Parker Water & Sanitation District
Phase 1
Meter Replacement Program
Water Efficiency Grant Final Report

December 2017

Meter Replacement Program Team

DISTRICT MANAGER: Ron R. Redd
ENTERPRISE SERVICES DIRECTOR: Steve Hellman, CFO
Billie Owens, Customer Relations Manager
Emily Coll/Chris White/Ray Rodriguez, AMI Coordinator
Randy Hellinger/Nikki Hoyt, Field Services Supervisor
Guy Fittje, Billing Administrator
Ken Boliba, Senior Field Service Specialist
Debra Laschanzky, Administrative Support Assistant

Parker Water & Sanitation District
Meter Replacement Program
Water Efficiency Grant Final Report

Table of Contents

APPENDICES

Section 1 – Background

Section 1.1 – Project Purpose

As part of Parker Water & Sanitations' (PWSD's) sustainable water initiative, which considers:

- The Colorado Water Plan (2015);
- Parker Water and Sanitation District's (PWSD) 2014 Water & Wastewater Master Plan;
- PWSD's 2015 Long Term Water Supply Plan; and
- PWSD's 2016 Water Efficiency Plan;

PWSD evaluated the effectiveness of Advanced Metering Infrastructure (AMI) technology. The District faced three challenges:

1. Aging water metering infrastructure;
2. Meter reading being conducted once per month, with the majority of meter reading being manually read walking routes; and
3. Remaining automated meter reading (AMR) batteries coming to the end of their useful life.

Recognizing the benefits of current best practices and technology, PWSD defined the following objectives:

- Improve water accounting methods via:
  - ⇨ Replacement of aging metering infrastructure;
  - ⇨ Improve water loss accounting methods through technological innovations;
  - ⇨ Develop best management practices in terms of water accounting and system wide water audits;
  - ⇨ Implement asset/infrastructure maintenance programs;
- More effectively inform water system operations for:
  - ⇨ Production;
  - ⇨ Treatment;
  - ⇨ Distribution; and
  - ⇨ Demand management;
- More effectively inform engineering for:
  - ⇨ Water infrastructure modeling
  - ⇨ Design; and
  - ⇨ Capital program development
- More effectively inform financial management by:
  - ⇨ More effectively project related revenues from water demands;
  - ⇨ Improve billing and rate structure modeling;
- More effectively inform customers to:

- ⇨ Quickly detect leaks
- ⇨ Better self-manage water consumption
- ⇨ Reduce water waste

- Reduce vehicle operational costs and employee safety incidents due to weather and vehicle operation

Section 1.2 – Project Planning

In 2016, the District committed to an 8 year, $6.2M capital improvement program to replace nearly 14,800 meters, both non-single family (NSFR) and single-family residential (SFR)meters.

TABLE 1 – Meter Replacement Phasing Plan

PWSD Meter Replacement Program Phasing Plan						
Phase	PWSD Funding	CWCB Funding	Communication Tower Installation	Software Integrations	NSFR Meter Installation	SFR Meter Installation
1	$1,225,000	$50,000	3-Towers & TGBs	Sensus, AquaHawk, BillMaster	634	61
2	$2,500,000	N/A	N/A	Additional AquaHawk Integration	575	6,656
3	$2,475,000	N/A	N/A	Potential Additional AquaHawk Integration	N/A	6850
					1,209	13,567

PWSD partnered with the Colorado Water Conservation Board through receipt of a $50,000 grant that has gone towards implementing the first phase of the District's program.

FIGURE 1 – Project Milestones

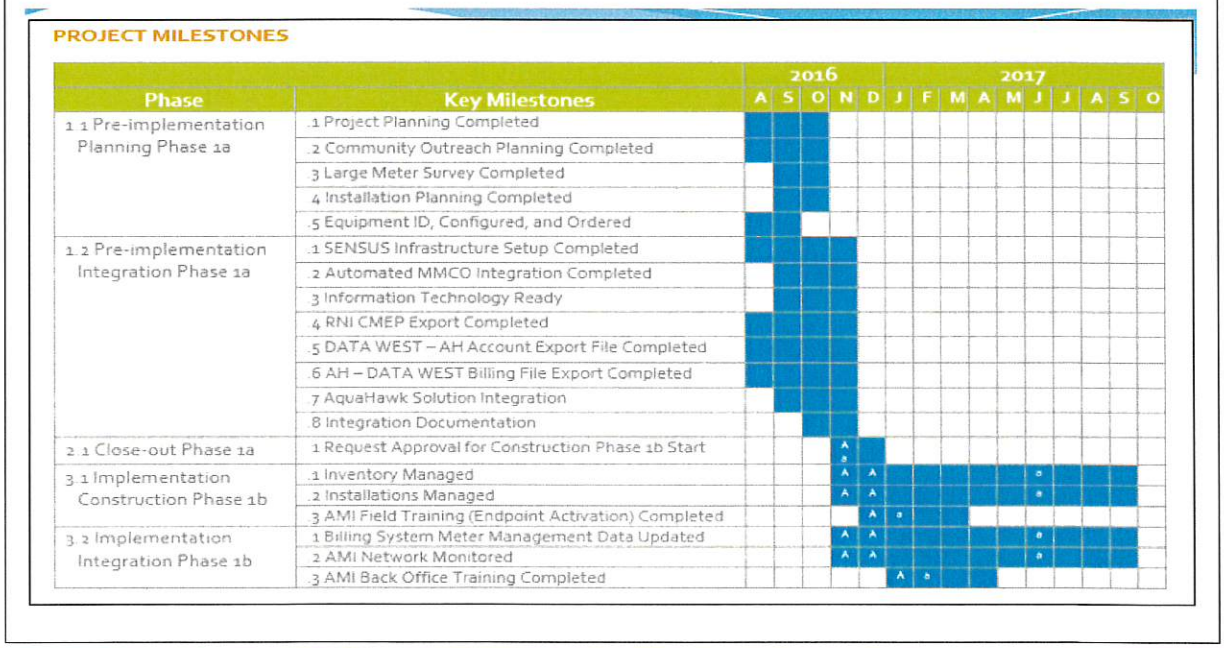


Figure 1 represents the project milestones for Phases 1 and 2. Appendix A is the Phase 2 meter reading route installation plan.

Section 2 – Project Implementation

Section 2.1 – Selection Process

In the last quarter of 2015, the District put out a request for proposals (RFP) to provide AMI infrastructure, systems, meter replacement and implementation services. Responses did not adequately address the District's functional requirements and needs. The RFP was revised and sent out again in the spring of 2016. Seven proposals were received, four vendor presentations were provided. Submittals were scored via a proposal evaluation matrix based on functional requirements, qualifications and preferences.

Staff went to the District Board of Directors for approval to enter into contract negotiations, and contracts were executed in 2016 as follows:

- Sensus – Advanced Metering Infrastructure Agreement for Spectrum Management Lease, purchase of AMI equipment through Dana Kepner Company, and Software as a Service for the Regional Network Interface
- XtraLight Manufacturing Ltd, Dba Utility Metering Solutions – For project management services and meter retrofit
- American Conservation & Billing Solutions – Software as a Service Managed Services Agreement for AquaHawk Alerting

Section 2.2 - Installation

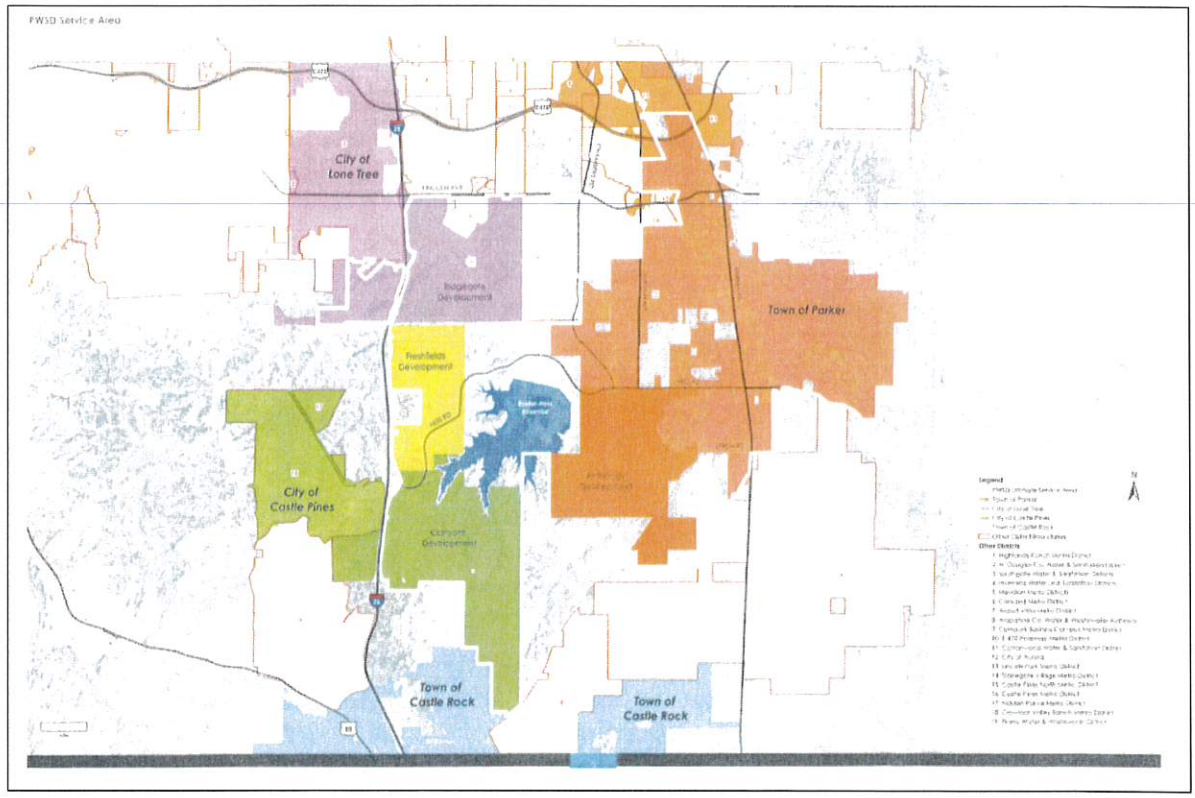
Section 2.2.1 Communication infrastructure – The type of communication infrastructure was a significant functional requirement for the District. Mesh systems can be effective in areas where infrastructure is owned by the water provider, for example in a municipality, or if managing several utilities, including gas and electric. While the District owns infrastructure across the service area, the mesh functionality would have reduced the District's reliability. In this case, the fixed-base approach seemed more effective.

The Sensus solution that was implemented was the FlexNet Communications Network. This is a two-way communications system that allows information to be received from the meters, and commands to be issued remotely to the meters in the field. The communication stations consist of a fixed base collection tower with antennas and a base station that connects to meter endpoints. PWSD leased primary use radio spectrum frequency from Sensus.

Sensus radio frequency engineers conducted a propagation study of the District's service area to determine the number, type, elevation and other antenna and base station requirements.

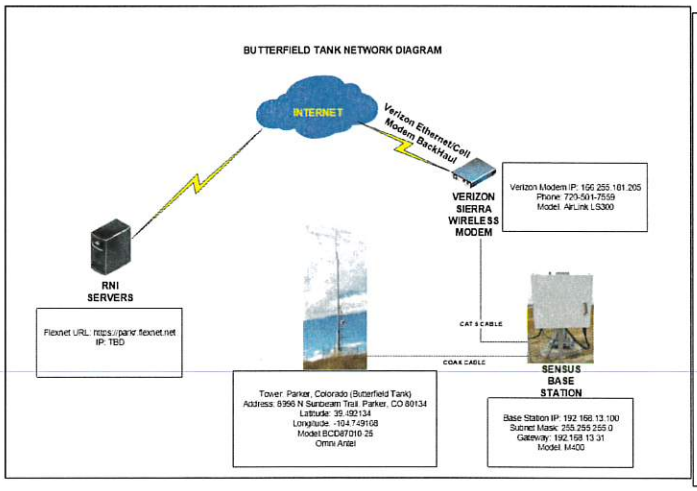
Topographical information, PWSD facility addresses, and GIS information was provided. Field verification also occurred.

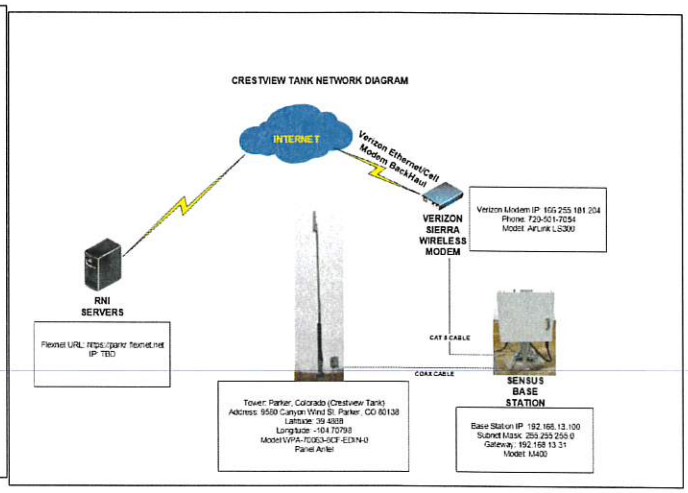
FIGURE 1 – PWSD SERVICE AREA



Via the propagation study, it was deemed that at this time three base stations would provide coverage for the majority of current and future metering infrastructure. An additional station will be required with the Canyons development in the southern portion of the District.

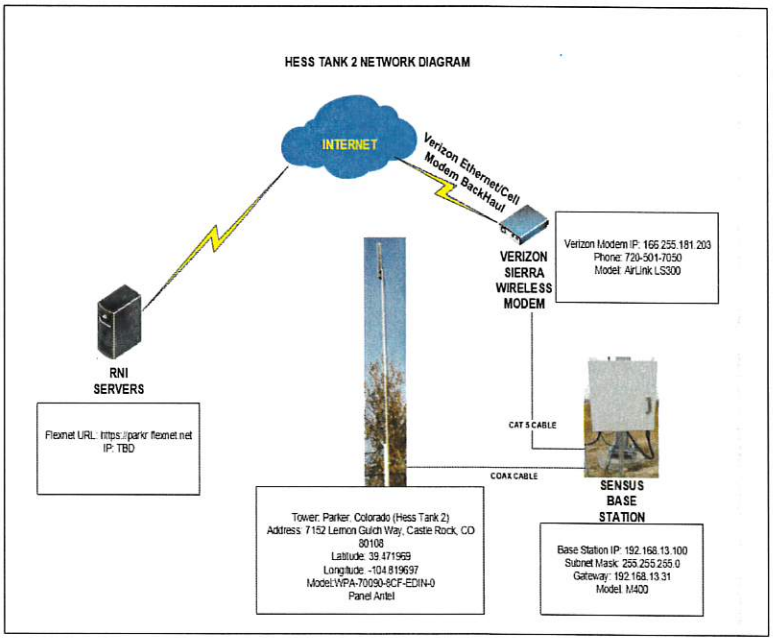
FIGURE 2 – BUTTERFIELD/CRESTVIEW/HESS TANK 2 TANK NETWORK DIAGRAM





Each facility includes a tower, antenna, and the base station.

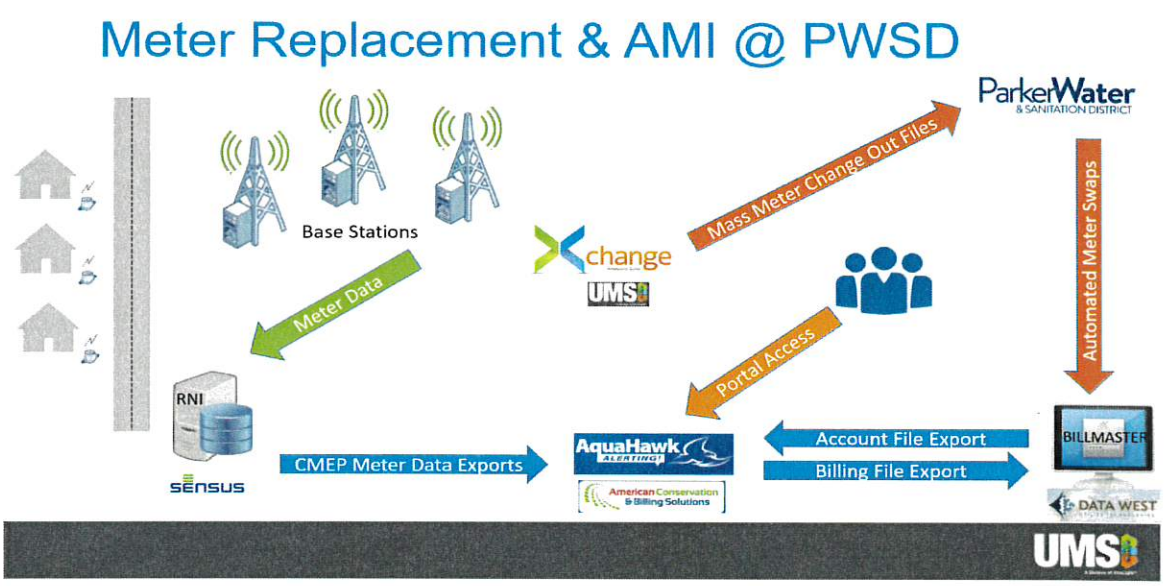
All stations were installed on PWSD property at high points throughout the District, consisting mainly of existing water tank locations. Installation required running electrical service, which was performed by PWSD maintenance staff and contracted electricians. Local contractors, KNS, assisted with deploying the wireless system, also working with PWSD IT to ensure there would be no interference with existing or future Supervisory Control and Data Acquisition (SCADA) infrastructure. Connectivity is facilitated through Verizon Ethernet connection for data backhaul.



Section 2.2.2 Software integrations – PWSD contracted for software services as follows:

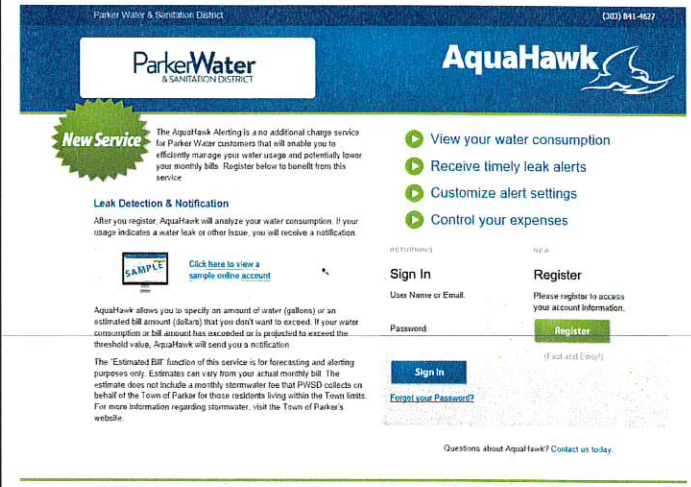
Sensus for Software as a Service (SAAS) managed services agreement for metering data managed through a proprietary cloud based Regional Network Interface (RNI). The RNI communicates with meter endpoints using two-way communications. The RNI receives and stores metering information, providing some level of metering infrastructure analytics related to consumption, alarms, and system health/connectivity, etc. The RNI also can issue commands to the endpoints, such as real time meter readings. This network also communicates metering data with the American Conservation and Billing Solutions AquaHawk Alerting software solution.

FIGURE 3 – Infrastructure and Software Integration Graphic



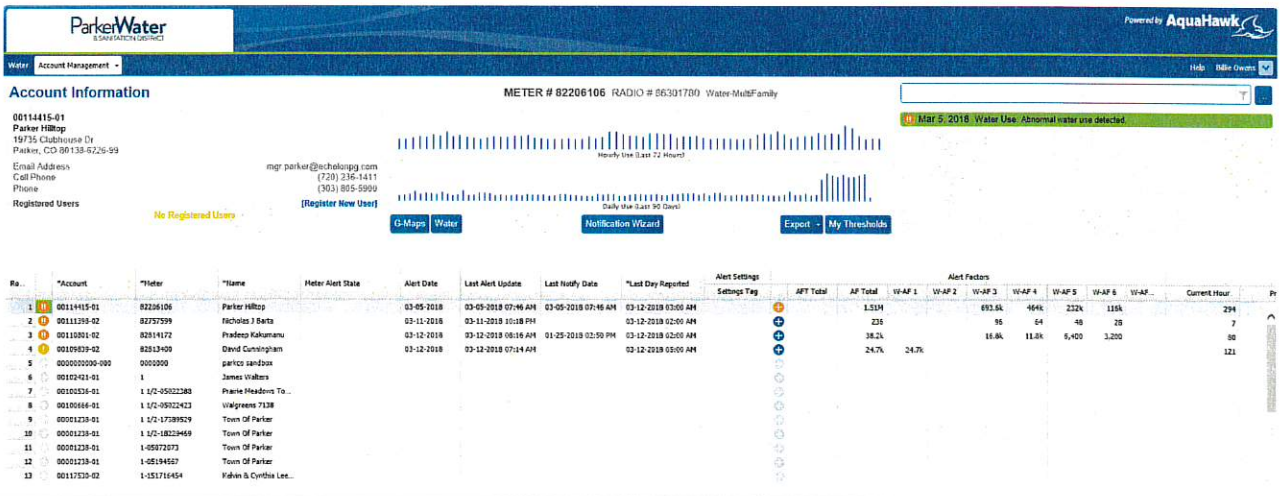
American Conservation & Billing Solutions for SAAS managed services for a customer portal and data analytics solution, known as AquaHawk Alerting. Account information is pushed on a regular basis from the billing software, a DataWest product known as BillMaster. AquaHawk also receives metering information from the RNI, and then presents that information for customers, billing and administrative uses. Meter reads are also imported from AquaHawk into the billing system for monthly billing purposes. Meter readings for final billing as customer properties are sold are also either acquired from the RNI or AquaHawk.

FIGURE 4 – AquaHawk Alerting (Customer Portal)



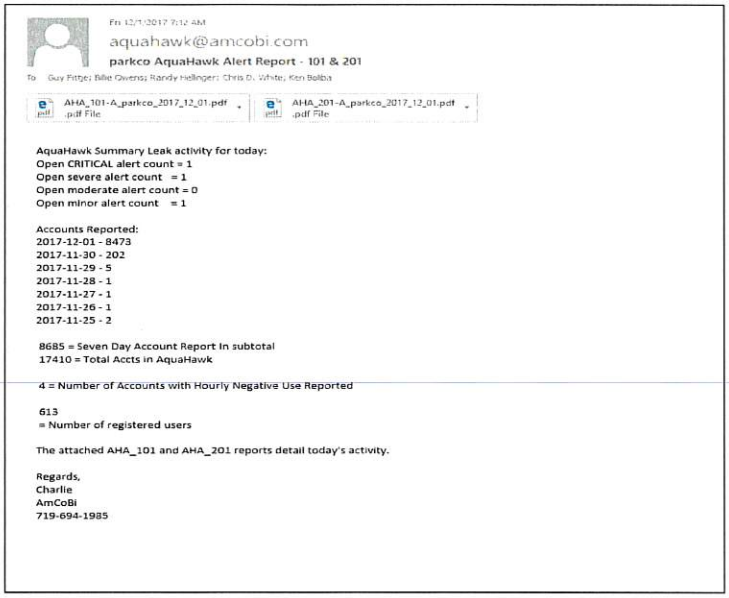
AquaHawk also provides an interface by which customer account alerts for high usage and potential leaks are generated. Figure 5 is an example of the AquaHawk account management screen. PWSD staff reviews alerts on a daily basis and can notify customers via several contact options using the messaging system in the portal.

FIGURE 5 – AquaHawk Account Management Screen



AquaHawk Alerting also sends a daily summary report to all authorized PWSD employees that summarizes leak activity, number of accounts reporting, and other data. Figure 6 provides examples of information that is received and reviewed daily.

FIGURE 6 – AquaHawk Daily Summary Snapshot



Fri 12/1/2017 7:12 AM
aquahawk@amcobi.com
parkco AquaHawk Alert Report - 101 & 201
To: Guy Fritz; Billie Owens; Randy Hellinger; Chris D. White; Ken Bolibo

AHA_101-A_parkco_2017_12_01.pdf .pdf File
AHA_201-A_parkco_2017_12_01.pdf .pdf File

AquaHawk Summary Leak activity for today:
Open CRITICAL alert count = 1
Open severe alert count = 1
Open moderate alert count = 0
Open minor alert count = 1

Accounts Reported:
2017-12-01 - 8473
2017-11-30 - 202
2017-11-29 - 5
2017-11-28 - 1
2017-11-27 - 1
2017-11-26 - 1
2017-11-25 - 2

8685 = Seven Day Account Report In subtotal
17410 = Total Accts in AquaHawk

4 = Number of Accounts with Hourly Negative Use Reported

613
= Number of registered users

The attached AHA_101 and AHA_201 reports detail today's activity.

Regards,
Charlie
AmCoBi
719-694-1985

FIGURE 6 – AquaHawk Alerting Notifications

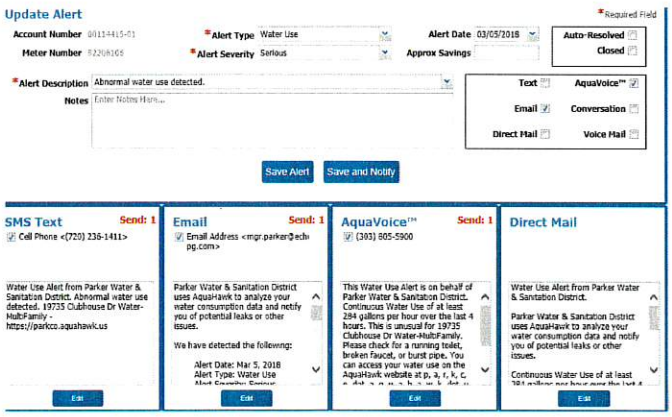


Figure 7 is an example of a customer's threshold management screen. For managed properties, such as irrigation or multifamily properties, the account owner can authorize other entities to access their usage information and set up their own customized alerts. This has proven to be very useful information to HOA's and their landscape/irrigation contractors.

Appendix B provides examples of daily summary reports on system activity and leak reporting.

Figure 7 is an example of the methods of notification PWSD has available to contact customers that have alerts.

Customers can also register themselves and set up their own customizable alerts based on several different criteria:

- An estimated dollar amount threshold
- A water use in gallons amount threshold; and
- Number of gallons per time period, which assists with determining whether a customer has a leak.

The customer can select their preferred method of contact.

FIGURE 7 – Example of Customizable Customer Thresholds

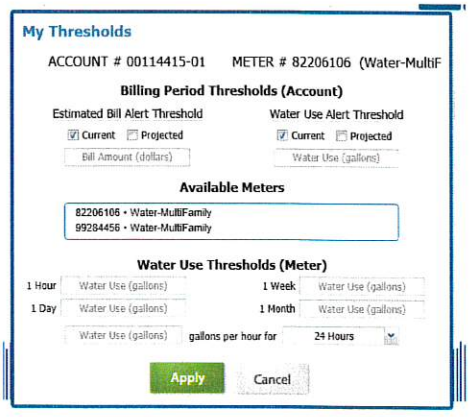
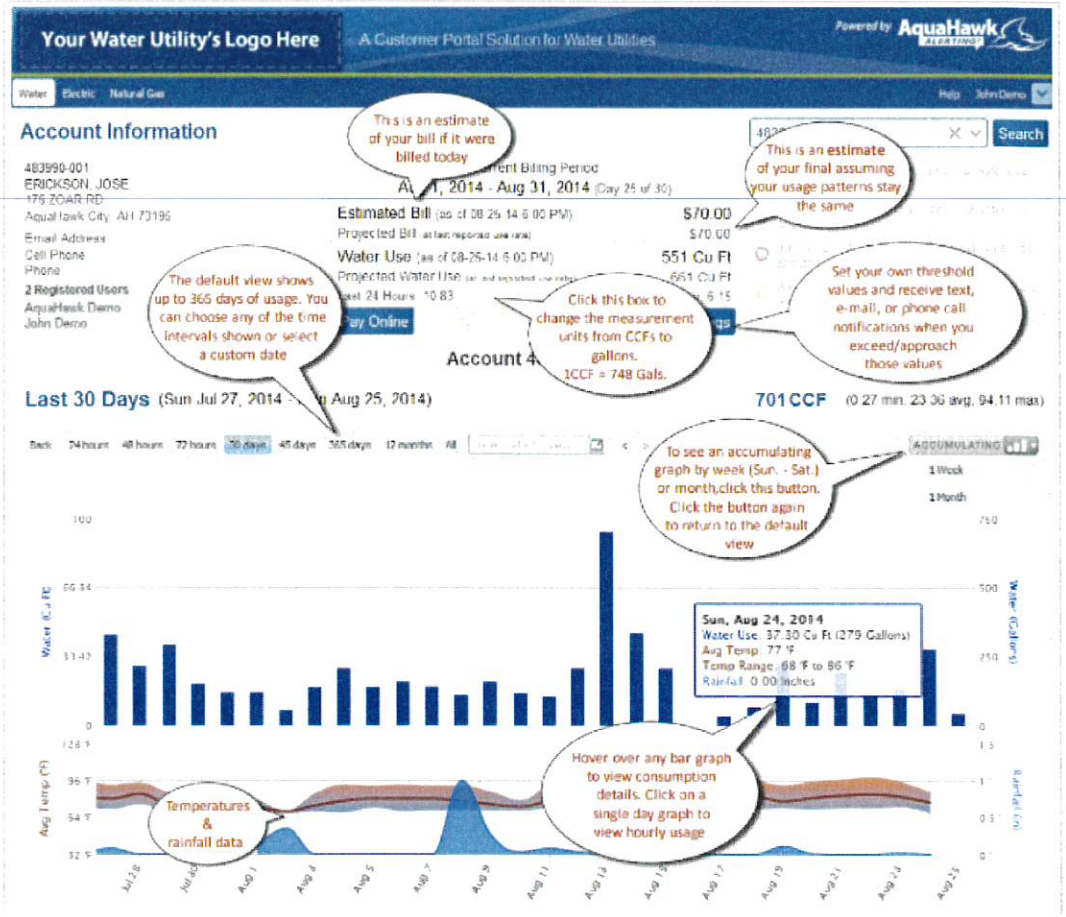


Figure 8 gives an overview of the AquaHawk Alerting portal screen, including information that is available to the customer such as:

FIGURE 8 – AquaHawk Alerting Customer Portal Overview



- Use for the last 365 days down to hourly use increments
- Estimated usage and billing costs based on current usage patterns
- A history of any alerts that have been registered
- A section for notes from the customer to the District, or to others that they have allowed to register on the account. This provides a method for contractors to communicate to HOA's, or to the District regarding leaks or abnormal usage.
- Temperature and rainfall data from a local weather station. This helps a customer correlate their usage with the weather.

UMS XChange Software – UMS used a proprietary import/export software by which new meter change out information could be linked to customer accounts in the billing system via a manually initiated process. This allowed new information for the new meters to be imported

directly to customer accounts without manual entry of each meter. However, to maintain quality control, the process was able to be initiated by billing staff at the appropriate times of the month, as to not interfere with other billing related functions.

2.2.3 Metering equipment – A priority for PWSD was to take advantage of the expanded flow capturing capacity of new metering technology. The District's existing metering infrastructure, exclusive of growth, had been in place for 20+ years. In evaluating metrology for smaller single-family residential, multi-family, commercial and irrigation (3/4"-1"), the use of electronic meters was very attractive for better low-flow accuracy and high flow durability. Elimination of moving parts, such as those of positive displacement meters, allows for:

Small Meters ¾"-1"
Sensus iPERL

- Less maintenance, including challenges with water quality
- Ability to tolerate high system pressures, which are present in many areas of the PWSD mainline system
- Installation in multiple orientations; and
- Reduced non-revenue water due to additional flow capturing capacity.

Large Meters 1 ½"-4"
Sensus OMNI C^2

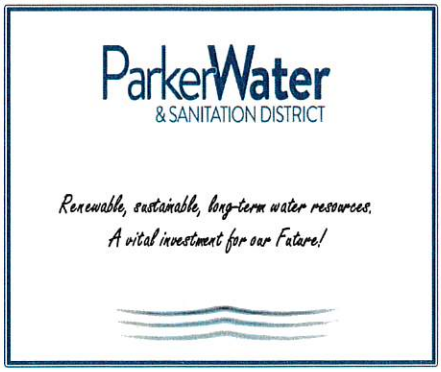
For larger (1-1/2"-4") non-single family residential customers, Sensus offered the OMNI™ Compound (C^2) meters that have the ability to accurately meter:

- Sustained flows
- Extended flow range for low-flow and extended high flow rate conditions
- Improved accuracy ranges reduce non-revenue water.

The District's meters are a combination of in houses and businesses, as well as in meter pits. It was important that the endpoint communication be able to support mounting on the outside of homes as well as in pits with traffic rated lids.

Inventory management was critical to successful project execution.

Section 2.2.4 Communication Plan – The District prepared a comprehensive project Communications Plan that integrated with other capital improvement projects that were part of a sustainable water initiative. This association with an overarching initiative helped present continuity for strategic planning and objectives for the District. The Plan is provided in Appendix C, along with samples of customer communications.



This Plan was designed to address internal and external stakeholder communication activities. Stakeholders include:

- District Board & Management
- Impacted customers (HOA's, management companies, commercial properties, and residential properties)
- Project team (PWSD, UMS, Dana Kepner, Sensus, AmCoBi)
- Other District employees
- The Colorado Water Conservation Board; and
- Other water providers

The Plan encompassed presentations, direct communications, website, open houses, informational fliers, billing tidbits, satisfaction surveys and FAQ's for each stage of the project.

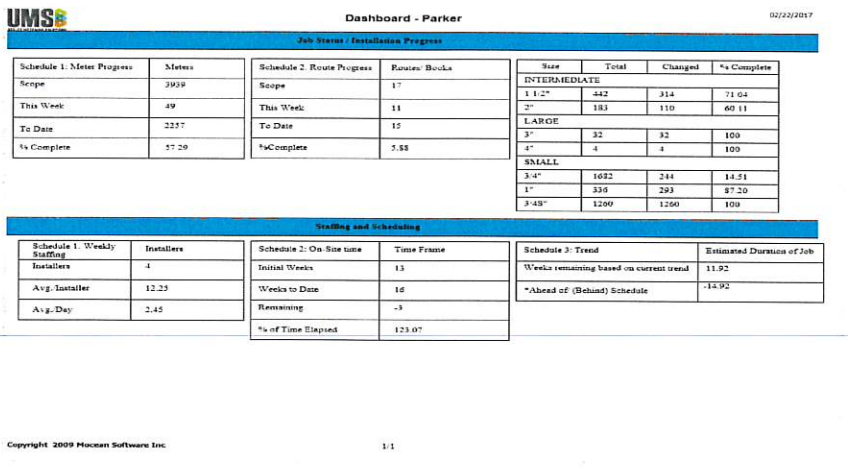
Materials were developed, reviewed, and updated dynamically based on customer feedback. UMS had several communication templates that were customized for this project, to consider District demographics, service levels, and PWSD's commitment to extraordinary customer service and customer relationships in mind.

The District also considers the Colorado Water Conservation Board as a valued partner in this program.

Additionally, as a water provider, PWSD shares information and knowledge with other providers, as well as learns from other industry professionals regarding the services the District provides. There has been particular regional interest in the District's AMI program. The District has hosted tours, shared information, provided presentations to other water providers to assist them in their own investigation for considering investing in the AMI technology, and will continue to do so through project completion and beyond. This information sharing helps the industry move forward, leveraging the experience of others, and creates opportunities to improve business practices and technological advancement.

Section 2.2.5 Meter Installation - UMS was selected to perform project management and meter retrofit installation services for the project. Crews were deployed on site for several months. UMS also provided scheduling services via a call center, where customers called UMS call center agents directly to set up appointments. Weekly project progress meetings were held throughout the installation process with project management, field management and PWSD staff. UMS provided a summary status report via their proprietary Xchange Software dashboard.

FIGURE 9 - UMS PROPRIETARY XCHANGE SOFTWARE DASHBOARD



UMS

Dashboard - Parker

02/22/2017

Job Status / Installation Progress

Schedule 1: Meter Progress	Meters
Scope	3939
This Week	49
To Date	2257
% Complete	57.29

Schedule 2: Route Progress	Routes/ Books
Scope	17
This Week	11
To Date	15
%Complete	5.88

Size	Total	Changed	% Complete
INTERMEDIATE			
1 1/2"	442	314	71 04
2"	183	110	60 11
LARGE			
3"	32	32	100
4"	4	4	100
SMALL			
3/4"	1682	244	14.51
1"	336	293	87 20
3/4B"	1260	1260	100

Staffing and Scheduling

Schedule 1: Weekly Staffing	Installers
Installers	4
Avg. Installer	12.25
Avg. Day	2.45

Schedule 2: On-Site time	Time Frame
Initial Weeks	13
Weeks to Date	16
Remaining	-3
% of Time Elapsed	123.07

Schedule 3: Trend	Estimated Duration of Job
Weeks remaining based on current trend	11.92
*Ahead of (Behind) Schedule	-14.92

Copyright 2009 Mocean Software Inc

1/1

This dashboard effectively allowed PWSD staff to monitor installation progress according to the project timeline. Weekly meetings allowed issues to be addressed on a timely basis, creating dynamic communications throughout the installation of approximately 8,000 meters and endpoints.

Section 2.3 Challenges and Future Opportunities

The retrofit project is high visibility, with installation affecting a large portion of PWSD customer's at their homes and businesses.

Balancing general project understanding, expectations and service levels with resources – both staffing and financial - present challenges. No matter how much forethought is put into a project, it is inevitable that challenges will arise. The key is to be prepared to meet the challenges with dynamic flexibility and unwavering resolve for creating a long-term functional solution.

2.3.1 Installation Issues

⇨ Contractor legitimacy – Initial customer outreach included a notice to customers within targeted meter reading routes (where the water meter is located inside the house) that informed them that they were part of the meter replacement program and that they were to call a 1-800 number to set up an appointment. Even with the notice containing PWSD and UMS logos, information being placed on the District's website, and a notice being placed on billing statements, a significant portion of customers called the District to ensure that the notice was not a fraud. To address these very realistic concerns, on the next routes, the District pre-empted the mailed notice with an IVR call to impacted customers that they would be receiving a notice. Also, additional information was placed on the project website, giving customers photos of UMS personnel and the trucks that they should be

seeing showing up to their door. These solutions addressed the majority of these types of customer concerns.

- ⇨ Customer perceptions of the technology – A very small demographic of customers were concerned with the reading technology that is used. We worked with the metering technology provider to create educational materials that could speak to these concerns and inform perceptions. Electromagnetic frequencies were the focus in most cases. Some customers sought "opt-out" options. To date, the District has chosen not maintain an "opt-out" policy. Those very few customers, less than five, to date, have had the retrofit at their properties put as a low priority to accomplish towards the end of the program. At that time, the District will consider a program that allows monthly reads to be obtained manually, with an applicable associated cost of service fee.
- ⇨ Managing social media – As part of the District's customer service objectives, staff keeps a finger on the pulse of social media outlets. When customer concerns were seen popping up in specific neighborhood threads, PWSD staff reached out to the HOA boards to be available to attend upcoming HOA meetings. This has become a very effective outlet for addressing customer concerns face to face, as well as a great opportunity to provide educational information on the advantages of the customer portal as a personal water management tool for residents and HOA irrigation contractors.
- ⇨ Customer service and quality control - One of the District's values is:

  "Extraordinary Service – Dedicated to earning the trust and respect of our community by exceeding expectations and delivering exceptional results."

  With this in mind, this project had an associated customer satisfaction survey, and customer feedback via our customer service and field staff. The PWSD project team was keen to listening for customer concerns about the project in general, the quality of customer service for the contractor call center and scheduling, as well as the quality of customer service for the contractor installations. Also, the meter replacement was made available to all employees living in the District, and feedback regarding their scheduling and installation experiences were monitored. Issues were highlighted during weekly project meetings and addressed as soon as possible, and on an ongoing basis. Following some of the experiences from the initial installation phase of this project, PWSD will be implementing some new procedures in the next installation phase for the installation contractor, as well as in the new installations that PWSD accomplishes for new development. This will include things like:

  - PWSD being engaged in the training of installers
  - *"Inspecting what we expect"* – PWSD will be conducting post-installation inspections, evaluating workmanship, ensuring customer satisfaction with the installation, that information regarding the benefits of the customer portal have been provided, and that the customer looks for leaks in their infrastructure over the next few weeks.

- Proactive post installation IVR and email customer satisfaction surveys.

⇨ Accessing indoor meter sets - In this first phase, the majority of single-family residential meter replacements were for interior meter sets. When you are entering a customer's home, many issues need to be addressed from a customer perspective. There needs to be a sensitivity for having a responsible adult present, contractors having clean shoes, being prepared to deal with any water that may drain when the meter is changed out, and leaving the customer's space as good or better than when you arrived.

There are also issues when the customer has finished their basement and not allowed access to the meter. In some cases, there was work that the customer needed to perform, such as installing access panels, in order for the meter to be replaced. In most of these instances, UMS did not perform these installations. In this phase, there were approximately only 150 taken out of scope, and they were managed individually by PWSD staff.

Meter "Floating" in Customer Wall

METER BEHIND WALL – Required access panel

There is also a need for the contractor to be aware of, and responsible for their own safety, including things like watching for animals/dogs, environmental issues, and unsafe behavior by customers. There was one incident where the Town of Parker police and additional PWSD representatives accompanied the contractor on site. One other situation required that the replacement be taken out of scope for the contractor, and was accomplished by PWSD employees and representatives, with police back up near the address.

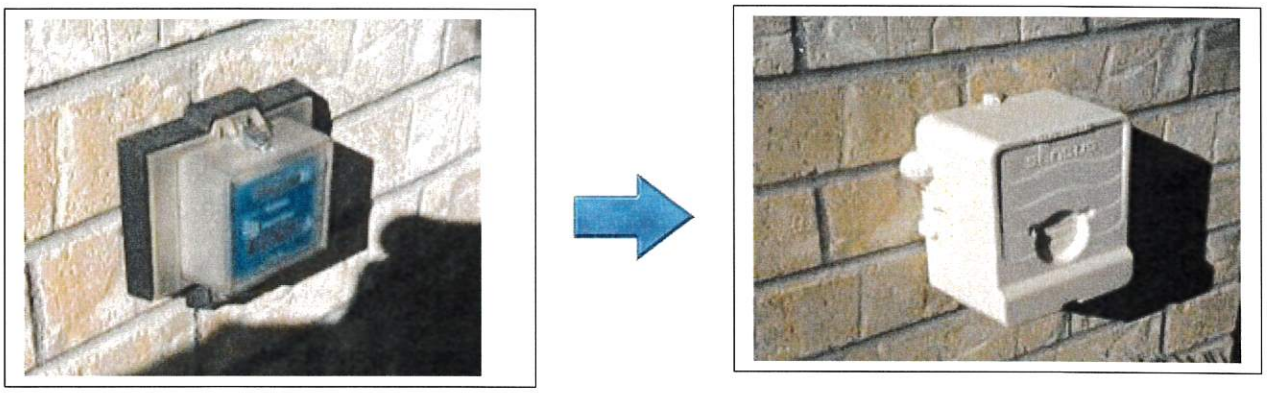
⇨ Customer infrastructure condition – piping condition/location in homes/PRVs/subsequent leaks – The only infrastructure owned by the District for an inside installation is the meter itself, not the setter or fittings. In order to perform the meter replacement, UMS had to access either the curb stop outside the home to turn the water off, or operate the customer's private shut-off valve in the house. There are inherent issues with operating a customer's private infrastructure, and increased risk of failure of those valves depending on condition. Customers were instructed in the initial letter to make sure their valves were in good working condition; however, this does not necessarily mitigate the risk of failure. Customers were also directed to check for leaks following the installation, however, there

were some cases where this did not happen. Therefore, insurance claims had to be filed by either the District or UMS.

With the new meters having no moving parts, the customer experienced in some cases increased water pressure at their service connection. In some cases, private pressure regulation valves then failed. While this is private customer infrastructure, there were some instances where the District accomplished repairs.

In order to better manage private infrastructure condition issues, additional verbiage is being added to customer outreach materials. This includes development of an instructional/informative video to put on the District's website to help educate customers regarding their infrastructure. In addition, more requirements for customer initials and sign-off's will be added to post-installation paperwork, of which the customer will be provided a copy.

- New endpoint aesthetics – Some customers were concerned with the look and size of the new endpoint. The new endpoints covered the existing remote location; however, they were a different color and was slightly longer than the existing remote. In order to mitigate



this issue, more information was put on the website to proactively inform customers that the new endpoints would look different. Customers were also informed that the endpoints could be painted. In very limited circumstances, and only when it was feasible, a few endpoints were relocated.

- Responsibility for alerting notifications – With AquaHawk, the District has the capability to proactively send alarms to customers. Customers also have the ability to set up their own water use alarms as well. There is a balance between proactively contacting customers, and then being perceived as being responsible for notifying customers of unusual usage. PWSD is developing an alerting guideline that addresses customer notification of leaks with promoting empowerment of customers to be responsible for managing their own water use. The District is also in the process of re-evaluating its leak adjustment policy related to

the information that customers, especially businesses and HOA's, can use to manage their water use.

- Managing, operating, and maintaining multiple meter reading methods and equipment throughout the project – Since the meter replacement project is phased over several years, the District is currently operating several different types of meter reading technologies. Managing manual, AMR and AMI reading systems can create challenges for operation and maintenance, as well as sets different customer service levels for those that have access to the customer portal's hourly meter reading information and those that do not. Currently if a customer requests to be changed out to the new technology, even though their meter is slated for replacement later in the project timeline, the District will go ahead and replace the meter with AMI technology. Usually these customers become advocates for the technology and share that enthusiasm with their neighbors.

- Existing endpoint wiring (2 wire versus 3 wire) – Older, existing interior water meter sets had a two-wire wiring system that allowed for a simple read to be transmitted from the water meter register via pulse to a remote located outside of the home. In order to make the AMI technology work effectively, and reliably obtain true two-way communication, a three-wire system is required. In order to adapt the existing two-wire system for the AMI, touch-couplers were used at the endpoint. While this method has been used in keep from having to run new wire, one of the issues that is occurring is when there is a new AMI meter reading failure after installation, in most cases, it has required PWSD staff to go back into the home and run new three wire. While replacing wire inside a home presents many challenges, there continue to be concerns that full connectivity and functionality of the AMI technology may be compromised in the future. In the next phase of installation, full wire replacement and not re-using existing two-wire may be considered.

- Reading to the gallon, versus tenth of a gallon – The Sensus iPerl meters are capable of registering flow to the tenth of a gallon. The District bills to the gallon, not in thousands of gallons like many water providers do. Initially the new meters were programmed to read to the tenth of a gallon. While having this level of usage granularity is technologically advanced, it was not necessarily practical. Following the initial installation of less than 1,000 meters that came programmed from the factory to read to the tenth of a gallon, the District decided to change back to having them programmed to read to the gallon. This required reprogramming of those initial meters, and a change in the meter order for future meters to be delivered from the factory set at a gallon resolution. If in the future, the District wishes to change that policy, meters can be re-programmed to a higher resolution.

⇨ Inventory Management - Constant attention was needed to order, track and manage equipment inventory. Cooperation with providers ensured that inventory was in stock to keep UMS moving with installations.

⇨ Enhanced History Compression – During the initial stages of the project, once data was being received from a good sampling of meters, PWSD staff began to see a trend that usage was being logged at a different time than it was used. An in depth test of staff member's account revealed that reads were not coming across hourly when they were used, but were rather manipulated using a reading algorithm. Sensus engineers were brought in to address this functionality issue. They explained how the design was intentional, so that the endpoint condensed read data in order to make the information packet transfer more efficient for the battery. The challenge was that this then did not accurately reflect hourly customer usage, especially during low usage periods. The District worked with Sensus to provide the functionality that was outlined in the contract documents. Sensus engineers had been working on a solution to this very issue, and had recently developed a solution that the District was able to implement on the AMI system. Due to the excellent system connectivity, the endpoints were reprogrammed to eliminate the use of the algorithm, and provide for actual usage reads while preserving the twenty-year battery functionality. This new functionality was dubbed "enhanced history compression" and meters were allowed to be reprogrammed over the air, without site visit.

2.3.2 Future Opportunities

The Sensus ally® meters – The new state of water metering technology is moving toward being able to conduct remote disconnection, as well as some level of water quality monitoring. The District is considering using the Sensus Ally meter in strategic locations to:

SENSUS ALLY®METER

- Have the ability to remotely control the water flow to a service connection (on, off, reduced), in order to save a truck roll. This technology is being considered on services that are repeatedly disconnected for delinquency; and
- Monitor pressure and temperate in various service locations across the service area.

Modification to meter reading schedule – The District is modifying its meter-reading schedule where meters were once read starting on the sixteenth of the month, to being read closer to the end of the month. This migration has begun, and reading is now beginning around the twentieth of the month, closer to when bills are generated and received by customers. This allows for more real-time monthly-billed water usage visibility to the customer. Moreover,

while the District once billed and began collection for expenses for water used potentially up to six weeks previously, the new meter reading schedule allows usage to be billed closer to when it was used, allowing the District to collect revenues towards expenses that have already been incurred sooner.

Integrated analytics – Once fully retrofitted, the District intends on integrating hourly water usage information with system hydraulic models. This will provide real time usage data, both collectively and hourly, in order to:

- More effectively operationally manage water production and distribution;
- Better inform capital project development and water resource needs: as well as
- Better inform water usage characteristics relative to rate and fee analytics.

Section 3 – Analysis and Findings to Date

3.1 Large Meter Audit

During the installation process, an audit was conducted to compare actual meter sizes and registration in the field to what was identified in the billing system. Sixteen (16) meters were not registering correctly or were the wrong size in the billing system, resulting in under registration and billing for water consumption. Table 2 lists these meters and the associated monetary impacts related to one year of improperly billed consumption to both water and wastewater services. Consumption was under registered in most cases by a factor of ten. Appendix D reflects that, using 2016 as a representative year, over 41 acre feet (AF) of consumption was not captured on an annual basis due to this meter/billing information error. The average duration was around seven years, reflecting potential under registration of 287 AF over time.

TABLE 2 – Meter Audit – 1 Year Estimated "Missed" Revenue

Type	Size	Date of initial Error	Water Impact	Wastewater Impact	Total
MF	1.5	7/18/2007	$1,724.81	$2,962.08	$4,686.89
MF	1.5	1/1/2006	$508.54	$1,602.12	$2,110.66
MF	1.5	1/1/2006	$892.21	$1,899.50	$2,791.71
COM	2	2/29/2008	$725.20	$1,944.70	$2,669.90
COM	1.5	7/25/2013	$3,938.42	$9,544.71	$13,483.13
COM	2	8/15/2006	$2,900.89	$7,879.31	$10,780.20
COM	1.5	11/8/2005	$488.39	$1,726.14	$2,214.53
IRR	2	3/16/2007	$7,678.21	$0.00	$7,678.21
COM	1.5	1/21/2004	$916.57	$1,775.38	$2,691.95
COM	1.5	9/6/2013	$350.94	$551.15	$902.09
COM	1.5	6/7/2011	$3,015.04	$2,406.06	$5,421.10
MF	1.5	4/9/2012	$749.98	$3,365.60	$4,115.58
IRR	1.5	1/14/2014	$15,399.10	$0.00	$15,399.10
IRR	1.5	10/3/2013	$13,289.85	$0.00	$13,289.85
IRR	1.5	6/10/2010	$24,261.81	$0.00	$24,261.81
IRR	1.5	10/30/2007	$2,145.07	$0.00	$2,145.07
TOTAL			**$78,985.03**	**$35,656.75**	**$114,641.78**

3.2 Enhanced Flow Registration Capacity

3.2.1 Meter Condition Analysis - A representative sampling of each size of meters that were removed were tested by a third party testing service. This testing showed in general that small meters (3/4" & 1") were generally within AWWA standards. Larger meters however fell outside of AWWA standards more often. As a summary, out of over 60 million gallons metered, the District under read and billed for nearly 5.5 million gallons, which equates to up to 9% flow being under registered on tested meters. Appendix E is a summary of testing results. This metric will continue to be tracked via comparison of usage of customer accounts, considering impacts of varying weather patterns year to year.

3.2.2 Metering/Reading Infrastructure Integration (register versus remote differential) -

Approximately 6,000 of the replaced meters – mostly inside sets - relied on volume registration at the meter, where via pulse, the usage was transmitted to a wired digital remote mounted outside of the home. In some cases, when the meter was replaced, it was found that the reading on the register at the meter was higher than the usage that was captured and used for billing purposes at the remote. Throughout the retrofit process, UMS logged the differential between these two readings. It is estimated that over the life of these meters, usage was under-registered collectively at over 26 MG or approximately 80.1 AF.

TABLE 3 -

Meter Register Vs Remote Differential Summary

Month	Register vs Remote
Nov-16	1,514,519
Dec-16	431,650
Jan-17	1,550,702
Feb-17	4,211,060
Mar-17	3,339,570
Apr-17	3,580,330
May-17	2,316,778
Jun-17	3,907,950
Jul-17	4,866,252
Aug-17	386,550
Total Gallons	26,105,361
Total AF	80.1

3.2.3 New Metrology Flow Registration Enhancement

There is currently not enough data to determine the impact of the flow enhancement component of the electronic meters, however this metric will be monitored. The additional low flow capture for the new single-family residential meters, per published meter specifications, could potentially be as high as 0.14 gallons per minute (gpm.) Using those figures, the District may realize up to 10 AF per year of billable water consumption.

TABLE 4 - Estimated Enhanced Metrology Flow Capture

Gallons per Capita Per Day	133 GPCD (PWSD)
10% use at low flow	13.3 gallons
Additional per Gallon	0.014 gallons
Additional GPCD	0.1862 GPCD
Per SFE/Day	0.50274 gallon
Per Year	183.5 gallon
17,000 Accts	3,119,502 Acct
Total	**9.6 AF**

3.2.4 Leak Detection

The following is a sample of accounts for which significant leaks were identified using the AMI system and customer portal. As more accounts are added to the AMI system, additional early leak detection and water savings is anticipated. Figure 9 provides an example of a leak that was detected on a Town of Parker account for which an alert was sent.

FIGURE 9 – Town of Parker Leak Alert

This leak escalated to nearly 1,200 gallons per hour, and was resolved within 72 hours due to the alert received from PWSD. Normal awareness of the leak would not have occurred for a minimum of another two weeks before PWSD would have had information available through the course of normal meter reading to contact the customer of the high use. That effectively saved this customer nearly 500,000 gallons of water.

Appendix F depicts a representative sampling of accounts that were sent high use notifications and the associated potential savings that were achieved through early detection of the abnormal usage. The savings is calculated considering that the customer would not have been notified of the issue until the next billing period. This sample shows savings through early detection and notification of over 25 million gallons.

3.2.5 Meter Reading Efficiencies

As of the end of October 2017, approximately 180-meter readings for final billing were acquired via the AMI systems, resulting in cost of service savings of $9,000 in staff time and vehicle costs.

Monthly meter reading has been reduced from a 5-day initial process of manually reading walking routes to now taking 1.5 days using AMI, AMR and scattered manually read meters. This has saved over 160 staff hours in reading meters, several 100 miles driven per month in acquiring consumption for monthly billing.

TABLE 5 – Staff Time Meter Reading Savings Estimates

Meter Reading Method	Hours of Reading per Month	Cost Estimates per Hour	Total Monthly Cost of Meter Reading*
Prior to AMI (with manual & AMR routes)	172	$140	$24,080
Read Time Post Phase 2	48	$100	$4,700

*Without benefits, Does not include time allocated for loading routes and read processing.
**Field Services Supervisor no longer is required to read meters, reducing cost estimates per hour.

Considering personnel costs, this is a savings of over $19,000 per month, not including fuel and vehicle costs. Field staff was therefore allocated towards other high priority duties.

It is critical to note that meter reading was only one week per month for Field Services staff. This team also accomplishes other duties such as:

- ⇨ New development single-family residential water and sewer service line inspections;
- ⇨ New meter sets;
- ⇨ Meter, endpoint and curb stop maintenance;
- ⇨ Customer initiated service order management and completion;
- ⇨ Disconnection for delinquency;
- ⇨ AMI system operation and maintenance; and
- ⇨ District-wide cross-connection control program compliance.

Personnel savings relative to reduced time reading meters may defer additional personnel costs associated with increasing workloads associated with other departmental demands.

Section 4 – Project Budget

The initial Meter Replacement and AMI Program budget in 2016 was as follows:

2016	2017	2018	2019	2020	2021	2022	2023	Total
$1,800,000	$1,000,000	$1,000,000	$500,000	$500,000	$500,000	$500,000	$400,000	$6,200,000

In order to accommodate revisions in the project timeline and work accomplished in 2016, the 2017 budget was as follows:

2016*	2017	2018	2019	2020	2021	2022	Total
$1,225,000	$2,500,000	$550,000	$550, 000	$550,000	$550,000	$275,000	$6,200,000

*Actual expense.

The approved 2018 Capital Project budget is as follows:

2018	2019	2020	2021	2022	Total
$550,000	$550,000	$550,000	$550,000	$275,000	$2, 475,000

The District is considering funding alternatives to determine the feasibility of accelerating the project schedule for a targeted 2019 completion date.

Section 5 – Next Steps

5.1 Final Phase

The final phase of the Meter Replacement Project includes:

- ⇨ Setting remaining manually read walking routes that were taken out of scope in Phase 2 (approximately 150 which will be addressed by PWSD staff starting in 2018)
- ⇨ Setting interior single-family residential AMR meters (approximately 3,000 to be accomplished via contract with UMS);
- ⇨ Retrofitting exterior single-family residential AMR meters (approximately 3,850 to be accomplished via contract with UMS and as time permits by PWSD staff);
- ⇨ Developing a targeted marketing plan to encourage customer portal (AquaHawk) use by customers that have been retrofitted with the AMI technology;
- ⇨ Continuing to migrate the meter reading schedule closer to month-end, so that the billing window between reading and billing can be shortened;
- ⇨ Performing analysis on the remaining phasing plan in the context of other District capital projects to determine the feasibility of potentially accelerating the installation schedule from 2018 – 2022 to be completed in 2018 or by 2019.

5.2 Business Intelligence

5.2.1 Water demand management – The District is considering making some level of the existing water restriction schedule mandatory at some level for 2018. Due to some temporary water delivery system challenges that exist around moving treated water from the west side of the District to the east side, the District may use AquaHawk Alerting as a means to monitor and contact irrigation customers that are watering outside of an approved watering window. Being able to use AquaHawk for monitoring (determining if a customer is adhering to prescribed days and times of approved irrigation), as well as for sending notifications (via the same contact method that alerts are sent – phone, email, and even USPS) - reduces the need to add staff to physically drive the service area as a means for enforcement, and reduces the resources necessary to create another method to send out non-compliance notifications.

5.2.2 Water rate structure – Water budget – The District will be using data obtained from hourly meter reading by user, user type and customer class to inform rate and fee making. Within a projected two-year timeframe, the District will be considering the efficacy of moving to a water budget rate structure for irrigation customers.

5.2.3 Inform 2018 Master Plan update – The Engineering Department is slated to update the District's Water/Wastewater Master Plan in 2018. While not all customers are equipped with AMI meters, the percentage of the service area that has had the technology installed for nearly

a year will provide exceptional information to planners projecting water resource and capital requirements for both water and wastewater infrastructure for this and future updates.

5.2.4 Inform Efficacy of Water Conservation and Efficiency Measures and Efforts – The District intends to more effectively analyze by customer, and hourly usage the cost of service, and return on investment, and for educational, audit and rebate programs. This information will also be used to further compare the status of actual use in comparison to water efficiency targets, as outlined in the District's 2016 Water Efficiency Plan on a more dynamic basis.

Water Use Efficiency Targets (Gallons per Capita per Day)*		
2014 Colorado Water Plan	2050	129 (Planned)
2014 PWSD Master Plan	2035	132 (Planned)
2016 PWSD Water Efficiency Plan	2025	128 (Planned)
*Information from PWSD 2016 Water Efficiency Master Plan		

5.2.5 Future Potential Fiscal Impact Analysis

A full return on investment analysis for the capital and operational cost of the AMI system considering decreasing non-revenue water, reduced read/billing errors, personnel and overhead cost savings is planned to be completed. Also under observation are the potential impacts of increased water use efficiency by customers and the potential associated revenue reduction impacts. The complete analysis dynamic will consider the financial impact of leveraging AMI information for operational efficiencies, as well as for capital planning.

APPENDIX A

2017 Phase II Installation Route Plan

2017 PWSD Phase II Route Plan

PHASE 2A – Release in January 2017

ROWLEY DOWNS (ROUTE 13) – 183

HIDDEN RIVER 1 (ROUTE 5) – 350

HIDDEN RIVER 2 (ROUTE 205) – 401

SUNSET RIDGE (ROUTE 8) – 211

PARKER VISTA (ROUTE 16) – 166

TOTAL = 1,311

PHASE 2B – Release once Phase 1 is 95% complete & Phase 2A is 75% complete

WILLOW PARK (ROUTE 14) – 202

BRADBURY RANCH 1 (ROUTE 19) – 503

QUAIL CREEK (ROUTE 10) – 77

RAMPART STATION (ROUTE 2) – 111

TURTLE CREEK (ROUTE 12) – 139

SADDLEBROOK (ROUTE 15) – 152

COUNTRY MEADOWS (ROUTE 3) – 153

TOTAL = 1,337

PHASE 2C – Release once Phase 2A is 95% complete & Phase 2B is 75% complete

AUBURN HILLS (ROUTE 18) – 380

CANTERBERRY 1 (ROUTE 11) – 601

CANTERBERRY 2 (ROUTE 211) – 646

CANTERBERRY 3 (ROUTE 311) – 116

SPIRIT GULCH (ROUTE 22) – 17

CHALLENGER PARK (ROUTE 6) – 272

TOTAL = 2,032

PHASE 2D – Release once Phase 2B is 95% complete & Phase 2C is 75% complete

CLARKE FARMS 1 (ROUTE 101) – 118

CLARKE FARMS 2 (ROUTE 201) – 236

CLARKE FARMS 3 (ROUTE 301) – 65

CLARKE FARMS 4 (ROUTE 401) – 337

CLARKE FARMS 5 (ROUTE 501) – 218

CLARKE FARMS 6 (ROUTE 601) – 202

TOTAL = 1,176

PHASE 2E – Release once Phase 2C is 95% complete & Phase 2D is 75% complete

STROH RANCH 1 (ROUTE 117) – 180

STROH RANCH 2 (ROUTE 217) – 324

STORH RANCH 3 (ROUTE 317) – 296

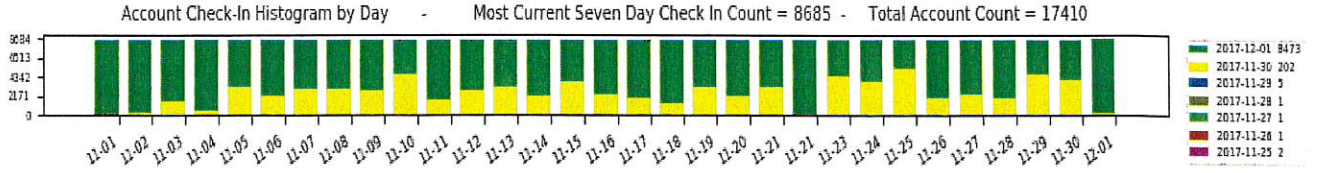
TOTAL = 800

APPENDIX B

Daily AquaHawk Alerting Summary Report Example

ParkerWater
& SANITATION DISTRICT

AquaHawk - Daily System Status Report - AHA 101D_A
Prepared by AmCoBi (c) 2017
System Activity from 11-30-2017 07:08
to 12-01-2017 07:08

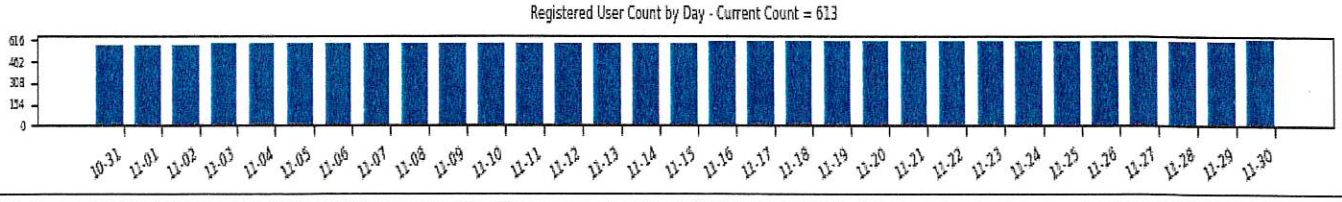


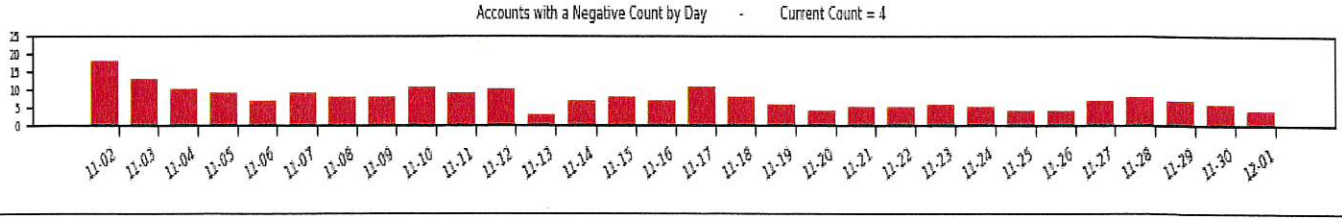
Meter File Check-Ins for PARKCO

1898538 Nov 29 05:10 PARKR_8HR_ReadReport201711282200.csv
1903365 Nov 29 13:10 PARKR_8HR_ReadReport201711290600.csv
1910431 Nov 29 19:11 PARKR_8HR_ReadReport201711291200.csv
1899908 Nov 30 01:11 PARKR_8HR_ReadReport201711291800.csv
1898862 Nov 30 05:10 PARKR_8HR_ReadReport201711292200.csv
1908963 Nov 30 13:11 PARKR_8HR_ReadReport201711300600.csv
1908786 Nov 30 19:11 PARKR_8HR_ReadReport201711301200.csv
1903460 Dec 1 01:11 PARKR_8HR_ReadReport201711301800.csv
1902731 Dec 1 05:10 PARKR_8HR_ReadReport201711302200.csv
1906482 Dec 1 13:10 PARKR_8HR_ReadReport201712010600.csv

Account File Check-Ins for PARKCO

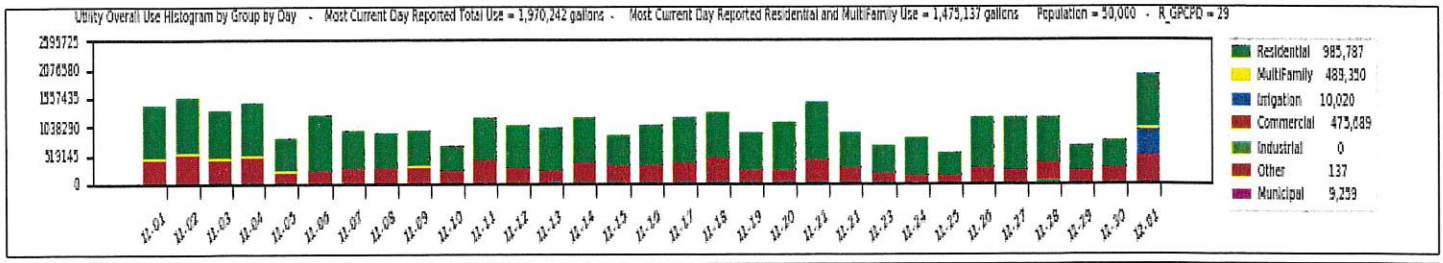
6154754 Oct 25 00:10 parkco_Accounts_20171024.csv
6164341 Nov 1 18:10 parkco_Accounts_20171101.csv
6167373 Nov 4 00:10 parkco_Accounts_20171103.csv
6167759 Nov 7 19:10 parkco_Accounts_20171107.csv
6171062 Nov 9 00:10 parkco_Accounts_20171108.csv
6174435 Nov 14 00:10 parkco_Accounts_20171113.csv
6175746 Nov 15 00:10 parkco_Accounts_20171114.csv
6179499 Nov 22 00:10 parkco_Accounts_20171121.csv
6179597 Nov 23 00:10 parkco_Accounts_20171122.csv
6181275 Dec 1 00:10 parkco_Accounts_20171130.csv

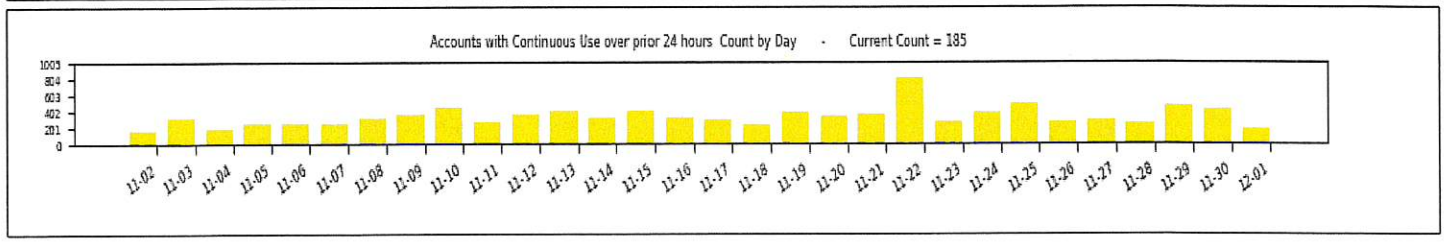




ParkerWater
& SANITATION DISTRICT

AquaHawk - Daily System Status Report - AHA 101D_A
Prepared by AmCoBi (c) 2017
System Activity from 11-30-2017 07:08
to 12-01-2017 07:08

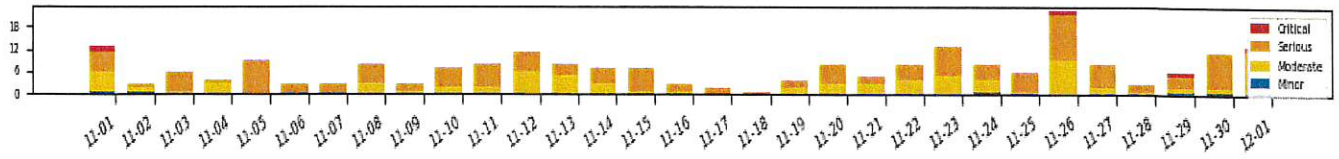




ParkerWater
& SANITATION DISTRICT

AquaHawk - Daily Alert Report - AHA 201D_A
Prepared by AmCoBi (c) 2017
Alert Activity from 11-30-2017 07:12
to 12-01-2017 07:12

Number of Leak Alerts by Day



Alert Summary for PARKCO during prior 24 hours

	Total	Severity Critical	Serious	Moderate	Minor
Leak Alerts	13	1	10	1	1
Threshold Alerts	9	0	0	9	0
Meter Alerts	0	0	0	0	0
	22	1	10	10	1

Open alerts for prior 24 hours

	Total	Critical	Serious	Moderate	Minor
Leak Alerts	3	1	1	0	1
Threshold Alerts	0	0	0	0	0
Meter Alerts	0	0	0	0	0
	3	1	1	0	1

Closed alerts for prior 24 hours

	Total	Critical	Serious	Moderate	Minor
Leak Alerts	10	0	9	1	0
Threshold Alerts	9	0	0	9	0
Meter Alerts	0	0	0	0	0
	19	0	9	10	0

Contacts for prior 24 hours

	Total	Text	eMail	vMail	Voice	FollowUp	Postcard
Leak Alerts	0	0	0	0	0	0	0
Threshold Alerts	9	3	6	0	0	0	0
Meter Alerts	0	0	0	0	0	0	0
	9	3	6	0	0	0	0

Alerts Closed from Today

	Total	Auto Resolved	Fixed
Leak Closes	10	9	1
Threshold Closes	9	0	9
Meter Closes	0	0	0
	19	9	10

Alerts Still Open

	Open
Leak Closes	3
Threshold Closes	0
Meter Closes	0
	3

ParkerWater
& SANITATION DISTRICT

AquaHawk - Daily Alert Report - AHA 202D_A
Prepared by AmCoBi (c) 2017
Alert Activity from 11-30-2017 07:12
to 12-01-2017 07:12

Open Leak Alert Details for PARKCO over prior 24 hours

#	Account	MeterID	Last Updated	Open Date	Type	Severity	User	Note
1	00100869-01	82206304	2017-12-01 14:07	2017-12-01 14:07	Abnormal water use detected.	Critical	Support	Continuous Water Use of at least 1,018 gallons per hour over the last 24 hours
2	00111413-02	82757746	2017-12-01 01:16	2017-12-01 01:16	Abnormal water use detected.	Serious		Continuous Water Use of at least 262 gallons per hour over the last 8 hours
3	00300052-01	82263450	2017-12-01 01:27	2017-12-01 01:27	Abnormal water use detected.	Minor		Unexpected non-zero Water Use of 1 gallons over the last 24 hours

Threshold Alert Details for PARKCO over prior 24 hours

#	Account	MeterID	Last Updated	Open Date	Type	Severity	Note
1	00107499-03	82529655	2017-12-01 13:40	2017-12-01 13:40	Water use exceeding a user defined threshold.	Moderate	Water Use of 224 gallons (124%) on Thu Nov 30, 2017 exceeds the 1 day threshold of 180 gallons
2	00107499-03	82529655	2017-11-30 14:34	2017-11-30 14:34	Water use exceeding a user defined threshold.	Moderate	Water Use of 182 gallons (101%) on Wed Nov 29, 2017 exceeds the 1 day threshold of 180 gallons
3	00107978-03	82751518	2017-12-01 05:18	2017-12-01 05:18	Water use exceeding a user defined threshold.	Moderate	Water Use of 57 gallons (380%) on Thu Nov 30, 2017 8:00 PM exceeds the 1 hour threshold of 15 gallons
4	00107978-03	82751518	2017-11-30 19:43	2017-11-30 19:43	Water use exceeding a user defined threshold.	Moderate	Water Use of 26 gallons (173%) on Thu Nov 30, 2017 6:00 AM exceeds the 1 hour threshold of 15 gallons
5	00109689-03	82751631	2017-11-30 15:22	2017-11-30 15:22	Water use exceeding a user defined threshold.	Moderate	Water Use of 32 gallons (128%) on Wed Nov 29, 2017 9:00 PM exceeds the 1 hour threshold of 25 gallons, Water Use of
6	00109689-03	82751631	2017-11-30 13:58	2017-11-30 13:58	Water use exceeding a user defined threshold.	Moderate	Water Use of 28 gallons (112%) on Wed Nov 29, 2017 7:00 PM exceeds the 1 hour threshold of 25 gallons, Water Use of
7	00111039-04	82751216	2017-12-01 13:42	2017-12-01 13:42	Water use exceeding a user defined threshold.	Moderate	Water Use of 201 gallons (122%) on Thu Nov 30, 2017 exceeds the 1 day threshold of 165 gallons
8	00119065-02	83393933	2017-12-01 01:17	2017-12-01 01:17	Water use exceeding a user defined threshold.	Moderate	Water Use of 102 gallons (102%) on Thu Nov 30, 2017 exceeds the 1 day threshold of 100 gallons
9	00119065-02	83393933	2017-11-30 14:15	2017-11-30 14:15	Water use exceeding a user defined threshold.	Moderate	Water Use of 146 gallons (146%) on Wed Nov 29, 2017 exceeds the 1 day threshold of 100 gallons

Leak Followup Required Alert Details for PARKCO over prior 24 hours

#	Account	MeterID	Last Updated	Open Date	Type	Severity	User	Note

All attemped contacts completed sucessfully

APPENDIX C

Communications Plan

and

Sample Customer Communications

METER REPLACEMENT AND AMI INSTALLATION COMMUNICATIONS PLAN

SITUATIONAL ANALYSIS:

The District has an aging metering infrastructure that:

- ✓ Has a mechanically-based measuring system that is decreasing in metering accuracy and coming to the end of its useful life in areas of the District that are 20 years in age or older;
- ✓ Requires approximately ½ of the meters to be read manually, requiring staff to walk and manually enter readings in all weather conditions;
- ✓ Has design challenges with ensuring reading accuracy due to the potential of a read discrepancy between the register and the remote, as well as issues with some large meter volumetric logging due to test circles/meter multiplier inaccuracies that are facilitated by the metering registration design;
- ✓ Provides only monthly meter readings which are less informative to determine customer-side leaks, enabling leaks to persist and take longer to detect by the customers on their bills and staff via limited meter analytics reports;
- ✓ Requires staff to be deployed on site to acquire special and final meter reads, adding to truck-rolls;
- ✓ Does not provide adequate information related to actual customer usage for financial, operational and capital modeling purposes;
- ✓ Does not provide adequate information to customers for them to effectively manage their water use in a timely manner;
- ✓ Enables customers to be more reliant on the District to assist them, and take on more responsible for customer water use than necessary;
- ✓ Has operational pressure requirements that are lower in most cases than the District's supplied pressure, requiring the District to have a privately owned pressure regulating valve installed upstream of the meter which creates challenges for customers designating, accessing and maintaining their infrastructure.

Current best practice metering infrastructure technology can enhance these areas:

Volumetric Metering & Meter Reading

- ⇨ More accurate flow capture at low and high flow volumes;
- ⇨ Reduce the costs and risks associated with meter reading;
- ⇨ Reduce moving parts and failure points in the water meter itself (electronic meters) so that accurate metering occurs and meter maintenance is reduced;
- ⇨ Operate in high pressure ranges without causing meter damage or reading inaccuracies, thus eliminating the need to reduce pressure prior to metering the use, resulting in less need for a property owner to have private infrastructure in the form of a PRC in a meter pit;
- ⇨ Provide meter read data on an hourly to every 15-minute frequency.

Billing

- ⇨ Provide on demand reads for special reads, and final billing;
- ⇨ Provide higher visibility information to billing customer service agents to assist customers;

- ⇨ Provides for billing process streamlining, potential reduction of the time period between when a meter is read and the bill for that usage is generated, putting customer's usage information in their hands sooner.

Customer Service

- ⇨ Customers can access usage information on a near real time basis, empowering them with the ability to more effectively manage their water use, potentially conserve water and helping them manage their water bills;
- ⇨ Provide customer access to set up an online account in a custom portal where meter reading data is available, usage patterns are analyzed, including leak detection, as well as allows them to set up alerts that go directly to them based on thresholds they set up, and provide them the ability to compare their usage in their neighborhood;

Analytics

- ⇨ Provide higher resolution data for automated usage pattern detection, including leaks assisting customer, customer service and operations;
- ⇨ Considers seasonal fluctuations and clarifies impacts of weather on customer consumption.

Capital/Distribution/Operational/Financial

Capital/Engineering:

- ⇨ Provide more granular demand and consumption characteristics information by customer class and/or subdivision for hydraulic modeling, demand analysis, planning/capital infrastructure sizing/timing; water resource management/development, etc.

Operational:

- ⇨ Provides information that assists with water loss management and non-revenue water, including more accurate flow capture, detection and prevention of leaks,
- ⇨ Informs distribution system condition, demand impacts and facilitates programs, processes and procedures to enhance operational efficiencies, including system performance and equipment condition.

Financial/Rate Making

- ⇨ Decreases unbilled water;
- ⇨ Provides more granular consumption characteristic information by customer class to better understand customers, their usage patterns and needs. This enhanced customer segmentation informs intelligent and intentional targeted rate structure design, informed fiscal policies and other programs;
- ⇨ Informs conservation impacts.

The Board authorized a meter replacement and AMI project in 2015. A meter manufacturer, AMI system and customer portal service provider was selected in 2016. Project implementation is scheduled to occur from 2016 – 2023, with a potential schedule collapse to upgrade all manually read meters in 2017. Expedited schedule is proposed in the 2017 budget.

METER REPLACEMENT AND AMI INSTALLATION COMMUNICATIONS PLAN

PROJECT PURPOSE: The purpose of this project is to - in a manner that is consistent with the District's vision, mission and values - effectively manage the District's metering assets through a retrofit and upgrade of aging metering infrastructure with state of the art technology that improves customer service, informs all business areas of the organization, and makes the most efficient use of existing department and District resources, resulting in more effective service provision from a financial and service level standpoint for our customers.

Primary project objectives include upgrade metering infrastructure with a 20-year solution according to approved budget and phasing plan. Additional information is available regarding project schedule, phasing, goals, tasks and responsible parties in the Project Management Plan.

Major project tasks are summarized at a high level as follows:

1. Install metering communication infrastructure that minimizes sites required by the District, maximizes redundancy, reliability and security of read acquisition;
2. Install, integrate and maintain meter reading and software analytics systems that minimize the required installation and maintenance of District IT support, and maximize information management capabilities;
3. Upgrade meters and install endpoints that increase volumetric reading accuracy, provide granular minimum hourly read capability, provide for 2-way communication, and reduce maintenance. Installation phasing targets non-single family customers, elimination of manually residential read meters, and then elimination of existing AMR metering infrastructure;
4. Create streamlined interface for billing to acquire monthly meter reads, special and final read;
5. Create customer portal for internal and customer use that allows for enhanced customer service and customer water use management empowerment;
6. Facilitate use of water usage data to other departments including Finance, Engineering and Water Operations.

COMMUNICATION PLAN PURPOSE: The purpose of the communication plan is to strategically outline overarching project goals and align outreach activities that effectively communicate consistent messaging to customers to streamline project completion, demonstrate project value and facilitate customer self-water use management, resulting in enhanced improved customer satisfaction. The plan defines:

- ☆ Purpose and value of the project to the District;
- ☆ The benefits of the technology to the customer;
- ☆ The process by which the retrofit and upgrade will occur; and
- ☆ The timing of the retrofit and upgrade on a District, and individual customer level.

Communication Plan Goals:

1. Maintain the support of the Board, and gain the support of customers and stakeholders impacted by this project.

2. Provide the necessary communication support to allow for the successful implementation of the meter retrofit and AMI installation.
3. Communicate the benefits of the new metering infrastructure and customer portal in terms of improved customer service and empowerment for customers to proactively manage their water use.
4. Maximize the adoption rate of the usage customer portal, and minimize billing customer service resources for customer usage discussions.

HIGH LEVEL COMMUNICATION PLAN IMPLEMENTATION ROLES:

PWSD is responsible for development of communication plan goals, public material content, internal PWSD customer communication protocols and service levels and associated communication tool support, PWSD staff training and management including primary spokesperson, public information officer, customer care billing and field services staff, as well as Board and leadership team communications. PWSD phone tree, development of call management protocol. This includes:

Website, PWSD call tree development logistics and content, PWSD primary spokesperson contact protocol, social media inquiry management, online video tutorial for retrofit and portal training

UMS is responsible for publishing, disseminating communication materials related to the customer interfacing for appointment scheduling, general project information, and survey dissemination. UMS is responsible for ensuring listed public communications are delivered in the applicable mode and according to project timing.

TARGET AUDIENCES:

Board
Leadership Team
PWSD Project Team (Including Sponsor – Steve Hellman
Contracted Services Project Team
PWSD Staff (Customer Care Team, and all other PWSD Staff)
Media

All User Categories Impacted by Retrofit

1. Irrigation – HOA
2. Irrigation – Commercial
3. Multi-Family
4. Commercial
5. Single-Family Residential
6. Other governmental (Douglas County, Town of Parker)
7. Home and commercial property builders/developers

TOOLS & METHODS OF COMMUNICATION/MODES OF DELIVERY:

Public Communications

Large Meter Audit Customer Coordination
Web site – General & Map
Press Release(s) – General/Neighborhood specific
Bill inserts & Tidbits
HOA Newsletters – Route specific
Social Media (District FB/Twitter
Individual Customer Notices

- Initial Notice
- 2nd Notice
- Final Notice
- Disconnect Hang Tag
- Hang tag/notice of completion
- Survey Enhance customer satisfaction as demonstrated by survey metrics
- Direct marketing tools with benefits/instructions for online services

General overall ongoing marketing tools with benefits/instructions for online services
Public project status updates
IVR call outs
Offer customer open houses – general, and HOA
Video online (of retrofit and tutorial for portal use)
PWSD customer inquiry management

- Designate, train, talking points for primary point(s) of contact
- Define customer communication service levels for managing customer interfaces
- Phone tree design/including recorded message information
- Internal SME/messaging, define expectations for customers, assistance and back up
- Customer Care (Field & Billing)
- Other PWSD support staff

<u>Internal (PWSD/PWSD & Contractor)</u>
Team status meetings
Status reports in relation to critical timelines, budget and dynamic issue resolution
Interim Board updates (memo and potential presentations)
All-staff meeting updates
Customer Care team status updates
Individual departmental meetings with IT, Engineering, Water Resources, Finance, as information is brought on line, integrated, and available for use in each area – rollout how the data can be used and facilitate its integration into each functional area and systems.
Internal risk management related to leading a major technology switch, including technological demands and impacts created by data management
Intranet

<u>Modes of Delivery</u>

- Utility spokesperson(s)

- Web & social media
- News media - Press releases, potential of using local paper advertisement
- Other agencies/boards (including local HOA meetings/newsletters)
- Direct mail
- Talking points
- Generic speeches for leadership, Board, PIO and other trained spokesperson(s)
- Designated web address and phone contact

CORE MESSAGES: Core messages will be consistent with the District's vision, mission and values, and will emphasize public health, safety and resource stewardship. Core messages should reflect District values, defined customer expectations, demonstrate project value, and pre-emptively address potential customer concerns. Critical messages should include:

1. Water is a critical resource
2. This project enhances overall resource management
3. This project enhances customer service
4. This project enhances reading efficiencies
5. This project provides information that will help the District do a better job for our customers today and in the future
6. We care about how our customers feel about the project

MESSAGES/CONENT:

1. Will be consistent with District Vision, Mission and Values
2. Will be consistent with project purpose, goals and objectives
3. Will be tailored to the target audiences
4. Will provide clear direction as to timing, expectations of the work to be performed by PWSD, the Contractor and what is expected of the customer.
5. Will provide the customer with a point of contact, and a service level expectation.
6. There will be a customer feedback loop that informs the District on how our customers are feeling about the project

SCHEDULE (timing/frequency of communications):

Individual customer-type process flowchart & escalation process (attach)

High-level project timeline

Targeted areas for implementation and anticipated timing/project schedule for each area

Associated Policies:

1. "Opt Out" Policy – Policy that determines the District's position on, and action to be taken relative to customers that refuse to allow access to perform the meter upgrade, and/or refuse the meter upgrade.

2. Customer service levels and associated programs (customer notifications processes) – Once AMI and associated information is available to customers and the PWSD Billing
3. Communication targeted service levels, metrics, and reporting.

ATTACHMENTS:

Attachment A – Communications Plan Schedule (with party responsible for developing and disseminating.)

Attachment B – PWSD customer communication protocol (phone & email) and service levels

Attachment C – Retrofit process and communication flowchart and escalation process (residential and non-single family residential)

Attachment D – Subdivisions/areas in order of retrofit/upgrade priority

Attachment E – Communication materials

An Important Message from PWSD
Response Required

No Later Than _____, 2016

Dear Valued Customer: (INSERT NAME IF MAIL MERGE), ACCOUNT #:_____ INSERT DATE

Parker Water & Sanitation District (PWSD) is committed to effective management of our critical water resources. As part of the sustainable water initiative, PWSD is replacing its aging water meters with new models that provider greater efficiency and conservation technology. We are partnering with Utility Metering Solutions (UMS) to complete the installation. ***Since the water meter is located inside your residence or business, we are asking for your help in providing access to the water meter by scheduling an appointment with UMS.***

How do you schedule your appointment?

- ✓ Please have your account number ready and visit the UMS 24-hr online scheduling portal at: **www.umsonlinescheduling.com.**
- ✓ Appointments may also be made by calling the UMS Call Center at **(844) 741-6248.** Spanish speaking agents are available (Option #2).

Scheduling agents are available:
Monday-Friday, 6:00AM to 4:00PM (MT)
Saturdays, 6:30AM to 2:00PM (MT)
Appointment times are available Monday through Friday, **8:00AM to 4:00PM** (MT).
Limited evening and weekend appointments are available upon request.
Please schedule an appointment no later than _____.

There is *no charge* to you for this meter replacement. To complete installation of the new water meter:

- ⇨ UMS will need access to the water meter inside your home or business.
- ⇨ The area should be clear and accessible. Related plumbing valves should be in working order.
- ⇨ The homeowner or a responsible party (18 years old or older) must be present at the time of installation.
- ⇨ For the safety of UMS meter installer, please secure all pets.

All PWSD meters are scheduled for replacement. *Failure to respond to this notice may result in service interruption.*

What you can expect during your appointment...

You will be asked to schedule an appointment spanning a two-hour block of time. The UMS installer will arrive to complete the meter installation work within the two-hour time frame. Pending any unforeseen issues, the actual installation process will take approximately 30-60 minutes. UMS is an experienced meter installation contractor. All installers will have ID, wear UMS uniforms, and travel in marked vehicles.

To find out about the enhanced customer service benefits, see the enclosed flier for more information. Questions? Contact the PWSD office via phone at **(720) 842-4233**, or email at **replacemymeter@pwsd.org**, or visit the website at **www.pwsd.org/meterreplacement**.

Parker Water & Sanitation District & UMS thank you for your cooperation in making this program a success!

ParkerWater & SANITATION DISTRICT

UMS UTILITY METERING SOLUTIONS

Water Meter Replacement Project

Parker Water & Sanitation District (PWSD) is committed to effective management of our critical water resources. As part of the sustainable water initiative, PWSD is replacing its aging water meters. Doing the best job we can for our customers today and in the future is our primary objective! Applying industry related best management practices & technologies is allowing key benefits to be realized:

- ✓ Enhancing customer service & empowering our customers with online access to information to help understand & manage water use;
- ✓ Increasing water metering effectiveness & meter reading efficiency; and
- ✓ Leveraging water use data to inform operating/engineering/financial decisions.

This multi-year project is designed to minimize the inconvenience of changing out water meters, while improving the management of this precious resource!

Parker Water & Sanitation District

Renewable, sustainable, long-term water resources.
A vital investment for our Future!

Key Milestones

2016: Communication infrastructure & integration
2016 – 17: Meter installation for commercial, multi-family, irrigation, and manually read single-family residential accounts
2018 – 2023: Remaining single-family residential accounts

Who We Are & Our Partners

Parker Water & Sanitation District (PWSD), established in 1962, provides water & wastewater services for the Town of Parkers, portions of unincorporated Douglas County, and in the near future, will also serve parts of Lone Tree & Castle Pines. PWSD is partnering with ***OUR CUSTOMERS*** & **Utility Metering Solutions** (UMS), our installation contractor, to successfully implement this multi-year water meter replacement project. Beginning in the fall of 2016 and continuing over the next several years, we will be visiting neighborhoods replacing aging meters with updated technology. The folks at UMS are nationally recognized, experienced professionals who are helping streamline the project, while supporting one of our primary values - customer satisfaction.

For More Information, Visit
pwsd.org/meterreplacement or call (720) 842-4233

The Plan

Parker Water & Sanitation District & our partners, UMS will be notifying customers by letter and door hanger when crews will be in their neighborhood. Information on how to make an appointment & what to expect during the meter replacement process will be provided. Customers will also be provided materials on how they can access their metering information online. A map showing the general timeline of when crews will be in each neighborhood is published on PWSD's website & will be updated as the project progresses.

For more information: pwsd.org/meterreplacement

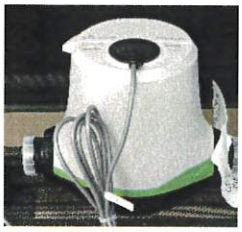
Sustainable Water Initiative: Water Meter Replacement Project

Frequently Asked Questions

ParkerWater & SANITATION DISTRICT

UMS UTILITY METERING SOLUTIONS

1. **Why is the water meter being replaced?**



Over time, meters wear out, and can under register the amount of water being used. By replacing meters, usage readings will be more accurate. In addition, the new system will include meter reading technology that will save labor, wear and tear on District vehicles, prevent reading recording errors, and minimize the need for District personnel to go on to customer's private property to read the meter. This technology will also empower customers to manage their water use by providing more timely information through an online customer portal where customers can access they own meter reading information, set up usage threshold alerts, and identify potential leaks.

2. **How does the new metering technology benefit me?** AquaHawk ALERTING!

Benefits of the new metering technology include:

- The new technology has a customer portal – AquaHawk - that allows you to find out your water use usually within a day, much faster than waiting for your water bill to arrive.
- Each customer can set up individualized usage thresholds/budgets in the customer portal, see how your usage compares to the same time last year, and can also alert for high use or continuous flow (which usually means you have a leak!)
- Understanding your water use helps you make informed decisions about your water use and your water bill.

3. **When will I get a new meter?**

PWSD will be replacing water meters over the next several years. We are starting in areas that have the oldest meters that we have to walk from home to home to read. There is a map on our website that outlines the current areas we are working in.

4. **Can you tell me more about how the meter replacement process works?**

- **When will this work be performed?**

The work is beginning in November 2016 and will continue in different phases for the next several years. You will receive a letter when crews are replacing meters in your area. You can also visit our website for a map outlining the areas and approximately when crews will be in your neighborhood.

You will receive a letter letting you know that crews are in your area, and we are ready to schedule the replacement of your water meter. The work will be performed Mondays through Fridays, during the hours of 8:00 a.m. – 5:00 p.m. You will be provided with how you can schedule your appointment online, or call in to our scheduling center.

- **How long will it take, and will my service be affected?**

Our partners, UMS, will come to your address and replace the water meter. In most cases, it is a simple procedure that will require 30-60 minutes. It takes approximately 15-20 minutes to change the meter itself. During that time no water can be used, but after that you can expect the same great service!

- **How do I know who is authorized to do the work?**

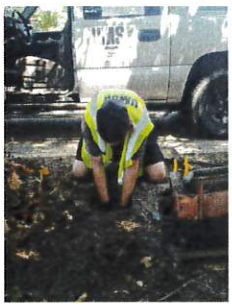
Our partners, UMS, will be performing the meter replacement. They will be driving "UTILITY METERING SOLUTIONS" trucks, wearing bright shirts, jackets, or vests identified by "UTILITY METERING SOLUTIONS" and carrying appropriate credentials.

- **Do they need to come inside my home/business?**

If the water meter is located inside your home in your basement or crawl space, yes, the installers will need to get into your home. For businesses, or multi-family residential customers, the water meter is usually in a mechanical room, so access is needed. The majority of homes built after 2008 have outside meter pit sets.

- **Do I have to be present for the installation if the meter is inside my home?**

If the water meter is located inside, yes. For your peace of mind, we require an adult be present during the installation. The installer will not enter your home unless authorized to do so by someone 18 years old or older.



- **What will they do inside my home?**

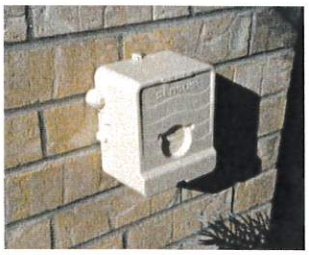
Installers will remove the old water meter, install the new meter, and install the meter communication endpoint, which usually goes on the outside of the home or building.

- **What if the meter is outside my home?**

If the water meter is located outside in a meter pit, it will not be necessary for anyone to be home. In this case, the majority of the work will take place near the street in the meter pit.

5. **The box on the outside of my house seems larger than before. Why?**

When you have a box on the outside of your house, that means that the actual water meter is somewhere in your basement. The box on the outside of your house is a battery-operated endpoint. There is a communication wire that runs from the meter, through your home, and connects to this endpoint, which then transmits your meter readings. The different size and configuration is due to a 20-year battery that is inside. This is actually the smallest unit available. These can be painted if you want them to blend in more with your home's exterior.



6. **Will the wireless technology affect my health, privacy or other electronic devices in my home?**

The new meters will not negatively affect health or privacy. In fact, these meters better address these types of concerns by replacing vehicles and manual visits to your home with environmentally clean radio communication. The wireless portions of the system:

⇨ Will be operated according to Federal Communications Commission rules;

ParkerWater & SANITATION DISTRICT

UMS UTILITY METERING SOLUTIONS

⇨ Will not interfere with other radio frequencies in the area;

When the meter is inside, the radio transmitter will be mounted outside the home or place of business, and the transmission time is less than a second per day.

Still have questions? Visit our website at www.pwsd.org/meterreplacement, email us at replacemymeter@pwsd.org, or call us at **(720) 842-4233**.

ParkerWater
& SANITATION DISTRICT

November 2017

INSERT CUSTOMER NAME
INSERT CUSTOMER ADDRESS
INSERT CUSTOMER ADDRESS

Dear INSERT CUSTOMER NAME,

Thank you for participating the District's water meter replacement program! We appreciate you taking time out of your day for the installation of the new water metering equipment. And now that the new water meter has been installed, you can take advantage of the benefits of the technology.

Enclosed is information that will help you sign up for "AquaHawk Alerting", a service provided to Parker Water customers that have the new metering technology that will enable you to efficiently manage your water use and potentially lower your monthly bills. Register for AquaHawk and you will be able to:

- See an estimated and projected bill amount anytime during the billing cycle
- See your water usage by hour, day, month and other time periods
- Set your own customized Threshold Alerts to be notified if you are going to exceed billing or consumption amounts, and receive alerts when abnormal use or potential leaks occur
- Enable other users – property manager, caretaker, etc. – to access your account and review alerts

Visit www.pwsd.org and click on the AquaHawk & Meter Replacement link to learn more, or go directly to the AquaHawk link at https://parkco.aquahawk.us/login to sign up. It's fast and easy! There is a step-by-step tutorial on how to register and information for setting up your own water use alerts.

We are excited to be able to offer you this technology! If you need any assistance getting registered, navigating how to set up your customized alerts, or learning more about how AquaHawk can help you manage your water use, please call us at 303-841-4627, Option 5, and we will be happy to introduce you to your personal water management tool today!

Sincerely,

Your Parker Water & Sanitation District Customer Care Team

ParkerWater
& SANITATION DISTRICT

Renewable, sustainable, long-term water resources.
A vital investment for our Future!

A Special Invitation for Our Irrigation Customers!

Now that your water meter replacement is complete,
we want to introduce you to the power of…
AquaHawk Alerting!

OPEN HOUSE

WEDS. MAY 10TH

2-4 p.m.

18100 E WOODMAN DRIVE

AquaHawk ALERTING!

AquaHawk Alerting is a powerful that you can use to:

- ✓ *Keep tabs on water use on throughout the month, before you get your bill;*
- ✓ *Alert you when you are using more water than you think you need to;*
- ✓ *Alert you when your bill is approaching a self-established dollar amount;*
- ✓ *Alert you when you have what could be a leak!*

As a property manager, you can allow your landscape contractor, on-site staff, or even your board members to have access to *AquaHawk*. Please feel free to pass this invitation along to those that you feel would benefit from learning more about how to use this powerful water management tool!

Even if you are already using AquaHawk Alerting, feel free to attend.
Come and learn more about how this new technology can work for you!

Staff will be available to help you sign up & assist you with setting up your personalized alarms *on the spot!*

SPACE IS LIMITED! Please RSVP by Noon, Monday, May 8th to:

Billie L. Owens, Customer Relations Manager
bowens@pwsd.org/720-842-4216

Parker Water & SANITATION DISTRICT

OPEN HOUSE
WEDS. MAY 10TH
2-4 p.m.
18100 E WOODMAN DRIVE
AquaHawk ALERTING!

April 20, 2017

[redacted]

Dear [redacted],

Thank you for participating in the District's water meter replacement program! Now that your new water meters have been installed, we wanted to make you are aware of our online customer portal that provides powerful information to help you manage your water use, and invite you to sign up today!

AquaHawk Alerting is a powerful tool that you can use to:

- ✓ Keep tabs on your water use on an hourly basis, as often as you like throughout the month, *before* you get your bill;
- ✓ Alert you when you are using more water than you think you need to;
- ✓ Alert you when your bill is approaching a self-established dollar amount;
- ✓ Alert you when you have what could be a leak!

As a property manager, you can allow your landscape contractor, on-sight staff, or even your board members to have access to AquaHawk.

Already using AquaHawk Alerting? Then you are familiar with how this tool will help you manage your water use. Not using it yet, but would like to know more? Visit our website at http://www.pwsd.org/2306/Meter-Replacement-Project step-by-step registration assistance, or call our expert staff for help at (303)841-4627 Option 5.

Want to take a deep dive into how this water management tool can work for you? Or just need some personalized hands on help? We will be holding an ***open house*** for you, your landscape contractor and/or board members to help you learn more about AquaHawk Alerting. Wednesday, May 10th from 2 – 4 p.m., come visit us at our offices located at 18100 E. Woodman Drive. We can show you how to get the most out of this new technology. We will have staff ready to help you get signed up on the spot, show you how to set up your personalized alarms, and give you tips about how this information can work for you.

Feel free to pass this invitation along to those that you feel would benefit from learning more about how to use this powerful water management tool. Please RSVP to Billie L. Owens, Customer Relations Manager at 720-842-4216, or via email at bowens@pwsd.org by noon on Monday, May 8th. Thank you and contact me should you have any questions.

Regards,

Billie L. Owens
Customer Relations Manager

SURVEY

Post-Installation Meter Replacement Program Survey

Extraordinary customer service – It's a core value!

Your satisfaction is important to us! We want your feedback! Thank you for taking a few minutes to complete a short survey about your experience with the meter replacement process.

Address or Subdivision*:
(Mandatory field – need to type something in here to be able to move forward.)

Date of Installation:
(Not mandatory field – drop down selection if possible.)

1. How did you make your appointment to get the water meter replaced?
    - Online
    - Through the call center

2. Were you satisfied with how your questions about the installation process were answered?
    - Very satisfied
    - Somewhat satisfied
    - Somewhat dissatisfied
    - Very dissatisfied
    - Didn't have any questions

3. How satisfied were you with the friendliness & courtesy of the call center staff?
    - Very satisfied
    - Somewhat satisfied
    - Somewhat dissatisfied
    - Very dissatisfied

4. Were you satisfied with the installation crew? (Please consider whether they were on time, were courteous, answered any questions you may have had, and were careful not to leave a mess.)
    - Very satisfied
    - Somewhat satisfied
    - Somewhat dissatisfied
    - Very dissatisfied

5. If you called PWSD directly, did you receive the help you needed from our staff concerning your retrofit?
    - Yes
    - No

- Didn't need assistance.

6. How would you rate the overall experience?
   - You made it easy on me!
   - It went okay.
   - It was a real challenge to get this done.
   - No opinion

7. Have you looked up your account in the online customer portal - AquaHawk Alerting?
   - Yes
   - Not yet
   - Probably won't

8. If you have viewed your account in AquaHawk Alerting, do you think this tool will help you manage your water use more effectively?
   - Yes! I think it will be very helpful.
   - Maybe.
   - No. Probably won't use it.
   - No opinion

9. Is there additional information that you wish was available about this project?
   (Free form box available for comments.)

Have questions? Want more information?
Call us at (720)842-4233, or email at replacemymeter@PWSD.org.

Understanding RF and Smart Meters

Despite news coverage of consumer concerns over smart meter radio frequencies (RF), numerous reports and industry group findings show that smart meter technology is very safe. Current Federal Communications Commission (FCC) standards provide an acceptable factor of safety against the health impacts of existing common household electronic devices and smart meters.

Sensus' metering and automation products and technologies fully comply with the FCC standards and guidelines for environmental exposure to RF, which have been in place since 1985. In 1996, the FCC implemented recommendations from two expert organizations, the National Council on Radiation Protection and Measurements (NCRP) and the Institute of Electrical and Electronics Engineers (IEEE), in respect to the permissible RF exposure limits for field strength and power density for transmitters. The FCC also adopted the specific absorption rate (SAR) limits for human exposure to RF emissions from devices operating within close proximity to the body as specified within the American National Standards Institute (ANSI) and the Institute of Electrical and Electronics Engineers (IEEE) guidelines which are available online.

The exposure guidelines are based on thresholds for known adverse effects, and they incorporate prudent margins of safety. A few facts in regards to meter RF:

- **RF exposure from a particular device varies, depending on the power of the radio in the device, by distance from the device and by attenuation from intervening objects**
  - The RF exposure from a meter for example drops by a factor of 100 when you move from a distance of 1 foot to 10 feet away
  - Smart meters are typically located on the outside wall of a residence; the RF exposure is inside a dwelling is typically a factor of 10 less than that immediately in front of the meter
- **Sensus smart meters and automation end points typically transmit radio signals for a very small amount of time during a day**
- **Data from a large smart meter deployment using Sensus technology indicates that the typical meter transmits less than one second per day and that 99.999% of smart meters transmit for less than one minute per day**

Generally speaking, there are a number of existing everyday environmental sources that produce much stronger RF fields than those of a smart metering system. RF energy produced by smart meters is not harmful and is comparable to cellular phone devices, wireless baby monitors, television broadcasts, garage door openers, microwave ovens, cordless home phones, and WiFi networks. In addition, because Sensus metering systems communicate over licensed spectrum, they are in complete compliance with FCC rules and regulations.

Meter RF Emissions

COMPARISON OF RF POWER DENSITY IN THE EVERYDAY ENVIRONMENT

• FM radio or TV broadcast station signal	0.005
• **SmartMeter device at 10 feet**	**0.1 or less**
• Cyber café (Wi-Fi)	10 – 20
• Laptop computer	10 – 20
• Cell phone held up to head	30 – 10,000
• Walkie-Talkie at head	500 – 42,000
• Microwave oven, two inches from door	5,000

Device Relative Power Density in microwatts per square centimeter.

Note: Information acquired from Sensus, a xylem brand at www.Sensus.com, and from the Federal Communications Commission at www.fcc.gov.

APPENDIX D

Large Meter Audit Report

Meter Audit Usage Discrepancies

Representative year **2016**

Month																	
jan	3626	1858	2115	2405	11251	9743	1653	0	1668	619	2729	2261	0	0	0	0	
feb	2958	1653	2281	2038	10915	7947	1309	0	1680	579	2267	4471	0	0	0	0	
mar	2353	1607	2162	1791	10611	6741	1570	0	1817	690	2804	4807	0	0	0	0	
apr	2837	1913	2646	1907	11959	8238	1360	0	2731	759	3602	1639	0	0	0	0	
may	3245	1705	2344	1725	10359	7110	1306	0	1409	665	4538	1436	0	623	0	0	
jun	2808	2437	2779	1751	8907	8395	1496	6901	1510	608	5843	1419	8533	0	91	432	
jul	2924	2055	2431	1924	10163	613	1494	14228	3266	612	7943	1603	66551	39339	48010	3156	
aug	4107	2239	2447	1875	8639	6957	931	22150	3447	691	12452	1562	86990	27674	79232	13705	**41.45636**
sep	5150	2118	3055	1873	7691	8294	786	51538	3891	3934	12723	2080	57977	57023	93202	13703	
oct	5030	2855	4981	1939	8698	7024	1184	33763	2995	544	12397	2888	16417	39523	82284	9132	
nov	5775	3377	6358	1866	6491	7254	990	11396	2125	732	14917	3631	38668	30043	29403	4040	
dec	4557	2950	2477	1997	6271	6455	1440	0	2200	565	11577	3017	7281	0	0	0	
Total	45370	26767	36076	23091	111955	84771	15519	139976	28739	10998	93792	30814	282417	194225	332222	44168	
Actual	453700	267670	360760	230910	1119550	847710	155190	1399760	287390	109980	937920	308140	2824170	1942250	3322220	441680	
Discrepancy	408330	240903	324684	207819	1007595	762939	139671	1259784	258651	98982	844128	277326	2541753	1748025	2989998	397512	
AF	1.25316477	0.739331307	0.996455196	0.637796511	3.092309055	2.341459791	0.428650299	3.866277096	0.793799919	0.303775758	2.590628832	0.851113494	7.800639957	5.364688725	9.176303862	1.219964328	

APPENDIX E

Removed Meter Condition Summary

Meter Testing Data - 2017

Total Water Metered (gallons) 60,893,084

Total Net Over/Under Charged to Customers (gallons)	5,486,492	(Black is over-metered, red is under-metered)

Size	Gallons	Qty of Meters
5/8" X 3/4"	283,186	38
1"	131,780	7
1 1/2"	125,578	2
2"	1,576	2
3"	875,821	1
4"	4,737,483	1

NOTE: All tests performed at National Meter

	0.25 gpm	2 gpm	15 gpm
Weighted Values 5/8" X 3/4"	0.10	0.60	0.30
Weighted Values 1"	0.75 gpm 10%	4 gpm 60%	40 gpm 30%
Weighted Values 1 1/2"	1.5 gpm 10%	8 gpm 60%	50 gpm 30%

	2 gpm	15 gpm	100 gpm	
Weighted Values 2"	5%	10%	85%	
Weighted Values 3"	.25 gpm 5%	2 gpm 10%	15gpm 20%	320 gpm 65%
Weighted Values 4"	.5 gpm 5%	3 gpm 10%	17 gpm 20%	500 gpm 65%

TEST DATA SHEET INFO

Date	Address	Owner	Acct Type	Meter Type	Size	Meter #	Flow (gpm)	% Measured	AWWA	Pass/Fail	Average Metering	Weighted Values (use)	Weighted Actual Metering	Perfect Metering	Final Read	PWSD Gain/Loss in Gallons	Notes
4/10/2017	11839 Saunter Ct	Idyllwilde Master HOA	Irrig-HOA	Badger	5/8" X 3/4"	6380018	0.25 2 15	100.4057% 100.7322% 99.3858%	95-101 98.5-101.5 98.5-101.5	Pass Pass Pass	100.17%	0.10 0.60 0.30	216,687 1,304,347 643,456	215,811 1,294,866 647,433	2,158,110	6,380	
4/10/2017				Badger	5/8" X 3/4"	19704896	0.25 2 15	99.3915% 99.3724% 98.0781%	95-101 98.5-101.5 98.5-101.5	Pass Pass Fail	98.95%	10% 60% 30%	157,200 943,016 465,367	158,162 948,972 474,486	1,581,620	16,037	Can't find in BM
4/10/2017				Badger	5/8" X 3/4"	98027691	0.25 2 15	100.4057% 100.4184% 98.5734%	95-101 98.5-101.5 98.5-101.5	Pass Pass Pass	99.80%	10% 60% 30%	293,026 1,758,377 863,035	291,842 1,751,050 875,525	2,918,417	3,980	Can't find in BM
4/13/2017	12681 Nate Dr	Stron Ranch - CCSMD#1	Irrig-HOA	Badger	1 1/2"	15144533	1.5 8 50	100.9489% 101.1619% 100.9543%	95-101 98.5-101.5 98.5-101.5	Pass Pass Pass	101.02%	10% 60% 30%	623,825 3,750,847 1,871,575	617,961 3,707,766 1,853,883	6,179,610	66,636	
4/13/2017				Badger	1 1/2"	98297277	1.5 8 50	100.9489% 101.1619% 101.4566%	95-101 98.5-101.5 98.5-101.5	Pass Pass Pass	101.19%	10% 60% 30%	484,141 2,910,974 1,459,727	479,590 2,877,540 1,438,770	4,795,900	58,942	Can't find in BM
4/25/2017	15702.5 Newlin Gulch Blvd	Newlin Gulch HOA	Irrig-HOA	Badger	2"	5013057	2 15 100	99.6595% 100.6345% 99.7998%	95-101 98.5-101.5 98.5-101.5	Pass Pass Pass	100.03%	5% 10% 85%	67,335 135,988 1,146,314	67,566 135,131 1,148,614	1,351,310	1,672	
4/25/2017	19185 E Lincoln Ave	Burt Ford	Comm	Badger	2"	18476899	2 15 100	100.1603% 99.1473% 100.1001%	95-101 98.5-101.5 98.5-101.5	Pass Pass Pass	99.80%	5% 10% 85%	61,458 121,674 1,044,164	61,360 122,720 1,043,120	1,227,200	96	
4/25/2017	10450 S Progress Way	R & M Builders LLC	Comm	Badger	1"	29576389	0.75 4 40	100.6036% 100.2008% 99.5475%	95-101 98.5-101.5 98.5-101.5	Pass Pass Pass	100.12%	10% 60% 30%	103,850 620,606 308,280	103,227 619,362 309,681	1,032,270	465	
4/25/2017				Badger	1"	99250206	0.75 4 40	95.1710% 101.3570% 99.1855%	95-101 98.5-101.5 98.5-101.5	Pass Pass Pass	98.57%	10% 60% 30%	154,779 989,033 483,922	162,632 975,792 487,896	1,626,320	1,414	Can't find in BM
5/17/2017	11864 High Desert Rd	Merlin Klotz	Sgl Family	Badger	5/8" X 3/4"	6144804	0.25 2 15	100.8016% 102.4573% 99.8510%	95-101 98.5-101.5 98.5-101.5	Pass Fail Pass	101.04%	10% 60% 30%	59,754 364,414 177,572	59,279 355,674 177,837	592,790	8,950	
5/17/2017					5/8" X 3/4"	15097575	0.25 2 15	101.3026% 101.7094% 99.6622%	95-101 98.5-101.5 98.5-101.5	Fail Fail Pass	100.89%	10% 60% 30%	987 5,944 2,912	974 5,844 2,922	9,740.000	103	Can't find in BM

					TEST DATA SHEET INFO												
Date	Address	Owner	Acct Type	Meter Type	Size	Meter #	Flow (gpm)	% Measured	AWWA	Pass/Fail	Average Metering	Weighted Values (use)	Weighted Actual Metering	Perfect Metering	Final Read	PWSD Gain/Loss in Gallons	Notes
5/17/2017					5/8" X 3/4"	15206140	0.25 2 15	101.2024% 101.4957% 99.6225%	95-101 98.5-101.5 98.5-101.5	Fail Pass Pass	100.77%	10% 60% 30%	10 59 29	10 58 29	9742.00%	1	Can't find in BM
5/17/2017	19542 E Parker Square Dr	Cornerstone Church of Parker	Comm	Badger	1"	15993489	0.75 4 40	95.8084% 104.4776% 99.7494%	95-101 98.5-101.5 98.5-101.5	Pass Fail Pass	100.01%	10% 60% 30%	562,874 3,682,835 1,758,083	587,500 3,525,000 1,762,500	5,875,000	128,793	
5/17/2017	11615 Snowcreek Ln	Reginald Organ	Sgl Family	Badger	5/8" X 3/4"	17122212	0.25 2 15	97.1944% 98.2906% 97.3574%	95-101 98.5-101.5 98.5-101.5	Pass Fail Fail	97.61%	10% 60% 30%	225,938 1,370,918 678,951	232,460 1,394,760 697,380	2,324,600	48,793	
5/17/2017	11932.5 Singing Winds St	Villages of Parker HOA	Irrig-HOA	Badger	5/8" X 3/4"	29544483	0.25 2 15	101.4028% 101.6026% 99.6622%	95-101 98.5-101.5 98.5-101.5	Fail Fail Pass	100.89%	10% 60% 30%	25,407 152,741 74,912	25,055 150,332 75,166	250,553	2,507	
5/17/2017	12355 Wanderlust Pl	Idyllwilde Master HOA	Irrig-HOA	Badger	5/8" X 3/4"	29567543	0.25 2 15	101.3026% 101.7094% 99.9007%	95-101 98.5-101.5 98.5-101.5	Fail Fail Pass	100.97%	10% 60% 30%	109,707 660,888 324,567	108,297 649,780 324,890	1,082,967	12,195	
5/17/2017	21541 Omaha Ave	Susan Casiano	Sgl Family		5/8" X 3/4"	90317570	0.25 2 15	101.2000% 99.0385% 97.8166%	95-101 98.5-101.5 98.5-101.5	Fail Pass Fail	99.35%	10% 60% 30%	56,596 332,324 164,112	55,925 335,550 167,775	559,250	6,218	
5/17/2017					1"	93578313	0.75 4 40	98.1038% 101.5991% 99.7494%	95-101 98.5-101.5 98.5-101.5	Pass Fail Pass	99.82%	10% 60% 30%	15,664 97,334 47,781	15,967 95,802 47,901	159,670	1,109	Can't find in BM
5/17/2017					5/8" X 3/4"	94554843	0.25 2 15	100.2004% 98.8248% 97.1091%	95-101 98.5-101.5 98.5-101.5	Pass Pass Fail	98.71%	10% 60% 30%	499,091 2,953,436 1,451,081	498,093 2,988,558 1,494,279	4,980,930	77,321	Can't find in BM
5/17/2017					5/8" X 3/4"	98743679	0.25 2 15	100.2004% 100.4274% 97.9535%	95-101 98.5-101.5 98.5-101.5	Pass Pass Fail	99.53%	10% 60% 30%	200,628 1,206,497 588,388	200,227 1,201,362 600,681	2,002,270	6,757	Can't find in BM
5/19/2017	9056 E Parker Rd	Ave Maria Church	Comm	Badger Compound	3"	99916494	0.25 2 15 320	50.0000% 69.8697% 55.4901% 3.2952%	95-101 98.5-101.5 98.5-101.5 97-103	Fail Fail Fail Fail	58.45%	5% 10% 20% 65%	28,335 79,191 125,786 24,276	56,671 113,341 226,682 736,717	1,133,410	875,821	Tested twice, results here are average of two tests
5/25/2017	12355 S Canterberry Pkwy	Town of Parker	Irrig-Comm	Badger Compound	4"	5010936	0.5 3 17 500	0.0000% 0.0000% 60.3865% 97.0083%	95-101 98.5-101.5 98.5-101.5 97-103	Fail Fail Fail Pass	20.13%	5% 10% 20% 65%	0 0 2,300,852 12,012,715	952,553 1,905,105 3,810,210 12,383,183	19,051,050	4,737,483	
7/18/2017	17486 E Dewberry Dr	Vance & Pamela Roth	Sgl Family	Badger	5/8" X 3/4"	16654530	0.25 2 15	98.0000% 98.3607% 97.1508%	95-101 98.5-101.5 98.5-101.5	Pass Fail Fail	97.84%	5% 10% 20%	93,998 188,689 372,736	95,917 191,834 383,667	1,918,335	15,995	
7/18/2017				Badger	5/8" X 3/4"	19084448	0.25 2 15	101.0000% 100.4098% 100.0198%	95-101 98.5-101.5 98.5-101.5	Pass Pass Pass	100.48%	5% 10% 20%	49,483 98,387 196,010	48,993 97,985 195,971	979,854	930	Can't find in BM
7/18/2017	23326 Briar Leaf Ave	Bryan & Peggy Schoening	Sgl Family	Badger	5/8" X 3/4"	19113856	0.25 2 15	96.0000% 101.4344% 98.2390%	95-101 98.5-101.5 98.5-101.5	Pass Pass Fail	98.56%	5% 10% 20%	103,199 218,081 422,423	107,499 214,997 429,995	2,149,974	8,788	

Meter Testing Data - 2017

Total Water Metered (gallons)	60,893,084
Total Net Over/Under Charged to Customers (gallons)	**5,486,492** (Black is over-metered, red is under-metered)

Size	Gallons	Qty of Meters
5/8" X 3/4"	283,186	38
1"	131,780	7
1 1/2"	125,578	2
2"	1,576	2
3"	875,821	1
4"	4,737,483	1

NOTE: All tests performed at National Meter

	0.25 gpm	2 gpm	15 gpm
Weighted Values 5/8" X 3/4"	0.10	0.60	0.30
Weighted Values 1"	0.75 gpm: 10%	4 gpm: 60%	40 gpm: 30%
Weighted Values 1 1/2"	1.5 gpm: 10%	8 gpm: 60%	50 gpm: 30%

	2 gpm	15 gpm	100 gpm	
Weighted Values 2"	5%	10%	85%	
Weighted Values 3"	.25 gpm: 5%	2 gpm: 10%	15gpm: 20%	320 gpm: 65%
Weighted Values 4"	.5 gpm: 5%	3 gpm: 10%	17 gpm: 20%	500 gpm: 65%

TEST DATA SHEET INFO

Date	Address	Owner	Acct Type	Meter Type	Size	Meter #	Flow (gpm)	% Measured	AWWA	Pass/Fail	Average Metering	Weighted Values (use)	Weighted Actual Metering	Perfect Metering	Final Read	PWSD Gain/Loss in Gallons	Notes
4/10/2017	11839 Saunter Ct	Idyllwilde Master HOA	Irrig-HOA	Badger	5/8" X 3/4"	6380018	0.25	100.4057%	95-101	Pass	100.17%	0.10	216,687	215,811	2,158,110	6,380	
							2	100.7322%	98.5-101.5	Pass		0.60	1,304,347	1,294,866			
							15	99.3858%	98.5-101.5	Pass		0.30	643,456	647,433			
4/10/2017				Badger	5/8" X 3/4"	19704896	0.25	99.3915%	95-101	Pass	98.95%	10%	157,200	158,162	1,581,620	16,037	Can't find in BM
							2	99.3724%	98.5-101.5	Pass		60%	943,016	948,972			
							15	98.0781%	98.5-101.5	Fail		30%	465,367	474,486			
4/10/2017				Badger	5/8" X 3/4"	98027691	0.25	100.4057%	95-101	Pass	99.80%	10%	293,026	291,842	2,918,417	3,980	Can't find in BM
							2	100.4184%	98.5-101.5	Pass		60%	1,758,377	1,751,050			
							15	98.5734%	98.5-101.5	Pass		30%	863,035	875,525			
4/13/2017	12681 Nate Dr	Stron Ranch - CCSMD#1	Irrig-HOA	Badger	1 1/2"	15144533	1.5	100.9489%	95-101	Pass	101.02%	10%	623,825	617,961	6,179,610	66,636	
							8	101.1619%	98.5-101.5	Pass		60%	3,750,847	3,707,766			
							50	100.9543%	98.5-101.5	Pass		30%	1,871,575	1,853,883			
4/13/2017				Badger	1 1/2"	98297277	1.5	100.9489%	95-101	Pass	101.19%	10%	484,141	479,590	4,795,900	58,942	Can't find in BM
							8	101.1619%	98.5-101.5	Pass		60%	2,910,974	2,877,540			
							50	101.4566%	98.5-101.5	Pass		30%	1,459,727	1,438,770			
4/25/2017	15702.5 Newlin Gulch Blvd	Newlin Gulch HOA	Irrig-HOA	Badger	2"	5013057	2	99.6595%	95-101	Pass	100.03%	5%	67,335	67,566	1,351,310	1,672	
							15	100.6345%	98.5-101.5	Pass		10%	135,988	135,131			
							100	99.7998%	98.5-101.5	Pass		85%	1,146,314	1,148,614			
4/25/2017	19185 E Lincoln Ave	Burt Ford	Comm	Badger	2"	18476899	2	100.1603%	95-101	Pass	99.80%	5%	61,458	61,360	1,227,200	96	
							15	99.1473%	98.5-101.5	Pass		10%	121,674	122,720			
							100	100.1001%	98.5-101.5	Pass		85%	1,044,164	1,043,120			
4/25/2017	10450 S Progress Way	R & M Builders LLC	Comm	Badger	1"	29576389	0.75	100.6036%	95-101	Pass	100.12%	10%	103,850	103,227	1,032,270	465	
							4	100.2008%	98.5-101.5	Pass		60%	620,606	619,362			
							40	99.5475%	98.5-101.5	Pass		30%	308,280	309,681			
4/25/2017				Badger	1"	99250206	0.75	95.1710%	95-101	Pass	98.57%	10%	154,779	162,632	1,626,320	1,414	Can't find in BM
							4	101.3570%	98.5-101.5	Pass		60%	989,033	975,792			
							40	99.1855%	98.5-101.5	Pass		30%	483,922	487,896			
5/17/2017	11864 High Desert Rd	Merlin Klotz	Sgl Family	Badger	5/8" X 3/4"	6144804	0.25	100.8016%	95-101	Pass	101.04%	10%	59,754	59,279	592,790	8,950	
							2	102.4573%	98.5-101.5	Fail		60%	364,414	355,674			
							15	99.8510%	98.5-101.5	Pass		30%	177,572	177,837			
5/17/2017					5/8" X 3/4"	15097575	0.25	101.3026%	95-101	Fail	100.89%	10%	987	974	9,740.000	103	Can't find in BM
							2	101.7094%	98.5-101.5	Fail		60%	5,944	5,844			
							15	99.6622%	98.5-101.5	Pass		30%	2,912	2,922			

					TEST DATA SHEET INFO												
Date	Address	Owner	Acct Type	Meter Type	Size	Meter #	Flow (gpm)	% Measured	AWWA	Pass/Fail	Average Metering	Weighted Values (use)	Weighted Actual Metering	Perfect Metering	Final Read	PWSD Gain/Loss in Gallons	Notes
7/18/2017				Badger	5/8" X 3/4"	93972513	0.25 2 15	100.0000% 99.8975% 98.3874%	95-101 98.5-101.5 98.5-101.5	Pass Pass Fail	99.43%	5% 10% 20%	158,442 316,559 623,547	158,442 316,884 633,767	3,168,836	10,545	Can't find in BM
7/18/2017				Badger	5/8" X 3/4"	95386032	0.25 2 15	101.0000% 101.4344% 98.9315%	95-101 98.5-101.5 98.5-101.5	Pass Pass Pass	100.46%	5% 10% 20%	93,694 188,194 367,101	92,767 185,533 371,066	1,855,331	376	Can't find in BM
7/19/2017	23006.5 E Mainstreet	Town of Parker	Irrig-Comm	Badger	5/8" X 3/4"	6379113	0.25 2 15	100.5000% 100.6356% 99.4155%	95-101 98.5-101.5 98.5-101.5	Pass Pass Pass	100.18%	5% 10% 20%	8,526 17,074 33,735	8,483 16,967 33,933	169,665	48	
7/19/2017	19737 Petersburg Ct	Jeffrey Ahrens	Sgl Family	Badger	5/8" X 3/4"	9158159	0.25 2 15	101.0000% 101.1653% 99.4155%	95-101 98.5-101.5 98.5-101.5	Pass Pass Pass	100.53%	5% 10% 20%	25,336 50,755 99,754	25,085 50,170 100,341	501,703	249	
7/19/2017	11674 Pine Hill St	Karen Moreau	Sgl Family	Badger	5/8" X 3/4"	17336086	0.25 2 15	99.0000% 100.6356% 99.4650%	95-101 98.5-101.5 98.5-101.5	Pass Pass Pass	99.70%	5% 10% 20%	81,144 164,970 326,102	81,964 163,928 327,856	1,639,280	1,532	
7/19/2017	11354 S Lost Creek Cir	Randy & Karen Savoie	Sgl Family	Badger	5/8" X 3/4"	18123100	0.25 2 15	97.0000% 99.5763% 98.5734%	95-101 98.5-101.5 98.5-101.5	Pass Pass Pass	98.38%	5% 10% 20%	42,743 87,757 173,746	44,065 88,130 176,260	881,301	4,210	
7/19/2017	23305 Song Bird Hills Way	Mitchell & Susanne Wettstein	Sgl Family	Badger	5/8" X 3/4"	19112334	0.25 2 15	99.0000% 100.6356% 98.9697%	95-101 98.5-101.5 98.5-101.5	Pass Pass Pass	99.54%	5% 10% 20%	101,016 205,370 403,941	102,037 204,073 408,146	2,040,730	3,928	
7/19/2017	11500 Night Heron Dr	Larry & Nancy Mayfield	Sgl Family	Badger	5/8" X 3/4"	19113805	0.25 2 15	100.0000% 100.6356% 99.5641%	95-101 98.5-101.5 98.5-101.5	Pass Pass Pass	100.07%	5% 10% 20%	32,532 65,477 129,559	32,532 65,063 130,126	650,630	154	
7/19/2017				Badger	5/8" X 3/4"	95062000	0.25 2 15	101.0000% 100.4237% 98.9895%	95-101 98.5-101.5 98.5-101.5	Pass Pass Pass	100.14%	5% 10% 20%	108,978 216,712 427,234	107,899 215,798 431,596	2,157,978	2,368	Can't find in BM
7/19/2017	20750 Bridlewood Ln	Pamela Spika	Sgl Family	Badger	5/8" X 3/4"	98026648	0.25 2 15	94.0000% 97.4576% 97.6818%	95-101 98.5-101.5 98.5-101.5	Fail Fail Fail	96.38%	5% 10% 20%	123,593 256,279 513,737	131,482 262,965 525,929	2,629,646	26,767	
7/19/2017	23944 Broadmoor Pl	Judith Campbell	Sgl Family	Badger	5/8" X 3/4"	99977369	0.25 2 15	99.0000% 98.5169% 98.9697%	95-101 98.5-101.5 98.5-101.5	Pass Pass Pass	98.83%	5% 10% 20%	67,460 134,261 269,757	68,141 136,282 272,565	1,362,824	5,511	
7/20/2017	16254 Plover Pl	Robert Wagner	Sgl Family	Badger	5/8" X 3/4"	16654856	0.25 2 15	99.0000% 98.2721% 98.0765%	95-101 98.5-101.5 98.5-101.5	Pass Fail Fail	98.45%	5% 10% 20%	112,164 222,678 444,469	113,297 226,593 453,186	2,265,931	13,765	
10/6/2017	10259.5 S Parker Rd	High Ploint	Irrigation	Badger	5/8" X 3/4"	8095827	0.25 2 15	100.1000% 100.5112% 98.9229%	95-101 98.5-101.5 98.5-101.5	Pass Pass Pass	99.84%	5% 10% 20%	203,723 409,120 805,310	203,520 407,039 814,078	4,070,390	6,484	
10/6/2017	12201.5 S Parker Rd	Brauwn Net Invest	Irrigation	Badger	5/8" X 3/4"	8095907	0.25 2 15	101.6000% 102.0450% 100.3755%	95-101 98.5-101.5 98.5-101.5	Fail Fail Pass	101.34%	5% 10% 20%	19,973 40,121 78,930	19,659 39,317 78,635	393,173	1,414	
10/6/2017	17901.5 Pine Ln	Top	Irrigation	Badger	5/8" X 3/4"	8095912	0.25 2 15	99.9000% 100.6135% 98.9328%	95-101 98.5-101.5 98.5-101.5	Pass Pass Pass	99.82%	5% 10% 20%	13,627 27,448 53,980	13,641 27,281 54,562	272,810	429	

					TEST DATA SHEET INFO												
Date	*Address*	*Owner*	*Acct Type*	*Meter Type*	*Size*	*Meter #*	*Flow (gpm)*	*% Measured*	*AWWA*	*Pass/Fail*	*Average Metering*	*Weighted Values (use)*	*Weighted Actual Metering*	*Perfect Metering*	*Final Read*	*PWSD Gain/Loss in Gallons*	*Notes*
10/6/2017	15965.5 Hess Rd	Top	Irrigation	Badger	5/8" X 3/4"	13070679	0.25 2 15	100.6000% 100.8180% 99.4170%	95-101 98.5-101.5 98.5-101.5	Pass Pass Pass	100.28%	5% 10% 20%	9,301 18,643 36,768	9,246 18,492 36,983	184,916	9	
10/6/2017			Irrigation	Badger	5/8" X 3/4"	15412971	0.25 2 15	100.0000% 100.5112% 99.3478%	95-101 98.5-101.5 98.5-101.5	Pass Pass Pass	99.95%	5% 10% 20%	8 16 32	8 16 33	163	0	Metter not in BillMaster
10/6/2017	15281 Auklet St	Aahish & Juoh Jahona	Sgl Family	Badger	5/8" X 3/4"	15508286	0.25 2 15	100.3000% 99.1398% 99.3145%	95-101 98.5-101.5 98.5-101.5	Pass Pass Pass	99.58%	5% 10% 20%	12,960 25,619 51,329	12,921 25,842 51,683	258,416	538	
10/6/2017	10628 Clarkeville	Patrick Van Sciver	Sgl Family	Badger	5/8" X 3/4"	15815487	0.25 2 15	95.0000% 97.1370% 97.5296%	95-101 98.5-101.5 98.5-101.5	Pass Fail Fail	96.56%	5% 10% 20%	166,365 340,215 683,180	175,121 350,242 700,484	3,502,422	36,088	
10/6/2017	15131 Delhi Ave	Abash Bhandary	Sgl Family	Badger	5/8" X 3/4"	16621393	0.25 2 15	99.7000% 100.6452% 99.3046%	95-101 98.5-101.5 98.5-101.5	Pass Pass Pass	99.88%	5% 10% 20%	5,545 11,196 22,093	5,562 11,124 22,248	111,241	100	
10/6/2017	11480 Whooping Crane Dr	Yung Chou	Sgl family	Badger	5/8" X 3/4"	17122078	0.25 2 15	100.0000% 101.2270% 98.8142%	95-101 98.5-101.5 98.5-101.5	Pass Pass Pass	100.01%	5% 10% 20%	43,460 87,986 171,777	43,460 86,919 173,839	869,194	995	
10/6/2017				Badger	1"	93085789	0.25 2 15	100.0000% 101.9149% 99.8600%	95-101 98.5-101.5 98.5-101.5	Pass Fail Pass	100.59%	5% 10% 20%	21 44 85	21 43 85	427	1	Meter not in BillMaster
10/6/2017				Badger	1"	96239777	0.25 2 15	93.8124% 99.1489% 99.5800%	95-101 98.5-101.5 98.5-101.5	Fail Pass Pass	97.51%	5% 10% 20%	20 42 85	21 43 85	425	2	Meter not in BillMaster
10/6/2017				Badger	1"	96239782	0.25 2 15	97.1058% 101.3830% 99.7300%	95-101 98.5-101.5 98.5-101.5	Pass Pass Pass	99.41%	5% 10% 20%	28 59 115	29 58 116	578	0	Meter not in BillMaster
10/6/2017				Badger	5/8" X 3/4"	97034615	0.25 2 15	101.0000% 101.2270% 99.0119%	95-101 98.5-101.5 98.5-101.5	Pass Pass Pass	100.41%	5% 10% 20%	61,733 123,743 242,070	61,122 122,243 244,486	1,222,431	305	Meter not in BillMaster
10/6/2017				Badger	5/8" X 3/4"	99213189	0.25 2 15	100.0000% 98.1595% 97.6285%	95-101 98.5-101.5 98.5-101.5	Pass Fail Fail	98.60%	5% 10% 20%	135,757 266,517 530,150	135,757 271,514 543,028	2,715,140	17,875	Meter not in BillMaster
10/6/2017				Badger	5/8" X 3/4"	99680222	0.25 2 15	100.2000% 100.1022% 98.6364%	95-101 98.5-101.5 98.5-101.5	Pass Pass Pass	99.65%	5% 10% 20%	8 16 32	8 16 32	162	0	Meter not in BillMaster

APPRENDIX F

High Use Notification Savings Example

Representative Sample of PWSD Intiated AquaHawk Alerts & Associated Potential Savings						
Date	Account	Type	Date of repair	Leak Per Hour	Days	Fixed Volume Saved
7/28/2017	00143550-01	MF				
6/23/2017	00300018-01	HOA Irr	6/26/2017	2000	43	2,064,000
3/17/2017	00300057-01					0
8/21/2017	00300057-01	Irr	8/24/2018	1080	43	1,114,560
12/30/2017	00114345-01	MF	1/3/2018	500	35	420,000
3/29/2017	00100323-01	COMM	4/4/2017	1400	20	672,000
4/18/2017	00100778-01	Irr	4/20/2017	250	45	270,000
12/18/2017	00100986-02	MF	12/18/2017	500	20	240,000
3/22/2017	00100869-01	COMM	3/24/2018	330	43	340,560
12/1/2017	00100869-01	COMM	12/1/2017	1000	34	816,000
4/17/2017	00300034-01	IRR	4/17/2017	1270	45	1,371,600
5/15/2017	00300057-01	IRR	5/21/2017	250	25	150,000
3/17/2017	00300057-01	Irr	3/20/2017	2600	20	1,248,000
12/27/2017	00100513-02	COMM	12/29/2017	350	35	294,000
12/28/2017	00103533-02	SFR	12/29/2017	331	35	278,040
12/26/2017	00100913-01	COMM	12/29/2017	550	40	528,000
12/19/2017	00100904-01	IRR	1/15/2018	40	30	28,800
12/15/2017	00107415-02	SFR	12/15/2017	900	20	432,000
10/23/2017	00300087-01	IRR	10/23/2017	783	45	845,640
10/17/2017	00111562-04	SFR	10/18/2017	396	18	171,072
10/12/2017	00100944-01	COMM	10/12/2017	657	25	394,200
5/26/2017	00100944-01	COMM	5/26/2017	800	45	864,000
10/11/2017	00100331-01	COMM	10/11/2017	1700	25	1,020,000
10/7/2017	00109569-02	SFR	10/9/2017	520	25	312,000
10/3/2017	00100853-01	COMM	10/4/2017	1071	32	822,528
4/24/2017	00001202-01	IRR	4/24/2017	2500	45	2,700,000
9/22/2017	00109065-04	SFR	9/22/2017	211	30	151,920
9/21/2017	00100181-01	COMM	9/21/2017	591	45	638,280
9/21/2017	00108320-03	SFR	9/21/2017	434	45	468,720
9/21/2017	00100269-01	COMM	9/21/2017	284	45	306,720
9/21/2017	00110031-04	SFR	9/22/2017	182	45	196,560
9/14/2017	00001270-01	IRR	No Repair Detected	245		0
7/11/2017	00111299-03	SFR	7/11/2017	480	15	172,800
4/25/2017	00300024-01	IRR	4/26/2017	271	35	227,640
9/21/2017	00001211-01	IRR	No Repair Detected	157	0	0
9/5/2017	00001516-01	IRR	9/5/2017	507	15	182,520
9/5/2017	00112777-01	SFR	9/5/2017	600	15	216,000
9/5/2017	00106177-03	SFR	No Repair Detected	20		0
9/5/2017	00107975-02	SFR	9/6/2017	175	16	67,200
9/5/2017	00300056-01	IRR	No Repair Detected	98	0	0
9/4/2017	00100015-02	COMM	9/5/2017	1242	31	924,048
9/4/2017	00103617-03	SFR	9/5/2017	420	31	312,480
8/24/2017	00110865-03	SFR	8/27/2017	240	41	236,160
8/16/2017	00300023-01	IRR	8/24/2017	531	15	191,160
8/21/2017	00300057-01	IRR	No Repair Detected	1071	0	0
8/16/2017	00100185-01	IRR	8/17/2017	2024	18	874,368
8/16/2017	00103424-02	SFR	No Repair Detected	70	0	0
8/16/2017	00110829-02	SFR	8/16/2017	180	19	82,080
8/16/2017	00001211-01	IRR	8/16/2017	314	19	143,184
8/14/2017	00105065-04	SFR	8/14/2017	1010	31	751,440
8/9/2017	00109254-02	SFR	8/11/2017	377	11	99,528
7/28/2017	00108787-01	SFR	7/29/2017	434	22	229,152
7/28/2017	00100287-01	COMM	No Repair Detected	100	0	0
7/28/2017	00100414-01	IRR	No Repair Detected	0	0	0
6/27/2017	00100996-01	IRR	No Repair Detected	70	0	0
7/20/2017	00105698-02	SFR	7/22/2017	61	45	65,880
7/17/2017	00107616-03	SFR	7/17/2017	1011	5	121,320
7/11/2017	00111028-02	SFR	7/11/2017	570	12	164,160
7/10/2017	00118522-02	SFR	7/11/2017	380	45	410,400
7/4/2017	00109344-02	SFR	7/7/2017	700	13	218,400
6/29/2017	00100524-01	COMM	7/2/2017	190	18	82,080
6/29/2017	00100144-01	COMM	7/6/2017	130	30	93,600
						25,024,800