental Impact Statement for the Supplemental Water Supply Project, which evaluated American River water supply project alternatives. Furthermore, EBMUD and USBR analyzed additional alternatives in a recirculated EIR/supplemental EIS. In December 2000, USBR, EBMUD, and Sacramento parties reached an agreement to develop a joint water supply from the Sacramento River, rather than from the American River. This effort led to the development of the Freeport Regional Water Project overseen by a joint powers authority between EBMUD and the Sacramento County Water Agency to deliver dry year water supplies to EBMUD and supplemental supplies to SCWA.

For additional information on, please refer to Section 4.8 on EBMUD's relationship to Bureau of Reclamation water sustainability.

2.7.1. Past Relationship with USBR Grant Programs

EBMUD has had a successful relationship with USBR over the years. The following is a summary of EBMUD's history with USBR and grants and awards.

- In September 2005, EBMUD received a $75,000 USBR grant under RFP 05SF203022. The project was titled End Use Demand Study Mapping Demand Patterns and Conservation Potential through Metering Technology. Although the grant requests 50% cost share, EBMUD has expanded the project scope and is providing more than $75,000 towards the project development. The purpose of the project was to evaluate the water conservation potential of using Automatic Meter Reading Systems datalogging technology. The project was completed in 2008.

- In September 2006, EBMUD received a $300,000 USBR grant under Agreement 06FG204165. The project was titled Aqueduct Leak Detection Study. The purpose of the project was to demonstrate advanced leak detection technologies on large pipe for which traditional leak detection technologies have not been successful. This project obtained water savings through the identification and repair of leaks on large pipelines and aqueducts and better understanding of the nature of leaks on these facilities. The project was completed in 2011.

- In September 2007, EBMUD received a $300,000 USBR grant under Agreement 07FG200096. The project was titled Distribution Pipeline Leak Detection Project. The purpose of the project is to obtain water savings from intensive leak detection and subsequent repair and better define the nature of pipeline leaks and the potential water savings from intensive leak detection. The project was completed in 2011.

- In September 2007, EBMUD received a $300,000 USBR grant under Agreement 07FG200076. The project was titled Water Conservation through Automatic Meter Reading

Systems. This project was co-funded by a separate grant from the California Department of Water Resources. The purpose of the project is to obtain water savings by providing customers web access to their real time water use, working with them to identify conservation opportunities such as ET Controllers, and better evaluating the conservation benefit from these measures. The grant project was completed in December 2014 but EBMUD still operates the system and still obtains savings.

- In April 2009, EBMUD received a $50,000 grant under Agreement 09SF200006 in the Water Conservation Field Services Program. The project was titled Fixed Network Leak Detection. This project involved the installation and testing of approximately 50 fixed network acoustic leak detection technology "loggers" in Kensington, California. These acoustic logging devices identified leaks on pipes and provided early detection of pipeline leaks before they become main failures. EBMUD receives daily signals from these devices via fixed network Advanced Metering Infrastructure installed in the project area and at EBMUD headquarters in Oakland, California. The project has been completed and the final report is in production. EBMUD continues to operate the system and has added 220 additional loggers.

- In July 2009, EBMUD received a $270,000 grant under Agreement 09SF200042 in the CALFED Water Use Efficiency Grant Program. The project is titled Enhanced Water Conservation by Combining Technologies: Evapotranspiration Controllers and Advanced Metering Infrastructure Systems. This project combines "smart" evapotranspiration irrigation controller technology with USBR, EBMUD and California Department of Water Resources grant-funded Advanced Metering Infrastructure systems to optimize landscape irrigation efficiency. This study was a first in researching the synergistic effects of combining detailed water use data with ET-based (accurate) irrigation scheduling. The project was completed in September 2015 and a final report was submitted in December 2015.

- In September 2009, EBMUD received a $300,000 USBR System Optimization Review grant under Funding Opportunity No. 09SF811471. The title of the Grant is Water System Optimization through the Development of an Advanced Metering Infrastructure Implementation Plan. This project was completed in December 2014 and the final report was submitted in March 2015.

- In April 2010 EBMUD was awarded the Regional Director's Water Conservation Award from USBR. The award is in recognition for EBMUD's efforts in the areas of distribution system leak detection and automatic meter reading systems.

- In September 2010, EBMUD received a $50,000 USBR grant under Agreement R10AP20049 in the Water Conservation Field Services Program. The project was titled GIS-Based Landscape Water Budget Calculator. This project involved the development of an automated landscape water budget reporting tool to assist customers in meeting the recently enacted California Model Water Efficiency Landscape Ordinance Maximum Allowable Water Allowance. The completed project also resulted in development of landscape water budgets for single-family residential customers, one of the first of its kind.

- In September 2010, EBMUD received a $100,000 USBR CALFED Water Use Efficiency Grant Program (Grant Agreement R10AP20077) for its WaterSmart High-Efficiency Toilet Rebate Program. Grant funding supported the purchase and installation of 5,000 high-efficiency toilets within the EBMUD water service area. The project was completed in April of 2013.

- In October 2011, EBMUD received a $295,000 WaterSMART: Water and Energy Efficiency Grant (Grant Agreement R11AP20097) for its WaterSmart Lawn Conversion Rebate Program. The final project report was completed in December 2015.

2.8. Consistency with State or Local Water Plan

This project is consistent with meeting resource management strategies presented in the California Department of Water Resources 2009 California Water Plan, the EBMUD 2010 Urban Water Management Plan (UWMP), EBMUD 2011 Water Conservation Master Plan (WCMP), EBMUD 2040 Water Supply Management Program (WSMP), and statewide Best Management Practices (BMPs) administered by under the California Urban Water Conservation Council (CUWCC) Memorandum of Understanding, and EBMUD's per capita conservation targets established under California's Water Conservation Act of 2009 under Senate Bill x7-7 also referred to as 20X2020.

3.0 TECHNICAL PROJECT DESCRIPTION

Please Note: Information presented in this section is intended to supplement the evaluation criteria in Section 4.0

3.1. PURPOSE:

AMI technology will allow for remote and near real time collection and presentation of water meter consumption data, leak detection data, system pressure data and potentially data from other instrumentation. EBMUD staff will work with its large customers/industry partners to use the consumption data to target water and energy conservation and greenhouse gas production at their facilities. EBMUD will use consumption data, leak detection and pressure data to target water and energy conservation and greenhouse gas production in its distribution networks.

Project objectives include:

- Facilitating customer's immediate water and energy conservation by identifying leaks, excess irrigation, high water consumption devices, hot vs. cold water usage patterns, etc.
- Provide data to assist customers in evaluating longer term energy and water conservation strategies such as identifying total energy use of existing equipment and processes.
- Providing real time pipeline leak detection data via acoustic loggers to EBMUD in order to facilitate leak repair and monitor areas of potential leaks.
- Improving customer and staff understanding of water consumption patterns and peak use and strategic conservation services outreach to reduce peak water use and pumping.
- Providing timely and cost-effective customer notifications of leaks and high uses.
- Helping identify real and apparent (supply-side) water losses, revenue recovery within distribution system.
- Synchronizing water, energy and GHG management efforts.

- Explore new potential benefits of AMI technology such as improvements to water quality, water storage management, and facility sizing.
- Improve metering accuracy by utilization of AMI-ready static meter technology.

3.2. BACKGROUND:

AMI Technology

While the use of AMI technology to collect water meter data continues to expand across the U.S. and internationally, the performance of the technology is still improving and additional features are being added. As more infrastructure (e.g. pressure management, water quality monitoring, leak identification) continues to be integrated with AMI platforms, the expanded benefits to water and energy efficiency programs are growing. AMI metered endpoints allow more frequent and granular meter reads than with standard AMR systems. They are also able to read many more codes and alarms from the meter and other ancillary equipment.

AMI end points are being increasingly investigated to read field instrumentation like pressure or water quality sensors, leak detection loggers, or even distribution equipment like pumps, valves, or regulators. AMI components also include data collection systems which communicate with the various endpoints. The collection systems in turn communicate with a central computer server which aggregates analyzes and distributes information collected from various sources. The data from this central server is then shared with various systems like utility Supervisory Control and Data Acquisition Systems (or SCADA) which are used to operate water distribution systems, meter data management systems, work force management systems, customer information and billing systems, and customers directly through AMI software and web portals (see Figure 3). EBMUD is actively investigating the full benefits of its AMI systems and while use of these additional features is not specifically part of the proposed work, EBMUD will certainly leverage the networks to obtain some of these additional benefits.

3.3. Customer Water Conservation

Previous AMI Studies

EBMUD's previously awarded grants from the USBR helped fund the installation of some smaller AMI deployments in limited geographic areas. EBMUD developed a web interface where customers can log onto a website to view their water consumption (see Figure 4). This website provides yearly, monthly, daily and hourly consumption data which can be used to identify water conservation opportunities such as plumbing leaks, excessive or poorly timed irrigation, and opportunities for plumbing retrofits. These systems have helped EBMUD work with customers to save considerable amounts of water and energy and significantly reduce water waste. Figure 5 shows a few screenshots of EBMUD's current AMI Customer Interface.

The proposed project includes additional customer AMI endpoints throughout EBMUD services area targeted at high water use customer/partners who have expressed desire to work with EBMUD to save water and energy. The existing web portal will allow customers to monitor their water use, receive helpful water savings tips, and access water and energy conservation rebates.

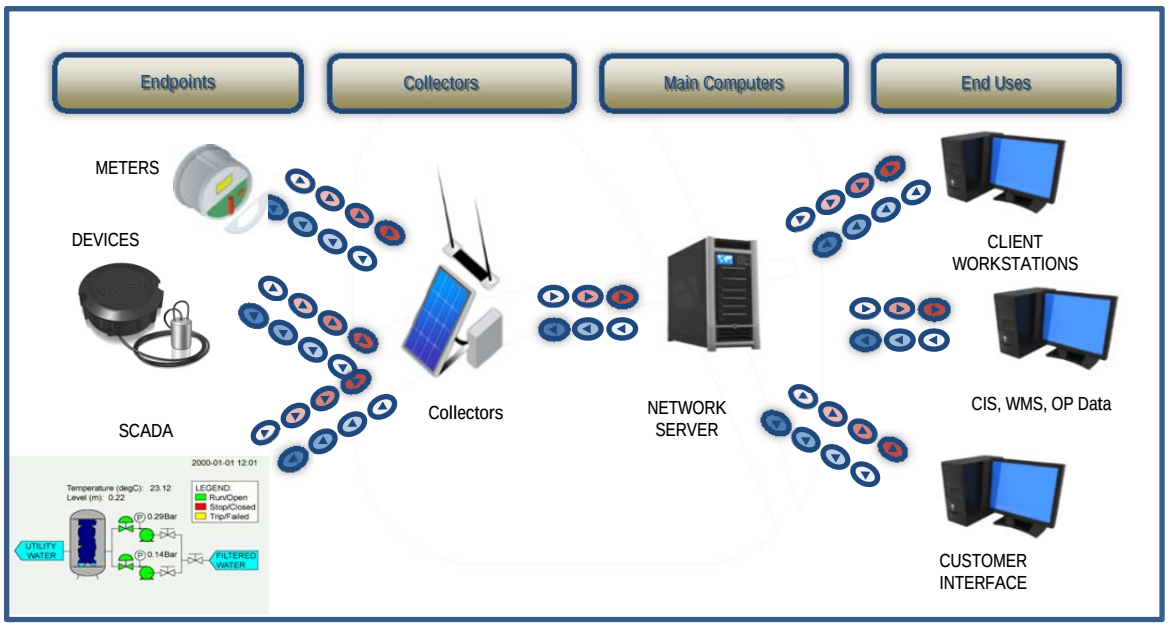


Figure 3. Components of Advanced Metering Infrastructure

EBMUD's previous AMI deployments have identified significant indoor and outdoor plumbing leaks, and other opportunities for in the specific project areas. In addition, a large number of customers were found to be irrigating three to four times more than necessary, and, some were unknowingly irrigating daily during the rainy seasons. EBMUD also identified significant leaks in some commercial and industrial facilities that were within the project area that led to immediate savings. EBMUD's AMI website portal helped EBMUD to engage customers directly over the phone or through site visits and EBMUD made recommendations on reducing water usage which were largely implemented immediately. The data presentation helped customers understand how much water they could conserve with the recommendations, and many continue to closely monitor their usage data on their own computers. Customers participating in the project were able to reduce water consumption by an average of 20% more than non-participating customers. Many customers outside of the project area contacted EBMUD requesting to be part of the project and indicated that they believed that having real time consumption information would be invaluable to their efforts to save water and energy at their homes and businesses.

Proposed Work

If grant funds are available, EBMUD plans to expand its network of AMI collectors, install additional distribution system loggers, pressure management equipment, and AMI metered endpoints. EBMUD will target areas with the largest customers who are interested in obtaining immediate savings and pipelines where leaks are biggest concerns. Additional AMI networks will be installed in areas with the highest potential number of large participating customers. Participating customers will have access to review their water consumption on-line, be provided with recommended daily and monthly landscape water budgets, and receive assistance from EBMUD in obtaining water and energy savings both on an immediate and long term basis. This will occur in a number of steps which are outlined in Section 3.6 Process.

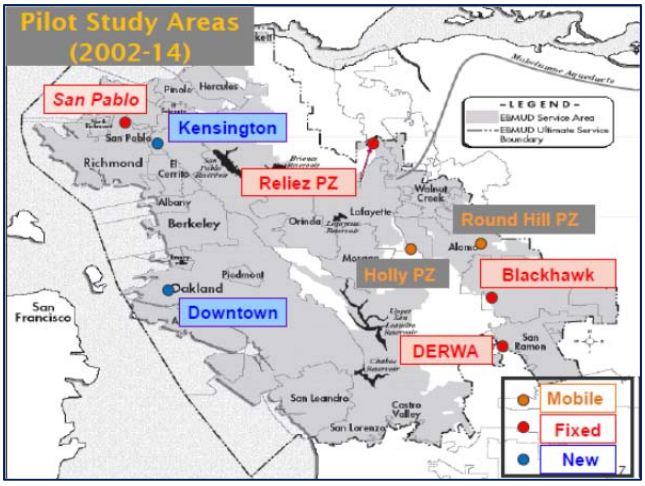


Figure 4. EBMUD AMR/AMI Pilot Studies (2002-16)

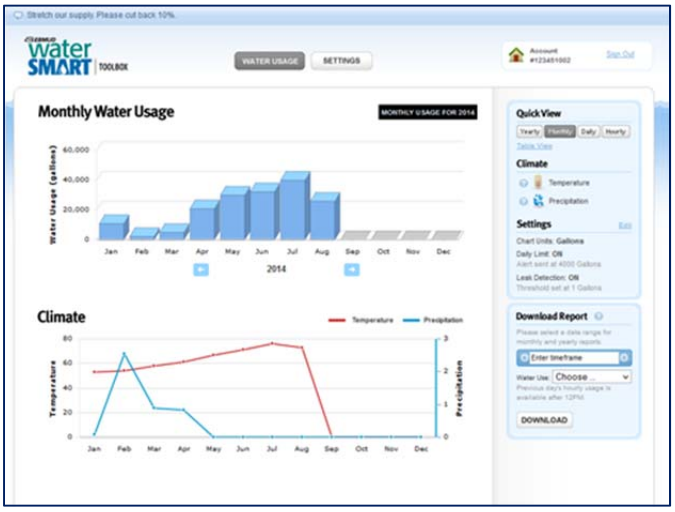


Figure 5. AMI WaterSmart Toolbox On-line Customer Portal

3.4. Reduction in Real and Apparent Water Loss

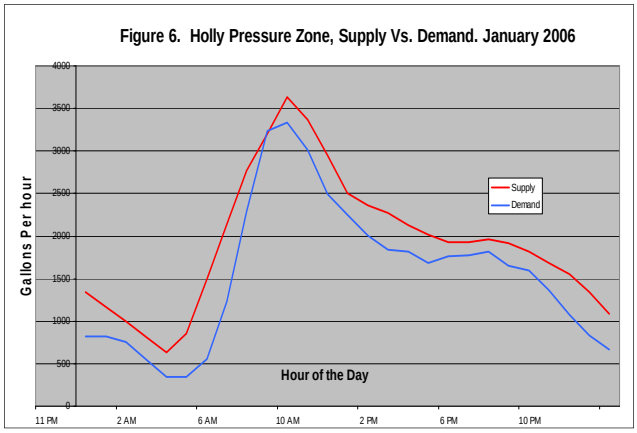
Previous Water Loss Studies

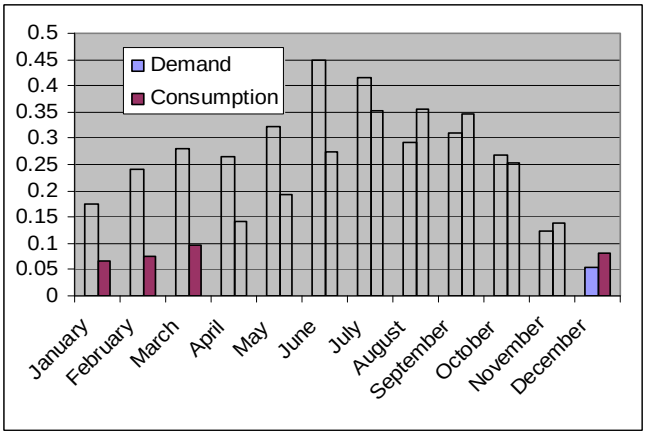
As described in the AWWA Research paper in Attachment B, EBMUD has deployed AMI to identify the probable cause of apparent water loss within its distribution system. Figures 6 and 7 below provide a comparison of supplied water vs. billed water as obtained from EBMUD's billing system in the Holly Pressure Zone. Since the majority of the customer meter data came from bimonthly meter reads, the discrepancy could not be easily explained.

Figure 6 below is taken from EBMUD's AMI project within the same zone. The graph shows a consistent discrepancy between the hourly supply to the pressure zone obtained from EBMUD's SCADA system vs. the billed demand obtained from AMI equipped customer meters. Because the two curves are separated by an apparent constant which is independent of flow rate, the nature of the water loss was identified as leakage. Further investigation revealed that the leak shown is actually a number of slow leaks on customer accounts where the large meters used in this area lacked the low end resolution necessary to pick up slow leaks. Nonetheless, this information was used by the homeowner's association to sponsor a toilet leak testing program which resulted in the

repair and replacement of many leaking toilets that provided substantial water savings to customers. The effort also improved the reduction in non-revenue water use from low-end unregistered usage which would have been better captured by newer static meters.

EBMUD has presented the results of its numerous AMI studies at many public forums including at the AWWA national conference, Distributech national conference, Utilimetrics Autovation Conference, Metering America, ConnectWeek, WaterSmart Innovations conference, the Pacific Energy Center Water Conservation Showcase (attended by USBR staff), and at CUWCC AMI Symposia. EBMUD has also participated in Water Research Foundation projects on the use of AMI technology in the water industry. EBMUD has worked with the Government Accountability Office in Washington D.C. to discuss how AMI along with other developing technology can be used to help address water supply shortages and increasing demand. The results of this project will be shared in March 2016 such that other utilities can benefit from the project design, lessons learned and water and energy conservation savings and revenue generation results.





Figures 6 & 7. Comparison of measured system demand vs. metered consumption

Water Supply Audits

EBMUD is using AMI to reduce overall distribution system and customer water loss and demonstrate AMI technology toward advancing water utility water management. EBMUD uses the American Water Works Association's (AWWA) M36 Manual "Water Audits and Loss Control Programs" as guidance for its water loss control program (see Figure 8). Historically, EBMUD water loss has ranged between 10 and 12 percent which represents the difference between water measured at the water treatment plants and metered customer water consumption. In addition, EBMUD's water audit reporting includes calculation of an Infrastructure Leak Index (ILI) using AWWA's water audit methodology. The ILI is the ratio of the annual losses due to leaks and the lowest achievable annual losses for a well-maintained and managed system. For calendar year 2014, EBMUD's ILI was 2.29 well within industry standards for similar-sized utilities.

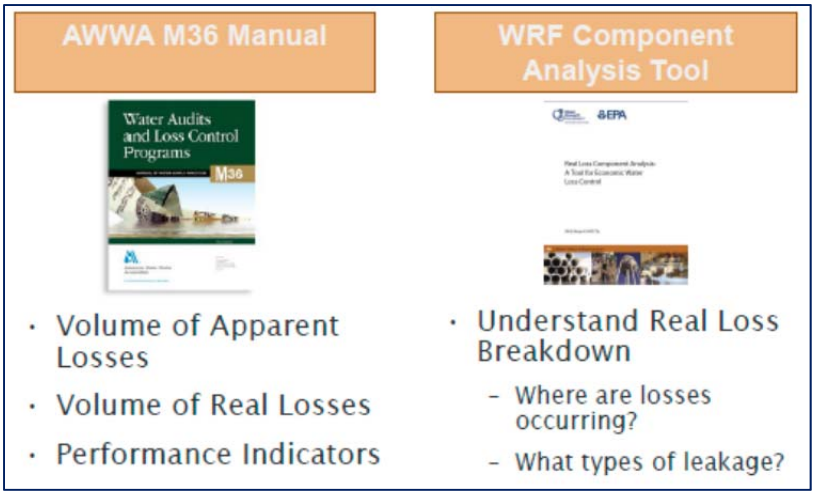


Figure 8. Guidance for Water Loss Control

As shown in Figure 9, water loss is defined as non-revenue water and includes ***apparent*** and ***real*** losses. Apparent losses are due to meter inaccuracy, unauthorized consumption and data handling errors, and real losses are due to leaks. Reducing apparent losses can increase revenue, while reducing real losses will recover water. However, given the size of the EBMUD 4,200 miles of water distribution piping and the frequency of approximately 380,000 meter reads (bi-monthly and monthly), it is not possible to easily and accurately determine real and apparent losses.

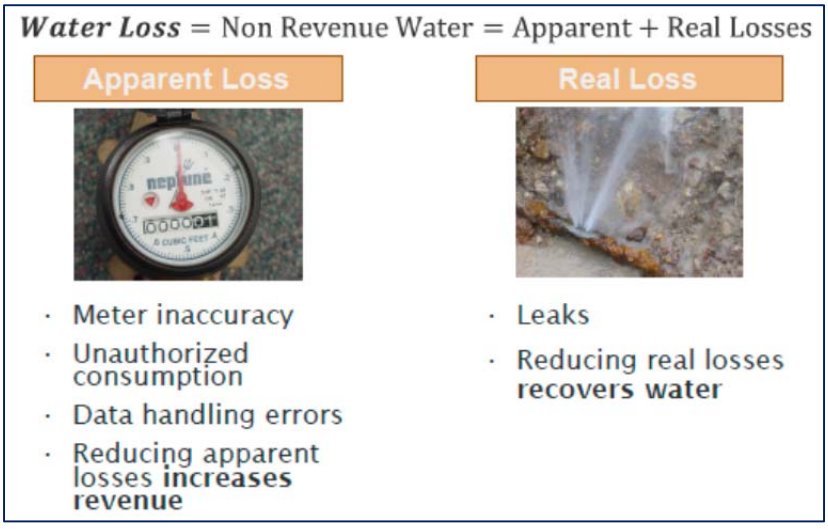


Figure 9. Water Loss Definition

To address water loss, EBMUD has a pipeline replacement program with plans to expand the program, increase the use of acoustic leak detection tools to actively find leaks, and has invested in equipment to improve the speed and quality of repairs. The goals of this water loss control initiative are to better understand water loss (i.e., real and apparent losses), improve leak detection both for the utility and customer, better quantify unmetered water and reduce overall water loss. As part of the water loss control initiative, EBMUD plans to purchase additional leak detection equipment, continue to use new leak detection technologies and try new tools like pressure transient monitoring technology. EBMUD has also surveyed approximately 6,000 non-coated

copper service connections and found up to 12 percent of the connections are leaking. It is estimated that there are approximately 32,000 of these types of connections, and staff will survey 4,000 connections a year.

A key component of the water loss control initiative is to better understand both real and apparent losses. To do so, is studying dynamic District Metered Areas (DMAs) within select areas of the EBMUD distribution system. A DMA is created by dividing the distribution system into smaller areas with a defined and permanent boundary, which will help address real losses. Valves and flow meters are installed in the DMA to measure flows in and out of the DMA. To be effective, meters within the DMA study areas need to have AMI connections. Data was collected in EBMUD's earlier AMI pilots and illustrates how AMI can allow detailed analysis of water production and usage. The difference in this study is that the resolution of the meters will be significantly higher and therefore the patterns will be more accurate and timely. Low flow leaks are likely to be a larger percentage of the water usage and of the potential savings.

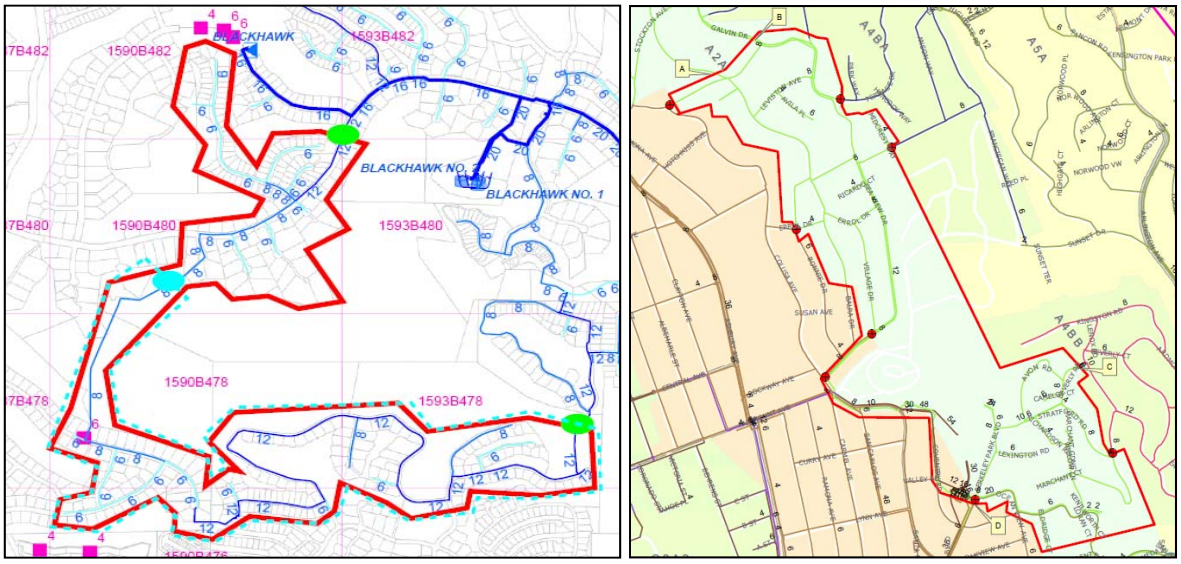
EBMUD plans to expand the use of AMI to target water loss auditing and control in targeted areas. The selection of these areas will be based on highest suspected water loss, areas with the highest energy demand requirements, and areas that are in range of available collectors. EBMUD has already begun installing two DMAs. The first two identified areas are the cities of Danville and Kensington where fixed network (AMI) collectors are in place. This pilot is the first of its kind in the United States. As detailed in Table 1 and illustrated in Figures 10 and 11 below, EBMUD intends to perform water supply audits using DMAs and AMI deployments at multiple locations across the service area.

Table 1. Existing Distributed Metered Areas Pilot Studies

Project Features	City of Danville	City of Kensington
Length of pipeline	6 miles	5.6 miles
Pipe material/age	Newer	Older (history of leaks)
No. of customers	320	490
Water demand	400,000 gal/day	300,000 gal/day
AMI/AMR equipment	Aclara	Sensus

3.5. GOALS:

1. Provide targeted customers/partners with on-line access to their real time water consumption to obtain water and energy savings.
2. Reduce distribution water loss by identifying leaks through real time acoustic pipeline leak detection.
3. Improve water supply accounting by providing more accurate and timely metering and better identify system leak.
4. Support the use of DMA analyses to identify and quantify water loss.
5. Provide additional tools to water operations to support more efficient management of the distribution networks such as real time pressure and demand data.
6. Obtain energy savings by reducing energy used in pumping and treating water, and at end uses by customers.



Figures 10 and 11. Danville and Kensington DMA Project Areas

3.6. PROCESS:

1. EBMUD's metering staff will begin installing additional AMI meters in areas covered by existing network in order to begin working with previously identified large customers/partners in these areas who have requested on-line access to their water consumption information. These customers will be immediately added to the on-line interface after the meters are successfully installed and tested. EBMUD's water conservation staff will work with these customers to obtain both immediate and long term water savings and where appropriate provide customers with weather-based landscape water budgets.

2. At the same time, EBMUD's maintenance staff will begin installing additional acoustic leak detection sensors and/or pressure sensors with AMI endpoints in areas covered by existing networks in order to identify additional leaks for repair. The loggers will be able to begin identifying leaks on connection.

3. At the same time, EBMUD's water conservation staff will identify additional large customers/partners that can benefit from the on-line consumption data in order to target water and energy savings and areas that will most benefit from additional leak detection. EBMUD already has a list of high use customers who have requested access to their on-line data. If the customers are in the area covered by the existing network, EBMUD will add AMI meters in order of priority.

4. As network coverage becomes available in each geographic area, EBMUD will begin installing AMI meters, pressure sensors and leak detection devices on high priority locations that will have the biggest potential water to energy savings. The endpoints will be utilized as soon as connection is verified.

5. EBMUD conservation staff will work with high water use customers/partners with AMI meters to identify immediate and longer term water and energy conservation strategies.

Some of these customers will be eligible for participation in other EBMUD incentive programs.

6. EBMUD will continue to add additional AMI meters over time where coverage is available. An on-line account will be set up for these customers and the customers will be contacted with access information. These customers although not the specific targets of this project, will also be able to obtain water savings from having the on-line data.

Where meter replacement is required, EBMUD will select AMI meters which are best equipped to provide accuracy at the flow ranges used by the existing customers. In many cases, this will involve replacing older technology meters with more accurate and higher resolution meters such as the new static meters. This will improve the accuracy of EBMUD's water supply accounting and reduce apparent water loss. It will also improve small customer leak identification.

4.0 TECHNICAL PROPOSAL: EVALUATION CRITERIA

For a more detailed explanation of project features and associated benefits, please refer to Section 3.0 – Technical Project Description (not repeated here) for evaluation criteria review.

4.1. Evaluation Criteria A: Water Conservation (32 Points)

4.1.1. Subcriterion No A.1---Water Conservation

4.1.1.1. Subcriterion A.1 – Quantifiable Water Savings (Municipal Metering):

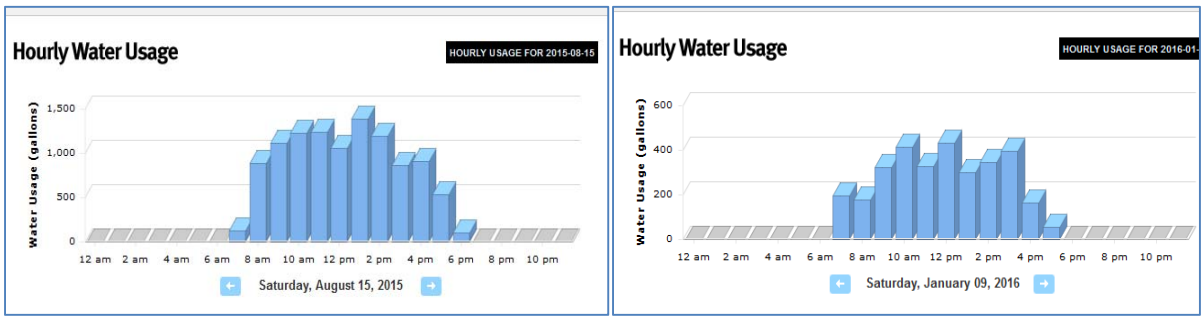
Previous Examples

In previous pilot projects, on-line water consumption information has been very successful in helping customers identify both short term immediate gains and long term strategies. The on-line access made it easy to quantify the savings because the website allows for easy comparison of pre- and post- water usage. Similar AMI gas and electric meters can show pre- and post- energy usage.

Example 1 Car Wash

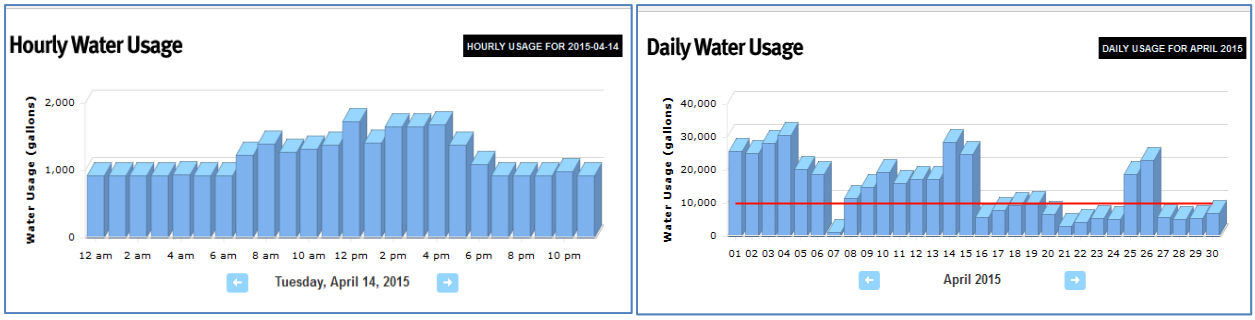
EBMUD staff has been able to identify leaks that have been immediately fixed by our customers resulting in immediate savings. For example, in 2015 EBMUD worked with a water efficient car wash business in an area served by an AMI pilot study. EBMUD noticed an increase in monthly consumption for the month of January which appeared to be an anomaly that required further investigation. The owner was not surprised by the high usage because his business was up due to the drought and limitations on home-washing of cars. However, upon closer examination of his daily and hourly usage it became apparent that something was running wrong with his equipment. His usage was high even on days where he was closed and even at night when he should have had no usage at all.

Figures 12 and 13 are examples of this car wash's typical hourly water use profile in peak season of August and during the off season in January. Water is used primarily during business hours of 8 a.m. to 5 p.m. During peak usage in the summer, water demand approached 1,400 gallons per hour and in the winter around 400 gallons per hour depending on the traffic.



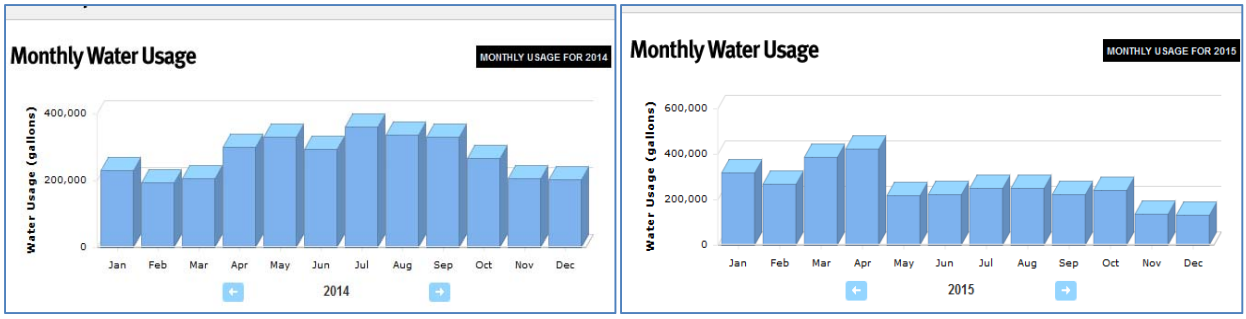
Figures 12 and 13. Typical car wash water use profile during peak summer and winter day.

Figures 14 and 5 are examples of hourly and daily water use during off season when EBMUD identified this anomaly and notified the customer. In this example nearly 1,000 gallons per hour was being used when the business was completely closed and 1,700 gallons per hour during peak time. This usage was over three times average summer usage and 6-8 times average winter usage. Note the red line represents the customer's established daily water limit alert. The system emails the customer if this limit is exceeded.



Figures 14 and 15. Car wash's hourly and daily water usage when malfunctioning.

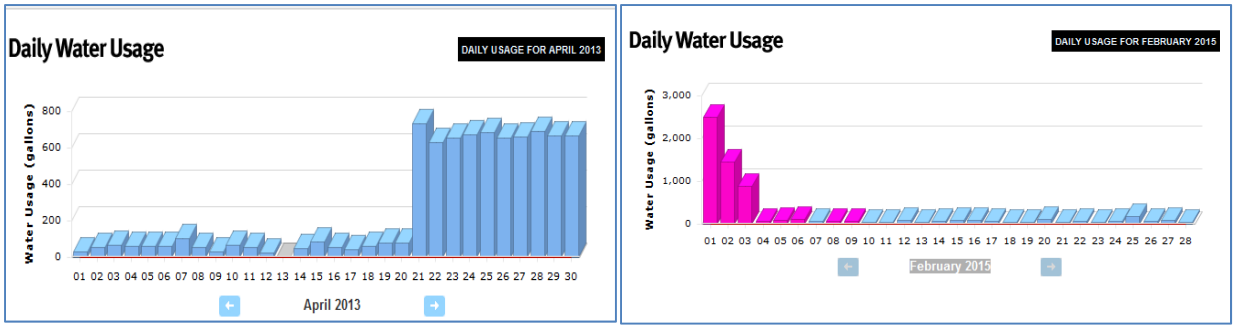
After EBMUD's notification, the car wash was able to identify and fix a broken high pressure hose in April which was running 24 hours per day even when the system was off. The hose was overwhelming the water recycling system and causing the business owner to use significantly more water, and electricity to heat, pump, and treat the water. Figures 16 and 17 illustrate the monthly usage in 2014 and 2015 and includes the period after the repairs were completed. By fixing the problem the customer was able to reduce their water use 50% as shown in the 2015 water use profile and save over 200,000 gallons per month. It is uncertain how long this problem would have gone on if EBMUD had not notified the customer. In review of 2014 operational data, the problem was also occurring in the previous year but less dramatically. If the customer was working with EBMUD earlier they could have saved an estimated one million gallons of water.



Figures 16 And 17 Car Wash's Monthly Usage Before and After Repair.

Example 2. Houseline Leak

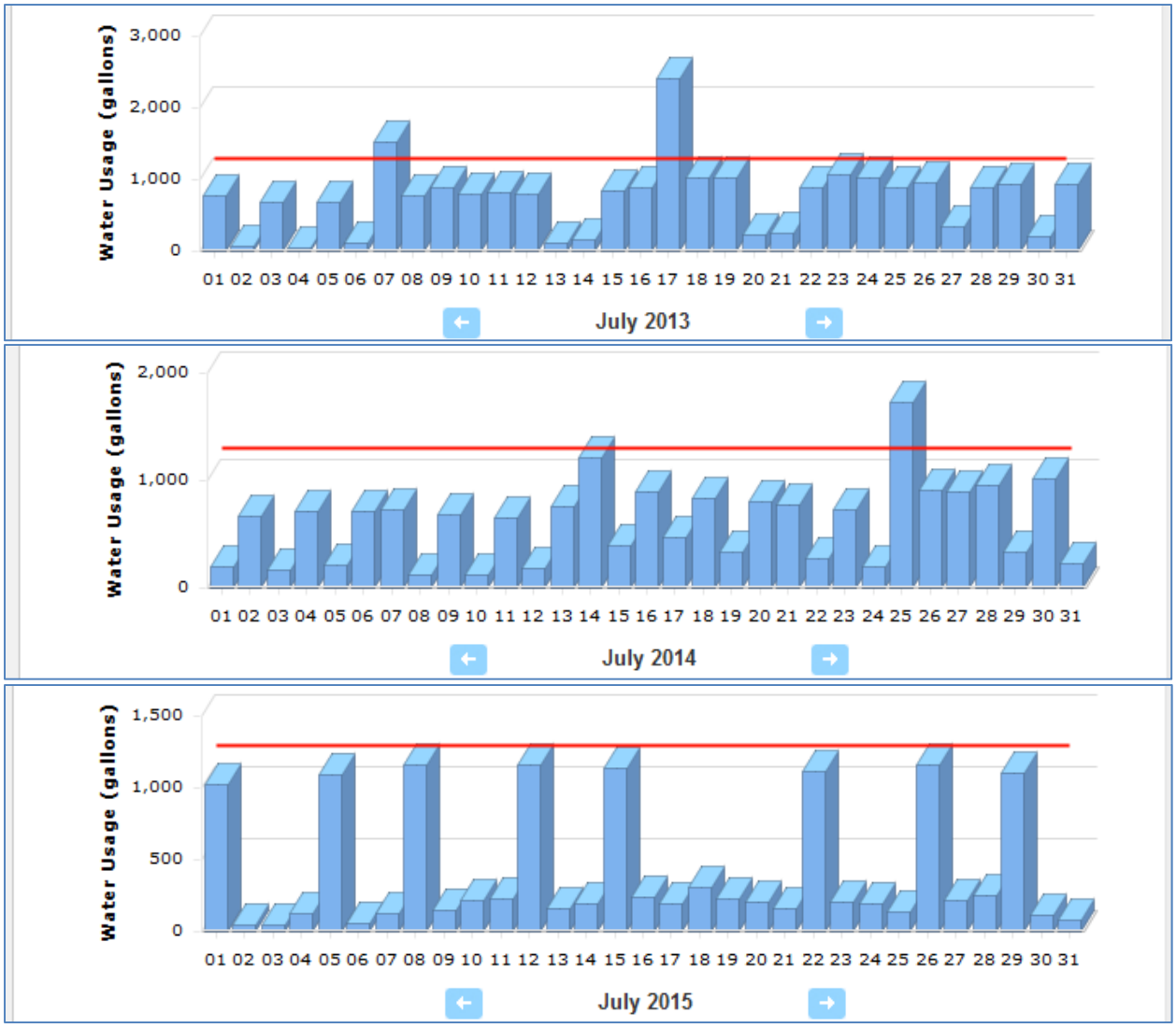
Figures 18 and 19 illustrate the daily water use of a residential customer with a house line leak in the month before the leak started and after it was fixed. The leak ran for almost two years (April 2013 to February 2015) and increased in size from 500 gallons per day to 1,400 gallons per day until EBMUD contacted the customer to notify them of the leak. The leak was fixed within hours of notification and now the customer is using less than 100 gallons per day. Catching this leak earlier would have saved approximately 500,000 gallons of water.



Figures 18 and 19. Houseline Water Leak Daily Usage Before and After Repair.

Example 3. Long Term Irrigation Water Savings

EBMUD identified excessive irrigation at a large residential property. In July 2013, the customer was irrigating six days per week and used 23,000 gallons per month. In April 2014, the customer worked with EBMUD to reduce their irrigation usage and install a weather based irrigation controller. In July 2014, the customer brought their usage down to 18,000 gallons while irrigating less frequently. By 2015, the customer had brought their irrigation usage down to 13,000 gallons in July and remained in compliance with EBMUD's drought restriction of irrigating a maximum of two days per week. Figures 20-22 illustrate the change in water use due to the irrigation controller and on-line access to AMI data.



Figures 20-22. Customers Irrigation Water Use Before and After Smart Controller Installed.

During this project, EBMUD intends to target large water using customers that are interested in partnering with EBMUD to save water and energy and in using on-line water consumption data to identify opportunities. EBMUD has been approached by numerous large water and energy users such as schools, factories, homeowners associations, and larger irrigators, and large residences about installing AMI meters to assist with this effort but has thus far been limited in the areas currently receiving such services.

Example 4. Fixed Network leak Detection

In a previous USBR grant funded project, EBMUD deployed pipeline acoustic leak detection loggers which are read by an AMI system as illustrated in Figure 23. This system has been very successful in identifying EBMUD pipeline leaks which have been quickly repaired. Originally 50 loggers were paid for by the USBR grant as well as two AMI network collectors and installed in January 2015. These have worked so well, that EBMUD has already an additional 220 loggers that can be read within the AMI network. This project entails an additional 100 loggers, but EBMUD will likely install many more than that as the network area is expanded. Figure 24 is an example of

a daily report produced by this system that indicates suspected leaks. Because the leakage is underground and not surfacing, it is difficult to measure the quantity of leakage from each repair. However, EBMUD estimates that approximately 7% to10% of its water supplies are lost to real water loss such as leaking pipes. If only a portion of this water was saved, it would still be a significant volume of water. However, EBMUD is not quantifying these savings in the estimates presented below.

Event Type Summary

Generated by Metersense on 2016/01/11 at 09:00:00 PST

Meter ID	Meter Name	Commodity Type	Event Type	First Occurrence	Last Occurrence	Total Occurrences
GP06140693	beverly & stratford	W	Acoustic Leak	2015/12/20	2016/01/10	6
GP06140705	424 Village Dr.	W	Acoustic Leak	2015/12/17	2016/01/04	19
GP06140706	Coventry Rd. & Valley Rd.	W	Acoustic Leak	2015/12/23	2015/12/24	2
GP06140707	761 Balra Dr.	W	Acoustic Leak	2015/12/19	2015/12/19	1
GP06140708	23 Kerr Ave.	W	Acoustic Leak	2016/01/02	2016/01/11	9
GP06140711	Stratford Rd. & Berkeley Park Blvd.	W	Acoustic Leak	2015/12/23	2015/12/31	9
GP06140715	Avon Rd. & Beverly Rd.	W	Acoustic Leak	2015/12/18	2016/01/11	20
GP06140720	Galvin Dr. x Terrace Dr.	W	Acoustic Leak	2015/12/19	2015/12/20	2
GP06140722	802 Balra Dr.	W	Acoustic Leak	2015/12/20	2015/12/20	1
GP06140724	8 Kerr Ave.	W	Acoustic Leak	2015/12/30	2016/01/11	13
GP06140727	722 Balra Dr.	W	Acoustic Leak	2015/12/29	2015/12/29	1
GP06140732	15 Sunset Dr.	W	Acoustic Leak	2015/12/12	2016/01/11	31
GP11140255	22 Franciscan Way	W	Acoustic Leak	2015/12/12	2015/12/29	18
GP11140256	Highgate Ct. & Highgate Rd.	W	Acoustic Leak	2015/12/22	2016/01/08	4
GP11140260	722 Balra Dr.	W	Acoustic Leak	2015/12/20	2015/12/20	1
GP11140271	Edwin Dr. & Highgate Rd.	W	Acoustic Leak	2015/12/13	2015/12/29	17
GP11140274	84 wilding ln @oak	W	Acoustic Leak	2016/01/08	2016/01/08	1
GP11140276	33 Edwin Dr.	W	Acoustic Leak	2015/12/30	2016/01/11	13

Figures 23 and 24. Fixed Network Leak Detection Pilot Equipment and Sample Report.

Proposed Methods in This Project

As demonstrated in the previous examples, EBMUD water conservation staff will use on-line water consumption and energy data to partner directly with larger customers to obtain water and energy savings. Water savings opportunities may include fixing leaks, using alternative irrigation techniques, and replacing older appliances and machinery with new higher efficiency appliances. This faster more immediately available and detailed data will be more customer-friendly and facilitate water conservation activities better than traditional water conservation interventions can provide. The quantifiable water savings and rationale is summarized below:

Project Water Savings: While previous EBMUD studies have delivered greater water savings, for this project EBMUD is assuming a conservative 10% water conservation savings rate. In its previous pilots, EBMUD has observed that one-fourth of its customers have continuous usage indicating leaks. These leaks accounted for between 15 and 20% of total water usage. The new meters to be used will be much more accurate at lower levels and will identify leaks that were previously undetectable by older meter technology.

In previous studies, EBMUD has seen averages as high as 20% reduction in water use amongst customers provided granular data and working with EBMUD to address the issue. This calculation is based on consumption the year before and after the real-time granular consumption data is presented to the customers compared with a control group of similar customers that only received bi-monthly billing data. As discussed above for some large customers, the identified savings have been much higher. In this project customers/partners who will be given access to AMI meter data will be selected based on their relatively high water usage and their interest in specifically using the AMI data to obtain water savings. In previous studies only one third of customers chose to utilize the web interface and often not until EBMUD contacted them about a specific problem. A

higher savings rate is expected from customers who already foresee the benefits of AMI-related tools and services even prior to installation and agreeing to partner with EBMUD to do so and have a business reason to lower utility expenses. Nonetheless, for this analysis EBMUD is using the more conservative 10% savings number as appropriate level of savings that has been demonstrated in prior projects and deemed transferable to additional larger commercial and industrial customers. This 10% savings will also contribute to EBMUD's 20X2020 per capita water use target for the CII sector required under the California Water Conservation Act of 2009.

Targeted Customers. EBMUD services water to a wide variety of customer classes and sizes throughout its 330 square mile service area. Figure 25 below is a map illustrating some of EBMUD's largest water customers that would be potential participants in this project. The type and size of water demand and potential to reduce both water and energy varies tremendously amongst these customers. Some of these customers are already within existing EBMUD AMI networks and can obtain real-time readings once an AMI meter is installed. However, a large portion of them will require AMI network expansion installation of additional networks to be able to read their water meters remotely.

If EBMUD is selected for this grant, EBMUD water conservation staff will begin outreach to this large customer group to identify willing partners who may have the most to gain from obtaining real-time water consumption data. As demonstrated by the partial list of customers who have offered their support in Attachment H, EBMUD does not anticipate having any difficulty identifying and signing on willing industry customers/partners in this effort.

The majority of EBMUD's service area already has a working electricity and gas AMI network owned and operated by Pacific Gas and Electric (PG&E) that is providing real time electric and gas energy use to our joint customers. EBMUD has previously partnered with PG&E on numerous other water and energy projects and is investigating partnering with them on other AMI related projects complimentary to this project. This project will allow both utilities to work with their water and energy residential and larger customers to ascertain and verify real water and energy conservation savings. EBMUD has established 93 Business Classification Codes (BCCs) to segment water and wastewater services. In Table 2 below includes a grouping of all BCCs seven major customer categories by average use in 2013 which is the most recent pre-drought emergency consumption data. This data will be utilized in selecting and prioritizing AMI installations to maximize potential water and energy savings benefits.

Table 2. EBMUD Average Use per Account (2013)

BCC Category	Total Use in MGD	# of Accounts	Average GPD/account
Commercial	14.3	15,490	923
Industrial	7.6	1835	4,125
Institutional	8.0	3706	2,150
Irrigation	13.7	5309	2,575
Multiple Family	29.6	28430	1,042
Petroleum	8.6	26	332,197
Single Family	85.9	325679	264

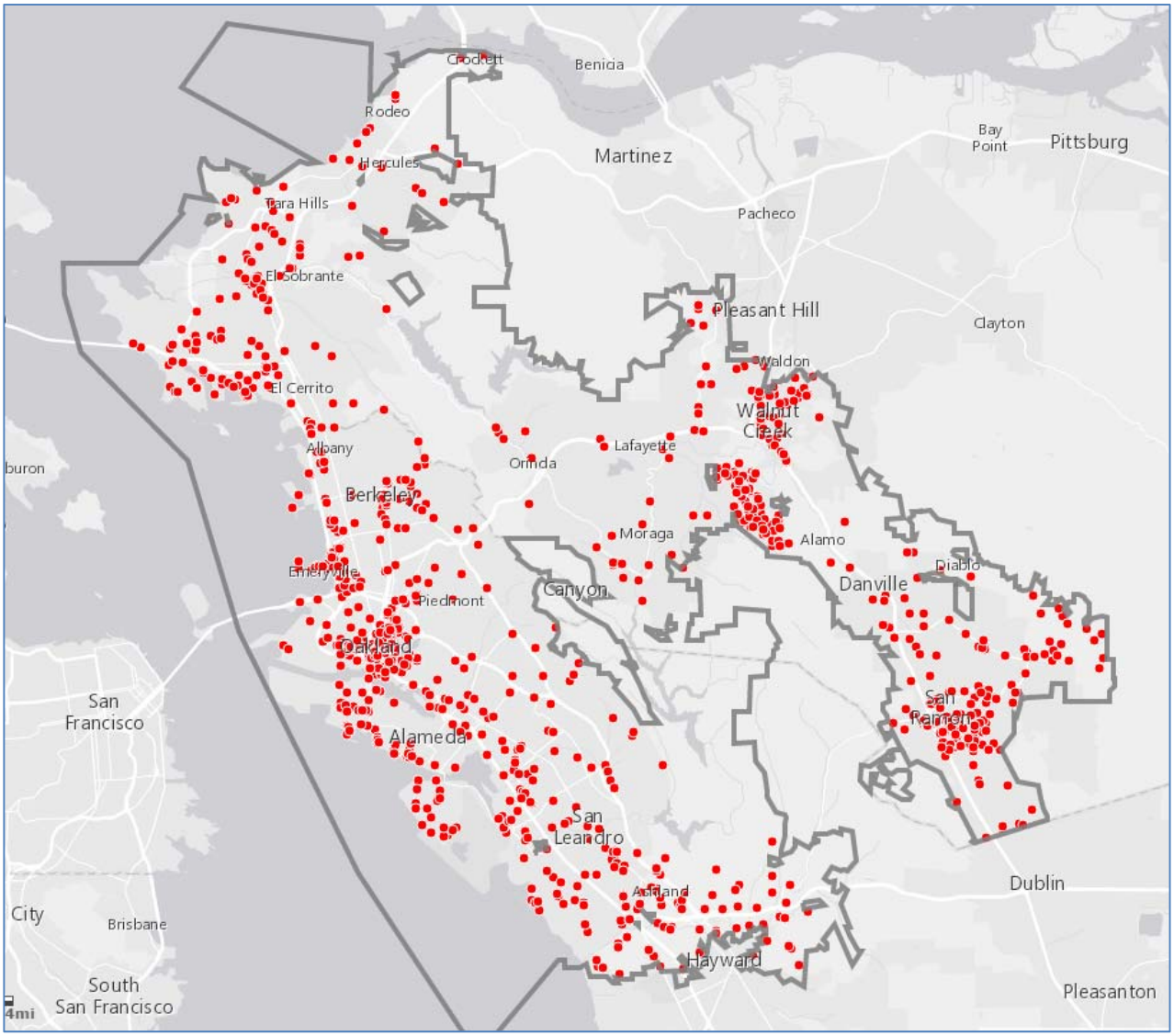


Figure 25. Map of Some of EBMUD's Largest Water Users.

As outline in Table 3 below, EBMUD anticipates a direct savings of at least 540 million gallons annually from this project from working with customers/partners, or a total of up to 1,680 acre-ft/year, or up to 16,800 acre-ft over the assumed ten-year lifespan of this project. There will also be additional savings obtained from the pipeline leak detection portion of this project and immediate drought response which is not included below. This calculation is based on the effectiveness of providing on-line access to water consumption data and audits with water conservation staff. Calculated savings are based on the following assumptions:

- 3,000 large commercial, industrial, and large residential properties.
- 100% pre-arranged participation of identified customers.
- 10% reduction in water usage of participants (based on previous studies) and conversations with industry partners. Note this is a conservative estimate which EBMUD is confident it can meet with the use of this technology.
- Average of at least 5,000 gallon per day (gpd) annual average customer/partner usage (based on scoping studies). Note this is a conservative estimate. Some larger consumption customers

have already requested to be part of this project but EBMUD conservatively assumes an average 5,000 gallon per day will be the average participation rate.

- EBMUD has already identified over 2,500 customers that exceeded 5,000 gpd average in 2013. The average consumption of these 1,000 potential participants is over 40,000 gallons per day. At least 400 of these customers had 2013 average consumption greater than 20,000 gallons per day. EBMUD is confident it will not have difficulty meeting this average savings. Please see Letters of Support from customers in Attachment H.
- 10-year project life. AMI systems are typically designed to last 20 years but are typically only fully warrantied for the first 10 years.
- Savings from fixed network leak detection and repair is not included in these calculations but is part of the project.

Table 3 Projected Water Savings Calculation (Conservative Estimate)

# of Accounts	Avg Usage	Savings %	LifeSpan	Tot. Svgs GPD	Tot Svgs AF
3,000	5,000 gpd	10%	10 years	1,500,000	16,800

EBMUD will also have at least an additional 4,000 customers in a mobile network. Depending on the AMI technology selected these customers may be converted to the fixed network system. Assuming an average 250 gpd for these customers, 50% participation rate, and 10% savings, these customers could represent an additional 50,000 gpd savings or 16,800 AF over 10 years.

4.1.1.1.1. Annual Water Supply:

As described in Section 2, EBMUD's average annual water supply in 2009-2013 was 202,000 acre-ft per year but in the last few years the demand has been down due to drought impacts, customer rationing and lingering effects of the economic downturn.

4.1.1.1.2. Where is that water currently going?

Water that will be saved from this project is either going to a city sewer or storm water system, or released to the environment as wasted potable water, e.g. leaks or excess irrigation runoff.

4.1.1.1.3. Where will the conserved water go?

Water made available through conservation efforts and programs can then be available for other programs or uses, or for in-stream use or for other watershed beneficiaries (i.e. senior water-rights holders), or to lessen the need for EBMUD to produce or acquire additional supply.

4.1.1.1.4. Type of equipment being proposed

EBMUD works with a wide variety of meter and AMI manufacturers and awards contracts based on a competitive process. For this project EBMUD intends to use a mix of new and retrofitted meters as well as a 2-way fixed based AMI system. New meters will be selected which meet EBMUD performance standards and encoded electronic output requirements. EBMUD has already tested a number of manufacturers and collected detailed information on fixed networks and static meters through a Request for Information (RFI) process. The size and material selection will be based on the customer participants selected and most appropriate meter for each application. EBMUD currently uses AMI compatible mechanical and static meters manufactured by Badger, Elster, Hersey, Neptune and Sensus. EBMUD has Aclara and Sensus AMI Networks.

4.1.1.1.5. Verification of savings

As with previously completed USBR grant sponsored AMI-related projects, EBMUD will compare consumption in the year before and after the customer was first provided with real-time water use. Water savings will also be verified through onsite water use audits and conservation services. These reductions in use will be compared against changes in use by similar customers who do not have real-time AMI data available (control group). Savings from specific interventions will follow the model illustrated in the examples above.

4.1.1.2. Subcriterion A.2 – Percentage of Total Supply:

1,680 AF/Year saved
201,600 AF/Year Supply

The savings from the 3,000 target customers using on average 5,000 gallons daily, is estimated to conserve 1,680 acre-feet per year, or 16,800 acre-feet over the 10-year measure life of the project. Although this is only 0.83% of the total supply, the methodologies in this project on these 3,000 customers can apply to the rest of the customers in EBMUD service area as well. This savings calculation does not consider a reduction in real and apparent water losses from leak detection and better water supply accounting from improved estimates of system-wide apparent losses from meter error, increased revenue generation, and improved water use signals to customers. It also does not include savings from additional mobile-network customers that may be added.

4.2. Evaluation Criterion B: Energy-Water Nexus (16 points)

4.2.1. Subcriterion No B.2---Increasing Energy Efficiency in Water Management

The water utility sector is an emerging target for energy efficiency (EE) efforts in the State of California (California Public Utility Commission Rulemaking 09-11-014). Advancing the quality of design and ease of deployment of projects that save energy through targeted water conservation demands an improved confidence in data collection, quantification and reporting. Toward this end, EBMUD is pursuing additional AMI technology deployments to advance the understanding of the spatial and temporal distribution of water demand and energy use across the water sector. Improved real time data collection through AMI will allow for better prediction, targeting, and monitoring of water and energy savings through conservation at both the utility scale and customer end uses.

This projects will reduce water demand by providing detailed information that will help large customers identify water conservation opportunities in their factories, businesses, and homes and improve EBMUD water distribution system monitoring, leak identification and prioritization of pipeline repairs. The nexus between water conservation and energy conservation has been well documented for many years. Four years ago, the Pacific Institute of Oakland, CA reported on quantifying energy savings as a result of conserving water. Their study found that it takes 7.2 KWh of electricity to pump one acre-ft. of water. Given that this program is expected to save up to 16,800 acre-ft. over the next ten years, resulting in an estimated energy savings of approximately to 120,960 KWh of electricity. The specific customer/partners has not been identified for this project, however several interested parties want to use the water consumption information to

manage systems that use both water and significant energy such as boilers, demineralizers, and product streams.

EBMUD plans to continue collaboration with the Center for Water-Energy Efficiency (CWEE) at University of California at Davis in partnership with PG&E, to expand on AMI pilot studies to supplement earlier assessments in the statistical variance of EI in space and time for the EBMUD water system and end users. Key pages of the water-energy intensity study in Attachment C and the executive summary of the proposed AMI pilot study with EBMUD with PG&E and CWEE is shown in Attachment J. EBMUD is the designated "partner" in Attachment J as submitted to the California Public Utilities Commission in January 2016. USBR Grant funds will be used to install additional AMI collection networks, acoustic logging and pressure monitoring equipment, cloud-supported data warehousing and computing to allow for meter reading devices to be read remotely throughout the service area, and a customer AMI-based water management web portal. The proposed framework for additional water-energy nexus research is summarized in Table 4 and illustrated in Figure 30.

Table 4. Water-Energy Nexus Research Parameters

Partners • East Bay Municipal Utility District (EBMUD) • Center for Water-Energy Efficiency, UC Davis (CWEE) • Pacific Gas & Electric (PG&E)
Description • CWEE developed an approach to characterize EBMUD energy flows through infrastructure. • Energy intensity varies seasonally by 10-12%, upwards of 12x between pressure zones. • Study to link water production, losses, customer use and conservation program data to dynamic use of energy and water.
Project Goals • Retrospectively and proactively determine the "cold water" energy savings associated at the parcel and distribution system level use from water production, water loss, and conservation program data deployed in the EBMUD territory, including direct install, rebate, and behavior-based conservation programs. • Estimate the end-use "hot water" energy savings associated specifically with behavior-based water conservation programs (e.g. Home Water Reports).
Required Data (Preliminary) • EBMUD water consumption data by customer at the highest resolution available for five years, including information on customer type and customer location by pressure zone. • Water conservation measure adoption by customer, estimated water savings achieved, and program cost. • WaterSmart Home Water Reports adoption by household. • Remaining pump station data not collected in our original study with EBMUD. • PG&E electricity and gas consumption data by customer.

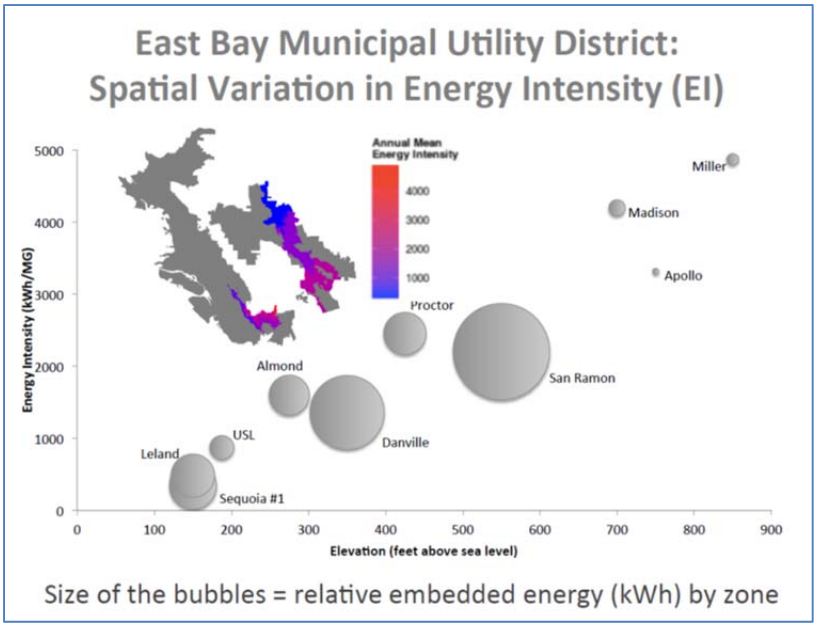


Figure 30. EBMUD Spatial Variation in Energy Intensity Among Water Pressure Zones

4.2.1.1. **Improved Water Management:**

The proposed project will improve water management by identifying potential real and apparent losses to improve the accuracy of estimates used in pressure zone balancing and water accounting, as well as improve the marketing, delivery and reporting of customer water conservation services. EBMUD has adopted the IWA methodology for water supply accounting both on the raw water and treated water system as described in EBMUD's 22 page internal Procedure 900 in Attachment A (first page only). As with any water system, EBMUD has identified a number of system losses and has identified areas where more data is needed to better define the nature of these losses.

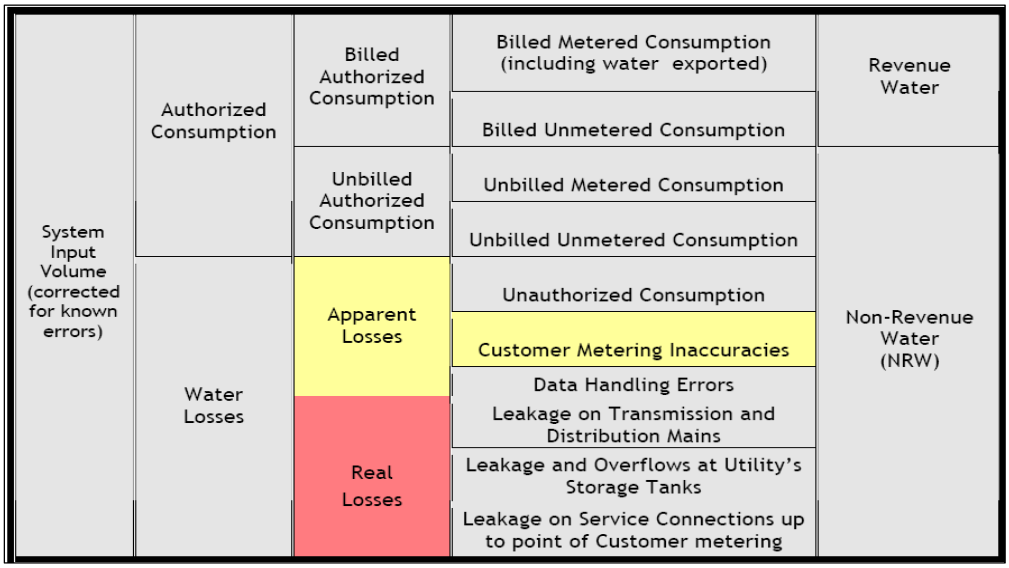


Figure 26. EBMUD Water System balance from Procedure 900

4.2.1.1.1. Water better managed

Water system audits help to improve the targeting of water efficiency measures across the water distribution system to conserve EBMUD's ten-year average annual 221,000 acre-ft water supply. Audits also provide information that can be used to improve the accuracy of meter error estimates to reduce non-revenue water use. Current meter error estimates are estimated to be about 3%, however that number will be refined as a part of the project. Based on review of some 400 EBMUD low-resolution meters under an ongoing study, it appears that the unmeasured or unregistered use may range from three to five percent due to low-end meter inaccuracies. Figure 27 below illustrates the proposed integration of DMA and AMI tools to improve system water audits. A copy of EBMUD's 2014 Water Supply Audit is provided in Attachment E. EBMUD's pipeline distribution system characteristics are illustrated in Figures 28 and 29.

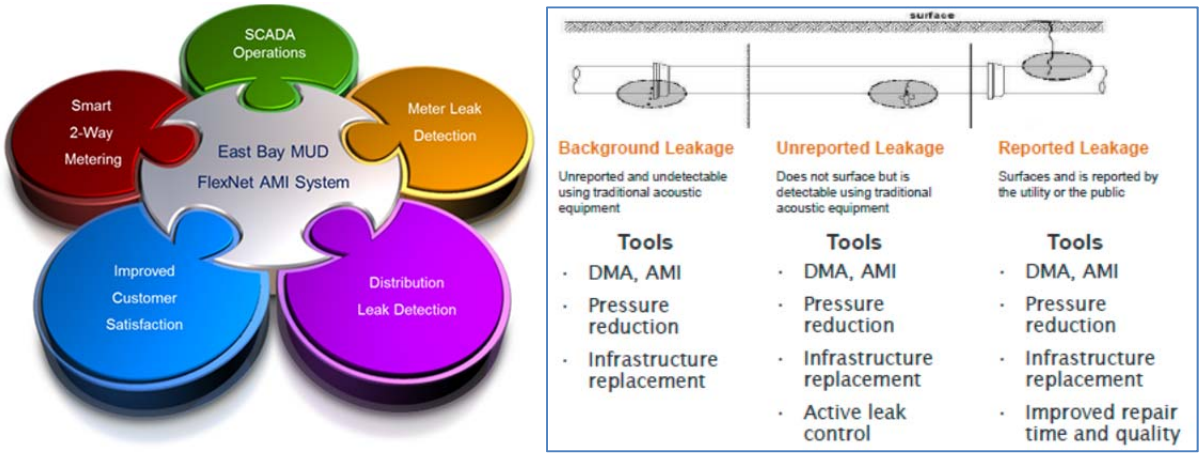
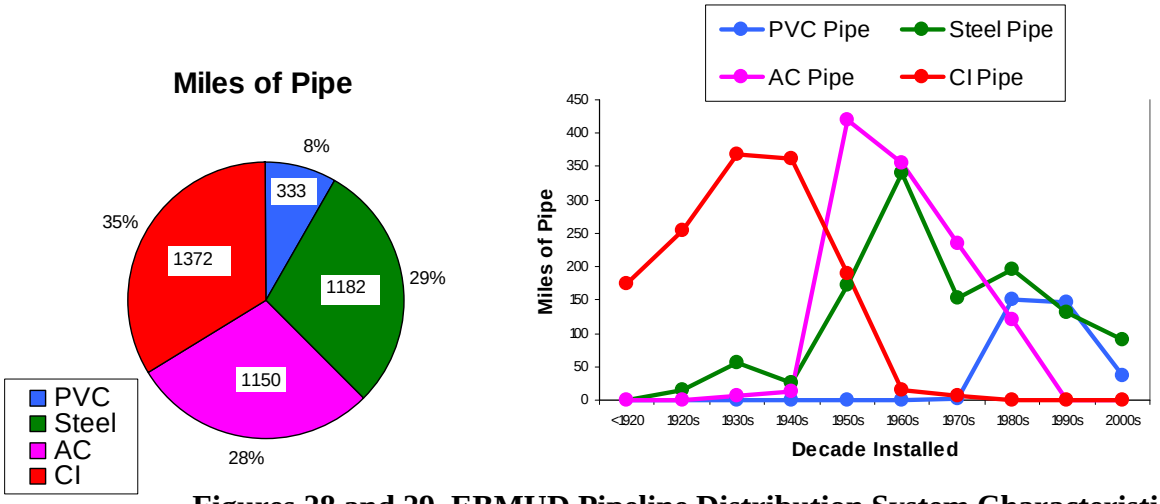


Figure 27. Tools for Improved Water Management



Figures 28 and 29. EBMUD Pipeline Distribution System Characteristics

4.3. Evaluation Criterion C: Benefits to Endangered Species (12 points)

While water conservation savings from this project are not directly earmarked, a number of savings is anticipated to provide state-wide benefits and in normal years, may increase volume and/or quality in river flows and Delta in-flow via saved water from the Mokelumne River watershed, which could benefit the endangered Central Valley steelhead. The National Marine Fisheries Service recently completed a draft recovery plan for listed Central Valley salmonids including steelhead. Approximately 90 percent of EBMUD's water supply is supplied from the Mokelumne River, known to support steelhead. One of the important factors to recovery of steelhead is the availability of sufficient cool water. Conserved water from the project is anticipated to contribute to a larger available supply due to reduced demand. This allows EBMUD to maintain cooler water releases to the Mokelumne River.

EBMUD is not aware of the presence or absence of endangered species on the private property of our customers within the East Bay service area where the usage will be studied. However, if these species are present, they would certainly benefit from improved water use efficiency, a reduction in the amount of irrigation run-off containing chlorinated water, as well as toxic chemicals from the application of fertilizer, herbicides, and pesticides applied to modern lawns. The run off from these lawns can drain to nearby catch basins which drain to our creeks and bay and into the habitat of birds, fish, amphibians and reptiles.

4.4. Evaluation Criterion D: Water Marketing (12 points)

There are no direct water marketing elements in this proposed project. However, EBMUD has constructed interties with adjacent water utilities including Contra Costa Water District, Dublin-San Ramon Services District, City of Hayward, and San Francisco Public Utilities Commission both on the raw water and treated water systems to allow sharing of water supplies during water supply emergencies.

EBMUD is participating in a grant funded effort termed the Mokelumne Watershed Interregional Sustainability Evaluation (MokeWISE). MokeWISE was initiated in the early fall of 2013 by the Mokelumne-Amador-Calaveras (MAC) and Eastern San Joaquin (ESJ) Integrated Regional Water Management (IRWM) Regions with $868,605 in funding provided by the California Department of Water Resources (DWR). MokeWISE emerged following years of dialogue between Upper and Lower Mokelumne River watershed stakeholders participating then in the Mokelumne Forum process. The program, when concluded in June of 2015, is expected to yield a scientifically-based and broadly-supported water resources program that includes comprehensive and sustainable approaches to water resources management in the Mokelumne River watershed. The programs considers how efforts such as enhanced water conservation both within the watershed and by EBMUD could be used to help stakeholder address their long term water supply goals and strategies.

EBMUD is participating along with eight of the largest Bay Area water agencies on a plan to improve regional water supply reliability for over six million residents. The partnership is seeking federal and state assistance to fund a feasibility study to determine how to best leverage existing infrastructure and identify additional infrastructure needs to booster reliability for a region. The eight participating agencies are:

- Alameda County Water District

- Bay Area Water Supply and Conservation Agency
- Contra Costa Water District
- East Bay Municipal Utility District
- Marin Municipal Water District
- San Francisco Public Utilities Commission
- Santa Clara Valley Water District
- Zone 7 Water Agency

Each of these agencies has formally adopted guiding principles to memorialize the willingness of the agencies to work together to develop regional solutions. The agencies are prepared to meet local match requirements attached to any federal assistance that may be secured.

Participating agencies have invested in significant infrastructure that can be leveraged regionally to improve climate change and drought resiliency, emergency preparedness, and water supply reliability. This includes inter-agency interties, state of the art intakes, groundwater banking and treatment, and advanced water treatment. Potential new areas for investment include additional interties, pre-treatment facilities, conveyance, and groundwater wells. Other efforts that EBMUD has underway with partner agencies include the following:

- Development of long term water transfer agreements with willing sellers located within the Sacramento River watershed.
- Participation in a Groundwater Banking demonstration project with San Joaquin County interests aimed at furthering a possible conjunctive use project in the Eastern San Joaquin Groundwater Basin
- Development of wheeling agreements to facilitate the delivery of transfer water secured by local Bay Area agencies from willing sellers in the Sacramento River watershed to meet dry-year water supply needs.

4.5. Evaluation Criterion E: Other Contributions to Water Supply Sustainability (14 points)

This project will provide valuable information on the use of AMI and real-time consumption data to obtain water and energy conservation savings amongst large users. This will complement previous research work EBMUD has provided in the use of AMI and web presentment of real time consumption information in the residential sector. In addition, this project will provide information to the water industry on potential unmeasured flow by existing and aging water meters. This information will improve the accuracy of water system audits and help justify the implementation of system-wide meter replacement programs including installation of AMI systems. Information obtained by EBMUD can be directly used by other agencies and added to the knowledge base of Water Loss Control strategies which is currently lacking detailed information on low-flow usage patterns.

4.5.1.**Subcriterion No E.3---Drought Water Supply**

On April 14, 2015, the EBMUD Board of Directors adopted revised drought management program guidelines, conducted a public hearing to declare a continuation of a water shortage emergency and declared a Stage 4 Critical Drought. While EBMUD Policy 9.03 establishes a maximum EBMUD -wide water use reduction goal of 15 percent, the revised drought management program guidelines define the need to exceed that goal in the current situation (an extreme drought of unknown duration generating statewide impacts as well as uncertainties regarding the availability of supplemental supplies to EBMUD). After considering these factors, the Board established a goal of saving 20 percent (or 42,800 acre-feet) throughout the service area in 2015 compared to 2013 and adopted revisions to an EBMUD regulation, Water Use During Water Shortage Emergency Condition - Section 28 (Attachment I). To guide EBMUD outreach activities and conservation services in support of the 20 percent EBMUD -wide goal, EBMUD's Board adopted a Critical Drought Action Plan to replace the Water Shortage Emergency Action Plan that the Board previously adopted. The new plan will support implementation of Section 28 and includes actions to comply with the California State Water Resources Control Board's regulations through 1) mandatory outdoor water use restrictions, 2) urging customers to strive for 35 gallons per person per day inside, which is very efficient use, and 3) requiring certain actions of restaurants, hotels, developers and city planning agencies. The Critical Drought Action Plan builds on the previous outreach and conservation efforts. Key changes from previous action plans are:

- Expanding outreach efforts by using robocalls and social media, investing more in advertising and community sponsorships, and participating in more community events and workshops. These activities will supplement ongoing efforts that include outreach to key stakeholders, website information, earned media, and communication through the bill inserts and top of bill messages.

- Expanding conservation programs by broadening incentives (rebate programs), conducting more audience-specific outreach on new drought restrictions, strengthening collaboration with public agencies on conservation efforts, opening a WaterSmart Drought Center at the Administration Building and expanding Home Water Reports to all 326,000 single-family residential customers as an opt-in email service.

The California State Water Resources Control Board (State Water Board) adopted emergency regulations that prohibit certain uses of potable water for outdoor irrigation, sidewalk and driveway cleaning, vehicle cleaning and decorative fountains. The State Water Board also directed that urban water agencies such as EBMUD implement mandatory water use restrictions and fulfill several communications and reporting responsibilities, and has announced its intention to require EBMUD to achieve a 16 percent reduction in overall water use. The Board's adoption of Section 28 addresses responsibilities for prohibiting certain classes of outdoor irrigation and water uses. The Board's adoption of the Critical Drought Action Plan establishes EBMUD's plan to promote water use restrictions, conservation services and rebates, and to comply with public outreach and reporting requirements established by the State Water Board. EBMUD's plan is intended to guide staff in working toward EBMUD's water savings goal, which is based on local needs, and will also enable EBMUD to comply with the state's anticipated water use reduction requirement.

EBMUD's AMI "WaterSmart Toolbox" On-line Customer Portal (Figure 5) proved to be a very powerful tool in helping customers save water during the drought. The Toolbox sends registered customers emails if water leaks are suspected or if a customer-defined daily water budget is exceeded. The on-line display of daily and hourly water use made it very easy for customers to identify ways to save water. These displays also make it very easy for EBMUD staff and its customers to recognize potentially wasteful water use patterns such as leaks and frequent irrigation or irrigation during warmest out of the day. EBMUD uses the Toolbox to identify customers with leaks and periodically calls all the non-registered customers with leaks to offer notification and assistance. EBMUD also used the Toolbox to identify customers who might be good candidates for participation in its incentive programs such as its USBR grant funded weather based irrigation controller and lawn conversion programs. Planned improvements to the Toolbox will allow the Toolbox to display recommend irrigation budgets as well as financial information directly on the charts allowing customers to better relate water savings with dollar savings

4.5.1.1. **Water Supplies impacted by the drought**

In response to the severe drought and other factors described in its Resolution No. 33994-14, on August 12, 2014 the EBMUD Board of Directors declared a water shortage emergency within the service area, and adopted Section 28 (See Attachment I), of EBMUD regulations entitled "Water Use During Water Shortage Emergency Condition," containing restrictions on water use to conserve the water supply for the greatest public benefit.

Since August 2014 the drought has continued and intensified, such that California has experienced its fourth year of drought and the dry conditions are so extreme that water years 2012-2014 now rank as the driest consecutive three-year period on record in terms of statewide precipitation. Over the winter of 2014-2015 California continued to experience below-average rainfall and a record low snowpack, as evidenced by the California Department of Water Resources' announcement on April 1, 2015 that the water content of the snowpack in the Sierra Nevada Mountains was just five percent of normal for that time of year, the lowest it has ever been since records began to be compiled in 1950, meaning the current meager snowpack is lower even than the extreme dry year of 1977. The current drought has occurred at a time of record warmth in California, with new climate records set in 2014 for statewide average temperatures, which warmth has further reduced what little snowpack existed over the winter of 2014-2015.

The continuing drought has severely affected EBMUD's water supply as well, with January 2015 constituting the driest January on record and March 2015 constituting the second driest March on record in the Mokelumne River Basin, causing EBMUD's total system storage to be only 65% of average on April 1, 2015, and, further, given the meager snowpack, in contrast to normal years when snowmelt occurs over the spring-summer thereby bolstering stored water supplies, in 2015 EBMUD received little additional snowmelt into its Pardee and Camanche Reservoirs because what little snow did fall in the Mokelumne Basin over the winter of 2014-2015 has largely already melted or evaporated.

On April 14, 2015, the Water Supply Availability and Deficiency Report was filed with the Board in accordance with District Policy 9.03, declaring that the District's water supply is deficient for meeting customer demands in 2015. EBMUD has undertaken substantial investments in comprehensive water conservation programs, including AMI deployments, water recycling

projects and dry year supplemental water supply projects to help reduce the severity of customer demand reductions that may be required in droughts, and will continue doing so.

In response to the severe drought and deficient water supply noted in the Water Supply Availability and Deficiency Report, on April 14, 2015, the EBMUD Board of Directors declared a Stage 4 critical drought, declared a mandatory District-wide water use reduction goal of 20 percent, and declare the need to use the Freeport Facilities to deliver supplemental supplies to the District's service area. For the period from February through December 2015, EBMUD customers have cut back on their water use by 22 percent and are achieving the goal mandated by Senate Bill X7-7 of 20 percent reduction in per capita water use by 2020 ahead of schedule.
EBMUD has set a water recycling goal of 20 million gallons per day by 2040, which means EBMUD customers will be recycling a total of more than 7.3 billion gallons per year by 2040, through the EBMUD's participation and investment in recycling projects such as the San Ramon Valley Recycled Water Program, the East Bayshore Recycled Water Project, the North Richmond Water Reclamation Plant Project, and the Richmond Advanced Recycled Expansion Water Project.

EBMUD's long-running, aggressive water conservation program, its utilization of AMI technology and real time water use monitoring tools, additional recycled water supplies, the dire nature of the current drought requires additional water use reductions by EBMUD, and a recommendation to adopt a mandatory District-wide water use reduction goal of 20 percent.

Section 29 "Prohibiting Wasteful Use of Water" is an ongoing, year-in and year-out provision in EBMUD's Regulations Governing Water Service to customers of EBMUD that describes actions aimed at eliminating wasteful use and imposes restrictions on largely the same classes of outdoor irrigation and water use that are prohibited by the State Water Board's emergency regulations.

Section 28 was adopted by the EBMUD Board only after declaring a water shortage emergency condition under Water Code Section 350 to provide for special restrictions on water use, over and above EBMUD's standard, ongoing provisions prohibiting wasteful use of water contained in Section 29 of the EBMUD Regulations referenced above, as well as enforcement through warnings, installation of flow restrictors and, finally, disconnection of water service.

A water shortage emergency condition within the meaning of Water Code Section 350 includes both an immediate emergency in which EBMUD is presently unable to meet its customers' needs, and a threatened water shortage in which EBMUD is empowered to anticipate a future water shortage and to impose appropriate regulations and restrictions where, lacking such control, its water supply will become depleted and it will be unable to meet the needs of its consumers, and therefore EBMUD is authorized under Water Code section 350 to declare a water shortage emergency condition and implement Section 28 in the EBMUD's Regulations Governing Water Service in order to further respond to the continued drought and to comply with the State Water Board's emergency regulations.

4.5.1.2. **Improve Reliability of Water Supplies during drought**

The project will increase reliability of water supplies by not only helping find water savings opportunities but allow for continuous monitoring of water usage and notification if a leak or an

unexpectedly high water use occurs. It will also involve continuous monitoring of EBMUD's pipelines for potential leaks, reducing the duration and size of these leaks by early identification and repair. EBMUD is exploring additional functionality that may also prove very useful.

4.5.1.3. Water and Energy Use Awareness

EBMUD's AMI customer web interface shown in Figure 5 in Section 3.3 was specifically designed to enhance customer water use awareness. The web interface currently allows customers to view their real-time water by the year, month, day and even hour and provides the weather patterns for the same period including temperature and weather. The interface also emails customers when a leak is suspected and when a pre-defined daily water use amount is exceeded. Planned enhancements to the website will allow for recommend water budgets based on landscape area and weather as well as other customer reporting features such as estimated bills.

EBMUD intends to work with participating customers and potentially PG&E to calculate both energy and water savings from recommended intervention strategies identified by the real-time water and energy use. As described in SubSection 4.1.1.1, the majority of EBMUD's customers also have on-line energy also available through PG&E's AMI system (refer to Attachment J).

EBMUD's WaterSmart Certification Program recognizes business customers that have successfully demonstrated water use efficiency and have implemented water savings measures at their facilities (see Figure 30). Certified applicants are invited to an annual recognition event and granted the use of the WaterSmart logo for promotional purposes. EBMUD also features certified businesses online and through publications including success stories and examples of how other business can use the same strategies to save water and energy. Having the real-time water and energy use available will not only facilitate finding water and energy savings but will also more easily illustrate to illustrate the savings achieved to other interested parties as shown in the examples in SubSection 4.1.1.1.

FIGURE 30. EBMUD WaterSmart Business Award Decal

4.6. Evaluation Criterion F: Implementation and Results (12 points)

4.6.1. Subcriterion No. F.1 – Project Planning

EBMUD has almost 40 years of experience in leak detection and 30 years in water supply accounting. EBMUD has been a leader in exploring all the benefits of AMI, supply side conservation, and the synergy between the two areas. This project supports, and is supported by

EBMUD's long-term water management and water use efficiency plans, as well as the CUWCC Best Management Practices. All project efforts would support compliance with the California statewide 20X2020 initiative. EBMUD intends to share the majority of the results of this study with ACWA, CUWA, AWWA, CUWCC, and AWE partner agencies and other related utilities many of whom are USBR contractors.

EBMUD has over 19 years of experience in performing end-use demand studies and has used AMI technology to increase water conservation savings for more than 13 years. EBMUD has been conducting meter accuracy testing for more than 30 years and has been a leader in promoting AMI technology for supply-side and demand-side conservation. The feasibility of this project has been demonstrated with on-site and in-field testing in cooperation with participating vendors.

AMI technology provides hourly consumption data which can be used to identify water conservation opportunities such as pipeline and plumbing leaks, excessive or poorly timed irrigation, and opportunities for pipeline replacement and plumbing retrofits. During previous end use and AMI studies, significant indoor and outdoor pipeline and plumbing leaks were identified. In addition, a large number of customers were irrigating three to four times more than necessary, and, some were unknowingly irrigating daily during the rainy seasons. EBMUD staff shared recorded hourly, daily, and monthly consumption patterns with customers through in home visits and made recommendations on reducing water usage. The data presentation helped customers understand how much water they could conserve with the recommendations, and many expressed a preference to access their usage data on their own computers. Customers participating in the study were able to reduce water consumption by 15-20%.

In 2014 EBMUD completed a study of the accuracy of its 5/8-inch meters. A pilot project utilizing 430 meters has already demonstrated the viability of the analysis of unmeasured flow using the technologies suggested here. Furthermore, EBMUD has demonstrated use of modifications to its meter test bench to reach extremely low flows. To date EBMUD has collected more than 55 million 1-minute meter consumption data points. Preliminary results of low-flow meter accuracy are illustrated in Figure 31. This project will expand the pilot analyses through the use of cloud computing technology to allow for improved data mining and analysis.

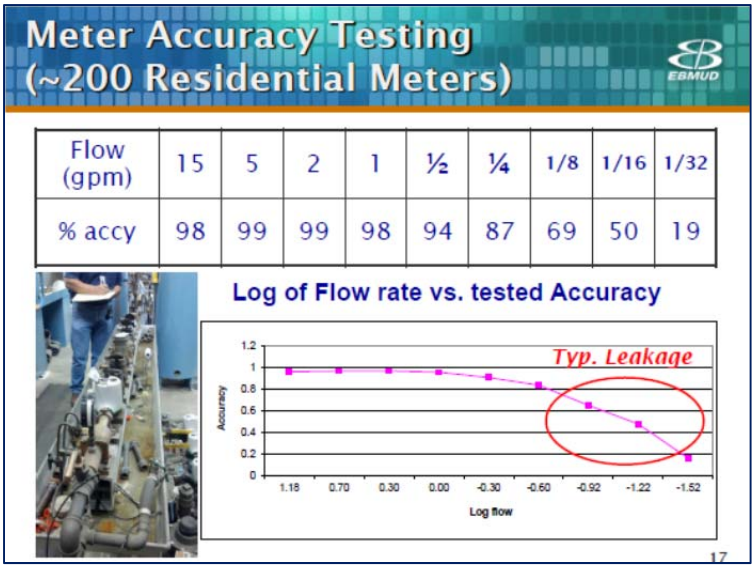


Figure 31. EBMUD Unmeasured Flow Study Preliminary Findings

In 2015, EBMUD began using its AMI networks to read acoustic leak detection devices to monitor pipelines for leaks. This has been a very successful program and many leaks have been identified and repaired already this year. EBMUD has already expanded this program even within its relatively small existing AMI network and will continue to expand this program if the network is expanded employing the same successful techniques and practices already implemented.

4.6.2.**Subcriterion No. F.2 – Readiness to Proceed**

This project involves meter replacement and testing, acoustic leak detection equipment installations, a vendor-supported AMI collection network, and web-presentment of real time water consumption information, all of which EBMUD has prior experience with and performs on a routine basis. Some meters and loggers will be installed in existing AMI network covered areas and will become activated on installation. EBMUD plans to install the expanded AMI collection system at EBMUD facilities to streamline project implementation and avoid potential delays from other third party permitting requirements. EBMUD's customer web interface is currently being modified to accommodate additional customers, and additional network connection. Furthermore since the project has already been defined and evaluation underway, this expansion can occur very quickly once additional funding is obtained.

PROPOSED SCHEDULE (24 months):

- Preliminary grant award notification from USBR — June 2016
- Expanded leak detection and customer account selection — July-Oct 2016
- Grant agreement executed: — Sep 2016
- AMI equipment procurement — Oct 2016-December 2017
- Additional meter, logger and radio installations — Sep 2016 thru Jun 2019
- Water loss control and conservation Interventions — January 2017–September 2019
- Draft Report — October 2019
- Final report — December 2019

4.6.3. **Subcriterion No. F.3 – Performance Measures**

Data Analysis. The main purpose of this study is to increase customer water and energy conservation savings through use of AMI provide real-time consumption patterns to identify savings strategies. The AMI meters themselves will provide an accurate measure of how successful the strategies are. Another purpose of this project is to reduce real and apparent water loss within the EBMUD water distribution system; and test new utility AMI applications to assist in standards development and water agency adoption of AMI technology in water distribution management. This part of the analysis will be harder to measure. However through the use of highly accurate water production, DMA, pressure zone balancing and more accurate and timely customer water meters, EBMUD will be able to document supply side water conservation.

Another part of this evaluation will determine if having better water use profiles and reducing peak demand can be used to optimize EBMUD distribution system pumping where beneficial and facilitate in more efficient water storage, piping, and pumping plant design.

Savings Evaluation. EBMUD will monitor real time water production and customer usage during the project period. In addition, historical trends and average seasonal use prior to and after the AMI data is available will be analyzed to enhance water and energy savings. Control groups of customers that do not have access to AMI data will be used as a measure of changes in water usage due to weather patterns, natural replacement, or other EBMUD Water Conservation activities.

4.6.4. **Subcriterion No. F.4 – Reasonableness of Costs**

- As discussed in Section 9, the total project cost is $4,677,007.
- Anticipated direct conservation savings is estimated to be 16,800acre-ft over a ten-year period (based on 3000 AMI meters, average customer use of 5,000 gal/day and 10% savings).
- The unit cost estimate based on customer conservation is approximately $278/acre-foot.
- The unit cost would be lower if savings from the fixed network leak detection, additional AMI accounts, and supply-side conservation benefits were included.

4.7. Evaluation Criterion G: Additional Non-Federal Funding (4 points)

$$\frac{\$3{,}870{,}733 \text{ EBMUD}}{\$4{,}677{,}007 \text{ Project Total}} = 79\%$$

4.8. Evaluation Criterion H: Connection to Reclamation Project Activities (4 points)

The proposed work is within the EBMUD approximate 330-square mile service area which lies on the eastern side of the San Francisco Bay region. The Mokelumne River is the primary source of EBMUD's water supply which receives insufficient and extremely variable runoff during droughts. Urban growth and associated increases in water usage in the East Bay service area, greater Bay Area and state as a whole is stressing available water supplies that are imported from mountain counties in the western foothill portion of the Sierras. In addition to meeting EBMUD customer demands, the Mokelumne River must meet the demand of the environment, downstream water users, and senior water right holders. The shortfall of the water supply to meet demand led to development of a supplemental water supply on the Sacramento River with the Central Valley Project's Freeport Regional Water Project. Efforts to secure delivery from this source entailed

over 37 years of contract negotiations with the US Bureau of Reclamation and legal disputes with entities claiming rights to the Sacramento River.

Please refer to Section 2.7 for more information on the relationship with EBMUD and Reclamation including previous grants awarded to EBMUD. In addition to EBMUD direct relationship, information obtained and methodology developed during this study will be shared with the USBR and other Reclamation project utilities to help them obtain similar benefits from meter accuracy, water supply accounting and AMI business cases.

5.0 PERFORMANCE MEASURES FOR QUANTIFYING POST-PROJECT BENEFITS

5.1. Performance Measure No A.2: Measuring Devices

As discussed in Section 4.1 and specifically SubSection 4.1.1.1.5, the water and energy conserved from the water conservation interventions will be calculated based on one year average water usage before and after AMI information is presented to customers. Full data analyses are not envisioned until approximately one year after the actual analysis of AMI-provided data is assembled. Comparative water usage must be based on approximately one year prior to the intervention and one year after. An anticipated significant benefit from the project is the additional information on apparent losses and the potential to identify and track low flow leaks which may ultimately result in significantly reduced demand. The success of specific incidents of leak management and other interventions can be documented on a case by case basis as illustrated in Section 4.1.1.1. This methodology is supported by previous research efforts in EBMUD AMI projects and documented in reports provided to the USBR.

5.2. Performance Measure No B: Projects with Quantifiable Energy Savings

5.2.1.**Performance Measure No. B.2: Increasing Energy Efficiency in Water Managerment**

Please refer to SubSection 4.2.1. 40,320 KWh of electricity energy savings is anticipated.

6.0 ENVIRONMENTAL AND CULTURAL RESOURCES COMPLIANCE

6.1. Impacts to the Environment

Due to the limited scope and nature of meter replacements and installation of radio equipment, this work is defined as routine and there will be no significant impacts to the environment. However,

6.2. Endangered Species

Endangered species within the project area will not be affected by this project.

6.3. Wetlands in Project Area

There are wetlands in some areas of the EBMUD service area. However, due to the electronic nature of this technology, there will be no work on this project in the wetlands area.

6.4. Age of Infrastructure

The EBMUD delivery system varies in age from over 100 years to less than 1 year.

6.5. Effect on Irrigation Features

The deployment of AMI technology to monitor distribution system and customer water demand is expected to have a positive impact on applied irrigation water, installation of water efficient irrigation equipment, and reduction in irrigation overspray and runoff.

6.6. Historical Buildings

Historical buildings and features within EBMUD will not be affected by this project.

6.7. Archeological Sites

Archeological sites within EBMUD will not be affected by this project.

6.8. Low Income or Minority Populations Affected

The project will have no adverse effect on low income or minority populations.

6.9. Access to Indian Sacred Sites or Tribal Lands

Not applicable because all work will take place on EBMUD pipelines, appurtenances and water metering equipment.

6.10. Spread of Invasive Species

Not applicable because all work will take place on EBMUD pipelines, appurtenances and water metering equipment.

7.0 PERMITS

Other than anticipate traffic control plans and permits, no additional permits or approvals are required for acoustic logger and meter change outs. AMI radio collection equipment will be installed on EBMUD owned facilities.

8.0 OFFICIAL RESOLUTION

EBMUD is submitting Attachment F in order to fulfill the requirements of this section. EBMUD Board Resolutions 33692-08 on November 25, 2008 and 33021-02 on August 13, 2002 authorize the General Manager to apply for grants of any amount and accept grants of funds not to exceed $500,000 without a specific resolution.

9.0 PROJECT BUDGET

9.1. Funding Plan and Letters of Commitment

9.1.1. Applicant Cost Share

As shown in the Proposed Budget table, the total project cost is projected to be $4,677,007 including up to $1,840,000 in meter and leak detection equipment, AMI vendor software contracts and $2,837,007 of in-kind services as labor and equipment. EBMUD anticipates contributing $3,677,007 of its own funds, requesting $1,000,000 from the USBR. EBMUD will pay for its portion of the project from its obligated capital and operating funds for its Water Conservation, Maintenance, Meter Reading, and Facilities Management Departments. EBMUD's contribution will include in-kind labor contributions and monetary funds as needed.

Attachment A -

EBMUD

Procedure 900

EFFECTIVE	02 DEC 13
SUPERSEDES	02 NOV 10
LEAD DEPARTMENT	WNR

WATER SUPPLY AND CONSUMPTION ACCOUNTING AND REPORTING

PURPOSE - To define water supply and consumption accounting terms; specify the authorized sources of supply and consumption data; and describe Departmental responsibilities for measuring, collecting, assessing, retrieving, validating, and reporting of data regarding District water supply uses and losses.

General Provisions

This procedure applies to all District employees directly or indirectly engaged in measuring, collecting, assessing, retrieving, validating, or reporting on District raw water supplies, treated water production, water consumption, water system loss, and water supply and demand projections. This procedure also describes storage, retrieval and quality control of metered consumption data.

Limitations

This procedure provides only a general overview of water supply and 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.

Water Supply Accounting Terms and Definitions

<table>
<tr><td rowspan="15">Water Sources
1</td><td rowspan="10">Distribution System Input
(i.e., production)
2</td><td rowspan="3">Authorized Consumption
(e.g., customer demand)
3</td><td>Billed Authorized Consumption 4</td><td>Billed Water Exported 5</td><td>Revenue Water 35</td></tr>
<tr><td></td><td>Billed Metered Consumption 6</td><td></td></tr>
<tr><td>Unbilled Authorized Consumption 7</td><td>Unbilled Metered Consumption 8</td><td rowspan="8">Non-Revenue Water 36</td></tr>
<tr><td></td><td>Unbilled Unmetered Consumption 9</td></tr>
<tr><td rowspan="7">Distribution Water Losses
10</td><td rowspan="3">Apparent Losses 11</td><td>Unauthorized Consumption 12</td></tr>
<tr><td>Customer Metering Inaccuracies 13</td></tr>
<tr><td>Systematic Data Handling Errors 14</td></tr>
<tr><td rowspan="4">Real Losses 15</td><td>Leakage on Mains 16</td></tr>
<tr><td>Leakage and Overflows at Storages 17</td></tr>
<tr><td>Leakage on Service Connections up to Customer Metering 18</td></tr>
<tr><td rowspan="5">Raw Water Input
19</td><td rowspan="2">Raw Water Uses
20</td><td>Billed Authorized Raw Water Uses 21</td><td>Billed Raw Water Exported 22</td><td>Revenue Water 35</td></tr>
<tr><td></td><td>Billed Metered Raw Water Uses 23</td><td></td></tr>
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27</td><td>Unbilled Authorized Raw Water Uses 24</td><td>Unbilled Metered Raw Water Uses 25</td><td rowspan="4">Non-Revenue Water 36</td></tr>
<tr><td></td><td>Unbilled Unmetered Raw Water Uses 26</td></tr>
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<tr><td>Raw Water Metering Inaccuracies 30</td></tr>
<tr><td rowspan="2">Raw Water Real Losses 31</td><td>Leakage on Aqueducts and Raw Water Piplines 32</td></tr>
<tr><td>Leakage at Water Treatment Plants 33</td></tr>
<tr><td colspan="4">Raw Water Balance (e.g., evaporation, releases and spills) 34</td></tr>
</table>

Note: Distribution System Input component definitions adopted from American Water Works Association (AWWA) International Water Association Audit Components.

Attachment B

Distribution

Pressure Zone Audits Pinpoint

Water Loss

AMR and leak-detection technology helped a California utility get a handle on the true nature of lost water. BY DAVID WALLENSTEIN AND ANDREW CHASTAIN-HOWLEY

WATER SYSTEM AUDITS are becoming an important tool in determining water system performance throughout the United States. Automatic meter reading (AMR) with data-logging functions and hourly system comparisons allow utilities to analyze new levels of detail in system supply and customer demand. The information gained helps utilities better understand water losses and whether the losses result from inaccurate meters, system leaks, or water theft.

In 2005, California's East Bay Municipal Utility District and a consultant evaluated the conservation benefits of mobile and fixed-network AMR systems, equipped with data-logging capabilities, in two pressure zones known as Round Hill and Holly (see table, page 19). The Round Hill zone was selected because of its relatively low discrepancy between water delivered to the zone and billed consumption. The Holly zone was selected because of a high discrepancy rate.

The goal was to determine the true nature of lost water—leaks, flushing, fire flow, system meter error, customer meter error, theft, leaks from one zone to another, or any combination of these factors. In addition to AMR and data-logging-equipped customer meters, the audit used historical hourly supervisory control and data acquisition (SCADA) operations data for flow rates and reservoir level indicators, acoustic leak-detection equipment, and customer-meter testing equipment.

AUDIT DETAILS

Pressure zone audits began by comparing billing records based on bimonthly meter readings and average supply rates from SCADA records. After a supply vs. demand discrepancy was identified, the formal audit process began using the steps detailed in Water Audit Tools of the Trade, page 20.

Authorized Use. Both pressure zones showed authorized use was primarily billed consumption. No known fireflows or fireflow testing, water quality flushing, contractor use, or other authorized hydrant uses occurred during the project. Lateral repairs in the Round Hill pressure zone resulted in minimal loss. Therefore, the resulting data were evaluated with little known interference from other factors.

Customer-Side Leaks. A surprisingly large percentage of total water usage in the Round Hill pressure zone was attributed to customer-side leaks. The leaks were identified by the absence of zero-consumption hourly readings over a 24-hr cycle. Forty percent of the customers had leaks that were recorded as a continuous flow of water. Typical leaks averaged between 1/8 gpm and ¼ gpm, common to toilet leaks, and amounted to 91 gal/household or about 12,500 gpd for the entire pressure zone. A 1/8-gpm leak equals about 1 ft^3/hr, the minimum unit recorded by most AMR-equipped meters. Ninety percent of the zone's meters recorded 1 ft^3 or greater resolution.

By comparison, the AMR system found only a few customer leaks—12 percent (19 of 156)—in the Holly pressure zone, although the actual leakage rate may have been much higher. Two of the 19 meters with recorded leaks measured water consumption in apartment buildings where the total leakage rate was 0.5 gpm and 2.5 gpm, respectively. The remaining 17 meters recording leakage were associated with customers on 5/8- and 1-in. meters. None of the 1.5-in. meters recorded any leakage. However, all 12 fourplexes connected to 1-in. meters recorded leaks. There are two likely reasons the smaller meters could record the leak rates and the 1.5-inch meters did not. The lower accuracy range of 5/8- and 1-in. meters (¼ gpm and ¾ gpm) listed in AWWA standards is lower than for 1.5-in. meters (1–1/2 gpm). The resolution of the electronic registers was 0.1 ft^3 (¾ gal) vs. 1.0 ft^3 (7.48 gal) of the 1.5-in. size.

The Round Hill zone, equipped with smaller meters than the Holly zone, allowed more precise leak measurement because the accuracy range of the meters was lower (¼ gpm to 20 gpm). However,

EBMUD found a surprising number of customer-side leaks within the two pressure zones.

David Wallenstein is an engineer with East Bay Municipal Utility District (www.ebmud.com), Oakland, Calif. Andrew Chastain-Howley is a consultant with Water Prospecting and Resource Consulting (www.wprconsulting.com), Fort Worth, Texas.

the resolution of most electronic meter registers in the Round Hill zone was 1.0 ft^3, requiring a continuous leak of at least ⅛ gpm to register. Utility personnel thought that customer leaks in the Holly zone's 1.5-in. meters were at least as prevalent as Round Hill leaks, although the leaks weren't being measured, because

- 40 percent of the Round Hill leaks were in homes of similar age and location.
- all 12 1-in. meters in fourplexes at a senior center in the Holly zone recorded leaks.
- two apartment buildings at the senior center in the Holly zone had identifiable leaks.
- none of the 127 1.5-in. meters recorded any leakage.
- senior center management completed toilet testing, found numerous leaks, and made necessary repairs after the study's completion.

EBMUD conducted a basic distribution system leakage survey in each pressure zone and found no major leaks. The district maintains a geographic information system-based record of all recorded main breaks; none were reported during the study period.

STUDY FINDINGS

During the study, losses varied significantly between the two pressure zones. The Holly zone had markedly more supply-side water loss than the Round Hill zone—20 percent vs. 8 percent of total system input. Holly also had more per-connection water loss than Round Hill—144 gpcd and 64 gpcd, respectively. However, both zones had significant customer-side leakage that was metered in Round Hill but undetected in Holly.

In the Round Hill zone, the results suggest that the SCADA system was the main source for recorded apparent losses; the system appeared relatively tight overall once this error was removed. The study also identified several high-use meters that were no longer working, most likely damaged by excessive flow over time. However, customer-side leaks still existed.

In the Holly zone, the results showed a good correlation between meter accuracy and water system losses. The problems were greatest above and below standard accuracy ranges. Low-flow periods had significant losses, but the largest volume problems appeared to occur during the highest flow conditions at the upper end of meter-flow accuracy ranges. A few major users were likely pumping far beyond the accuracy range of the in-place meters. For example, as recorded by the AMR system, one user was constantly pumping 78 gpm through a 1-in. meter during the summer.

High-flow conditions occurred only during irrigation season when there was a massive daily flow variation. Demand in the Holly zone was peak-driven by irrigation systems and unseasonably warm weather spikes.

A comparison of January and June hourly averages for the Holly zone during the project time period in 2006, when a more detailed review was conducted, illustrates:

- January data recorded consistent daily loss because of low-flow meter inaccuracy.
- June data recorded highly variable daily losses associated with high-flow meter inaccuracy.
- A large variation existed between average and peak water use, usually causing significant stress on the distribution infrastructure and meter performance.
- June water losses were greater in early morning hours when lawn irrigation peaked.
- The 10 largest users, who drove system demand and apparent losses, accounted for more than 60 percent of the peaks in this pressure zone.

Meter Testing. As part of the study, EBMUD also tested numerous meters outside of normal operation. However, the utility's meter-testing laboratory was designed to test meters in normal operating range, so limited tests were completed at various stable low-end flow

Consumption by Meter Size

Part of the study conducted by EBMUD involved completing several tests on meters outside of normal operation.

Round Hill Pressure Zone			Holly Pressure Zone		
Meter Size	Number of Meters	Average Daily Use*	Meter Size	Number of Meters	Average Daily Use*
⅝ in.	116	981	⅝ in.	13	1,216
¾ in.	6	1,905	¾ in.	0	–
1 in.	4	2,193	1 in.	13	1,445
1.5 in.	15	1,581	1.5 in.	127	741
			2 in.	6	6,797
			3 in.	1	26,780
Total	**141**	**1,103**	**Total**	**160**	**1,223**

*gpd calculated from 2004 annual consumption from bimonthly billing records

EBMUD is developing additional pressure zone balance studies using fixed-network AMR technology.

WATER AUDIT TOOLS OF THE TRADE

The East Bay Municipal Utility District used several tools to conduct a water system audit in two pressure zones to provide more specific information about water loss in the utility's system.

- **Demand Data.** Hourly data were downloaded from AMR-equipped customer meters.
- **Demand Calculation.** Hourly AMR data were summed to determine total customer demand.
- **Supply Data.** Hourly pumping plant and reservoir operating data were extracted from historical SCADA records and added to the database. The pressure zones didn't have regulated subzones, so there was no bulk outflow.
- **Supply Calculation.** Hourly system supply was calculated from hourly pumping and changes in reservoir storage.
- **Calibration.** SCADA data were corrected to detect system anomalies, loss of signal, and calibration errors. Pump-flow meters were calibrated to pump curves and reservoir fill rates. When typical loss rates were established, system accuracy was rechecked.
- **Time Shift.** When necessary, AMR data were shifted to accommodate daylight savings time and to match SCADA records.
- **Averaging.** A 3-hr rolling average was used to compare hourly demands measured by the SCADA and AMR systems.
- **Statistical Analysis.** Statistics were developed to measure the loss percentage as a function of month, pumping plant operation times, overall demand, several large-user demands, and other factors.
- **Meter Testing.** A few well-used meters and new or unused meters were shop-tested for accuracy at flows ranging from below and above design flow rates.
- **Pipeline Leak Detection.** Acoustic leak-detection equipment identified distribution pipeline or valve leaks.
- **Audits.** Customer audits verified there was no unmetered use.

rates, which weren't easily repeatable. Testing revealed:

- New 5/8-in. meters were 99 percent accurate at flows from 1/8 gpm to 30 gpm. Magnetic disconnect occurred at flows approaching 50 gpm.
- New 1-in. meters were 96 percent accurate at ¼ gpm and 100 percent accurate at 100 gpm.
- New 1.5-in. meters averaged 94 percent accuracy at ¼ gpm, but lower flow rates couldn't be tested.

Testing of six 5/8-in. used meters, all of which performed within standard ranges, revealed:

- One meter with more than 2.3 mil ft^3 of recorded consumption was slipping and reporting only about 2 percent in standard ranges.
- Another meter having more than 1.2 mil ft^3 of recorded consumption broke at 20 gpm.
- The remaining four meters tested at ⅛ gpm were 90–103 percent accurate; at ¼ gpm the meters were 95–98 percent accurate.
- One meter was tested to 38 gpm and found to be 96 percent accurate.

In addition, one used 1-in. meter with more than 700,000 ft^3 flowing through it during 16 mo was 70 percent accurate at 0.135 gpm and 84 percent accurate at 0.25 gpm. Various testing on 1.5-in. meters revealed:

- Three used 1.5-in. meters were tested at 0.171 gpm and found to be 10, 45, and 60 percent accurate, respectively.
- Another three meters were tested at 0.19 gpm and found to be 38, 75, and 80 percent accurate, respectively.
- A field test on an in-service meter at 1/25 gpm and 1/5 gpm showed no registration at the lowest flow rate and only 69 percent registration at 1/5 gpm.
- Meter accuracy generally increased with flow rate. Even without actual testing at these rates, however, it seems reasonable to assume that used 1.5-in. meters were less than 50 percent accurate at a slow leak rate of ⅛ gpm (0.125 gpm).

Meter Error. The test results suggest that 40 percent of 62 single-family homes and 50 fourplexes with 1.5-in. meters have system leaks that are being recorded at only 50 percent. Based on this assumption, gpd losses can be calculated as follows:

% of metered connections leaking × ⅛ gpm × 50 percent accuracy = gpd losses

$[0.40 \times (62 + 50)] \times 0.0125 \times 1{,}440 \times 0.50$ = 6,732 gpd lost in the pressure zone from customer-side low-flow leaks

This calculation considers only 1.5-in. meters and doesn't include meter errors or potential leaks in 48 remaining meters.

FINAL ANALYSIS

The field tests revealed that data analysis can be time consuming, especially if AMR and SCADA system data don't match. Manual data analysis and organization also required extra time.

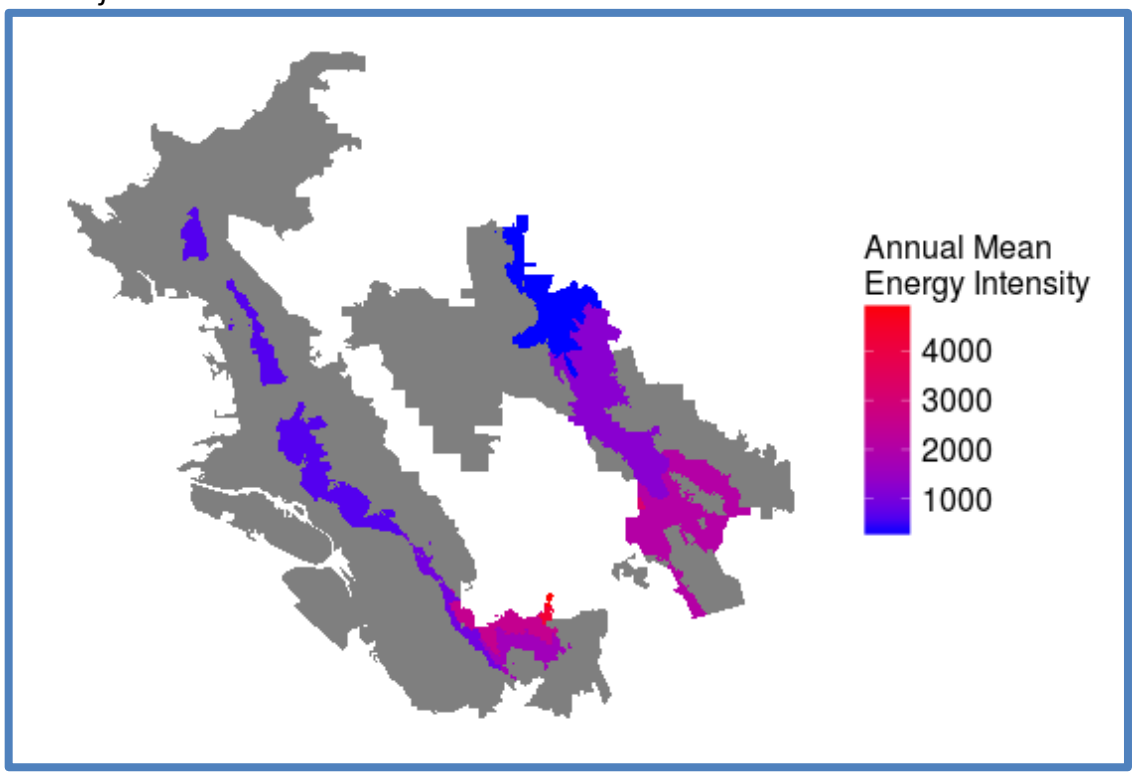
The Holly pressure zone had low-flow and high-flow meter recordings, with the top 10 users driving demand and creating the greatest stress on the infrastructure. When data coordination problems are resolved, a pressure zone audit can determine apparent water loss variations.

The Round Hill pressure zone had relatively low losses, and these were mainly due to SCADA calibration and individual meter failures. Several customer-side leaks were found, but these were metered and not a supply-side water loss.

Apparent losses are evident from graphical analysis. The leakage survey revealed no significant distribution system leaks within the pressure zones. Slow customer-side leaks, especially on large meters, are sleeping giants of system loss within pressure zones. Currently, EBMUD is developing additional pressure zone balance studies using fixed-network AMR technology.

A Statistical Approach to the Embedded Energy in Water: Understanding Variance in Space and Time Across Hydraulic Systems

ET Project Number: ET12PGE5411



Project Manager: Sam Newman
Pacific Gas and Electric Company

Prepared By: Edward Spang, Ph.D.
Frank Loge, Ph.D.
UC Davis Center for Water-Energy Efficiency
215 Sage St. Suite 200
Davis, CA 95616-7379

Issued: June 14, 2013

EXECUTIVE SUMMARY

PROJECT GOAL

The goal of this study is to develop and apply a method for providing a high-resolution characterization of the spatial and temporal variability of energy intensity in the East Bay Municipal Utility District (EBMUD) water system.

PROJECT DESCRIPTION

The water sector is an emerging target for energy efficiency (EE) efforts in the State of California (California Public Utility Commission Rulemaking 09-11-014). Effectively allocating EE dollars to water system energy savings requires a clear, defensible calculation of energy intensity (EI) within the hydraulic life cycle. Advancing the quality of design and ease of deployment of projects that save energy through targeted water conservation demands an improved confidence in these calculations. Specifically, understanding the spatial and temporal distribution of energy use in the water sector will allow for better prediction, targeting, and monitoring of energy savings through water conservation. Toward this end, the Center for Water-Energy Efficiency (CWEE) at UC Davis assessed the statistical variance of EI in space and time for the EBMUD water system.

PROJECT FINDINGS/RESULTS

The scale and diversity of the EBMUD service area make it an excellent case study for a high-resolution exploration of EI variability. The study revealed significant temporal and spatial variation in the EI calculations for EBMUD. The monthly EI values for "outdoor" water provision (including energy use for raw water pumping, water treatment, and distribution pumping) varied ~10–12% above and below the annual mean and for "indoor" water use (including energy use for wastewater collection and treatment) varied ~10–13% around the annual mean. The outdoor water provision EI peaked in October–November with a low in May–June. Indoor water use EI demonstrated a slight shift in seasonality, with a September–October peak and February–March lows.

To calculate spatial variation across the EBMUD system, CWEE focused on outdoor water provision alone. CWEE evaluated ten different pressure zones of varying size and elevation within the EBMUD service area. The average annual outdoor EI for the selected pressure zones ranged from a low value of 363 kWh/MG to a maximum value of 4,924 kWh/MG, with an average value for all pressure zones equaling 1,197 kWh/MG. As a rough estimate, the results showed that EI increased by approximately 1,000 kWh per 200 feet of pressure zone elevation.

PROJECT RECOMMENDATIONS

Based on the results of the study, CWEE recommends that EI estimates and measurements be calculated at sufficient resolution to represent appropriately the real temporal and spatial patterns of EI variation across a water system. At a minimum, temporal variability should be captured at the seasonal level, but we suggest monthly metrics be used whenever possible. Achieving monthly resolution should not be a major barrier for most water agencies, as energy consumption data are usually available every month in the form of their energy bill.

Concerning temporal resolution, we found that EI generally increases approximately 1,000 kWh/MG for every 200 feet of elevation. Hence, we suggest a rough heuristic of creating elevation-based pressure zone clusters for every 200 feet of average pressure zone elevation.

As anticipated, we learned that data of sufficient granularity for high-resolution energy intensity analysis already exist within the EBMUD SCADA (Supervisory Control And Distributed Acquisition) system. This

data are currently used for real-time operational control, but there is great potential to leverage the information contained with the SCADA system for other uses (including energy intensity measurement) – not only for EBMUD, but any other water utility currently operating a SCADA platform. Most important to this analysis, SCADA data provided both water flow and energy use data at hourly intervals across the majority of the operational components of the water system where energy is added to the water, e.g. at water pumping and treatment systems. Where energy data in the SCADA system are lacking (water treatment plants), we used data directly from the electricity provider, PG&E.

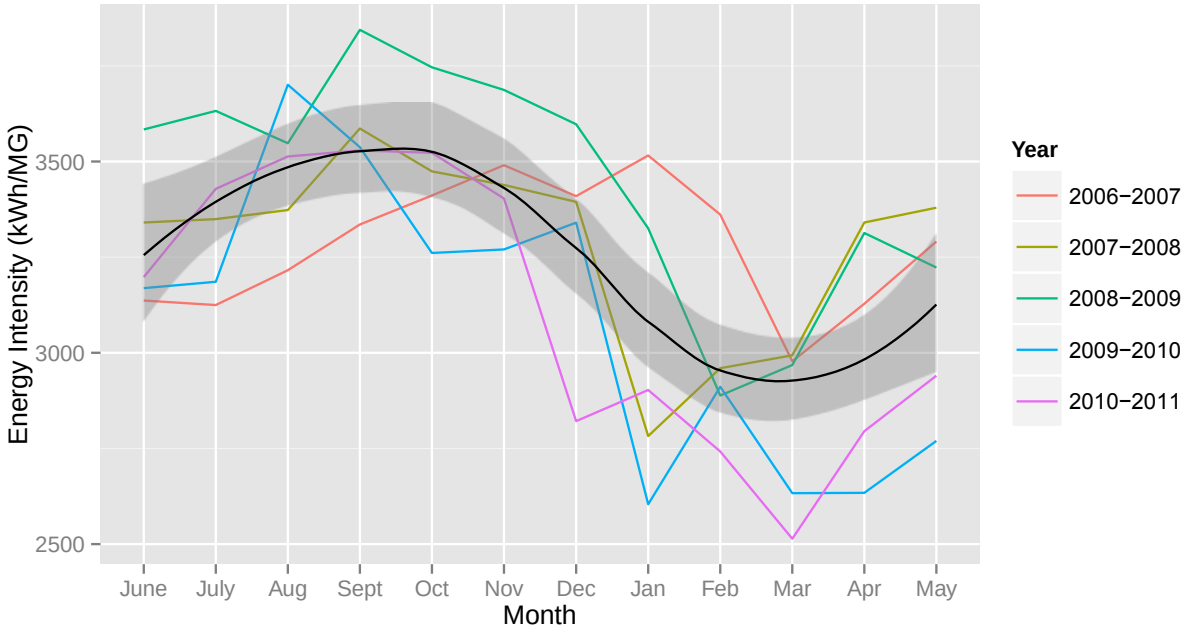


FIGURE 1. TEMPORAL EI VARIATION FOR EBMUD WATER LIFECYCLE (WATER & WASTEWATER SYSTEMS)

INTRODUCTION

The water sector is an emerging target for energy efficiency (EE) efforts in the State of California (California Public Utility Commission [CPUC] Rulemaking 09-11-014). While a number of existing EE programs have focused on the water sector for many years, most of these programs have focused on increasing the energy efficiency of component technologies, e.g. more efficient pumps, treatment technologies, and water heaters. Though these programs remain relevant today, the next generation of EE intervention is to derive energy savings through the direct conservation of water itself.

Programs designed to generate "embedded energy" savings are established with recognition that energy inputs are required at all stages of the water life-cycle: source extraction, potable treatment, distribution, end use, collection, and wastewater treatment. Hence, when water is conserved anywhere in the water cycle, associated upstream and downstream energy is conserved as well. This approach adds a layer of complexity to EE programs because it requires a systems-based understanding of the water infrastructure, as opposed to focusing on independent component technologies deployed within the system.

Therefore, effectively allocating EE dollars to water system conservation efforts requires a clear, defensible calculation of the energy embedded in the target water system. Improved

AWWA Free Water Audit Software: Reporting Worksheet

WAS v5.0

? Click to access definition
+ Click to add a comment

Water Audit Report for: East Bay Municipal Utility District
Reporting Year: 2014 (1/2014 - 12/2014)

Please enter data in the white cells below. Where available, metered values should be used; if metered values are unavailable please estimate a value. Indicate your confidence in the accuracy of the input data by grading each component (n/a or 1-10) using the drop-down list to the left of the input cell. Hover the mouse over the cell to obtain a description of the grades

All volumes to be entered as: MILLION GALLONS (US) PER YEAR

To select the correct data grading for each input, determine the highest grade where the utility meets or exceeds all criteria for that grade and all grades below it.

Master Meter and Supply Error Adjustments

WATER SUPPLIED

<---------- Enter grading in column 'E' and 'J' ---------->

	Grading	Value	Unit	Grading	Pcnt:	Value:	Unit
Volume from own sources:	9	61,527.200	MG/Yr	9			MG/Yr
Water imported:	10		MG/Yr				MG/Yr
Water exported:	10		MG/Yr				MG/Yr

Enter negative % or value for under-registration
Enter positive % or value for over-registration

WATER SUPPLIED: 61,527.200 MG/Yr

AUTHORIZED CONSUMPTION

Click here: ? for help using option buttons below

	Grading	Value	Unit	Pcnt:	Value:	Unit
Billed metered:	8	53,684.200	MG/Yr			
Billed unmetered:	n/a		MG/Yr			
Unbilled metered:	8	18.000	MG/Yr			
Unbilled unmetered:	6	109.600	MG/Yr		109.600	MG/Yr

Use buttons to select percentage of water supplied **OR** value

AUTHORIZED CONSUMPTION: 53,811.800 MG/Yr

WATER LOSSES (Water Supplied - Authorized Consumption) 7,715.400 MG/Yr

Apparent Losses

	Grading	Value	Unit	Pcnt:	Value:	Unit
Unauthorized consumption:	4	73.200	MG/Yr		73.200	MG/Yr
Customer metering inaccuracies:	6	1,978.000	MG/Yr		1,978.000	MG/Yr
Systematic data handling errors:	6	0.720	MG/Yr		0.720	MG/Yr

Apparent Losses: 2,051.920 MG/Yr

Real Losses (Current Annual Real Losses or CARL)

Real Losses = Water Losses - Apparent Losses: 5,663.480 MG/Yr

WATER LOSSES: 7,715.400 MG/Yr

NON-REVENUE WATER

NON-REVENUE WATER: 7,843.000 MG/Yr

= Water Losses + Unbilled Metered + Unbilled Unmetered

SYSTEM DATA

	Grading	Value	Unit	
Length of mains:	8	4,135.3	miles	
Number of active AND inactive service connections:	9	395,599		
Service connection density:		96	conn./mile main	
Are customer meters typically located at the curbstop or property line?		No		
Average length of customer service line:	10	0.0	ft	(length of service line, beyond the property boundary, that is the responsibility of the utility)
Average operating pressure:	3	83.0	psi	

COST DATA

	Grading	Value	Unit	
Total annual cost of operating water system:	10	$242,796,000	$/Year	
Customer retail unit cost (applied to Apparent Losses):	10	$6.85	$/1000 gallons (US)	
Variable production cost (applied to Real Losses):	5	$220.00	$/Million gallons	☐ Use Customer Retail Unit Cost to value real losses

WATER AUDIT DATA VALIDITY SCORE:

*** YOUR SCORE IS: 79 out of 100 ***

A weighted scale for the components of consumption and water loss is included in the calculation of the Water Audit Data Validity Score

PRIORITY AREAS FOR ATTENTION:

Based on the information provided, audit accuracy can be improved by addressing the following components:

1: Variable production cost (applied to Real Losses)
2: Volume from own sources
3: Unauthorized consumption

AWWA Free Water Audit Software:
System Attributes and Performance Indicators

Water Audit Report for: East Bay Municipal Utility District
Reporting Year: 2014 | 1/2014 - 12/2014

*** YOUR WATER AUDIT DATA VALIDITY SCORE IS: 79 out of 100 ***

System Attributes:

	Apparent Losses:	2,051.920	MG/Yr
+	Real Losses:	5,663.480	MG/Yr
=	Water Losses:	7,715.400	MG/Yr
?	Unavoidable Annual Real Losses (UARL):	2,475.46	MG/Yr
	Annual cost of Apparent Losses:	$14,047,444	
	Annual cost of Real Losses:	$1,245,966	Valued at Variable Production Cost

Return to Reporting Worksheet to change this assumpiton

Performance Indicators:

Financial:	Non-revenue water as percent by volume of Water Supplied:	12.7%	
	Non-revenue water as percent by cost of operating system:	6.3%	Real Losses valued at Variable Production Cost
Operational Efficiency:	Apparent Losses per service connection per day:	14.21	gallons/connection/day
	Real Losses per service connection per day:	39.22	gallons/connection/day
	Real Losses per length of main per day*:	N/A	
	Real Losses per service connection per day per psi pressure:	0.47	gallons/connection/day/psi
	From Above, Real Losses = Current Annual Real Losses (CARL):	5,663.48	million gallons/year
?	Infrastructure Leakage Index (ILI) [CARL/UARL]:	2.29	

* This performance indicator applies for systems with a low service connection density of less than 32 service connections/mile of pipeline

Attachment F -

RESOLUTION NO. 33692-08

AUTHORIZING ACCEPTANCE OF GRANTS AND EXECUTION OF GRANT AGREEMENTS TO FUND QUALIFYING DISTRICT PROJECTS

Introduced by Director Coleman ; Seconded by Director Foulkes

WHEREAS, from time to time the East Bay Municipal Utility District has an opportunity to accept grant funds available through public or private sources, which funds facilities and programs the District would otherwise be required to finance through other sources; and

WHEREAS, acceptance of such grant funds also require the execution of grant agreements; and

WHEREAS, under Resolution No. 33021-02, the Board of Directors authorized the General Manager to submit from time to time application materials as may be required to request grant funds for qualifying District programs and facilities and to execute application materials in a form approved by the General Counsel; and

WHEREAS, under Resolution No. 33021-02, the Board of Directors retained the authority to accept grant funds; and

WHEREAS, the Board of Directors has from time to time granted authority to the General Manager to accept individual grants and to execute individual grant agreements; and

WHEREAS, it would be in the best interest of the District to expand the General Manager's authority to generally accept certain grants and to execute certain grant agreements.

NOW, THEREFORE, BE IT RESOLVED that Resolution No. 33021-02 is hereby amended to authorize the General Manager to apply for and accept grants of funds not to exceed $500,000, to execute grant agreements for such grants in a form approved by the General Counsel, and to attach to said grant agreements, as required, a certified copy of this Resolution as evidence of such authorization.

BE IT FURTHER RESOLVED that Resolution No. 33021-02, except as amended above, shall remain in full force and effect and shall apply to grants that offer grant funds in excess of $500,000 and grants that require acceptance by the Board of Directors.

ADOPTED this 25th day of November, 2008 by the following vote:

AYES: Directors Coleman, Foulkes, Katz, Linney, Mellon, Patterson and President McIntosh.

NOES: None.

ABSENT None.

ABSTAIN: None.

President

ATTEST:

Secretary

APPROVED AS TO FORM AND PROCEDURE:

General Counsel

Attachment F -

RESOLUTION NO. 33021-02

AUTHORIZING EXECUTION AND SUBMISSION OF APPLICATIONS FOR LOANS AND GRANTS TO FUND QUALIFYING DISTRICT PROJECTS

Introduced by Director Coleman ; Seconded by Director Richardson

WHEREAS, from time to time, East Bay Municipal Utility District has an opportunity to apply for grant funds or low-interest loans available through public or private sources, which funds for district facilities and programs the district would otherwise have to finance through other sources; and

WHEREAS, it would be in the best interests of the district to submit timely applications for consideration for such grant funding and low-interest loans for qualifying projects; and

WHEREAS, application for a loan or grant funding does not constitute a commitment on the part of the district to accept an award of said funding nor to implement any project and, if the district is selected to receive grants or loans, the terms and conditions of such funding would be presented to the Board of Directors for review and consideration prior to acceptance.

NOW, THEREFORE, BE IT RESOLVED that the Board of Directors ("Board") does hereby authorize the General Manager to submit from time to time such application materials as may be required to request grant funds and low-interest loans for qualifying district programs and facilities and to execute application materials, in a form approved by General Counsel, and to attach to said application, as required, a certified copy of this Resolution as evidence of such authorization.

BE IT FURTHER RESOLVED that if EBMUD is offered funding, the terms and conditions of such funding shall be reviewed by the Board of Directors and the Board shall determine whether to authorize acceptance of the funds.

BE IT FURTHER RESOLVED that Resolution Nos. 33237-01, 33241-01, 33255-01, 33261-01, 33263-01, 33273-01, 33002-02, and 33292-02 remain in full force and effect.

ADOPTED this 13th day of August, 2002 by the following vote:

AYES: **Coleman, Linney, McIntosh, Mellon, Patterson, Richardson, Foulkes.**

NOES: **None.**

ABSENT: **None.**

ABSTAIN: **None.**

President

ATTEST:

Secretary

APPROVED AS TO FORM AND PROCEDURE:

General Counsel

W:\410 EBMUD BOARD\410.01 Resolutions\Grants & Loans 081302.doc

Attachment G -

United States Department of the Interior
INTERIOR BUSINESS CENTER
Indirect Cost Services
2180 Harvard Street, Suite 430
Sacramento, CA 95815

July 14, 2015

Mr. D. Scott Klein, Controller
East Bay Municipal Utility District
375 Eleventh Street, Mail Slot 402
Oakland, CA 94607

Dear Mr. Klein:

Enclosed is the signed original Negotiated Indirect Cost Rate Agreement that was processed by our office. If you have any questions concerning this agreement, please refer to the signature page for the name and contact number of the negotiator.

As a recipient of federal funds, the regulations require you to maintain a current indirect cost rate agreement. For provisional/final indirect cost rates, Indirect Cost Proposals should be submitted on an annual basis, and they are due within six (6) months after the close of your fiscal year. For predetermined rates and approved rate extensions, proposals are due in our office six (6) months prior to the expiration of your current rate agreement. Please note that proposals are processed on a first-in, first-out basis.

Common fiscal year end dates and proposal due dates are listed below:

Fiscal Year End Date	Proposal Due Date
September 30th	March 31st
December 31st	June 30th
June 30th	December 31st

Please visit our Web site at http://www.doi.gov/ibc/services/Indirect_Cost_Services for guidance and updates on submitting future indirect cost proposals. The website includes helpful tools such as a completeness checklist, indirect cost and lobbying certificates, sample proposals, Excel worksheet templates, and links to other Web sites.

Sincerely,

for Mark W. Steuart
Deborah A. Moberly
Office Chief

Enclosure

cc: Wilson Orvis, Grants Management Analyst, BOR

Ref: J:\States & Local Gov\Local Gov't & Water Districts\East Bay Municipal Utility District (Ebmuw733)\FY 14F 16P\Ebmu-IssueLtr.14F&16P.docx

Phone: (916) 566-7111
Fax: (916)566-7110
Email: ICS@ibc.doi.gov
Internet: http://www.doi.gov/ibc/services/Indirect_Cost_services

State and Local Governments
Indirect Cost Negotiation Agreement

EIN: 94-6000590

Organization:

East Bay Municipal Utility District
375 Eleventh Street, Mail Slot 402
Oakland, CA 94607

Date: July 14, 2015

Report No(s).: 15-A-0882(14F)
15-A-0883(16P)

Filing Ref.:
Last Negotiation Agreement
dated August 22, 2014

The indirect cost rates contained herein are for use on grants, contracts, and other agreements with the Federal Government to which 2 CFR Part 200 applies for fiscal years beginning on or after December 26, 2014 subject to the limitations in Section II.A. of this agreement. Applicable OMB Circulars and the regulations at 2 CFR 225 will continue to apply to federal funds awarded prior to December 26, 2014. The rates were negotiated by the U.S. Department of the Interior, Interior Business Center, and the subject organization in accordance with the authority contained in applicable regulations.

Section I: Rates

Type	Effective Period From	To	Rate*	Locations	Applicable To
Final	07/01/13	06/30/14	20.28%	All	All Programs
Provisional	07/01/15	06/30/16	20.28%	All	All Programs

***Base:** Total direct costs, less capital expenditures and passthrough funds. Passthrough funds are normally defined as payments to participants, stipends to eligible recipients, subcontracts and subgrants, all of which normally require minimal administrative effort.

Treatment of fringe benefits: Fringe benefits applicable to direct salaries and wages are treated as direct costs; fringe benefits applicable to indirect salaries and wages are treated as indirect costs.

Section II: General

A. **Limitations:** Use of the rate(s) contained in this agreement is subject to any applicable statutory limitations. Acceptance of the rate(s) agreed to herein is predicated upon these conditions: (1) no costs other than those incurred by the subject organization were included in its indirect cost rate proposal, (2) all such costs are the legal obligations of the grantee/contractor, (3) similar types of costs have been accorded consistent treatment, and (4) the same costs that have been treated as indirect costs have not been claimed as direct costs (for example, supplies can be charged directly to a program or activity as long as these costs are not part of the supply costs included in the indirect cost pool for central administration).

B. **Audit:** All costs (direct and indirect, federal and non-federal) are subject to audit. Adjustments to amounts resulting from audit of the cost allocation plan or indirect cost rate proposal upon which the negotiation of this agreement was based will be compensated for in a subsequent negotiation.

C. **Changes:** The rate(s) contained in this agreement are based on the organizational structure and the accounting system in effect at the time the proposal was submitted. Changes in organizational structure, or changes in the method of accounting for costs which affect the amount of reimbursement resulting from use of the rate(s) in this agreement, require the prior approval of the responsible negotiation agency. Failure to obtain such approval may result in subsequent audit disallowance.

D. **Rate Type:**

1. Fixed Carryforward Rate: A fixed carryforward rate is based on an estimate of the costs that will be incurred during the period for which the rate applies. When the actual costs for such periods have been determined, an adjustment will be made to the rate for future periods, if necessary, to compensate for the difference between the costs used to establish the fixed rate and the actual costs.

2. Provisional/Final Rates: Within six (6) months after year end, a final indirect cost rate proposal must be submitted based on actual costs. Billings and charges to contracts and grants must be adjusted if the final rate varies from the provisional rate. If the final rate is greater than the provisional rate and there are no funds available to cover the additional indirect costs, the organization may not recover all indirect costs. Conversely, if the final rate is less than the provisional rate, the organization will be required to pay back the difference to the funding agency.

3. Predetermined Rate: A predetermined rate is an indirect cost rate applicable to a specified current or future period, usually the organization's fiscal year. The rate is based on an estimate of the costs to be incurred during the period. A predetermined rate is not subject to adjustment. (Because of legal constraints, predetermined rates are not permitted for Federal contracts; they may, however, be used for grants or cooperative agreements.)

4. Rate Extension: Only final and predetermined rates may be eligible for consideration of rate extensions. Requests for rate extensions of a <u>current</u> rate will be reviewed on a case-by-case basis. If an extension is granted, the non-Federal entity may not request a rate review until the extension period ends. In the last year of a rate extension period, the non-Federal entity must submit a new rate proposal for the next fiscal period.

E. **Agency Notification:** Copies of this document may be provided to other federal offices as a means of notifying them of the agreement contained herein.

F. **Record Keeping:** Organizations must maintain accounting records that demonstrate that each type of cost has been treated consistently either as a direct cost or an indirect cost. Records pertaining to the costs of program administration, such as salaries, travel, and related costs, should be kept on an annual basis.

G. **Reimbursement Ceilings:** Grantee/contractor program agreements providing for ceilings on indirect cost rates or reimbursement amounts are subject to the ceilings stipulated in the contract or grant agreements. If the ceiling rate is higher than the negotiated rates in Section I of this agreement, the negotiated rates will be used to determine the maximum allowable indirect cost.

H. **Use of Other Rates:** If any federal programs are reimbursing indirect costs to this grantee/contractor by a measure other than the approved rate(s) in this agreement, the grantee/contractor should credit such costs to the affected programs, and the approved rate(s) should be used to identify the maximum amount of indirect cost allocable to these programs.

I. **Central Service Costs:** If the proposed central service cost allocation plan for the same period has not been approved by that time, the indirect cost proposal may be prepared including an amount for central services that is based on the latest federally-approved central service cost allocation plan. The difference between these central service amounts and the amounts ultimately approved will be compensated for by an adjustment in a subsequent period.

J. **Other:**

1. The purpose of an indirect cost rate is to facilitate the allocation and billing of indirect costs. Approval of the indirect cost rate does not mean that an organization can recover more than the actual costs of a particular program or activity.

2. Programs received or initiated by the organization subsequent to the negotiation of this agreement are subject to the approved indirect cost rate(s) if the programs receive administrative support from the indirect cost pool. It should be noted that this could result in an adjustment to a future rate.

3. Indirect cost proposals must be developed (and, when required, submitted) within six (6) months after the close of the governmental unit's fiscal year, unless an exception is approved by the cognizant agency for indirect costs.

Section III: Acceptance

Listed below are the signatures of acceptance for this agreement:

By the State & Local Government:

East Bay Municipal Utility District
State/Local Government

/s/
Signature
D. Scott Klein
Name (Type or Print)
Controller
Title
7-8-15
Date

By the Cognizant Federal Government Agency:

U.S. Department of the Interior
Agency

/s/
Signature
Deborah A. Moberly
Name
Office Chief
Office of Indirect Cost Services
Title
U.S. Department of the Interior
Interior Business Center
Agency
JUL 14 2015
Date
Negotiated by Elena Chan
Telephone (916) 566-7102

EAST BAY MUNICIPAL UTILITY DISTRICT

DATE: July 27, 2015

TO: Sophia Skoda, Acting Director of Finance

FROM: Scott Klein, Controller

SUBJECT: FY 2016 Rates for Paid Absence, Fringe Benefits and Overhead

Summary

Staff has completed the analysis of internal rates for fiscal year 2016. The details of the changes are described in the note below.

Paid Absence

The paid absence rate will remain unchanged at 22.25% for Water. The rate for Wastewater will increase to 22.25% to recover the under applied usage of FY15.

Fringe Benefits

The fringe benefits rate will remain unchanged at 71.75% for Water. The rate for Wastewater will slightly increase to 70.25% due to health costs increasing greater than labor costs.

Department Overhead

The Water and Wastewater department's overhead rate will decrease as a result of a reduction in total labor designated to overhead activities.

Administrative & General (A&G)

The A&G overhead rate for Water will decrease from 38.00% to 35.75%. This is attributed to a reduction in total labor designated to A&G activities. The rate for Wastewater will increase from 15.25% to 15.75% primarily due to a higher share of the joint A&G costs.

If you have questions, please call Lawrence Fan at extension 0258.

Attachment H. Letters of Support -

UNIVERSITY OF CALIFORNIA, DAVIS

BERKELEY • DAVIS • IRVINE • LOS ANGELES • MERCED • RIVERSIDE • SAN DIEGO • SAN FRANCISCO

SANTA BARBARA • SANTA CRUZ

CENTER FOR WATER-ENERGY EFFICIENCY
TEL (530) 754-5447
FAX (530) 752-6572

215 SAGE STREET, SUITE 200
DAVIS, CALIFORNIA 95616

January 19, 2016

Mr. Richard Harris
Manager of Water Conservation
East Bay Municipal Utility District
P.O. Box 24055
Oakland, CA 94623

RE: Support of USBR WaterSMART: Water and Energy Efficiency Grant for EBMUD's *Water and Energy Conservation through AMI* Project

Dear Richard:

The Center for Water-Energy Efficiency (CWEE) at the University of California, Davis is an academic leader working on identifying, developing, and testing innovative technologies and practices for aggressive improvements in water-energy efficiency; designing policies and outreach activities that facilitate market access and penetration of innovative water-energy conservation strategies and technologies; and serving as a collaborative hub for universities, industrial partners, and government agencies to advance water-energy research, education, technology development, and policy assessment.

As the faculty director of CWEE, I support EBMUD in your efforts to provide real-time, water consumption information via an Advanced Metering Infrastructure network and your grant application to further this important work. We strongly agree with EMBUD that greater deployment of Advanced Metering Infrastructure (AMI) combined with real-time data visualizations and analytics to customers will result in important water and energy savings across the utility. I also believe that EBMUD's position as an innovative leader among California water utilities makes you an excellent candidate to successfully administer a USBR WaterSMART grant. We look forward to the possibility of partnering with EBMUD on this very important project to develop strategies and practices that will optimize water and energy use.

Please feel free to contact me by phone at (530) 754-2297 or by email at fjloge@ucdavis.edu if you need any additional information about my support of your application for the WaterSMART grant.

Sincerely,

Frank Loge

Frank Loge, Ph.D., P.E.
Director, Center for Water-Energy Efficiency
Professor, Department of Civil and Environmental Engineering
Krone Endowed Professor in Environmental Engineering

SAN RAMON VALLEY UNIFIED SCHOOL DISTRICT
OPERATIONS SUPPORT SERVICES
Craig M. Cesco, Director of Maintenance & Grounds
3280 Crow Canyon Road, San Ramon, California 94583
(925) 824-1818 • FAX (925) 866-8131
CCESCO@SRVUSD.NET

January 14, 2016

Mr. Richard Harris
Manager of Water Conservation
East Bay Municipal Utility District
P.O. Box 24055
Oakland, CA 94623

RE: Support of USBR WaterSMART: Water and Energy Efficiency Grant for EBMUD's *Water and Energy Conservation through AMI* Project

Dear Mr. Harris:

As a representative of the San Ramon Valley USD I am in support of the East Bay Municipal Utility District (EBMUD) in its efforts to provide real time water consumption information via an Advance Metering Infrastructure network. I strongly believe that such real-time information will help conserve water and energy savings at our facilities. We have partnered with EBMUD on two similar projects that we believe helped optimize water use.

Having real-time water and energy consumption data available is very useful in identifying and quantifying water conservation such as leaks and higher than expected water use in our operations. The district tracks water consumption on a monthly basis which we find at times is not frequent enough to identify the source of a problem. Real-time data is useful in helping identify leaks as soon as they happen which in turn helps conserve water.

Sincerely

Craig M. Cesco
Director of Maintenance & Grounds
San Ramon Valley USD

Science For A Better Life

January, 15, 2016

Mr. Richard Harris
Manager of Water Conservation
East Bay Municipal Utility District
P.O. Box 24055
Oakland, CA 94623

RE: Support of USBR WaterSMART: Water and Energy Efficiency Grant for EBMUD's *Water and Energy Conservation through AMI* Project

Dear Mr. Harris:

Bayer HealthCare of Berkeley supports the East Bay Municipal Utility District's (EBMUD) in its efforts to provide real time water consumption information via an Advanced Metering Infrastructure network. Bayer HealthCare of Berkeley strongly believes that such real-time information will advance water and energy savings at our facilities. We look forward to partnering with EBMUD on this very important project to develop strategies and practices that will optimize water and energy use.

Bayer HealthCare of Berkeley believes that having real-time water and energy consumption data available will be very useful in more easily identifying and quantifying water conservation opportunities such as leaks and unintentional or higher than expected water uses in our operations. We normally track water consumption on a monthly basis which we sometimes find is not frequent enough to identify the source of the problem. Real-time data will be more useful in helping in identifying the real water uses of our specific operations and help us select the most cost effective water and energy efficient equipment and practices for our facilities on a long term basis.

Sincerely,

Ron Roberts
Principal Engineer

Bayer HealthCare LLC
BHC-PS-BT-SC BR-ENGI-CENT, Central Utilities
Building B56, Room 47
94701-1986, Berkeley, USA

Tel: +1 510 705 4826
Fax: +
Mobile: +
E-mail: ron.roberts@bayer.com
Web: http://www.bayer.com

January 19, 2016

Mr. Richard Harris
Manager of Water Conservation
East Bay Municipal Utility District
P.O. Box 24055
Oakland, CA 94623

RE: Support of USBR WaterSMART: Water and Energy Efficiency Grant for EBMUD's *Water and Energy Conservation through AMI* Project

Dear Mr. Harris:

Jamba Juice ® supports the East Bay Municipal Utility District's (EBMUD) in its efforts to provide real time water consumption information via an Advanced Metering Infrastructure network. Jamba ® strongly believes that such real-time information will advance water and energy savings at our facilities. We look forward to partnering with EBMUD on this very important project to develop strategies and practices that will optimize water and energy use..

Jamba believes that having real-time water and energy consumption data available will be very useful in more easily identifying and quantifying water conservation opportunities such as leaks and unintentional or higher than expected water uses in our operations. We normally track water consumption on a monthly basis which we sometimes find is not frequent enough to identify the source of the problem. Real-time data will be more useful in helping in identifying the real water uses of our specific operations and help us select the most cost effective water and energy efficient equipment and practices for our facilities on a long term basis.

Sincerely,

Rachael Kirk
Manager, Corporate Responsibility
& Field Marketing
Jamba Juice Company
510.407.9022 (c)

ClubSport
San Ramon

January, 15, 2016

Mr. Richard Harris
Manager of Water Conservation
East Bay Municipal Utility District
P.O. Box 24055
Oakland, CA 94623

RE: Support of USBR WaterSMART: Water and Energy Efficiency Grant for EBMUD's *Water and Energy Conservation through AMI* Project

Dear Mr. Harris:

Clubsport of San Ramon is a large multi-purpose Health Club. We support the East Bay Municipal Utility District (EBMUD) in its efforts to provide real time water consumption information via an Advanced Metering Infrastructure network. We strongly believe that such real-time information will advance water and energy savings at our facilities. We average 29,000 gallons a day. We look forward to partnering with EBMUD on this very important project to develop strategies and practices that will optimize water and energy use..

We believe that having real-time water and energy consumption data available will be very useful in more easily identifying and quantifying water conservation opportunities such as leaks and unintentional or higher than expected water uses in our operations. We normally track water consumption on a monthly basis which we sometimes find is not frequent enough to identify the source of the problem. Real-time data will be more useful in helping in identifying the real water uses of our specific operations and help us select the most cost effective water and energy efficient equipment and practices for our facilities on a long term basis.

Sincerely,

Lawson Bill

Lawson Bill
Controller
Clubsport of San Ramon
350 Bollinger Canyon Ln
San Ramon CA 94582

Saint Mary's College of California
1928 St. Mary's Road
PMB 4747
Moraga, CA 94575
tel. 925.631.4286 fax 925.247.0837
www.stmarys-ca.edu

Facilities Services

January 15, 2016

Mr. Richard Harris
Manager of Water Conservation
East Bay Municipal Utility District
P.O. Box 24055
Oakland, CA 94623

RE: Support of USBR WaterSMART: Water and Energy Efficiency Grant for EBMUD's *Water and Energy Conservation through AMI* Project

Dear Mr. Harris:

Saint Mary's College of California (SMC) supports the East Bay Municipal Utility District (EBMUD) in its efforts to provide real time water consumption information via an Advanced Metering Infrastructure network. SMC strongly believes that such real-time information will advance water and energy savings at our campus. We look forward to partnering with EBMUD on this very important project to develop strategies and practices that will optimize water and energy use.

SMC believes that having real-time water and energy consumption data available will be very useful in more easily identifying and quantifying water conservation opportunities, such as leaks and unintentional or higher than expected water uses on our campus. We normally track water consumption on a monthly or less frequent basis, which we sometimes find is not frequent enough to identify the source of the problem. Real-time data will be more useful in helping us identify the real water uses of our specific operations and help us select the most cost effective water and energy efficient equipment and practices for our campus on a long term basis.

Sincerely,

Safa Toma
Director, Environmental Health & Safety

Pacific Gas and Electric Company
P.O. Box 770000
San Francisco, CA 94177-1490

January, 15, 2016

Mr. Richard Harris
Manager of Water Conservation
East Bay Municipal Utility District
P.O. Box 24055
Oakland, CA 94623

RE: Support of USBR WaterSMART: Water and Energy Efficiency Grant for EBMUD's *Water and Energy Conservation through AMI* Project

Dear Mr. Harris:

Pacific Gas And Electric (PG&E) supports the East Bay Municipal Utility District (EBMUD) in its efforts to provide real time water consumption information via an Advanced Metering Infrastructure network. PG&E strongly believes that such real-time information will advance water and energy savings at our facilities. We look forward to partnering with EBMUD on this very important project to develop strategies and practices that will optimize water and energy use.

PG&E believes that having real-time water and energy consumption data available will be very useful in more easily identifying and quantifying water conservation opportunities and in assessing the potential of behavior-based interventions to reduce water usage, peak energy usage, and total energy usage.

Sincerely,

Susan Norris
Senior Manager, Energy Efficiency Products
Pacific Gas & Electric Company
o 415.973.1421

SECTION 28

WATER USE DURING WATER SHORTAGE EMERGENCY CONDITION

Drought conditions require that all customers reduce their 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.

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 their 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 their 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.

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 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.

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.

PACIFIC GAS AND ELECTRIC COMPANY

Water AMI Integration Draft Pilot Project Proposal

January 2016

Executive Summary

The California Public Utilities Commission (CPUC) has issued a ruling requiring Investor-Owned Utilities (IOUs) to propose pilot projects that explore the technical challenges of water agencies "piggybacking" on the IOU electric/gas infrastructure to obtain water smart meter data for advancing water conservation programs.

In response to this ruling, PG&E provides a preliminary conceptual proposal for a pilot project that aims to analyze behavior-based water interventions and their impact on reducing water usage, peak energy usage, and total energy usage. The project will do this by assessing the value of integrating smart water meters into its existing Advanced Metering Infrastructure (AMI) and providing customers with real-time water use reporting. This project will require close collaboration with a water utility as well as with a third-party water-energy data analytics provider. The project will also require recruitment of participating customers, and agreement between PG&E and the participating water utility on protections for customer privacy and information security, as well as appropriate cybersecurity protections for any access to PG&E's utility networks and AMI. In addition, the CPUC will need to approve any necessary rate changes to ensure full recovery of the reasonable costs of the pilot from utility customers.

Evaluation of water-energy savings will be carried out by studying the water, electric, and gas usage of roughly 1,500-2,000 Residential sector customers in PG&E's (and its partner water utility's) service territory who volunteer to participate in the pilot. Among the 1,500-2,000 households studied, 1,000 households will receive smart water meters (either new or via retrofit to existing meters) that communicate usage data via the PG&E gas AMI. The project will use a treatment and control group approach; random assignment of households into various groups will allow for the attribution of differences in behavior to the interventions.

The initial budget estimate for the project is between $350,000 and $400,000− final numbers will depend on the selected project partners and whether existing water meters can be retrofitted or if new smart water meters are required. The projected pilot duration is between 18-24 months, inclusive of the time required to retrofit/install the hardware, conduct a 12 month-long observation, analyze the data, and publish the final report for broad dissemination.

1- A specific statement of the concern, gap, or problem that the pilot seeks to address and the likelihood that the issue can be addressed cost-effectively through utility programs. This statement should include any market research done to support the statement of gap and the solution proposed.

As part of its Water-Energy Nexus Proceedings, the California Public Utilities Commission (CPUC) adopted Decision 15-09-023 that provides tools to better quantify the benefits of water savings. These new calculators should

ATTACHMENTS FORM

Instructions: On this form, you will attach the various files that make up your grant application. Please consult with the appropriate Agency Guidelines for more information about each needed file. Please remember that any files you attach must be in the document format and named as specified in the Guidelines.

Important: Please attach your files in the proper sequence. See the appropriate Agency Guidelines for details.

1) Please attach Attachment 1	Water Energy AMI 2016-Final d	Add Attachment	Delete Attachment	View Attachment
2) Please attach Attachment 2		Add Attachment	Delete Attachment	View Attachment
3) Please attach Attachment 3		Add Attachment	Delete Attachment	View Attachment
4) Please attach Attachment 4		Add Attachment	Delete Attachment	View Attachment
5) Please attach Attachment 5		Add Attachment	Delete Attachment	View Attachment
6) Please attach Attachment 6		Add Attachment	Delete Attachment	View Attachment
7) Please attach Attachment 7		Add Attachment	Delete Attachment	View Attachment
8) Please attach Attachment 8		Add Attachment	Delete Attachment	View Attachment
9) Please attach Attachment 9		Add Attachment	Delete Attachment	View Attachment
10) Please attach Attachment 10		Add Attachment	Delete Attachment	View Attachment
11) Please attach Attachment 11		Add Attachment	Delete Attachment	View Attachment
12) Please attach Attachment 12		Add Attachment	Delete Attachment	View Attachment
13) Please attach Attachment 13		Add Attachment	Delete Attachment	View Attachment
14) Please attach Attachment 14		Add Attachment	Delete Attachment	View Attachment
15) Please attach Attachment 15		Add Attachment	Delete Attachment	View Attachment