CWCB Water Efficiency Grant Proposal – Meter Replacement and Advanced Meter Infrastructure Installation for both State and Region-wide Benefits

April 2016

1. Entity Seeking a Grant

Parker Water and Sanitation District
18100 East Woodman Drive
Parker, CO 80134
www.pwsd.org

2. Grant Request Overview and Justification

Parker Water and Sanitation District (PWSD) is seeking a Water Efficiency Grant to help fund a Meter Replacement and Advanced Metering Infrastructure (AMI) System Project (Project) to aid in the data collection and analysis of PWSD's water consumption data. This program integrates meter replacement and an AMI system with a water consumption data analysis software program and customer communication web-based portal. The objectives of this program are to:

- Improve water loss accounting methods through technological innovations,
- Develop best management practices in terms of water accounting and system wide water audits,
- Improve water accounting methods,
- Implement infrastructure maintenance programs,
- Improve billing and rate structure modeling,
- Quickly detect water leaks on system and demand side,
- Reduce excessive irrigation,
- More effectively manage District water consumption,
- Provide a tool for customers to better self-manage water consumption,
- More effectively project water demand and related revenues.

The overall goals and objectives of this Project are in-line with the goals of the Colorado Water Conservation Board (CWCB) and the Colorado Water Plan. The shared goals follow:

- Address the largest regional supply gap in the Metro/South Platte Basin,
- Utilize water resources efficiently in order to preserve agricultural water use,
- Reduce the negative economic and environmental impacts associated with "buy and dry" agricultural transfers,
- Use the data from the new meters and AMI system to learn more about low flow capture of electronic meters and high resolution data collection and management,
- Identify opportunities to optimize existing and future water supply infrastructure,
- Provide project results to other water providers in order to promote adoption by other water providers.

According to the Colorado Water Conservation Board website, http://cwcb.state.co.us/water-management/water-supply-planning/Pages/TheWaterSupplyGap.aspx, there is about a 20% gap in water supply needs mostly in the South Platte and Arkansas basins. Douglas County comprises a significant portion of the South Metro sub-basin of the South Platte Basin and was the fastest growing county in Colorado between 2000 and 2010. PWSD is expected to more than double in size at build-out, with 122,000 residents and approximately 50,000 taps.

PWSD currently installs Badger positive displacement meters for the majority of meters. The larger sized meters (2" or greater) are compound or turbo meters. PWSD is pursuing the electronic meter to replace all meters in PWSD's service area that are less than 2", due to the fact that PD meters do not accurately measure low-flows (less than 1 gpm) and become less accurate with normal flows as the meter ages.

The volume of water used at low flow rates may be larger than water providers realize. According to Richards et al, "Apparent Losses Caused by Water Meter Inaccuracies at Ultralow Flows," published in the Journal AWWA May 2010, "approximately 16% of all domestic water consumption occurs at flow rates < 1 gpm." Another study conducted by DeOreo et al in 2009, the "Residential End Uses of Water Study", concluded that 10% of total water consumed occurs at flow rates below 1 gpm. These volumes of water do accumulate and correspond to substantial annual revenue losses if they are not accurately registered and billed.

PWSD will use 10% of the total annual customer consumption for the calculations based on potential to reduce non-revenue water by more efficiently capturing low-flows. An annual average of 10% of the water distributed to PWSD customers is 598 acre-feet (AF). This is the amount of water that PWSD anticipates will be affected by the installation of the electronic meters. Due to the lack of published research on this topic, PWSD is challenged to estimate water savings, however, the results from this project will be submitted to the AWWA Journal of Operations potentially to be published.

The AMI system collects meter data and alarms from the utility meter base and transmits the data wirelessly to one or more data collection points. AMI provides two-way communication from the host computer to the data collection and to the installed meter transceivers. The AMI will be designed to provide coverage for all meters in PWSD's service area in order to collect all consumption data. AMI supports demand management initiatives by providing alarms for high/low usage, no usage, continuous usage, and reverse flow. It could also be used to determine compliance with voluntary guidelines.

Prior to this project, if PWSD detected high usage on a customer's account, the leak could have been running for 30 days or longer due to a one-time per month standard meter reading schedule. The latency or delay in the standard notification/billing cycle is too long to allow customers to fix problems or change their usage patterns in order to positively affect annual water demand. A decreased latency in acquisition of consumption data aids water providers and customers to discover leaks more quickly and determine the level of irrigation efficiency without conducting on-site assessments.

PWSD staff currently reads meter once per month manually and using Automated Meter Reading (AMR) technology. AMR is a technology that has been on the market for many years. This meter reading technology allows water, gas and electric providers to read meters using radio frequency which reduces the labor and vehicle use that are involved with the traditional methods of reading meters as well as the accidents and Worker's Compensation associated with those traditional methods.

AMI takes this technology a step further because of its ability to acquire and store and analyze granular consumption data on an hourly basis. This would decrease the consumption data acquisition latency which will increase the robustness of water demand management activities by enhancing leak detection practices, identifying irrigation inefficiencies and system infrastructure audits. Water demand management programs will benefit tremendously from this enhanced technology. As more water consumption data is collected and analyzed, water consumption can then be better managed and demand more accurately projected. Demand management may then become a measure more often discussed and utilized in the water supply community.

Although it is difficult to determine how to define water saved, PWSD will use two metrics to calculate water saved. First, PWSD will analyze the impact of the electronic meter low-flow capture on customer consumption. We anticipate that 10% of the customer consumption will be affected as per the results of the "Residential End Uses of Water Study". 10% of the total average district customer consumption that is projected to be impacted by the installation of the electronic meters is approximately 598 AF. Therefore, PWSD anticipates a reduction in the non-revenue water by an estimated 50% or 299 AF.

Second, PWSD will compare the amount of leaks and their associated operational costs to deliver that water pre-project and post-project annually. PWSD's leak policy is to adjust the applied rate for the atypical usage so that the rate applied is the "normal" rate for the accounts historical usage. The average of the last two years is 45 leak adjustments per year totaling an

average of approximately 8.65 AF lost water due to leaks. PWSD anticipates this number will dramatically decrease based on the results from Castle Pines Metro District's similar program.

Currently, Sensus AMI systems are installed in local communities of Fort Collins/Loveland, Golden, and other mountain communities. During Golden's pilot program in 2011, many irrigation leaks were found by the Parks and Recreation Department as well as a customer that had a malfunctioning irrigation controller that would run every night on a default program unbeknownst to the customer.

Pagosa Area Water and Sanitation PWSD (PAWSD) installed the Mosaic Mesh AMI system in 2009. Statistics drawn directly from the AMI show **456,000 gallons were** lost in 2009 due to leaky toilets, dripping faucets, etc. **732,000 gallons** was lost in 2009 to outdoor irrigation issues consisting of irrigation lines equaling 385,000 gallons and yard hydrants lost 347,000 gallons. **1.3 million** gallons were lost due to frozen/broken pipes winter 2009/10. These statistics were provided by Mat deGraaf, who was the Water Conservation Coordinator for PAWSD.

Castle Pines Metropolitan District actively contacted customers using data collected from their AMI Fixed Base System and customer communication web-based portal from December 2011, to April 2013 and potentially saved 2,464,000 gallons or 7.56 acre-feet **if the discovered leaks would have continued to leak until the end of the billing cycle or when customers received their bills**. 7.56 acre-feet is 0.7% of the total water supplied in 2011. PWSD polled other Water Demand Management Specialists along the Front Range and in the Rocky Mountain region were asked about leaks and water use behaviors in their utilities' service area and it was determined that the majority of leaks or excessive irrigation water use is not discovered until the customer receives their water bill.

The AMI system is critical to collect water consumption data, however, the data must be analyzed in order to most accurately be used for demand management and projection purposes. The customer communication web-based portal could be used for this purpose. If the customer communication portal incorporates evapotranspiration (ET) rates, localized irrigation requirements (IR), and landscape irrigable area data and successfully combines these elements to help their customers irrigate more efficiently. By targeting water leaks and excessive irrigation, this project has the ability to affect approximately 598 acre-feet of water every year in capturing low-flow (<1 gpm) by providing a system-wide demand management system. It offers an additional value of promoting proactive communications between water providers and their customers to encourage customers to act quickly and become more aware of their water use behavior.

The long-term objectives of this program are to ensure that a decrease in water consumption occurs due to this Project, that water savings can be used in water supply planning initiatives and to provide evaluations to the CWCB that demonstrate the effectiveness of collecting and analyzing high resolution water consumption data as well as improved low-flow data capture on the electronic metering. Installation of electronic meters and data analysis using AMI Systems could be a foundational element for every water demand management program in Colorado.

There is also a monetary benefit to the customer besides water bill savings and that is property damage savings. Water damage can be incredibly costly and PWSD provides a great customer service benefit by participating in this program and helping customers avoid costly property damage. However, PWSD also cannot be held liable for detecting leaks and therefore the language used to market this program must be chosen carefully.

The current projected funding requires that the Project be implemented in three phases with project completion in 2023. PWSD staff believe it best to retrofit the whole system in as short amount of time as possible to increase potential savings and increase the return on investment therefore PWSD will be doing what it can to collapse the installation schedule.

If a mid-sized district like PWSD could prevent the loss of millions of gallons in one year, as it is estimated with the new meters and AMI system in place, then larger water providers could potentially prevent the loss of enough gallons to close the statewide gap between water supply and water demand, projected and actual. This program has the capability to demonstrate to these water providers that there is a favorable ROI for meter replacement and installation of an AMI system. Also, the AMI system and the customer communication web-based portal will greatly increase customer satisfaction by closing the workflow communication feedback loop which is a very important element for any water provider.

Water demand management programs will be required by water providers and state and federal agencies to better understand water demand in order to adequately manage water resources for the growing population. The installation of new electronic meters and AMI system coupled with the statistical analysis of consumption data associated with the AMI system, will provide much needed return-on-investment (ROI) data and quantify low flows due to the electronic meters as well as greatly improved water accounting methods. It will be invaluable to water resource managers and federal and state stakeholders who deal with state or nationwide water supply issues.

3. PWSD System Information

A breakdown of the total service population for PWSD by development area, based on the dwelling unit projections in Table 1, is summarized in Table 2, “Population Projection by Area for PWSD.” This population growth is also shown graphically on Figure 1, “PWSD Historical and Projected Population.”

Table 1

Dwelling Unit Projections for PWSD

Year	Town of Parker[1]	Ridgegate	Canyons	Freshfields	Total
2010	15,151	0	0	0	15,151
2015	16,069	690	24	0	16,783
2020	17,413	4,224	596	0	22,233
2025	18,631	7,098	1,094	24	26,847
2030	19,475	9,312	1,516	596	30,899
2035	20,193	10,866	1,864	1,094	34,017
Build-Out	29,555	12,000	2,500	2,500	46,555

Notes:
[1] Town of Parker DUs include the Anthology Development. Anthology is served by a extraterritorial contract with PWSD.

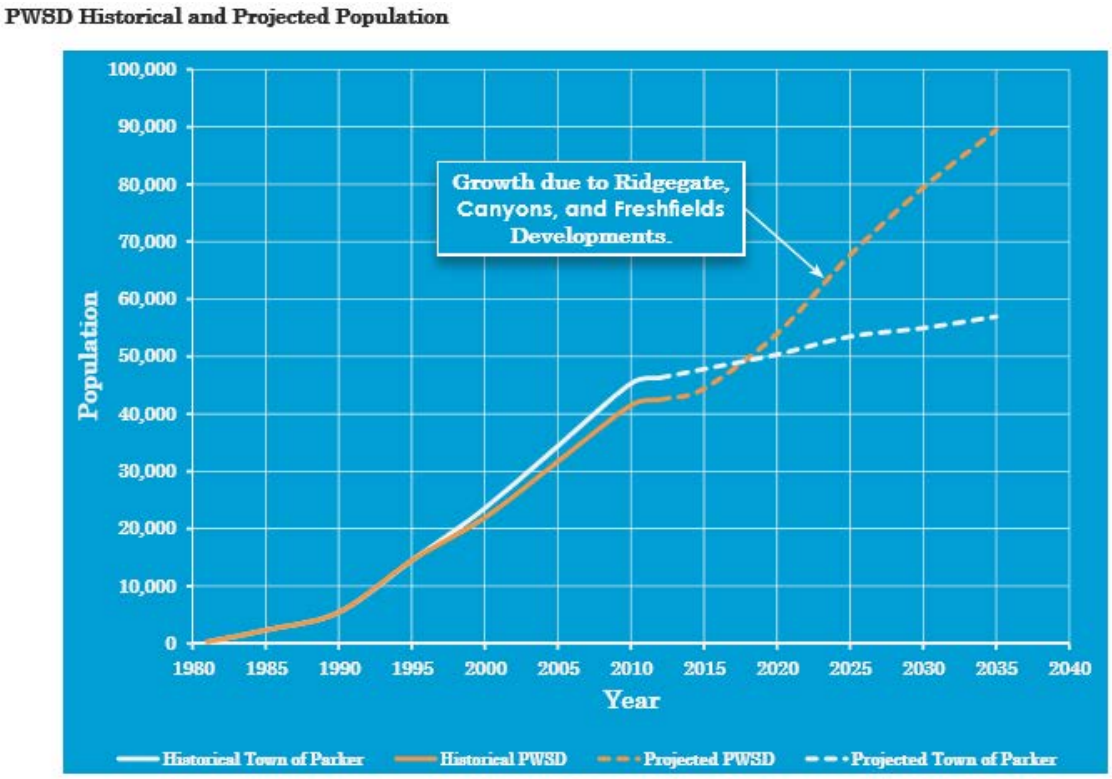
Table 2

Population Projections by Area for PWSD

Year	Persons/ Total DU	Town of Parker	Ridgegate	Canyons	Freshfields	PWSD Total Population
2010	2.74	41,500	0	0	0	41,500
2015	2.73	43,900	400	100	0	45,400
2020	2.67	46,500	6,500	1,000	0	54,000
2025	2.66	49,600	15,600	2,400	100	67,700
2030	2.62	51,000	23,700	3,700	1,100	79,500
2035	2.62	52,900	29,000	4,900	2,500	89,300
Build-Out	2.62	77,500	31,500	6,600	6,600	122,200

Notes:
[1] Population is rounded to the nearest 100 persons.

Figure 1

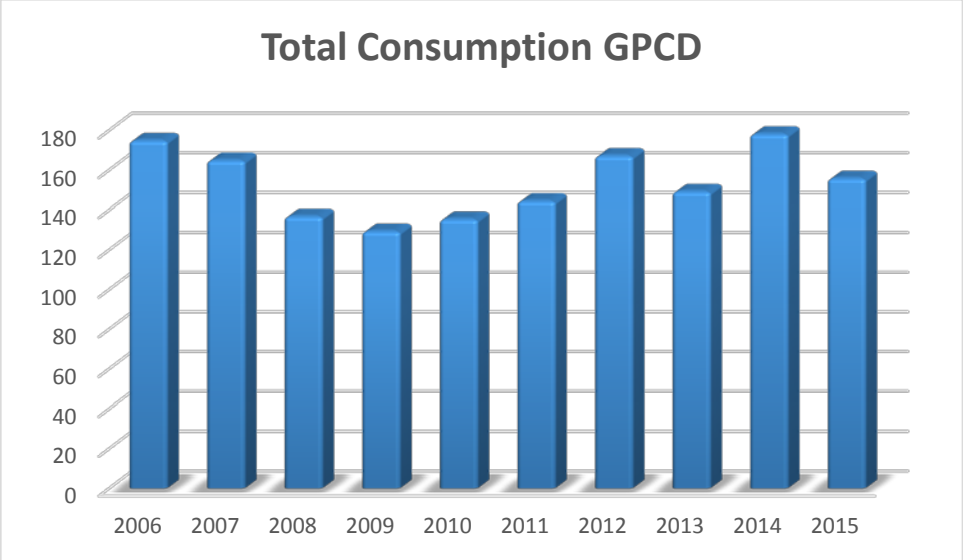


Notes:
Most of the PWSD growth will be outside the Town of Parker.

Water Demand

Historical Water Demands Forecasting water demands involves determining the historical water use based on gallons per capita per day (GPCD) and applying this per capita water use to the projected growth populations. The GPCD calculation includes all types of water use for the system including residential, multifamily, commercial and irrigation. The historical average consumption demand for PWSD was determined to be 155 GPCD over the last ten years. Table 3 graphically displays the annual GPCD including all uses of water, billed and system usage.

Figure 2



2008 and 2009 were wet years and therefore the total usage dropped. Since 2006 there has only been one year that had a higher GPCD, in 2014 it was 178, however, most years since 2005 have been much lower than that. PWSD estimates that perhaps this higher GPCD was due to the decreased population of its service area.

Table 3

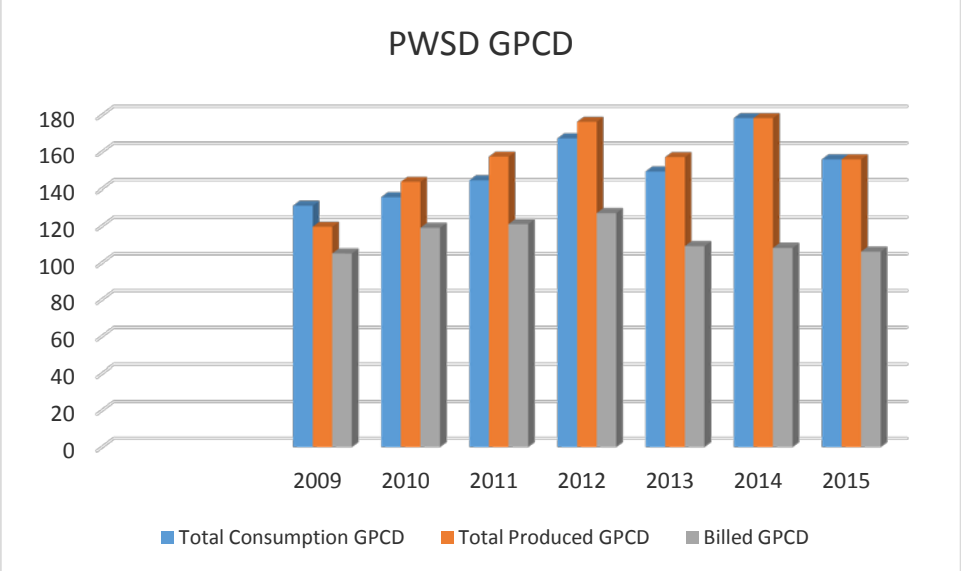
Year	GPCD
2005	166
2006	175
2007	165
2008	137
2009	130
2010	136
2011	145
2012	167
2013	149
2014	178
2015	156

Annual Consumption per Customer Category(AF) and Gallons per Capita per Day*							
	2009	2010	2011	2012	2013	2014	2015
SF	3719	4201	4152	4483	3972	3851	3840
Comm	870	1246	992	519	497	516	518
Irr	512	535	708	1297	991	923	1039
MF	462	533	519	538	513	515	474
Total	5563	6456	6371	6836	5974	5805	5872
SFE	16256	16454	16659	17015	17403	17566	18140
GPCD	104	119	121	127	109	108	106
* GPCD is calculated using only billed customer categories.						Delta	

Table 4

Table 4 displays the annual consumption per customer category (AF) and GPCD per customer category. The GPCD is dramatically different than the GPCD calculated using the total consumption data and total produced data because the latter two categories due to the increased number of uses of water in each of these categories.

Figure 3



PWSD staff reviewed the historical average GPCD numbers and determined that a reduced average per capita usage of 132 GPCD for total consumed treated water could be expected by 2025 with continued conservation efforts. Therefore, based on this goal, the average GPCD projection was decreased incrementally each year from 167 in 2012 to 132 in 2025 and

maintained at 132 from 2025 to build-out. For calculating future water demands, these yearly per capita water use averages were used in combination with the projected populations. Projected Water Demands are illustrated in Figure 4, "Historical and Forecasted Averaged Day Demands." As a comparison, a "best fit" straight line projection is shown based on the historical demands. The historical straight line projections also correlated to a single family rate of growth of 470 DU/yr. It can be seen that the projected demand rises slightly above this line due to the proposed start of the Ridgegate, Canyons and Freshfields developments along the I-25 corridor.

For water system master planning, Maximum Day (MD) demand is used to size treatment plant and storage tank capacities and the Peak Hour (PH) demand is used to properly size pump stations and distribution pipelines. A MD factor of 2.5 and a PH factor of 5.0 were determined to be the Peak Factors for future projections. The peak water demand projections are shown in Table 6, "Projected Peak Water Demands."

Table 5

Projected Peak Water Demands

Year	Average Day	Maximum Day	Peak Hour
Peaking Factor	**1.0**	**2.5**	**5.0**
	MGD	**MGD**	**MGD**
2014	6.8	16.9	33.9
2020	8.3	20.8	41.6
2025	10.3	25.6	51.3
2030	12.0	30.1	60.2
2035	13.6	33.9	67.8
Build-Out	18.5	46.2	92.5

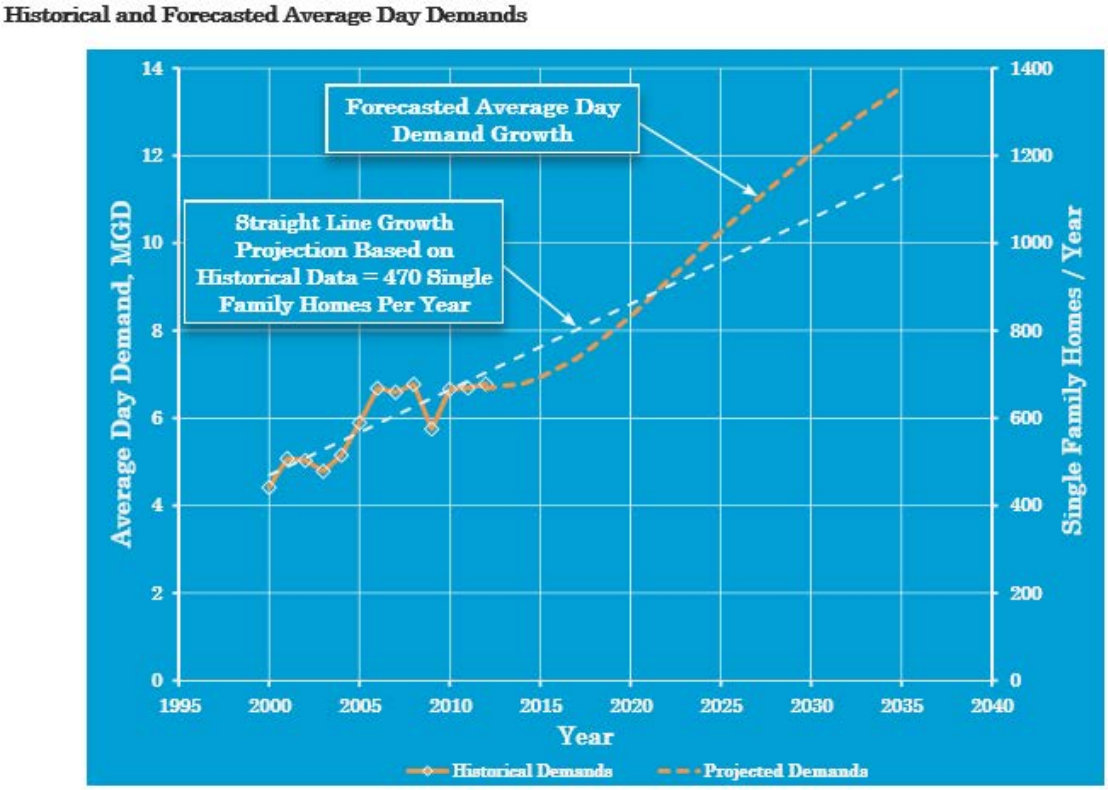
Table 6

Historical Average Day Wastewater Flows

Year	District WW Population[1]	NWRF	SWRF	Combined WRF	Average GPCD
		MGD	MGD	MGD	
2006	37,301	1.05	1.63	2.68	71.8
2007	38,934	1.36	1.58	2.94	75.5
2008	40,019	1.32	1.37	2.69	67.2
2009	40,639	1.38	1.48	2.86	70.4
2010	41,064	1.37	1.43	2.80	68.2
2011	41,524	1.21	1.35	2.56	61.7
2012	41,975	1.30	1.54	2.84	67.7
				Average	68.9
				Use for Projections	**69.0**

Notes:
[1] Population is slightly less than the water system population due to septic systems used by some subdivisions.

Figure 4



WISE Demands

A recent development for the PWSD is participation in the Water Infrastructure and Supply Efficiency (WISE) agreement. With the WISE program, the District will have the right to purchase excess water from Denver Water and Aurora Water when it is available. Because of the geographic location of PWSD relative to some of the other WISE participants, PWSD has been approached by these partners to deliver or "wheel" their purchased water through the PWSD distribution system. These WISE demands were added to the future PWSD demands for the sizing of the water distribution piping and facilities.

Water Distribution System Evaluation

Description of Existing Water Distribution System Pressure Zones: PWSD currently has three (3) main pressure zones. Potable Water Storage Tanks: The PWSD is currently served by six (6) potable water storage tanks. The total potable water storage capacity is 20 million gallons (MG). Groundwater Wells: PWSD has thirty-five (35) Denver Basin aquifer wells and seven (7) Cherry Creek alluvial wells. There are seventeen (17) well facilities. Booster Pump Stations: The PWSD currently has four (4) booster pump stations. Transmission Mains: The PWSD water system

piping consists of transmission pipelines and distribution mains. Pipes 16" and larger diameters are considered to be transmission mains.

Rueter-Hess Reservoir: Rueter-Hess Reservoir (RHR) has a capacity of 75,000 acre-feet (AF). RHR allows PWSD to fully develop a renewable water supply and to become less dependent on groundwater from the Denver Basin Aquifers.

Rueter-Hess Water Purification Facility: The RueterHess Water Purification Facility (RHWPF), is currently being constructed and is expected to be operational in 2015. The facility has an initial capacity of 10 MGD and a build-out capacity of 40 MGD.

Water Distribution System Modeling

A water system model was used to evaluate the existing system for deficiencies and to size the future water distribution system capacities for the transmission lines, storage tanks and booster pump stations. InfoWater® is the modeling software used to evaluate the hydraulic performance of the PWSD water system.

Demands by Land Use: PWSD tracks customer water consumption on a monthly basis for four (4) billing classifications: Single Family, Multifamily, Commercial, and Irrigation. This monthly billing data was used as the foundation for determining the water demands to be incorporated into the water model. Historical billing data from 2010 through 2015, is summarized in Table 7, "PWSD Annual Water Consumption by Customer Classification." The future flow projections based on the customer classification are shown in Table 8, "Average Daily Demand Projections By Customer Classification."

Table 7

PWSD Annual Water Consumption by Customer Classification

Classification	2010		2011		2012		3 Year Average
	MG	%	MG	%	MG	%	%
Single Family	1,370	65.1%	1,360	65.2%	1,460	65.6%	65.3%
Multifamily	160	7.8%	170	8.2%	180	7.9%	7.9%
Commercial	170	8.2%	170	8.2%	170	7.6%	8.0%
Irrigation	400	18.9%	380	18.4%	420	19.0%	18.8%
Total	2,100	100.0%	2,080	100.0%	2,230	100.0%	100.0%

Table 8

Average Daily Demand Projections By Customer Classification

Year	Average Year Total	Single Family	Multifamily	Commercial	Irrigation
	MGD	MGD	MGD	MGD	MGD
		65.3%[1]	7.9%[1]	8.0%[1]	18.8%[1]
2014	6.8	4.4	0.5	0.5	1.4
2020	8.3	5.4	0.7	0.7	1.5
2025	10.3	6.7	0.8	0.8	2.0
2030	12.0	7.8	0.9	1.0	2.3
2035	13.6	8.9	1.1	1.1	2.5
Build-Out	18.5	12.0	1.5	1.5	3.5

Notes:
[1] Percent of Billed Use

Existing System Analysis

Peak Hour Analysis: The Peak Hour (PH), steady state analysis for the existing condition evaluated a worst case operating scenario for the water system. The modeling results were compared to the evaluation design criteria which included a peak hour velocity criteria of 10 ft/s and a peak hour minimum pressure of 40 psi. During peak hour analysis, some areas had pressures slightly less than 40 psi. No customer service issues have been reported in these areas; therefore, no corrective measures are recommended at this time.

Fire Flow Analysis: Fire flow analyses during maximum day demand (MDD) were conducted to evaluate the existing water system's firefighting capabilities. Fire flow requirements maintaining residual pressures above 20 psi and velocities less than 10 ft/s were met at all locations within the District except for Rancho Montecito, the Vista Road/Vista Circle loop in the Parker Vista Subdivision, and the north loop in the Bell Cross Ranch Subdivision. Fire flow demands (FFDs) in the Rancho Montecito and Parker Vista subdivisions could not be met while keeping the pipe velocities less than 10 ft/s. However, there is adequate pressure in these areas and FFDs can be met with pipe velocities slightly above 10 ft/s. Although the velocity criteria is not met, the required fire flow can be delivered; therefore, corrective measures are not recommended at this time. The Bell Cross Ranch area is a small, separate pressure zone that experiences low pressures during hydrant flushing. The District is currently looking at installing a new pump at the Bell Cross Ranch pump station to provide additional flow and pressure. Fire flow analyses for the multifamily and commercial areas resulted in all areas being able to supply the required fire flow at the specified residual pressure and maximum velocity criteria.

Build-Out System Analysis

The analysis of the future system involved determining the ultimate sizing and phasing of the transmission mains, storage tanks and booster stations.

Distribution System Requirements: A significant portion of the new distribution system infrastructure will be within future developments which will be funded and constructed by developers.

Storage Tank Requirements: Distribution system storage tanks are needed to reduce the peak supply capacity of the wells and RHWPF. For a water distribution system there are generally three (3) types of storage volume needs:

- Peak Hour Storage
- Emergency Storage
- Fire Flow Storage

Based on the recent construction of several 5 million gallon (MG) tanks, it has been assumed that all the future tanks would be added using a 5 million gallon (MG) size.

Booster Pump Station Improvements: Most of the PWSD system growth will occur in Zones 2 and 3 in the Western portion of the District. It is calculated that for build-out demands, the total Zone 2 to 3 capacity will need to be approximately 20 MGD. This demand will be planned to be met by two (2) new 10 MGD booster stations. The existing booster stations will remain in place with their current capacities.

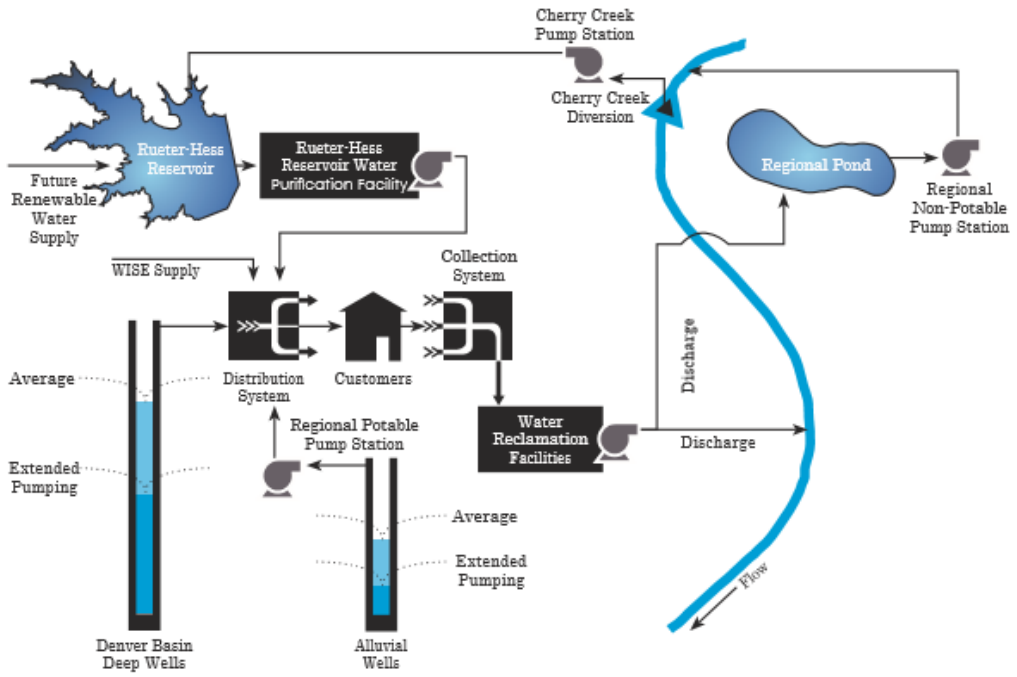
Water Supply System Evaluation

Description of Existing Water Supply Sources

The PWSD existing water supplies consist of four (4) water supply sources: (1) Denver Basin Deep Wells, (2) Cherry Creek, (3) WISE (Water, Infrastructure and Supply Efficiency) Water and (4) Reclaimed Water. The future water average annual demand at build-out is estimated to be approximately 20,000 acre-feet. Figure 5, "PWSD Existing Water Supply Schematic" illustrates how the various water supplies relate to the water distribution and wastewater collection systems to provide a renewable water supply system.

Figure 5

PWSD Existing Water Supply Schematic



Denver Basin: The Denver Basin Deep Wells pump water from the Dawson, Denver, Arapahoe and Laramie-Fox Hills geologic formations. At this time, the District has over 32,000 acre-feet/year (AFY) of Denver Basin ground water rights for its use. However, due to the limitation of existing well capacities, the actual well production is about 17,000 AFY.

Cherry Creek: PWSD has acquired junior and senior direct flow rights, plus junior storage rights on Cherry Creek and Newlin Gulch, a tributary to Cherry Creek. The approximate long term average volume of water available is 5,000 AFY. This amount varies from year to year depending on the annual precipitation and how the water rights are allocated along the Creek. Return flows are collected and pumped to Rueter- Hess Reservoir by either a direct diversion off of Cherry Creek or by pumping from the Cherry Creek alluvial wells. WISE Water: The District has contracted to participate in the WISE project at an allotment of 1,200 AFY. The actual range of WISE water that may be available is between 0 and 4,000 AFY.

Reclaimed Water: Reclaimed water as a source of supply is the ability to recover return flows and reuse it. For PWSD, the current total volume of reuse water is around 46% of the source water. PWSD's reclaimed water sources are: 1) the advanced wastewater treatment (AWT) effluents from both the SWRF and the NWRF and 2) the lawn irrigation return flows (LIRF).

Description of Existing Water Supply Facilities

Denver Basin Well Houses: The PWSD has seventeen (17) well houses. Supplying water to these well facilities are thirty-five (35) Denver Basin Deep wells which are located throughout the Parker area.

Cherry Creek Alluvial Wells: There are a total of seven (7) Cherry Creek alluvial wells. PWSD may pump from the alluvial wells if they have a surface water right in priority to directly withdraw from Cherry Creek or in exchange for wastewater flows discharged into Cherry Creek.

WISE Infrastructure: The components of the WISE infrastructure will include a 42" transmission pipeline from the East Cherry Creek Valley (ECCV) Water District's Western Pipeline, located in E-470, to the RHWPF site. At the RHWPF, a Receiving Tank will be constructed along with pipes and a Booster Station for pumping the water into PWSD's potable water distribution system. A pipeline will also be extended to RHR to transport the WISE water for storage. Also, a new Pressure Zone 2 to Pressure Zone 3 Booster Station, will be constructed to convey WISE water.

Rueter-Hess Reservoir: Rueter-Hess Reservoir (RHR) has a water storage volume of 75,000 acre-feet. As of April 7, 2016, the reservoir contained about 25,712 acre-feet of raw water. The existing RHR volume allocations are shown in Table 9, "Rueter-Hess Reservoir Storage Allocation."

Table 9

Rueter-Hess Reservoir Storage Allocation

Participant	Storage[1] AF
Parker Water and Sanitation District	46,000
Town of Castle Rock	8,000
Castle Pines North Metropolitan District	1,500
Stonegate Village Metropolitan District	1,200
Available for Future Lease	18,300
Total	**75,000**

Notes:
[1] Storage requirements were evaluated as part of the Long-Term Water Supply Plan.

Rueter-Hess Water Purification Facility: The Rueter Hess Water Purification Facility (RHWPF) has been constructed and was online April 1, 2015. This plant is designed to treat the water from the RHR and pump the treated water into the water distribution system. The first phase of the plant is designed for an initial capacity of 10 MGD.

Reclaimed Water System: The Reclaimed Water System begins with the water reclamation facilities (WRFs) which treat the District's wastewater using primary, secondary and advanced wastewater treatment (AWT) processes. Each WRF has an effluent pump station that pumps the AWT water into reclaimed water conveyance pipelines. The WRFs conveyance pipelines can release to a permitted discharge point on Sulphur Gulch just upstream of Cherry Creek. Discharged AWT water can also be pumped from the Cherry Creek Pump Station (CCPS) and transported to Rueter-Hess Reservoir for storage through a 48" diameter pipeline. The CCPS has a capacity of approximately 50 MGD.

Estimated Water Savings

PWSD estimates the water savings from previous conservation efforts to be six GPCD over the last ten years. The average GPCD was 155 over the last ten years and the average GPCD prior to implementation of PWSD's active conservation program was 165. PWSD expects the GPCD will decrease to 132 in ten years and continue at that level beyond build-out due to the inherent improved data collection of system and demand side consumption with the AMI system and how powerful this high-resolution data will improve demand management.

PWSD anticipates that the meter replacement portion of this project will help PWSD improve the water accounting methods and therefore reduce the percentage water loss. PWSD estimates the amount of low-flow water that will be captured with the new meters is roughly 596 AF. This may not be considered "saved" water but will be critical to managing water loss.

4. Project Team

The following is a list of professionals who will perform various activities and tasks associated with this project.

Billie Owens – Project Manager
Ms. Owens, Customer Care Manager, is responsible for overseeing the project, to ensure the project is within budget and running according to schedule.

Randy Hellinger – Field Services Supervisor
Mr. Hellinger, Field Services Supervisor, is responsible for overseeing Ms. Colls coordination of this project. Ms. Coll will collaborate with Mr. Hellinger on any troubleshooting or installation questions or issues.

Emily Coll - Project Coordinator
Ms. Coll, AMI Coordinator, is responsible for managing the project's scope of work, ensuring PWSD and its team are meeting appropriate timelines, and delivering progress reports for the CWCB Board. Ms. Coll will be the primary point of contact to the CWCB.

Ms. Coll will also manage this project by working directly with the vendors to ensure proper installation of all the equipment and will work with the vendor Project Manager to ensure the

data collection portion of this project is appropriately integrated with PWSD's existing data collection system.

Guy Fijte – Billing Administrator
Mr. Fijte, Billing Administrator, is responsible for managing the Accounting and Billing Department which has previously been responsible for consumption data and contacting the homeowners regarding usage. Ms. Coll will collaborate with Mr. Fijte to ensure the program is successful.

5. Project Summary

The objectives of this program are to increase the capture of low-flow (<1gpm) water use and decrease the latency of collecting and analyzing water use data. This data will be used to determine demand management water savings which in turn will be used in PWSD's water supply planning and initiatives and water resource management. Other anticipated results of this Project will be more accurate water demand projections and cost of service analysis.

This project will ensure annual water savings by catching leaks with decreased latency as compared to prior to installation of AMI and also to utilize the customer communication web-based software portal that water providers will use to provide customer access for self-management of their water consumption and proactively contact them via e-mail or telephone when leaks, over-irrigation, or other problems are detected.

PWSD customers will be empowered with capabilities to:

- Discover any size leak from leaky toilets to irrigation mainline breaks,
- Determine if they are irrigating properly,
- Set a usage or price budget each month and be notified via an auto-generated method of contact if their consumption is trending to exceed that limit,
- Track how much water they are using and how much they are spending during the month,
- See how they compare to similar residences.

Specific goals of the Project include:

1. Determine the ROI for electronic meters.
2. Determine amount of low-flow capture by electronic meters.
3. Determine if this system can be a model for water utilities throughout Colorado.
4. Develop infrastructure maintenance programs.
5. Improve billing and modeling for the most appropriate rate structures.
6. Quickly detect water leaks on distribution and demand side.
7. Reduce excessive irrigation throughout the District.
8. More effectively manage District and customer water consumption.
9. More effectively project water demand and related revenues.

10. Make it easier for customers to manage their water consumption.
11. Provide a water consumption data analysis program that aids Water Demand Managers in performing their daily duties.
12. Provide information to water providers so they can better target demand management activities and get the most out of their demand management investments.
13. Provide summary data about the project's water demand management results to the CWCB.

The Project will transform the way water demand management incentives, education and outreach activities are developed, implemented and evaluated. Instead of implementing traditional demand management programs such as irrigation audits, rebates, and educational events that are one-time savings initiatives affecting a small percentage of a water utility's customer base, AMI and the data analytics program will address all District water use and all customers' water use behavior on an on-going basis.

Demand management programs need to reach all water users in a community in order to positively affect annual demand. If annual demand can be more accurately projected, water resources can be more efficiently managed statewide and allocated appropriately.

An AMI System promotes efficient water demand management by enabling water providers to:

- Provide system health data,
- Quickly detect system and customer-side leaks and excessive irrigation,
- Uncover theft and tampering,
- Discover inoperable water meters.

The Project addresses the mission and objectives of the CWCB and the Metro Basin Roundtable in numerous ways. For example, by working to eliminate water waste, providers can "avoid or reduce the need to develop or acquire new water supplies." They can also "postpone, downsize or avoid altogether the need for new water treatment or wastewater treatment infrastructure." This Project is intended to improve demand management results for water providers. Successful demand management will "reduce operating costs related to water and wastewater treatment and source water production."

The way this Project focuses on communicating valuable information directly to water users will have tremendous public relations value for water providers and "improve public credibility by demonstrating stewardship of natural and financial resources." Overall, this Project "promotes the sustainable use of finite water supplies" in a way that may prove more effective than all other water demand management programs combined.

The specific tasks to be funded with the Water Efficiency Grant include Meter Replacement and AMI System cost and installation.

14. Project Scope of Work

- State the purpose and primary features of the project

- End products to be delivered
- Clear timelines
- Detailed narrative of all tasks to be performed before completion
- Include 50%, 75%, final report submissions
- Identify PWSD staff responsible for each task
- Identify funding sources

The purpose of this project is to purchase and install meters and an AMI System which will be used as the primary water demand management tools for PWSD. AMI System collects meter data and alarms from the utility meter base and transmits the data wirelessly to one or more data collection units (DCU). AMI provides two-way communication from the host computer to the DCU and to the installed meter transceivers (endpoints). The AMI system will be designed to provide coverage for all meters in PWSD's service area in order to collect all the consumption data.

There are three more housing developments that have not currently begun construction. When these and other future homes are built, PWSD is committed to ensuring the meters installed are those compatible with the AMI system.

AMI will be used in conjunction with the customer communication web-based portal program to provide a web-based water demand management and customer communications system that would enable PWSD to share information with customers so they can reduce unnecessary consumption and water waste. This data will also be used to create water use policies, inform engineering design, improve operational processes, help project customer usage and customer characteristics, and to analyze and determine rate and fee structures.

All changes to PWSD's Water Conservation Program will be reflected in the seven-year Water Conservation Plan update.

Primary Features of the Project

Meter Replacement and AMI

Purpose and primary features of the project: The purpose of purchasing and installing electronic meters and an AMI System is to take PWSD's water demand management to a new level whereby the water system as a whole is being affected by data collection and analysis.

End Product to be Delivered to CWCB: Two progress reports at 50% and 75% of project completion and a final report will be delivered to the CWCB. It is estimated that the 50% report will be submitted October 1, 2016, the 75% report will be submitted January 1, 2017 and the final report will be October 1, 2017.

Timeline Tasks to be Performed:

Phase 1: Upon contract to September 31, 2016 – Installation of communication infrastructure for the District build-out service area and metering infrastructure for one or two subdivisions consisting of approximately 350 single family homes, approximately 1,100 commercial and irrigation meters, communication infrastructure end-to-end (meter end point to test environment Billing software) and customer portal with thorough testing to assure complete functionality of all components.

The following are perceived tasks associated with this program phase:

Task 1 – Provide and install all hardware, firmware, and software required for demonstrating achievement of the District's AMI program goals for approximately 1,450 metered services. Include IT interfaces for CIS, the existing Work Order Management System, and the Customer Web Portal.

Task 2 – Collaborate with the District to develop and monitor the AMI system expected performance measures.

Task 3 – Test and evaluate performance measures, including IT interfaces (will be the basis to proceed to the subsequent Phase 2).

Task 4 – Develop, in close collaboration with the District, a Customer Communications and Public Relations Program, which describes program goals, detailed steps for implementation, and customer installation and post-installation procedures agreed to by the selected Proposer and the District.

Task 5 – Provide staff training on all hardware, firmware, and software provided in Task 1.

Task 6 – Respond to service calls on AMI installed end points and associated infrastructure. AMI installation contractor to lead this process and it will include on-the-job training for PWSD staff.

Phase 2: October 1, 2016 to December 31, 2018 – Installation of approximately 6,000 meters and endpoints replacing primarily walking route meters with local readouts and will include retrofit of AMR endpoints.

The following are perceived tasks associated with this program phase all done by PWSD staff and contracted vendor except the purchase of 500 meters

Task 1 – Receive AMI equipment (approximately 6,000 metered services)

Task 2 – Schedule, install and activate approximately 6,000 metered services. (District will work with selected Proposer to determine Phase 2 installation sequencing.)

Task 3 – Respond to service calls on AMI installed end points and associated infrastructure.

Task 4 – Develop implementation plans for Phase 3.

NOTE: The current project plan requires meter/endpoint installation services through Phase 1 and 2. Phase 3 installation is currently anticipated to be conducted by PWSD staff.

Phase 3: January 1, 2019 to December 31, 2023– Installation of approximately 7,000 meters and endpoints, replacing mostly existing AMR endpoints.

The following are perceived tasks associated with this project phase:

Task 1 – Continue deployment of meter replacement and AMI system, approximately 7,000 metered services, in accordance with the approved implementation plan. (District will review use of contract installation services prior to implementation of Phase 3.)

Task 2 – Evaluate performance measures related to Tasks provided in the Scope of Services and questions in Section 3.2.

Task 3 – Provide ongoing planning and support to assist the District with day-to-day management of the AMI Implementation.

Task 4 – Respond to service calls on AMI installed end points and associated infrastructure.

Task 5 – Provide AMI system clean up and confirm functionality.

Task 6 – Provide all infrastructure and software warrantees and documentation.

Task 7 – Provide training documentation.

Task 8 – Train identified District employees.

The following requirements also apply to all Phases above:

1. Installation, construction (if applicable), and management services, including procurement and installation of new equipment.
2. Startup, integration, commissioning and testing of the equipment and systems.

3. Preventive and emergency maintenance and servicing of the equipment installed, if applicable.

4. PWSD staff training on Operations and Maintenance ("O&M") of new or modified equipment, systems, software, and procedures.

5. Measurement and verification processes and project management need to confirm performance and ensure Project success.

Task Responsibility: PWSD will provide all the labor resources to manage, evaluate and report the Project as in-kind contributions are not reflected in the overall cost of the project and grant. The selected vendor will be installing the meters and endpoints for Phase 1 and 2. Their services will be paid for by PWSD.

Funding Source: **$5,162,023.00** is the overall cost of the project, **$50,000.00** will come from CWCB grant funds and will be used to purchase electronic meters in Phase 1. PWSD is committed to funding $5,112,023.00 for the majority of infrastructure, equipment and installation labor costs.

15. Detailed Project Budget

- Broken down by task
- Identifying all costs associated with the project -- labor hours, costs (in-kind and cash) other direct costs such as meter and AMI materials and installation.

The total project expense to install the Advanced Meter Infrastructure is **$5,162,023.00.** PWSD is **requesting a grant in the amount of $50,000.00** which is just less than 1% of the total project cost**.** The grant would fund the purchase of 500 electronic meters. PWSD will contribute the remainder of the project totaling $5,112,023.00 in direct cash investment and in-kind labor contribution. PWSD's contributions will purchase 813 electronic meters, 137 compound and turbo meters, the Advanced Metering Infrastructure, 1450 endpoints, the Customer Communication Web-based portal, and all of the installation costs to install meters, and the AMI system. The other portion of the total PWSD will contribute includes PWSD's committed labor resources. The tables below delineate the expenses associated with the Project per phase.

PWSD Meter Replacement and AMI Grant and Loan Cost Table – Phase 1

PWSD Meter Replacement and AMI Grant and Loan Cost Table				
Task	PWSD Staff or Contractor + Hours	PWSD Cash Contribution	PWSD WE Grant Request	Project Total Expenses
Phase 1 - June 2016 to September 2016				
Task 1 - Purchase meters	Emily Coll - 25			
1313 Electronic meters		$ 81,300.00	$ 50,000.00	$ 131,300.00
137 Compound & Turbo meters		$ 200,568.00		$ 200,568.00
Task 2 - Purchase AMI	Emily Coll - 45			
AMI		$ 159,625.00		$ 159,625.00
1450 Endpoints		$ 72,500.00		$ 72,500.00
Customer Communication Web Portal		$ 40,000.00		$ 40,000.00
Installation	Vendor - 640	$ 363,355.00		$ 363,355.00
Task 3 - Project Management	Vendor - 60, Emily Coll- 160			
Task 4 - Annual O & M costs/year	Emily Coll - $78,300, Vendor - $40,000			
Total Phase 1:	$ 115,075.00	$ 917,348.00	$ 50,000.00	$ 1,082,423.00

PWSD Meter Replacement and AMI Grant and Loan Cost Table – Phase 2

PWSD Meter Replacement and AMI Grant and Loan Cost Table				
Task	PWSD Staff or Contractor + Hours	PWSD Cash Contribution	PWSD WE Grant Request	Project Total Expenses
Phase 2 - October 2016 to December 2018				
Task 1 - Purchase meters	Emily Coll - 60			
6000 Electronic meters		$ 600,000.00		$ 600,000.00
Task 2 - Purchase AMI	Emily Coll - 85			
6000 Endpoints		$ 300,000.00		$ 300,000.00
Installation	Vendor - 1920	$ 810,000.00		$ 810,000.00
Task 3 - Project Management	Vendor - 60, Emily Coll- 160			
Task 4 - Annual O & M costs/year	Emily Coll - $78,300, Vendor - $40,000			
Total Phase 2:	$ 187,300.00	$ 1,710,000.00	$ -	$ 1,897,300.00

PWSD Meter Replacement and AMI Grant and Loan Cost Table – Phase 3 and Total Project Cost

PWSD Meter Replacement and AMI Grant and Loan Cost Table				
Task	PWSD Staff or Contractor + Hours	PWSD Cash Contribution	PWSD WE Grant Request	Project Total Expenses
Phase 3 - January 2019 to December 2023				
Task 1 - Purchase meters	Emily Coll - 50			
7000 Electronic meters		$ 700,000.00		$ 700,000.00
Task 2 - Purchase AMI	Emily Coll - 90			
7000 Endpoints		$ 350,000.00		$ 350,000.00
Installation	PWSD - 1920	$ 945,000.00		$ 945,000.00
Task 3 - Project Management	Vendor - 60, Emily Coll- 160			
Task 4 - Annual O & M costs/year	Emily Coll - $78,300, Vendor - $40,000			
Total Phase 3:	$ 187,300.00	$ 1,995,000.00	$ -	$ 2,182,300.00
Total Project Cost:	**$ 489,675.00**	**$ 4,622,348.00**	**$ 50,000.00**	**$ 5,162,023.00**

The grant monies will be used to address PWSD's stated goals using the new meters and AMI System, necessary to determine potential water savings and a ROI on the electronic meters. PWSD's AMI Coordinator will monitor the project daily to ensure that the project is being implemented correctly and in a timely manner. The AMI Coordinator will track findings and input them into monthly progress reports.

16. Signing Authority

Ron Redd, District Manager, will commit the PWSD's resources to fulfill the tasks presented in this grant request. Mr. Redd is authorized to submit this grant on behalf of PWSD.

_____ _____

Signature Date

_____

Title

ParkerWater & SANITATION DISTRICT