ParkerWater
& SANITATION DISTRICT

January 17, 2017

Colorado Water Conservation Board
Office of Water Conservation and Drought Planning
1313 Sherman Street, 7th Floor
Denver, CO 80203

RE: Parker Water and Sanitation District Water Efficiency Plan Update

Please find enclosed a copy of Parker Water and Sanitation District's (PWSD) updated Water Efficiency Plan. The plan was prepared in accordance with the 2004 Colorado Water Conservation Act by PWSD staff, including members of PWSD's Enterprise Services, Engineering, Water Resources, and Business Solutions Departments, as well as review and input from Element Water Consulting.

PWSD provides water and wastewater services to over 15,000 accounts, serving a population of nearly 50,000 people in the Town of Parker, areas of Douglas County, and now includes new development areas located within the City of Lone Tree and the City of Castle Pines.

The Water Efficiency Plan was available for public review and comment from July 28, 2016 through September 26, 2016. The public was also invited to provide comments during regularly scheduled PWSD Board meetings on December 8, 2016 and January 12, 2017. No comments (written or oral) were received from the public. On January 12, 2017, the Plan was adopted by resolution.

Please direct any questions regarding the Plan to PWSD's Customer Relations Manager, Billie Owens at bowens@pwsd.org or (720) 842-4216.

Sincerely,

Ron R. Redd
District Manager

Enclosure: Parker Water & Sanitation District 2016 Water Efficiency Plan

18100 E. Woodman Dr. Parker, CO 80134 303-841-4627 • FAX 303-841-8992

RESOLUTION NO. 2017-01

A RESOLUTION OF THE BOARD OF DIRECTORS OF THE PARKER WATER AND SANITATION DISTRICT ADOPTING THE 2016 WATER EFFICIENCY PLAN

WHEREAS, the Parker Water and Sanitation District provides water and sanitation services to the residents of the District, and the Board desires to comply with the Colorado State water conservation legislative directives;

WHEREAS, the Board has commissioned the staff to update the District's water conservation plan in an effort to continually provide effective management of critical water resources;

WHEREAS, the Board wishes to adopt the water efficiency plan attached hereto and incorporated herein.

NOW THEREFORE, BE IT RESOLVED BY THE BOARD OF DIRECTORS OF THE PARKER WATER AND SANITATION DISTRICT:

Section 1. The Water Efficiency Plan attached hereto as Exhibit A is hereby adopted effective on the date hereof.

Section 2. The staff of the District is hereby directed to implement the conservation and efficiency measures identified herein.

Done and Resolved this 12th day of January, 2017.

PARKER WATER AND SANITATION DISTRICT

By: _____
President

ATTEST:

By: _____
Secretary

November *2016*

ParkerWater
& SANITATION DISTRICT

2016

Water Efficiency Plan

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ABBREVIATIONS

AD	Average Day
AF	Acre - Feet
AFY	Acre-Feet per Year
AMI	Advanced Metering Infrastructure
AWT	Advanced Wastewater Treatment
AWWA	American Water Works Association
District	Parker Water and Sanitation District
DU	Dwelling Unit
ECCV	East Cherry Creek Valley
GPCD	Gallons Per Capita Per Day
GPM	Gallons Per Minute
HOA	Homeowners Association
LIRF	Lawn Irrigation Return Flows
MD	Maximum Day
MGD	Million Gallons Per Day
NWRF	North Water Reclamation Facility
PH	Peak Hour
PWSD	Parker Water and Sanitation District
RHR	Rueter-Hess Reservoir
RHWPF	Rueter-Hess Water Purification Facility
SDF	System Development Fee
SFE	Single-Family Equivalent
SMWSA	South Metro Water Supply Authority
SWRF	South Water Reclamation Facility
WEP	Water Efficiency Plan
WISE	Water Supply and Infrastructure Efficiency
WRF	Water Reclamation Facility

ACKNOWLEDGEMENTS

The development of the Parker Water and Sanitation Water Efficiency Plan was a collaborative effort led by the Customer Care Team, involving District divisions, including Engineering, Water Resources, Business Solutions and Enterprise Services. Review assistance was provided by Element Water Consulting.

SECTION 1
PROFILE THE EXISTING WATER SYSTEM

1.1 SERVICE AREA

The Parker Water & Sanitation District (PWSD) provides water and wastewater services within several local jurisdictions located south of Denver. Formed in 1962, PWSD historically served areas within and around the Town of Parker, located along Parker Road south of Highway E-470. Over the last decade, the PWSD service area has also expanded, through inclusion, west to Interstate 25 and now includes new development areas located within the City of Lone Tree and the City of Castle Pines, including:

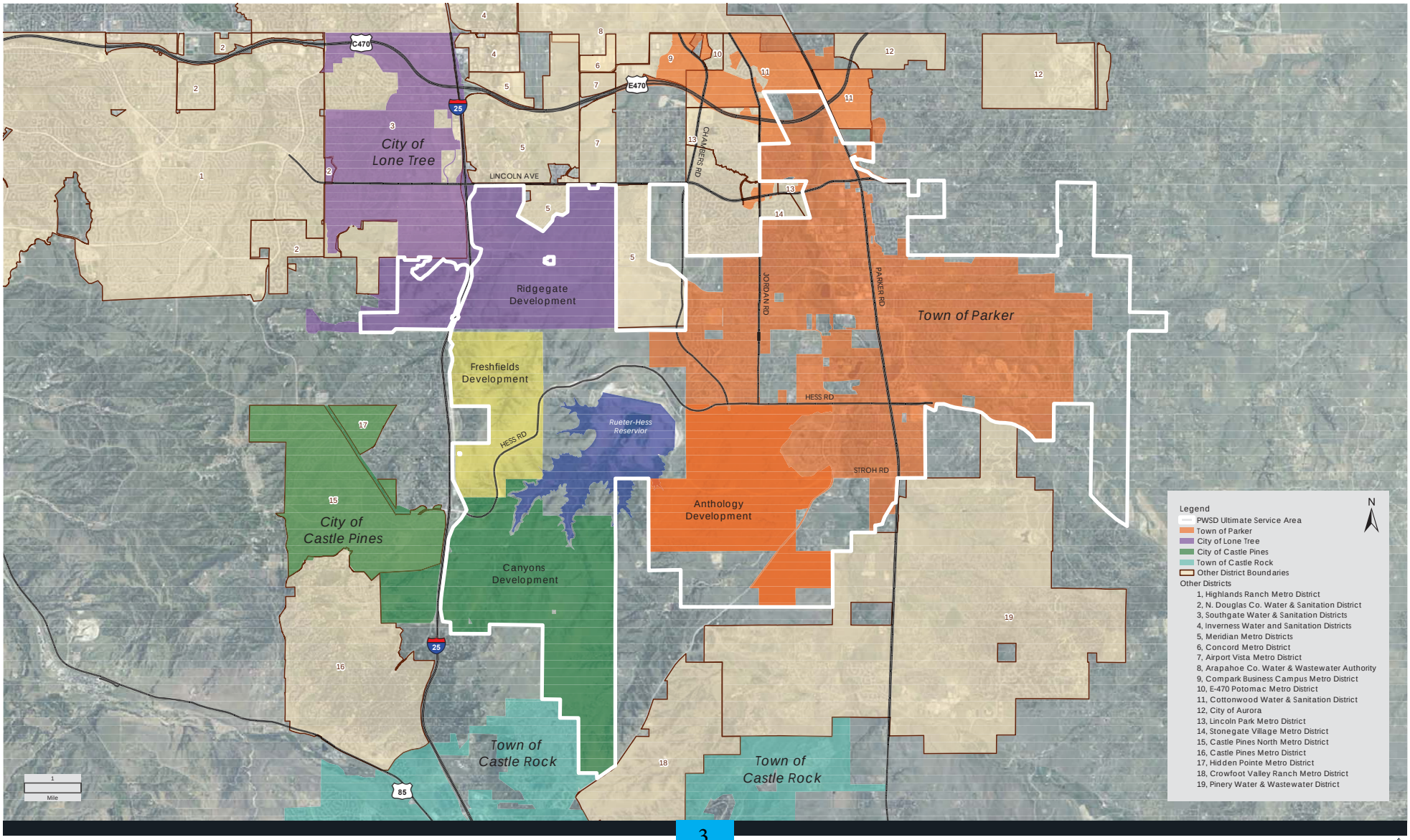
- Ridgegate;
- The Canyons; and
- Freshfields.

PWSD's service area now covers approximately 27,600 acres (43 square miles) of northern Douglas County, and is shown in **Figure 1-1**.

PWSD currently provides water and sanitary sewer services to nearly 15,000 accounts, representing over 18,000 single family equivalents (SFE's) – which equates to a population of nearly 50,000 people. A SFE represents the annual water demand equal to that of a single family home. According to the 2014 Water & Wastewater Master plan, at build-out, which is projected to be beyond the 2035 timeframe, PWSD will serve approximately 50,000 SFE's, a projected population of 122,200.

Figure 1-1

PWSD Service Area



1.2 SOURCES OF WATER

Existing Water Supply Sources

PWSD's existing water supplies consist of five (5) water sources:

- Denver Basin Deep Wells;
- Cherry Creek;
- WISE (Water, Infrastructure and Supply Efficiency) Water;
- Reuse Water; and
- Logan County supplies of senior direct flow rights, junior alluvial aquifer well rights, and junior direct flow rights.

Table 1-1 outlines average annual yields from existing PWSD water supply infrastructure.

Table 1-1 Existing Water Supplies (2015 PWSD Long-Term Supply Plan)

Source	Annual Volume[1] Available	Portion of Total Supply
	AFY	%
Deep Denver Basin Wells[2]	17,000	49
Cherry Creek and Newlin Gulch[3]	5,300	15
WISE Program[4]	1,200	4
Reuse Water[5]	10,900	32
Logan County Farms	Unavailable[6]	Unavailable[6]
Total	**34,400**	**100**

[1] Volumes rounded to the nearest 100 AFY.

[2] Available well volume is based on the total of the 2014 peak well pumping capacity. Actual water volume by water right is around 32,000 AFY. Well capacity is decreasing each year due to declining groundwater elevations in the Denver Basin.

[3] Cherry Creek volume is based on the modeled reservoir inflow amount provided in the Rueter-Hess Dam and Reservoir, Final Environmental Impact Statement (USACE, 2007a). Renewable amounts are based on a review of all the water rights for Cherry Creek and Newlin Gulch, and it is assumed that 50% of this supply is reusable and 50% not reusable.

[4] PWSD has agreed to participate in the WISE Program which will deliver treated water to the PWSD water distribution system beginning in 2017.

[5] The reuse water is the water that can be reused by water rights from the Denver Basin wells, the WISE program and a portion of the Cherry Creek water rights (see note 3). Reuse water is calculated using the same methodology for calculating the reuse water for the build-out water supply modeling. For 2014, reuse water is approximately 46.4% of the total Denver Basin, Cherry Creek, and WISE Program water supplies. Evaporative losses from Rueter-Hess Reservoir are not accounted for.

[6] Logan County Farms firm yield is a long-term renewable water resource for the District.

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

existing well capacities, the actual well production is approximately 17,000 AFY. (Note, existing water supplies could yield more with additional infrastructure.)

Cherry Creek and Newlin Gulch: 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 5,300 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 (RHR) by either a direct diversion off of Cherry Creek or by pumping from the Cherry Creek alluvial wells.

WISE Water: PWSD has contracted to participate in the WISE project at an average 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 is a source of supply, to the extent PWSD has 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 South Water Reclamation Facility and the North Water Reclamation Facility and 2) the lawn irrigation return flows (LIRF).

Logan County Farms: The District purchased farms in Logan County, Colorado along with the irrigation water rights associated with the farms as long term renewable resource for the District. The District has adjudicated 9,400 AF in junior water rights, and is in the process of adjudicating approximately 5,000 AF of senior water rights from agricultural to municipal use. There is a long-term project to then convey this water to the RHR, yielding on average approximately 8,100 AF annually.

1.3 WATER SYSTEM

Water Supply System

PWSD's water system consists of Denver Basin groundwater aquifers, the Cherry Creek alluvium and tertiary treated wastewater effluent. PWSD disinfects the groundwater and delivers it to the potable water system for use by its customers; no additional treatment is required by Colorado Department of Public Health and Environment regulations.

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.

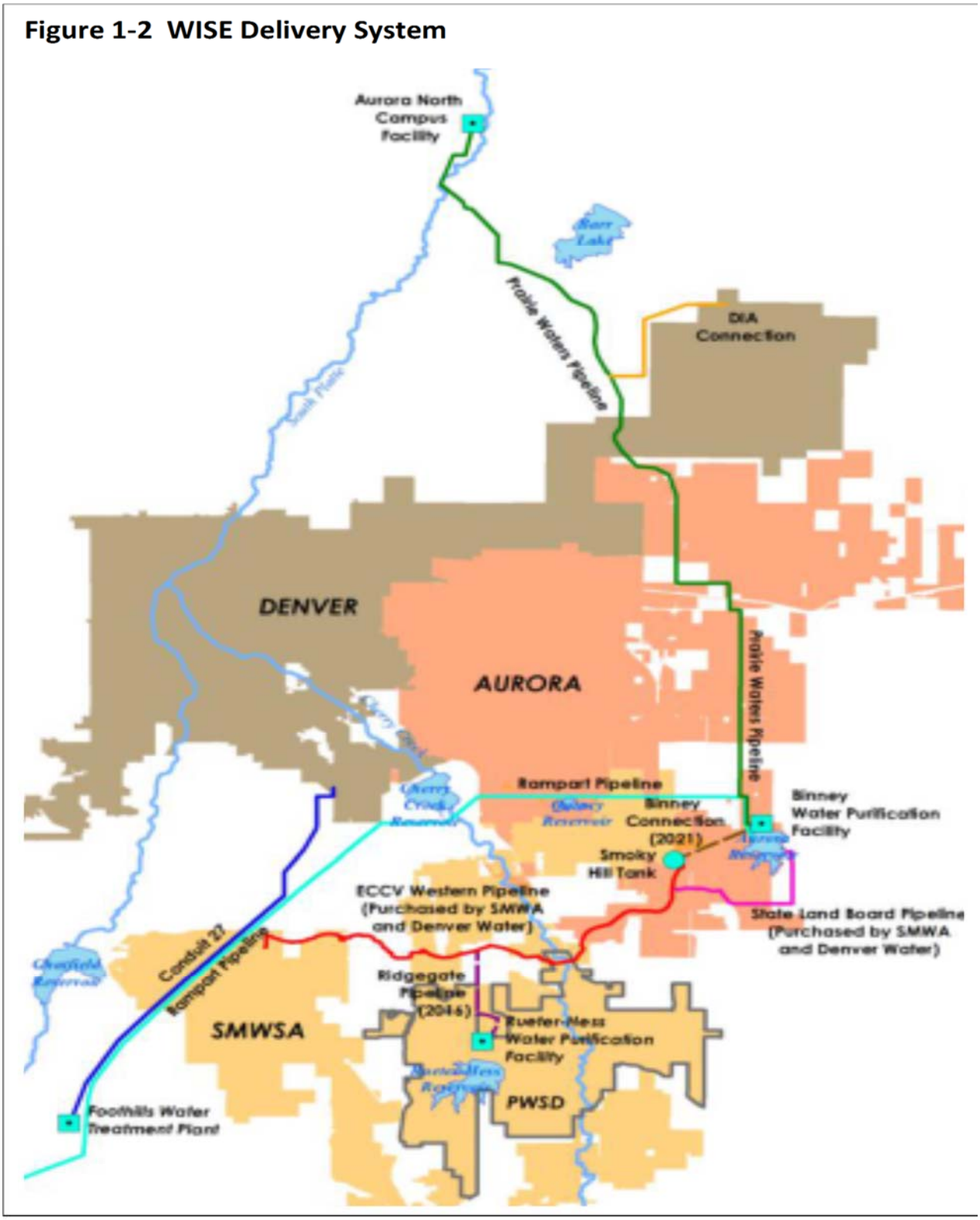
Cherry Creek Alluvial Wells: There are a total of seven (7) Cherry Creek alluvial wells. PWSD may pump from the alluvial wells if they have a surface water right in priority to directly withdraw from Cherry Creek or in exchange for wastewater flows discharged into Cherry Creek.

Water Reclamation System: PWSD's water reclamation system is a key component of the District's overall water management program. In summary, the system transfers tertiary treated wastewater into Cherry Creek. This wastewater is then pumped to Rueter-Hess Reservoir. The Reclaimed Water System begins with the water reclamation facilities (WRFs) which treat the PWSD'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.*

WISE Infrastructure:

The components of the WISE infrastructure will include a 42" transmission pipeline from the East Cherry Creek Valley (ECCV) Water PWSD'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 in RHR. Also, a new Pressure Zone 2 to Pressure Zone 3 Booster Station, will be constructed to convey WISE water. An overview the WISE delivery system is provided in Figure 1-2.

Figure 1-2 WISE Delivery System



Water Storage (Raw): Used to help firm renewable water supplies, RHR is an off-stream reservoir with a raw water storage volume of 75,000 acre-feet, of which PWSD has an allotment of 56,700 acre-feet, 18,300 of which is available for future lease. The dam rises 185 feet above the bedrock and will encompass 1,170 acres. Currently the reservoir contains about 30,000 acre-feet of raw water. The existing RHR volume allocations for shared capacity are shown in Table 1-2, "Rueter-Hess Reservoir Storage Allocation."

Table 1-2 Rueter-Hess Reservoir Storage Allocation (2014 PWSD Water & Wastewater Master Plan)

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**

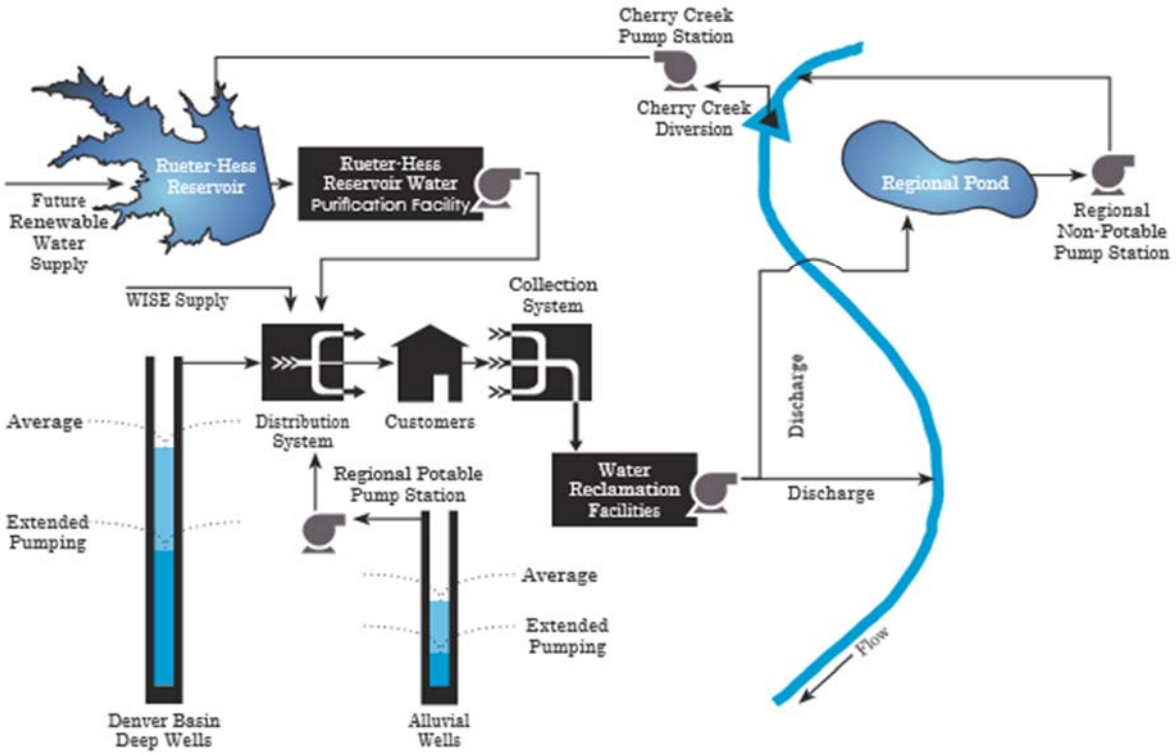
Notes:
[1] Storage requirements were evaluated as part of the Long-Term Water Supply Plan.

Water Treatment: PWSD disinfects the groundwater and delivers it to the potable water system. Treatment meets all Colorado Department of Public Health and Environment (CDPHE) regulations. In most cases, several wells discharge to a common wet well in the well facility where the water is chlorinated and then pumped into the distribution system. A sequestering agent is also added to control the precipitation of iron and manganese.

The Reuter-Hess Water Purification Facility (RHWPF) became operational during the summer of 2015. The facility has an initial capacity of 10 MGD, and a build-out capacity of 40 MGD. The RHWPF treats raw water from the Rueter-Hess Reservoir through a ceramic membrane filtration process.

Figure 1-3, "PWSD Existing Water Supply Schematic" illustrates how the various water supplies relate to the water distribution and wastewater collection systems to provide a reliable renewable water supply system.

Figure 1-3 PWSD Existing Water Supply Schematic



Water Storage (Potable): PWSD is currently served by six (6) potable water storage tanks, with potable storage capacity of 20 million gallons (MG).

Water Distribution:

Pressure Zones: PWSD's current service area has varying topography and is centered on the middle reach of the Cherry Creek watershed basin. As a result, three (3) pressures zones have been developed.

Booster Pump Stations: PWSD currently has four (4) booster pump stations that serve to meet maximum day demands in the system by transferring water between pressure zones.

Pipelines: The PWSD water system consists of approximately 255 miles of transmission pipelines (larger diameter mains designed to transport large quantities of water typically between major facilities with the system) and distribution mains (smaller pipelines that deliver water from the transmission pipelines to the customer.)

Additional information about PWSD water system is provided in **CWCB Worksheet 1**.

CWCB Worksheet 1 2015 Water System Profile

A	SERVICE CHARACTERISTICS		Number	
1	Estimated service population		49,703	
2	Estimated service area (square miles)		43.1	
3	Miles of mains		225	
4	Number of treatment plants		17 well houses, 1 Water Purification Facility, 2 Water Reclamation Facilities	
5	Number of separate water systems		1	
6	Interconnection with other systems		0	
B	ANNUAL WATER SUPPLY[1]	Annual volume AF	Number of intakes or source points	Percent metered
7	Groundwater	17,000	17	100%
8	Surface water	717	1	100%
9	Purchases: raw	0	0	0%
10	Purchases: treated	0	0	0%
11	Total annual water supply	17,717	18	100%
C	SERVICE CONNECTIONS[2]	Connections	Water sales, $	Percent metered
12	Residential, single-family	13,625	4,089,440,.75	100%
13	Residential, multi-family	349	596,053.97	100%
14	Commercial	420	741,988.39	100%
15	Industrial	0	0	0%
16	Public or governmental	0	0	0%
17	Wholesale	0	0	0%
18	Other (Irrigation only)	475	1,892,081.21	99%
19	Total connections	14,869	7,319,564.32	99%
D	WATER DEMAND[3]	Annual volume AF	Percent of total	Per connection (1,000 gallons)
20	Residential sales	4314	73.4	100.6
21	Nonresidential sales	518	8.8	401.1
22	Wholesale sales	0	0	0
23	Other sales (Irrigation only)[4]	1039	17.7	712.8
24	Non-revenue water: authorized uses	3.4	0.1	N/A
25	Non-revenue water: unauthorized uses	0	0	0
26	Total system demand (total use)[5]	5875	100	128.7
E	AVERAGE & PEAK DEMAND	Volume (MGD)	Total supply capacity (MGD)	Percent of total capacity
27	Average-day demand	5.2	30.710	17%
28	Maximum-day demand	16.9	30.710	55%
F	PLANNING	Prepared a plan	Estimated completion date	Filed with state
30	Capital, facility, or supply plan	Yes	2014	
31	Drought or emergency plan	Yes	2015	
32	Water Efficiency Plan Update	In progress	2016	2016

Notes:
1. Annual Water Supply data, Water Demand data.
2. Service Connections = Number of meters as of 2015 (does not include fire – which is unmetered.)
3. Based on 2015 billed consumption.
4. Irrigation = Dedicated commercial and homeowner association irrigation usage.
5. Hydrant/bulk permit usage not included.

1.4 System Limitations and Solutions

PWSD recognizes that water levels in the Denver Basin groundwater aquifers have been declining, and expected population growth and future demands within PWSD's service area may exceed existing supplies. PWSD's 2015 Long-Term Water Supply Plan includes strategies for success such as:

- Maximizing current groundwater supplies through conservation and management initiatives.
- Adding critical infrastructure.
- Locating and investing in renewable surface water supplies.
- Securing the financial resources necessary to ensure the community's water needs are met well into the future.
- Propagating working relationships with other water providers to acquire potential water resources through cooperation and cost sharing.

Long-term water supply goals are summarized below:

- Achieve the use of 75% renewable water sources by build-out to meet average day demands, assuming that the remaining 25% would still be produced from groundwater supplies, thus reducing the overall cost to the District's customers and recognizes that some water would still be able to be economically produced from the aquifers.
- Identify water supply alternatives that PWSD could develop and implement without the participation and need for project partners.
- Reach an average storage volume of 40,000 acre-feet (AF) in Rueter-Hess Reservoir at build-out.

With the Denver Basin aquifers as the current primary source of water for PWSD, alternative water supply sources have been identified and projects are underway to make the sources productive. The average annual demand at build-out is estimated to be approximately 21,000 AFY. PWSD's goal is to transition water supply from groundwater to renewable sources including the 75,000-acre-foot Rueter-Hess Reservoir to store surface water rights, and the associated conveyance infrastructure required to move the water. The Rueter-Hess Water Purification Facility was brought online in 2015 to treat the reservoir water. The conveyance infrastructure includes a 78 cubic feet per second raw water pumping facility with 4,750 horsepower of pumps and approximately 4 miles of 48-inch pipe.

The PWSD has partnered with neighboring entities to make the reservoir a regional project, sharing storage with the intent to reduce the peak groundwater pumping rates. The participating entities are the Town of Castle Rock, Stonegate Metropolitan District, and Castle Pines North Metropolitan District. Also, PWSD is participating in the WISE project which is another regional water supply project through the South Metro Water Supply Authority, Denver Water and Aurora Water.

Additional information on the PWSD system is provided in CWCB Worksheet 9.

CWCB Worksheet 9 Summary of System Conditions

PLANNING QUESTIONS	Yes	No	Comment
Is the system in a designated critical water supply area?		X	
Does the system experience frequency shortages or supply emergencies?		X	
Does the system have substantial non-revenue and lost water?		X	
Is the system experiencing a high rate of population and/or demand growth?	X		There was a 10.1% population increase from 2010 to 2015 according to the U.S. Census bureau data.
Is the system planning substantial improvements or additions?	X		Water distribution, water supply system and reclamation treatment improvements are outlined in PWSD's 2014 Water & Wastewater Master Plan.
Are increases to wastewater system capacity anticipated within the planning horizon?	X		Several improvements to wastewater conveyance and treatment facilities have been completed, and additional information is provided in PWSD's 2014 Water & Wastewater Master Plan.

1.5 Water Costs and Pricing

PWSD recognizes its responsibility to equitably charge for services. In its most recent rate, charge and cost of service study, performed in 2014, the standard industry practice of using cost-based principles was used for establishing rates and charges. With the primary objective to recover annual revenue requirements by customer class based on costs of service, the study:

- Consolidated tap fees into three separate System Development Fee (SDFs) categories: water, water resources, and wastewater;
- Projected annual revenue requirements in separate financial plans for water and wastewater;
- Calculated rates based on costs of service and determined the true costs of serving PWSD customers; and
- Simplified the current rate structure by maintaining a fixed service charge per single family equivalent (SFE) but simplified the rate structure from five to three volumetric tiers.

Rates and Fees

Cost of service rate making principles as applied to monthly base charges and volumetric rates are generally considered fair and equitable because rates are designed in a way that each class of customer pays the costs allocated to serving that class, and cross-class subsidies are avoided.

Objectives of rate making included:

1. Effectively covering revenue requirements in a stable and predictable manner.
2. Promotion of efficient water use – an important thing in our semi-arid state!
3. Striving for equity across different types of water users so that each customer is paying for the demand they are creating.
4. Making rates understandable and simple to administer.

Residential customers are on an inclining block rate structure designed to:

- Provide water for fundamental household needs at the lowest tier;
- Charge for irrigation use that includes applicable peaking factors; and
- Discourage excessive water use over and above indoor and outdoor needs.

For the last several years, and continuing into the future, separate taps are required for commercial properties' domestic and irrigation services. The existing rate structure associated with the demand placed on the system by indoor use for commercial customers results in a uniform rate per thousand gallons for domestic services.

Irrigation customers are currently on a tiered rate structure that was developed in 2010. It allows the tier threshold to be multiplied by the number of SFE's associated with the tap size, and also allows customers to aggregate their usage against their total number of SFE's for all of their accounts. These "various" accounts were established in order to phase in rate increases in order to provide HOA's time to adjust their landscaping and irrigation practices. During the 2014 rate and fee study it was determined that irrigation customers were being subsidized by other users. Therefore, with the 2016 rate update, dedicated irrigation customers will experience a rate change on October 1, 2016, enacting a uniform cost per thousand gallons, in order to better capture cost of service for this user category. The intention in the future is to evaluate the implementation of a water budget based structure for irrigation customers, and is included as a goal within this Plan goal.

System Development Fees (SDFs)

SDFs are one-time charges to new connections that recover a proportional share of investments in capacity to serve new connections. For SDFs, the primary policy for the Board to consider was that "growth pays for the costs of growth." This policy confirms that existing customers do not subsidize future customers, as well as prevents the subsidization of existing customers by new development.

The combined method of calculating SDF uses both the existing capacity and required new capacity, combining the equity buy-in and incremental cost methods to derive a proportional fee.

PWSD's tap and development fees, current as of January 2016, are as follows:

Table 1-3 2016 Tap and Development Fee Schedule

Tap & Development Fee Schedule
Effective January 1, 2016

Meter Size	Water SDF	Sewer SDF	Water Resources SDF	Water Resource Toll
3/4"	$ 9,830	$ 3,510	$ 12,040	$ 5,000
1"	$ 19,660	$ 7,020	$ 24,080	$ 10,000
1 1/2"	$ 39,320	$ 14,040	$ 48,160	$ 20,000
2"	$ 68,810	$ 24,570	$ 84,280	$ 35,000
3"	$ 157,280	$ 56,160	$ 192,640	$ 80,000

Water Rates
Effective January 1 thru September 30, 2016

Residential and Multi-Family Accounts
Per Single Family Equivalent (per month)

Water Service Fee		$ 29.22
Tier 1	Per 1,000 gallons for first 6,000 gallons	$ 2.20
Tier 2	Per each additional 1,000 gallons up to and including 20,000 gallons	$ 4.12
Tier 3	Per each additional 1,000 gallons in excess of 20,000 gallons	$ 8.51

Commercial Accounts
Per Single Family Equivalent (per month)

Water Service Fee		$ 29.22
Per 1,000 gallons		$ 3.60

Irrigation Accounts
Per Single Family Equivalent (per month)

Water Service Fee		$ 28.77
Tier 1	Per 1,000 gallons for first 10,000 gallons	$ 2.69
Tier 2	Per each additional 1,000 gallons up to and including 20,000 gallons	$ 4.36
Tier 3	Per each additional 1,000 gallons up to and including 30,000 gallons	$ 6.45
Tier 4	Per each additional 1,000 gallons up to and including 50,000 gallons	$ 8.43
Tier 5	Per each additional 1,000 gallons in excess of 50,000 gallons	$ 9.30

Hydrant Water Accounts

Water Service Fee (per month)		$ 225.00
Per 1,000 Gallons		$ 6.95

NOTE: The Water Resource Toll (WRT) is separate from the Water Resources SDF, and references the fee that may be accepted in-lieu of water rights as a conveyance to the District in order to received water service.

Existing Meter Reading System(s)

The large majority of service connections are metered, with the exception of fire taps. Per a pre-existing special agreement, there are unmetered irrigation taps within a subdivision in the District for which consumption is currently estimated. PWSD is working with that irrigation customer to install meters on those services, and reviewing all service agreements as necessary to determine if other special agreements exist.

Water meters are currently read via two methods, (1) manually and (2) using drive by electronic radio receiver. The meter reading is captured by a handheld or laptop computer that accepts or rejects the reading if it is outside the normal use pattern. Rejected readings are re-read. PWSD's Customer Care Team does extensive meter reading evaluation and proactively reach out to customer's that are flagged on high usage reports. This customer centric communication helps inform customers of potential leaks, and reduces potential long term water waste. The Team also intends to make use of interactive voice recording technology (IVR) to automate these calls, and potentially reach more customers.

In 2016, PWSD is initiating a multi-million-dollar, multi-year Meter Replacement and Advanced Metering Infrastructure (AMI) system project whereby all existing meters in the service area will be replaced, with the electronic meters. These electronic meters are more accurate at low-flow levels (<1/4 gallons per minute.) An AMI reading, analytics and customer portal system will capture consumption data numerous times per day. The new meters and AMI system ensures metering accuracy and assists with leak detection, hydraulic modeling and more effective water accounting methods. Also, because there is a web-based customer portal that will be integrated with the AMI data management and analytics program, customers will be empowered to take control over their water consumption, encourage conservation and use water more efficiently. With the addition of AMI, the customer portal requirements include the ability for a customer to log in, see standard flags, as well as be able to set up customer alarm features to notify them of water use anomalies and approaching use thresholds.

PWSD intends to leverage synergies from state of the art technologies and state of the industry business practices in order to create business solutions to bring extraordinary value and service to our customers. The information from this AMI system will be used to inform water dedication policies, capital development projects, integrated operational and management water system solutions, as well as rate and fee setting applications.

Below is the targeted implementation and financing phasing plan for this project.

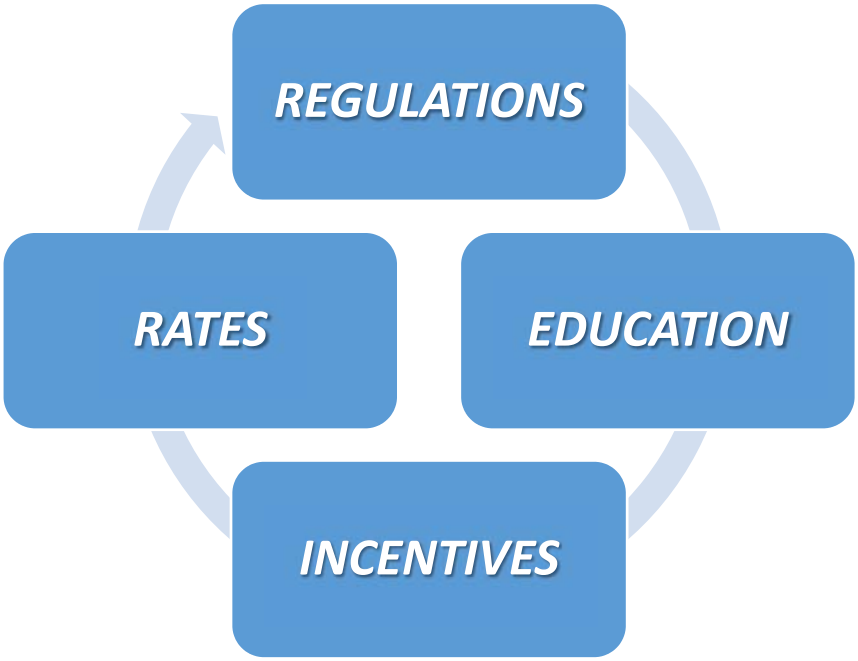
Table 1-4 Meter Replacement and AMI Project Projected Budget & Schedule

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
Phase I	**Phase II**		**Phase III**					
Includes communication infrastructure, replacement of all existing meters, and project management.								

1.6 Current Policies and Planning Initiatives

PWSD takes a multi-faceted integrated approach to conservation and water use efficiency. By employing:

- Education to increase awareness;
- Regulations to ensure new development is water efficient and waste is prohibited;
- Positive incentives such as rebates; and
- Water rates that encourage efficient use.



Regulations and Planning Initiatives

Waste: PWSD prohibits wasteful use of water through its Rules and Regulations in Section 4.15 Waste of Water Prohibited. The section states:

> *"Water is a valuable and precious commodity in the State of Colorado and within the boundaries of the PWSD. Waste of water is hereby prohibited. Runoff of water from landscaped and irrigated properties, and overspray from irrigation systems to impervious surfaces is prohibited. Customers are required to maintain any sprinkler system, irrigation system or hoses in such a manner as to avoid runoff, overspray, leaks and/or wastage. Any employee of PWSD who observes waste, as herein described occurring, shall notify the owner or resident of the property upon which the waste, whether from runoff, overspray or leaking, is occurring of the existence of such waste. In the event the owner or resident (including tenants of either residential or commercial or industrial properties) fails to cease the activity resulting in waste, or in the event any*

employee of PWSD shall observe such waste at the same location for a second or subsequent time, PWSD may terminate the provision of water at such address or structure until such waste ceases."

Irrigation System Requirements: Per Section 4.16 of PWSD's Rules and Regulations, irrigation systems are required to use SMART irrigation controllers and rain sensors for irrigation taps and rain sensors for all residential construction. Inspections are conducted to ensure compliance, with a contingency of final approval and meter set.

Master Plan Objectives: PWSD updated its Water and Wastewater Master Plan in 2014, and developed a Long-Term Water Supply Plan in 2015, both of which were used to inform this Plan. The Master Plan is used to provide general information on the status of the PWSD's infrastructure, to estimate infrastructure improvements that may be necessary to accommodate future growth, and to provide general budgeting information. Conservation is highlighted as a major objective to assist with management of ground water and other water resources. The Long-Term Water Supply Plan includes conservation and water efficiency projections in order to identify per capita usage and develop future water supply requirements.

Local/Regional Land Use Planning Activities: While PWSD is not a regulatory land use authority, it works with the Town of Parker and Douglas County, as well as groups such as South Metro Water Supply Authority (SMWSA), which includes fourteen regional water providers and governmental agencies. PWSD recognizes and shares the commitment to wise water use from its neighbors and the communities it serves. PWSD's tap sizing and efficient irrigation requirements, and water waste regulations work in concert with applicable land use authority regulating activities, supporting their intent and implementation. PWSD is also working with SMWSA to develop regional landscaping and irrigation guidelines, as well as regional contractor training and certification programs that the District can endorse to support smart, water-saving decisions for the communities in its service area.

Water Planning Activities: PWSD continues to develop its long-term water vision, focusing on a shared commitment among employees, customers and partners of the District to support the conservation and management of existing and future water resources. PWSD has within its 2015 Long Term Water Supply plan developed a strategic foundation that incorporates technical viability, economic feasibility and consistency with regional water management activities in which PWSD participates in partnerships with other water and government agencies.

One example of this is the WISE Program, which is a regional water solution that reduces demand on non-renewable Denver Basin groundwater supplies.

Rates and Fees

System Development Fees: While PWSD is not a land use authority, conservation and efficient water use are mandated through irrigation tap sizing processes that consider the square footage of each plant material and its associated water use requirements - and thus SDFs - associated with the type of plant material, encouraging the effective design and use of water efficient plant materials.

Water Rates: PWSD conducted a Rate, Charge, and Cost-of-Service Study in 2014 with conservation as one of the goals, coupled with a future objective to move to a water budget type rate structure for dedicated irrigation services. The primary policy intended to impact water use during normal and drought conditions is the residential inclining block rate structure.

Table 1-3 outlines PWSD's rates and fees.

Education and Incentives

On an annual basis, PWSD evaluates conservation related activities and budgets for approved programs, which include:

- General educational outreach activities (website, materials and publications);
- Give-aways (shower heads, toilet leak detection kits, faucet aerators, sprinkler catch cups);
- Third Party Irrigation Audits (Slow The Flow);
- Participation in South Metro Water Supply Authority Conservation Activities;
- Rebates for irrigation equipment;
- Irrigation customer irrigated area efficiency evaluations;
- PWSD facility tours, including Rueter Hess Reservoir; and
- PWSD staff educational opportunities.

1.7 Current Water Conservation Activities

PWSD has programs in place to encourage its domestic, commercial, industrial and public facilities customers to use water more efficiently, and will not only continue these programs, but will strive to enhance them in the future. Existing PWSD water conservation activities include:

Rebates: Rebates to install or retrofit PWSD approved multi-stream, multi-trajectory rotary sprinkler heads reimbursed at up to $5 per head with a maximum of $100 per single family home or commercial lot, and $500 maximum per Homeowners Association or multi-family development. Rebates to install PWSD approved rain sensors at 50% of cost of sensor with a maximum of $50 per controller. Rebates to install PWSD approved SMART controllers at $50 per single family home, commercial property, or Homeowners Association. Table 1-5 is a summary of rebates given out from 2011 to 2015.

Table 1-5 Irrigation Equipment Rebate Summary 2011-2015

Year	# of Accounts	Value
2011	53	$5,334.93
2012	45	$7,536.90
2013	36	$2,410.40
2014	9	$560.00
2015	17	$924.94

NOTE: in 2014, PWSD revised equipment qualification requirements from identifying specific makes/models to referencing EPA Water Sense approved equipment. Minimal program advertisement was conducted in 2014 & 2015. Additional rebate program promotion is slated for 2016 and beyond.

Part of PWSD's goals for monitoring program effectiveness is to evaluate consumption of these rebate program participants in order to determine and quantify water savings.

Low water use landscapes**:** PWSD manages commercial water use through its size-based system development fees and its irrigation system development fees. Irrigation tap size is dictated by the demand placed on the system as determined by type and quantity of landscaping proposed for each site. For each SFE (equivalent to a ¾-inch tap), a commercial site is allowed 6,000 square feet of high water-use turf (e.g. bluegrass), 10,000 square feet of native grass, or 20,000 square feet of drip irrigated shrubs and perennials. Taps sizes are also based on fixture counts. These requirements, along with progressive costs for tap sizes, successfully encourage the use of more water efficient plant materials in the landscape, thus reducing the tap size for the developer and subsequent water use for the life of the project. A copy of the existing landscape/irrigation worksheet is included as Appendix 1.

Drought-resistant vegetation**:** PWSD encourages the installation of low water use landscapes (xeriscape) in all landscaping projects. PWSD makes available to its customers, free of charge, a variety of xeric landscape designs that are available on request, and will be available via PWSD's website, that can be used in front parking strips and yards, as well as information on proper landscape construction, irrigation system design and maintenance. Xeriscape information, including references to local xeric/educational programs, is available on the PWSD's website. Through educational outreach and in-office marketing materials, PWSD also encourages the use of water efficient turf alternatives, such as blue grama and buffalo grass.

Efficient irrigation**:** PWSD encourages all of its users, through billing tidbits, consumption information that is posted on each bill, fliers and in-office marketing materials, as well as website information, to use clock operated, properly zoned irrigation systems, water efficient sprinklers and drip irrigation wherever irrigation is required. PWSD giveaways include sprinkler catch cups to encourage customers to understand their landscape irrigation application rates.

Public education**:** PWSD incorporates general water related educational information, as well as water efficiency and conservation into its facility tours, as well as into classroom visits that are coordinated with local schools. PWSD also participates in the Water Ambassador Program,

which serves the south metro area under the South Metro Water Resource Authority. This program provides in-depth focus on local water issues, engaging youth at the elementary, middle school and high school scholastic levels.

PWSD maintains a Conservation page on its website with comprehensive information on water conservation, including a list of xeric plant materials, information on establishing water efficient blue grama lawns and indoor and outdoor water management guides.

PWSD has initiated a program to assist irrigation customers with irrigating more efficiently. By providing geospatial mapping of irrigated areas along with evapotranspiration based targeted plant material demands, customers are provided with a water use target that they can manage to on a monthly basis.

Informative & understandable monthly water bill**:** PWSD's water bill gives actual monthly meter readings and water usage. The bill also gives a graph with the customer's water use from last year compared to the current billing month and the previous year of historical usage. PWSD strives to calculate rates based on costs of service and determines the true costs of serving the PWSD's customers.

Water bill tidbits and inserts**:** PWSD provides efficiency information in the form of tidbits that are published on all water bills, as well as referencing links to information on the District's website.

Customer water use audits targeted at large users and at large landscapes**:** PWSD contracts with the Center for Resource Conservation to provide irrigation audits, at no direct cost to the customers, through the "Slow the Flow" program. While audits are available to all customers, additional marketing to the top irrigation accounts, in terms of total water usage, is accomplished in order to encourage program participation.
Table 1-6 references "Slow the Flow" program participants over the last several years. While results vary and are dependent on the weather pattern, the Center for Resource Conservation estimated an average annual water savings of 2,000 gallons per participant for 2014.

Table 1-6 Center for Resource Conservation "Slow the Flow" Program Contract

Customer Class	2015	2014	2013	2012	2011
Residential	35	55	37	57	30
HOA	7	12	10	10	10

Part of PWSD's goals for monitoring program effectiveness is to evaluate consumption of these audit program participants in order to determine and quantify water savings.

In 2015 and 2016, in concert with dedicated irrigation volumetric rate revisions, PWSD also implemented an additional voluntary, no-cost audit program for dedicated irrigation customers. This program focuses specifically on homeowner association (HOA) managed irrigated areas,

starting with the top ten highest users, while making it available to all. Program participation is anticipated to be high. The program includes PWSD working with HOA representatives and their landscape contractors to gather site specific information in order to provide geospatial images of the area irrigated by each meter. Contractors highlight the irrigated areas associated with each meter and/or account. PWSD GIS staff then create maps representing the area and associated square footage. These square footages are fed into an evapotranspiration calculator in order to provide a water use target for each property, i.e. how much supplemental irrigation should be applied to these areas. The HOA can then compare this to what they are using in order to determine if efficiency improvements are necessary, as well as help them determine which efficiency improvements may be most effective for them.

Conservation (tiered) rate structure**:** PWSD has an inclining block rate structure based on volume of water used. PWSD does not use a flat rate structure except for irrigation only accounts. Please refer to Section 1.4 for more information. In 2016, significant revisions were made to tier thresholds for residential customers, as well as revisions to commercial and dedicated irrigation customers.

Monthly billing frequency**:** PWSD issues water bills once per month, with bills issued within approximately 2 weeks of meter reading. However, PWSD is implementing an AMI system whereby consumption data will be analyzed daily. This data will also be provided to customers via the web-based customer portal which will give customers the opportunity to reduce their water use more often by drawing more frequent attention to their usage.

Irrigation equipment**:** In 2007, PWSD passed a resolution requiring all new construction (commercial, industrial and residential homeowner's association common areas) in PWSD to be equipped with evapotranspiration (ET) based irrigation controllers and rain sensors. As a contingency of approval, all new single family homes are required to have rain sensors installed.

Water waste prohibition**:** In 1996, PWSD passed Resolution 1996-8, which allows it to shut off water services that are wasting water. Please refer to Section 1.5 for more information.

Give-aways**:** PWSD provides free water conservation literature at the PWSD's main office.

PWSD distributes free home water audit kits with toilet leak detection tablets, shower flow measuring bags and informational brochures that encourage water conservation. We also provide our customers with water restricting faucet aerators, rain gauges and instructions on how to determine irrigation system precipitation rates for more efficient use of landscape irrigation water.

PWSD advertises and distributes approximately 100 no-cost 2.0 gallons per minute (gpm) low flow shower heads per year. Water saving educational coloring books and activity books for children are given away through school outreach and when possible, at other local community

events, as well as during tours of our facilities. These items are also available free of charge at our main office along with other water conservation literature.

Reuse of tertiary-treated reclaimed water**:** PWSD currently practices a highly innovative reclaimed water reuse program that allows it to reuse all of its wastewater, gallon for gallon, through its augmentation programs and through its reclaimed water irrigation policies. The former is accomplished by treating all of the PWSDs' wastewater with advanced treatment systems, discharging the treated wastewater into Cherry Creek and then, after mixing and natural treatment in the Cherry Creek alluvium, each gallon of wastewater is reclaimed through the PWSD's alluvial wells for treatment and distribution into the potable water system.

Leak repair**:** Identified leaks are promptly repaired by either PWSD staff or a variety of local contractors. PWSD created and constantly updates a geographical information system (GIS) database of their water system infrastructure. PWSD uses their GIS database to locate waterlines and provide waterline location mapping to contractors.

Water audits and loss control programs**:** Over the last two years, PWSD has identified a water loss of approximately 2.8%. Loss control processes include analysis of non-revenue water, and involves implementing the AWWA audit methodology to help quantify and track water losses associated with the water distribution systems, and identify areas for improved efficiency.

PWSD constantly monitors the difference between the water it pumps from its wells and the amount of water it actually delivers by means of a Supervisory Control and Data Acquisition (SCADA) system to be constantly aware of leakage losses. It maintains strict construction standards for all new water infrastructure construction, which is rigidly inspected with the standards enforced to maintain the highest possible water distribution system integrity. PWSD also has employed the use of sonic testing contractors to assess pipeline integrity.

Non-revenue water includes water used for construction, fire suppression, distribution system flushing, and PWSD facilities. PWSD requires flow meters for construction water use; construction water taken without a flow meter carries a minimum $500 fine. Water used during the installation of new mainline infrastructure, as well water used during distribution system are tracked on a monthly basis. PWSD also monitors water use at its facilities to check for leaks and confirm normal system operation.

Meter source water**:** PWSD has flow meters installed on every well, as required by CDPHE.

Meter service connections**:** PWSD has had flow meters installed on over 99% of its service connections.

Meter testing and replacement**:** PWSD recalibrates each well flow meter every three years, and replaces flow meters as necessary. PWSD is currently embarking on a meter replacement and

advanced metering infrastructure project, which is slated to replace all existing meters, and upgrade metering equipment.

Improved water accounting**:** With the installation of the AMI system, PWSD will improve its water accounting methods by tracking water produced and consumed on a daily basis. PWSD also has a goal that includes improving water accounting, and provides for a system by which ongoing water balancing will occur. Water audits, loss control programs, and non-revenue tracking along with updated customer metering support a streamlined water loss reduction assessment process.

Meter replacement and AMI Project**:** PWSD is embarking on a system-wide meter replacement and Advanced Metering Infrastructure (AMI) project. The intent with this program is to better capture low flow water consumption (<1/4 gallon per minute) and monitor the water loss numbers to see if these new electronic meters indeed do reduce water loss numbers due to increased data collection capabilities. This system will be offered to customers in order to empower water users to more closely manage their water consumption.

Four major program areas have been identified as areas of opportunity for business management and customer service related to the Meter Replacement and AMI Project. These program areas translate into the following PSWD-specific goals:

1. Leverage AMI water demand data to improve water conservation effectiveness and monitoring. Specific elements of this goal include:
    a. Improve customer consumption metering and logging;
    b. Increase data availability and accuracy to improve reporting;
    c. Perform water restriction monitoring;
    d. Perform water efficiency program monitoring;
    e. Improve synchronization between purchased water (supply) and billed demand; and
    f. Improve Non-Revenue Water understanding and monitoring.

2. Enhance Customer Relations. Specific elements of this goal include:
    a. Provide access to their own consumption data to help customers better understand their water use, set individual consumption alerts, and act on these alerts;
    b. Provide tools to District Customer Service staff to better assist customers;

c. Provide ease of access to data to respond to customer billing issues; and
d. Identify potential customer-side leaks.

3. Potentially Provide Revenue Enhancement Opportunities. Specific elements of this goal include:
    a. Increase metered flow capacity, increasing billed consumption accuracy as well as increased accuracy of consumption used to develop wastewater flow charges;
    b. Reduce customer-side leak adjustments;
    c. Identify consumption at Inactive Accounts and other water theft activities;
    d. Provide better demand-side calibration for Hydraulic Modeling; and
    e. Provide integrated distribution-system-side noise logging and potential leak detection.

4. Improve Metering Reading Acquisition. Specific elements of this goal include:
    a. Reduce truck rolls (labor, fuel, carbon footprint) for acquisition of billed reads (monthly and final), as well intermittent consumption monitoring on specified accounts;
    b. Provide remote or more efficient soft shut-offs;
    c. Perform proactive workload leveling through access to better data; and
    d. Monitor large meters for inaccuracy and longevity.

Rates and Fees**:** Objectives of rate making included:

1. Effectively covering revenue requirements in a stable and predictable manner;

2. Promotion of efficient water use;

3. Striving for equity across different types of water users so that each customer is paying for the demand they are creating; and

4. Making rates understandable and simple to administer.

CWCB Worksheet 1-3 presents a summary of current water conservation activities. Water savings estimates are frequently difficult to estimate due to variables such as participation rates, water use practices, public education effectiveness, and other issues.

CWCB Worksheet 1-3 Summary of Current Conservation Activities

Water conservation measures and programs	Implementation dates	Is continued implementation planned?
Landscape efficiency		
Low water use landscapes	2003 to present	Yes
Drought-resistant vegetation	2003 to present	Yes
Efficient irrigation	2007 to present	Yes
Education/information dissemination		
Public education	2007 to present	Yes
School programs	2007 to present	Yes
Informative & understandable water bill	Ongoing	Yes
Water bill inserts	2007 to present	Yes
Technical assistance		
Customer water use audits targeted at large users and at large landscapes	1994 to present	Yes
Water conservation expert available	2007 to present	Yes
Rate structures & billing systems		
Volume billing	1980s to present	Yes
Conservation (tiered) rate structure	1988 to present	Yes
Increased (monthly) billing frequency	Ongoing	Yes
Regulations/Ordinances		
Water waste prohibition	1996 to present	Yes
Incentives		
Give-aways		
Home water audit kits	1994 to present	Yes
Low flow shower heads	1996 to present	Yes
Water restricting faucet aerators	2008 to present	Yes
Water reuse systems		
Reuse of tertiary-treated reclaimed water	1980 to present	Yes
Distribution system efficiency		
Leak repair	1990 to present	Yes
Leak identification	1990 to present	Yes
Meter source water	1980s to present	Yes
Meter service connections	1986 to present	Yes
Meter testing and replacement	1980s to present	Yes
Improved water accounting	2007 to present	Yes
Analysis of water loss/non-revenue water	1997 to present	Yes
Meter Replacement and AMI	2016 - 2023	Yes
Irrigation Budget Rate Structure	2016	Yes

CWCB Worksheet 1-3 identifies several water conservation activities for which projected water savings data is anecdotal. Implementation of the AMI data analytics system, coupled with coordinating data analysis with regional governmental entities, will provide firmer statistics regarding the efficacy of many water efficiency and conservation activities.

Table 1-7 outlines previous water conservation and efficiency goals that were identified in the 2009 Water Conservation Plan, as well as the status of those goals.

Table 1-7 2009 Water Conservation Plan Goals and Status

2009 WCP Goals			
	GOAL	**By**	**Current Status**
165 GPCD (2009)	Billed Use of 140 GPCD (15% savings)	2018	10-Yr Average 133 GPCD (19% savings) **Goal Exceeded**
	Reduce Production by 10 GPCD (6% savings)	2018	From 2009 – 2015 Average 149 GPCD (9% savings) **Goal Exceeded**

Past and current conservation and efficiency activities have resulted in a reduction of gallons per capita per day (GPCD) usage reported at 165 in PWSD's 2009 WCMP to a current 10-year billed average of 133. PWSD's 2014 Water and Wastewater Master Plan (WWWMP) shows an average GPCD for the period 2000-2012 of 137. The GPCD goal identified in that plan was a further reduction to 132 GPCD by 2035. The Colorado Water Plan has a state-wide goal of 129 GPCD by 2050.

Table 1-8 summarizes the PWSD's 2009 WCMP target, as well as the 2014 WWWMP and Colorado State Water Plan goals relative to PWSD's 2015 10-year average GPCD.

Table 1-8 Existing GPCD Planning versus Actual

Existing GPCD Planning/Actual		
Source of Information	**Planning Period/Date to Achieve**	**GPCD**
10-Year Billed Average	2006-2015	133 (Actual)
2014 Master Plan Average	2000-2012	137 (Actual)
2014 Master Plan Target	2035	132 (Planned)
2014 Colorado Water Plan	2050	129 (Planned)

The current 10-year billed average GPCD of 133:

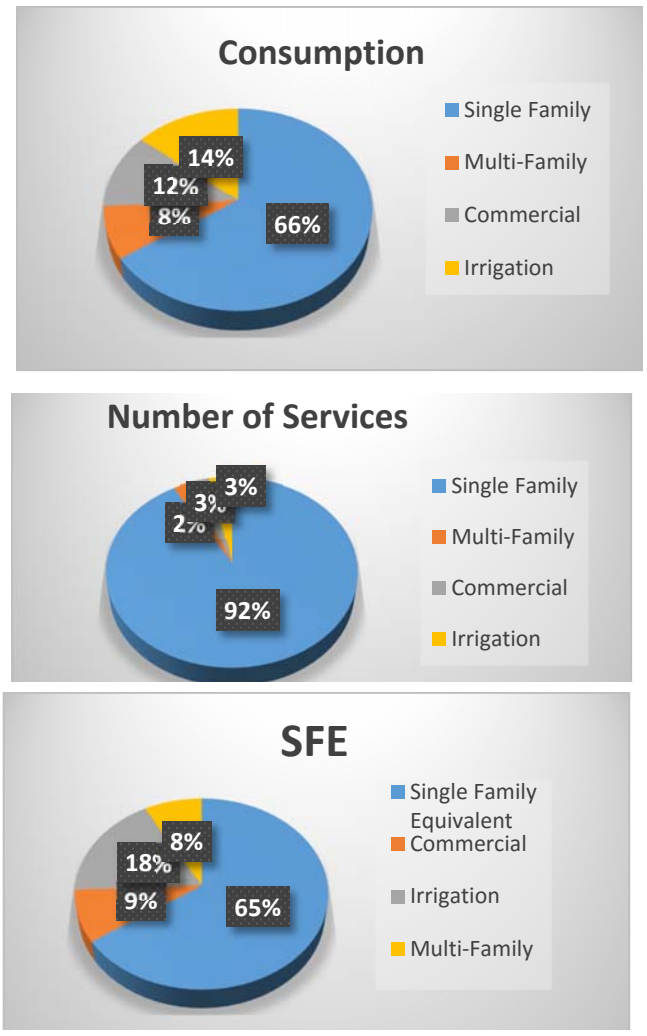
- ✓ Exceeds previous conservation plan targets;
- ✓ Reflects a continuing reduction from the 137 GPCD from the 2014 WWWMP;
- ✓ Is within one gallon of the 2035 goal from the 2014 WWWMP; and
- ✓ Is very close to the State's 129 GPCD goal for 2050.

SECTION 2
WATER USE AND DEMAND FORECAST

Documents used for planning projections that are reflected in this plan were previously completed in 2014 and 2015. These master planning documents calculated the historical billed average demand, and the historical system consumption average demand using data from the years 2003 through 2012. Additional projections were made which included billing and production information through 2015 in order to determine the conservation and efficiency goals outlined in this plan. Demand, supply, and facility forecasting, however, is based on the 2015 Master Plan.

2.1 WATER USE CHARACTERISTICS

Figure 2-1 PWSD Services Distribution by Customer Category Distribution



PWSD's customers are primarily residential, with some commercial and irrigation-only taps. Currently there are no industrial users. Single-family residential connections represent the largest number of customers, as well as the majority of overall water consumption. Demand for all user categories is quantified in terms of the average amount of water required to serve a single family home, aka a Single Family Equivalent (SFE.) Commercial, multi-family, and irrigation services include the larger meters, and therefore account for a higher number of (SFE's.)

Figure 2-1 summarizes the distribution of the services by customer category currently served by the District, as well as presents a seven-year summary of the distribution of usage by customer category. Table 2-1 compares consumption based on the number of accounts, and the number of SFE's per category.

Table 2-1 Percent of Accounts/Number of SFE's/Consumption by Customer Category

Customer Category	# of Accounts	# of SFE's	Consumption
Single Family	95%	65%	66%
Multi-Family	2%	8%	8%
Commercial	3%	9%	12%
Irrigation	3%	18%	14%

PWSD's dedicated irrigation customer water use by SFE on average is 18% of total consumption. This usage is closely associated with regional precipitation. Irrigation demands account for approximately 50% of PWSD's annual consumption. **Figure 2-2** shows annual precipitation in Denver since 2000 per National Oceanic and Atmospheric Administration data.

Figure 2-2 South Denver Metro Annual Precipitation

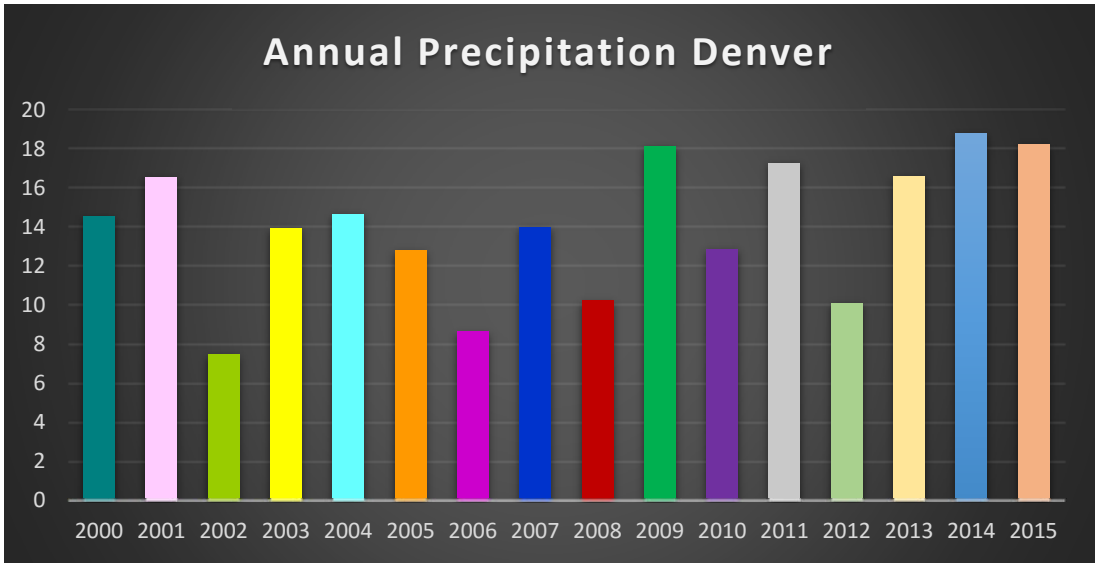
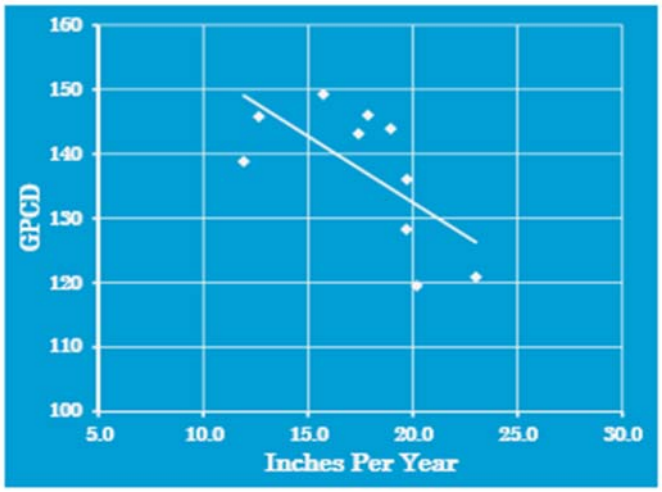


Figure 2-3 demonstrates the correlation between annual per capita usage from 2003 to 2012 and the total annual precipitation expressed in Figure 2-3 as inches. As would be expected, the years with lower per capita usage occur when the annual precipitation is higher than average, and inversely, the per capita usage is higher when the annual precipitation is below average. It can be concluded from Figure 2-3 that the calculated average (2003-2012) billed GPCD of 137 trends consistently with the average precipitation for the PWSD area.

Figure 2-3 Rainfall to Billed GPCD Relationship 2003-2012 (2014 PWSD Water & Wastewater Master Plan)



PWSD water use varies seasonally with low use in the winter and high use in the summer. The high use is due to irrigation, and irrigation typically fluctuates in proportion with the year's precipitation conditions.

A breakdown of the total service population for PWSD by development area, based on the dwelling unit projections in Table 2-3, is summarized in Table 2-2, "Population Projection by Area for PWSD." This population growth is also shown graphically on Figure 2-4, "PWSD Historical and Projected Population." It is estimated that the number of people per DU will be declining from 2.73 to 2.62 over time.

Table 2-2 Population Projections by Area for PWSD (2015 PWSD Long-Term Water Supply Plan)

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

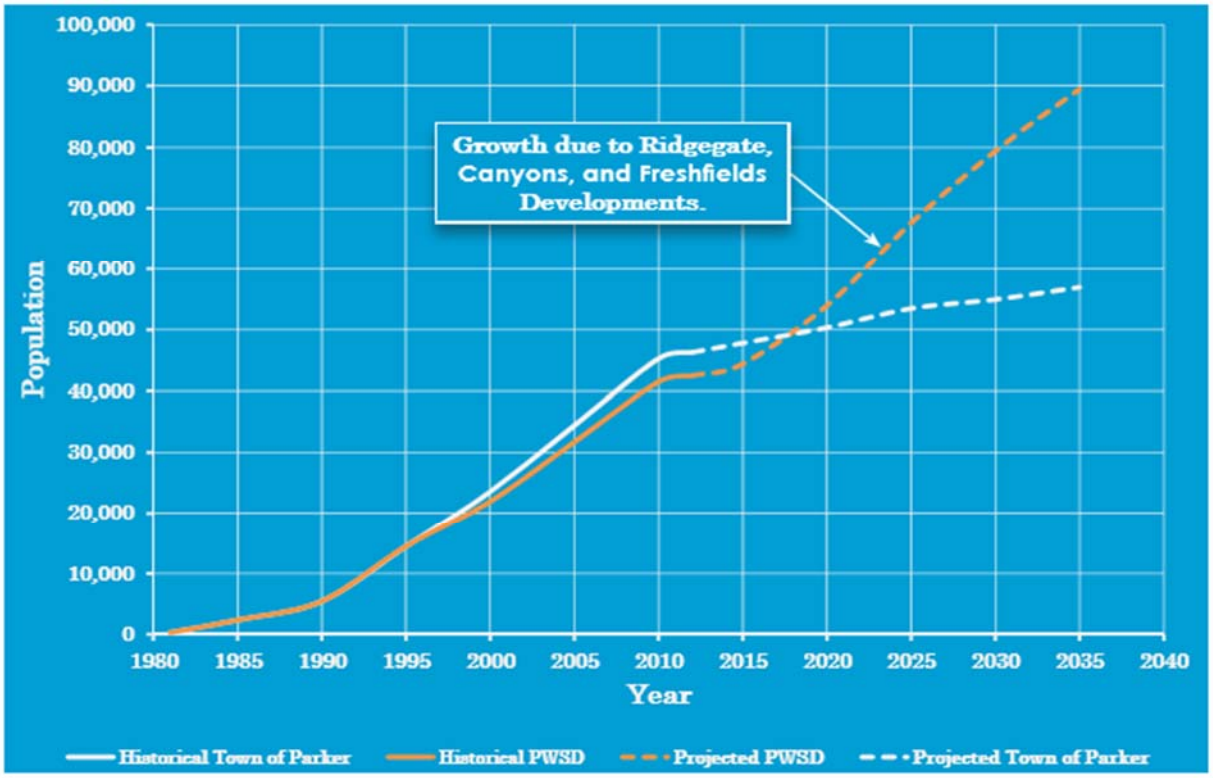
Notes:
[1] Population is rounded to the nearest 100 persons.

Table 2-3 Dwelling Unit Projections for PWSD (2014 PWSD Water & Wastewater Master Plan)

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.

Figure 2-4 PWSD Historical and Projected Population (2014 PWSD Water & Wastewater Master Plan)



Notes:

1. A majority of PWSD growth will be outside the Town of Parker.
2. Population estimated based on number of service connections and assuming 2.73 people per tap; 2.73 people per household based on U.S. Census Bureau Census demographic data for Douglas County for average persons per household, 2010-2014.
3. Engineering estimates project the estimated number of people per DU will be declining from 2.73 to 2.62 over time.

The methodology for determining GPCD - whether based on all water produced relative to population and on the number of SFE's; or DU's; water produced that was used within the

distribution system; or based on water sold relative to population and the number of SFE's/DU's - results in differing values, and informs system conditions and customer usage characteristics.

A ten-year average demand of 133 GPCD, based on billed usage, and population from 2006 through 2015 is shown in Table 2-4. The average demand published in the 2014 Water and Wastewater Master Plan calculated this billed consumption using the years 2003 through 2012 at 137 GPCD.

Table 2-4 10-Year Billed Usage/Average Demand/GPCD

Year	Annual Billed Use (MG)	Avg Day Demand (MGD)	Population	GPCD
2006	2,006	5.50	37,638	146
2007	2,054	5.63	39,323	143
2008	2,153	5.9	40,457	146
2009	1,813	4.97	41,081	121
2010	2,104	5.76	41,511	139
2011	2,084	5.71	41,972	136
2012	2,229	6.11	42,433	144
2013	1,946	5.33	43,526	122
2014	1,892	5.18	44,619	116
2015	1,913	5.24	45,713	115
Avg Yr	**2,219**	**6.08**		**133**

Figure 2-5 graphically represents the PWSD's average annual water use per person in gallons per capita per day based on system consumption from 2006 through 2015.

Figure 2-5 Total PWSD Billed Consumption GPCD (Based on DU's)

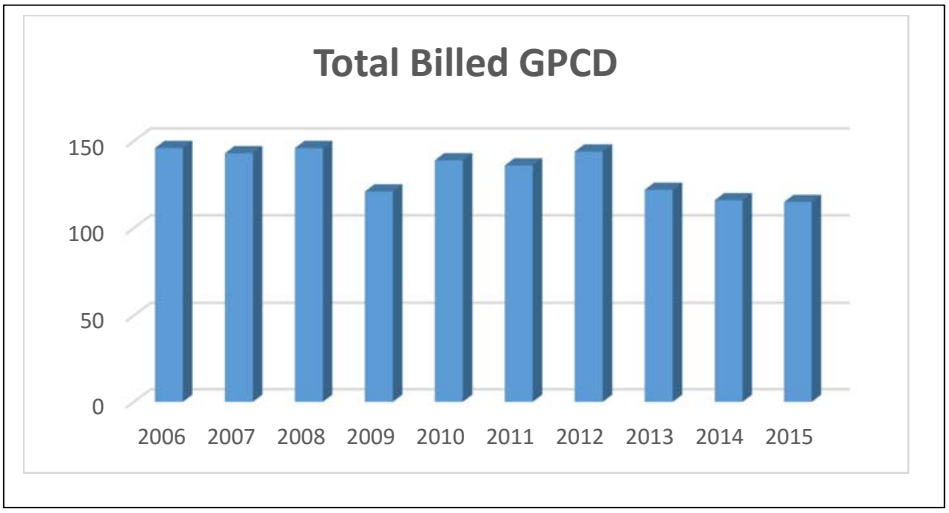
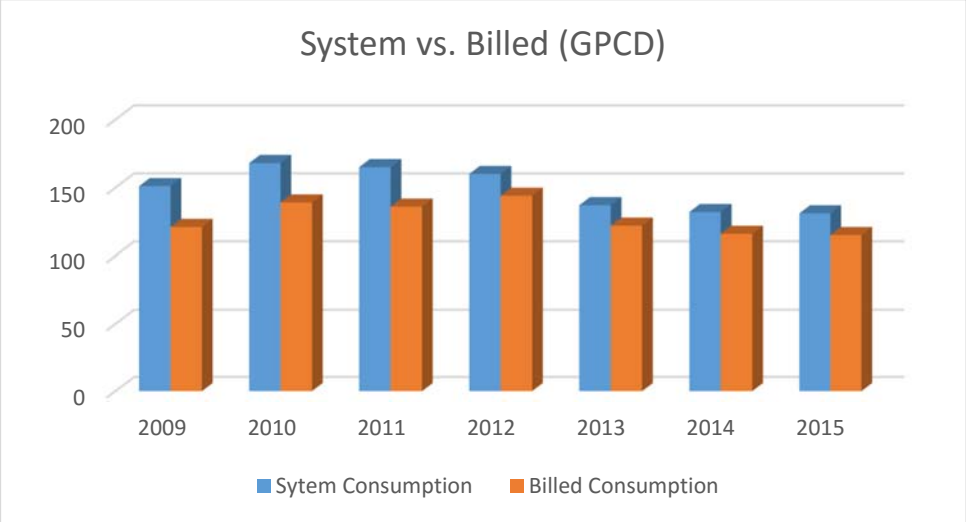


Figure 2-6 provides a more in-depth perspective on system consumption in relation to billed consumption, in GPCD, from 2009 through 2015. The difference between the two figures represents non-revenue water, including metered unbilled (tracked hydrant/system flushing, PWSD facility usage), as well as unaccounted for losses. This provides PWSD staff insight into the total system demand versus total water produced, which ranges from 11-20%.

Figure 2-6 Billed versus System Consumption GPCD (7-Year Comparison)



It is important to note that the 2014 Water and Wastewater Master plan reflected an historical system consumption average demand using the years 2003 through 2012 of 155 GPCD. Recognizing figures updated since the development of that document, a decreasing trend can be seen in both the historic billed demand and historic system average consumption demand.

2.2 Forecasting Method

Forecasting water demands, for the purposes of this plan, utilized information developed in the 2014 Water and Wastewater Master Plan. This process 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 through the year 2035, and build-out. Assumptions regarding efficiency targets related to per capita usage and potential future changes to the number of people per development unit (DU) are included in long-term demand projections.

The method assumes that water use rates will remain approximately the same. This is anticipated to be generally accurate, as ongoing water efficiency efforts will continue to improve customer sensitivity to water use and should lead to the same, if not lower water use.

2.3 DEMAND FORECAST

Historical Water Demands

Non-Revenue Water: PWSD maintains records of total water production, as well as metered billed consumption and metered unbilled consumption. On a monthly basis, PWSD calculates real and apparent water losses related to non-revenue water in order to track water system efficiencies. Operationally additional emphasis is being put on implementation of the M36 AWWA audit methodology in order to better quantify and address water loss.

Table 2-5 categorizes billed and unbilled water.

Table 2-5 Accounted for Water

Billed Water	Unbilled Water
Metered customer sales	Development related construction mainline flushing
	Hydrant flushing (water quality & hydrant maintenance)
Estimated customer sales	Well start-up discharges/"blow down"
	PWSD process usage
Metered permitted bulk/hydrant use	PWSD administrative facilities usage
	PWSD facility construction & mitigation usage

Non-revenue water includes unbilled water plus unauthorized consumption, metering inaccuracies and errors, transmission and distribution side leaks, and customer service line leaks occurring upstream of the meter. PWSD is moving towards improved methods of capturing and quantifying non-revenue water in order to inform system condition and increase efficiencies.

The amount of water supplied is more than what is billed. In order to develop future water demand projections, the amount of water that is not billed must be quantified. The total water usage, billed and unbilled, must be considered for sizing pump stations, distribution system pipelines, and treatment facilities.

Demand Forecasting: Forecasting water demands involves determining the historical water use based on 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. In the 2014 Master Plan, the historical billed average demand for PWSD was determined to be 137 GPCD, and the historical system consumption average demand was determined to be 155 GPCD.

For calculating future water demands, these yearly per capita water use averages were used in combination with the projected populations. The projected Average Day (AD) water demand is

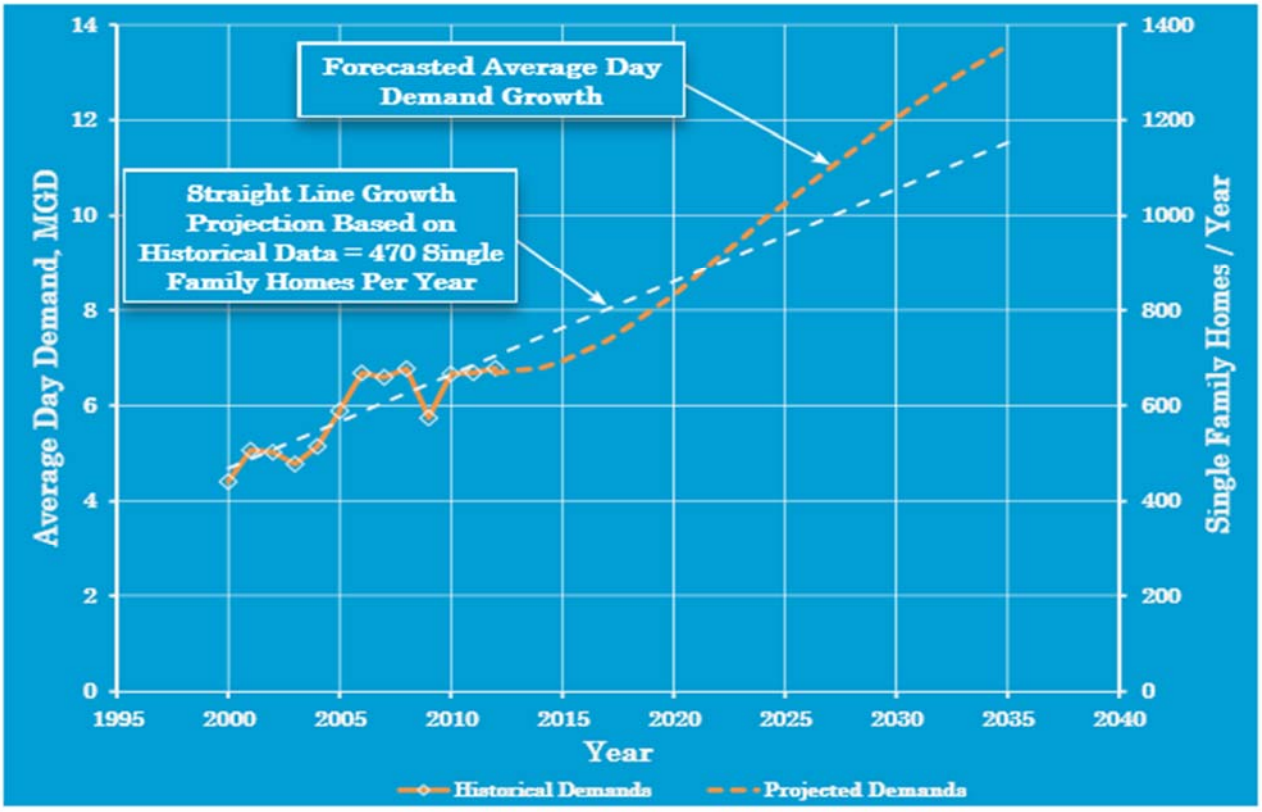
provided in Table 2-6 and Figure 2-7, “Historical and Forecasted Averaged Day Demands.” As a comparison, a “best fit” straight line projection is shown based on the historical demands. The historical straight line projections also correlated to a single family rate of growth of an average 470 Development Units/yr. It can be seen that the projected demand rises above this line, due to the proposed start of the Ridgegate, Canyons and Freshfields developments along the I-25 corridor.

Table 2-6 Average Daily Demand Projections by Customer Classification (2014 PWSD Water & Wastewater Master Plan)

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

Figure 2-7 Historical and Forecasted Average Day Demands (2014 PWSD Water & Wastewater Master Plan)



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 2-7, "Projected Peak Water Demands."

Table 2-7 Projected Peak Water Demands (2014 PWSD Water & Wastewater Master Plan)

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

WISE Demands

A recent development for the PWSD is participation in the Water Infrastructure and Supply Efficiency (WISE) agreement. With the WISE program, PWSD 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.

The historical produced per capita average water demand, which includes both billed and unbilled water, was used to estimate future water demands within the PWSD service area. These projected demands and the yearly average produced demand GPCD are shown in Table 2-8, "Average Produced Water Demand Projections."

To gain a better understanding of where future water demands will be within the District, Table 2-8 also breaks down the average day water demand projections by development area. As shown in Table 2-4, the projected water demand for 2035 and build-out was estimated to be 13.6 MGD (15,140 acre-feet per year (AFY)) and 18.5 MGD (20,720 AFY), respectively. Water demands within the Town of Parker will continue to steadily increase as growth continues. Ridgegate and the Canyons developments will have water demands beginning within the next few years as the proposed developments become established. At this time, the future Freshfields development is not expected to have water demands prior to 2025. The plan for how to provide facilities for these water demands is discussed in Section 5.

Table 2-8 Average Produced Water Demand Projections (2014 Water & Wastewater Master Plan)

Year	Billed Water GPCD	Unbilled Water GPCD	Produced Water GPCD	Town of Parker MGD	Ridgegate MGD	Canyons MGD	Freshfields MGD	Total MGD	Total AFY
2014	136	20	156	6.8	0.0	0.0	0.0	6.8	7,590
2015	136	20	156	6.9	0.1	0.0	0.0	7.0	7,760
2016	136	20	156	6.9	0.2	0.0	0.0	7.1	8,000
2017	135	20	155	7.0	0.3	0.1	0.0	7.4	8,240
2018	135	20	155	7.0	0.5	0.1	0.0	7.6	8,580
2019	135	20	155	7.1	0.8	0.1	0.0	8.0	8,960
2020	134	20	154	7.2	1.0	0.2	0.0	8.4	9,310
2021	134	20	154	7.3	1.3	0.2	0.0	8.8	9,760
2022	134	20	154	7.3	1.5	0.2	0.0	9.0	10,220
2023	133	20	153	7.4	1.8	0.3	0.0	9.5	10,630
2024	133	20	153	7.5	2.1	0.3	0.0	9.9	11,100
2025	132	20	152	7.5	2.4	0.4	0.0	10.3	11,490
2026	132	20	152	7.6	2.6	0.4	0.1	10.6	11,860
2027	132	20	152	7.6	2.9	0.4	0.1	11.0	12,320
2028	132	20	152	7.6	3.1	0.5	0.1	11.3	12,720
2029	132	20	152	7.7	3.4	0.5	0.1	11.7	13,100
2030	132	20	152	7.7	3.6	0.6	0.2	12.1	13,480
2031	132	20	152	7.8	3.8	0.6	0.2	12.4	13,860
2032	132	20	152	7.8	4.0	0.6	0.2	12.6	14,220
2033	132	20	152	7.9	4.2	0.7	0.3	13.1	14,560
2034	132	20	152	8.0	4.3	0.7	0.3	13.3	14,870
2035	132	20	152	8.0	4.4	0.7	0.4	13.5	15,190
Build-Out	132	20	152	11.7	4.8	1.0	1.0	18.5	20,720

The demand forecast based on the 2014 Master Plan is summarized in CWCB Worksheet 2-1, in a format suggested by CWCB.

CWCB Worksheet 2-1 Water Demand Forecast

Line	Item	2015	5-year forecast	10-year forecast	20-year forecast
A	**RESIDENTIAL DEMAND**				
1	Current annual water residential sales (total gallons)	1,996,686,000			
2	Current population served	44,000			
3	Residential sales per capita (line 1 divided by line 2)	45,379			
4	Projected population		54,000	67,700	89,300
5	Projected annual residential water demand (line 3 multiplied by line 4)		2,450,478,273	3,072,173,686	4,052,364,995
B	**NONRESIDENTIAL DEMAND**				
6	Current annual water nonresidential sales (total gallons)	507,329,208			
7	Current percentage of population [1]	4%			
8	Water use per capita (line 6 divided by line 7)	336,713			
9	Projected percentage of population		4%	4%	4%
10	Projected annual nonresidential water demand (line 8 multiplied by line 9)		527,622,376	548,727,271	570,676,362
C	**NONREVENUE WATER (WATER NOT SOLD TO CUSTOMERS)**				
11	Current and forecast amount [2]	95,960,000	100,758,000	98,359,000	98,359,000
D	**WATER SYSTEM TOTAL DEMAND**				
12	Current total annual water demand (add lines 1, 6, and 11)	2,105,287,106			
13	Projected total annual water demand (add lines 5, 10, and 11)		2,353,874,160	2,810,344,669	3,522,490,823
14	Adjustments to forecast (+ or -)		-0-	-0-	-0-
15	Current (line 12) and adjusted total annual water demand forecast (add lines 13 and 14)	2,105,287,106	2,365,771,968	2,847,584,480	3,509,735,119
16	Current and projected annual supply capacity [3]	14,859,274,400	18,801,274,400	19,589,674,400	19,589,674,400
17	Difference between total use and total supply capacity (+ or -) (subtract line 15 from line 16)	12,753,987,294	16,435,502,432	16,742,089,920	16,079,939,281
E	**AVERAGE-DAY AND MAXIMUM-DAY DEMAND**				
18	Average-day demand (line 15 divided by 365)	5,767,910	6,481,567	7,801,601	9,615,713
19	Current maximum-day demand	16,900,000			
20	Maximum-day to average-day demand ratio (line 20 divided by line 19)	2.9			
21	Projected maximum-day demand (line 18 multiplied by line 20 for all forecast years)		18,796,544	22,624,643	27,885,568
22	Adjustment to maximum-day demand forecast		-0-	-0-	-0-
23	Current (line 19) and adjusted maximum-day demand forecast (add lines 21 and 22)	16,900,000	18,796,544	22,624,643	27,885,568
24	Daily supply capacity (divide line 16 by 365) [4]	40,710,341	51,510,341	53,670,341	53,670,341
25	Ratio of maximum-day demand to daily supply capacity (divide line 23 by line 24) [5]	0.42	0.37	0.42	0.52

Notes: [1] Non-residential Demand growth was assumed to maintain the current percentage of total taps, where taps are directly related to population by a factor of 2.73 people per tap. Nonresidential Demand includes commercial and irrigation taps, which currently represent 4 percent of the total taps. The Nonresidential Demand growth rate is thereby assumed to be the same as the projected population growth rate.

[2] Non-revenue water was assumed to increase by 5 percent under the 5-year forecast and by 2.5 percent under the 10-year and 20-year forecasts. Production minus consumption.

[3] The annual supply capacity is in MGY and assumes one additional 1,500 gpm well facility per year, and an additional ten million gallons per day for six months per year will be added from PWSD's new Rueter-Hess Water Treatment Plant in 2015.

[4] The daily supply capacity can be increased to draw more water from the groundwater wells; the numbers listed represent typical average annual supply rates.

PWSD has set a goal of 75% renewable water sources by build-out to meet average day demands. This means that the District would continue to rely upon the deep Denver Basin aquifers for 25% of its water supply. Currently, only 28% of the District's water supply is from renewable sources; therefore, the District has developed a plan to secure new renewable water sources for the future that includes water resources from the Logan County Farms and RHR.

The total build-out supply demands will be about 18.5 MGD on an average day basis and 46.2 MGD on a maximum day basis. In the short term, some of this new supply will be provided through the WISE program. The other supplies will be from the Logan County Farms. For the purpose of this Water Efficiency Plan, the supplies were assumed to be received in RHR as raw water, then treated by RHWPF and finally pumped into the water distribution system.

Overall, the Denver Basin well capacities will decrease over time. Previously, it was stated that the existing well facilities are losing about 4% of their capacity each year; therefore, new well sites must be developed to offset this lost capacity. For master planning purposes, it was assumed that the new Denver Basin well capacity would come from new well facilities in the future development areas. Also, it was assumed that each new well facility would have a well pumping from the Denver, Dawson and Arapahoe formations, resulting in a combined well facility capacity of 1,500 gpm (2.2 MGD).

Based on these assumptions and the capacities of existing well facilities within the District, a summary of the water supply and reclaimed water system improvements are provided in Table 2-9. There are a total of six (6) new facilities needed through build-out. In actuality, as the need for additional well capacity arises, PWSD will evaluate the capacity needs, location, and the extent of well site development on a case-by-case basis.

Table 2-9 Summary of Water Supply and Reclaimed Water System Improvements (2014 PWSD Water & Wastewater Master Plan)

Improvement Name	Location/Comments	Phase 1 2014 - 2020	Phase 2 2021 - 2025	Phase 3 2026 - 2035	Phase 4 2036 - Build-Out
30" Alluvial Pipeline[1]	Regional PS to Cherry Creek Diversion PS	8,500 ft	-	-	-
16" AWT Parallel Pipeline[1]	Regional PS to Cherry Creek Diversion PS	8,500 ft	-	-	-
16" AWT Parallel Pipeline[2]	NWRF AWT Pump Station to NWRF south property corner	1,500 ft	-	-	-
16" Secondary Effluent Parallel Pipeline[2]	NWRF AWT Facility to Horseshoe Pond	1,000 ft	-	-	-
Horseshoe Pond Enlargement[3]	NWRF Site	-	-	4 MG	-
18" Gravity Outlet[4]	Bar CCC Pond	-	250 ft	-	-
12" Alluvial Pipeline to KOA Wells	KOA wells across Cherry Creek to Regional PS	2,500 ft	-	-	-
Cherry Creek Alluvial	Located on Existing Properties Dedicated for Well Sites	-	2 - Each at 1.5 MGD	2 - Each at 1.5 MGD	3 - Each at 1.5 MGD
Regional Non-Potable PS Expansion	Expansion would occur by adding new pump	-	-	3.4 MGD	-
Denver Basin Well Facility[5]	Located in Ridgegate, Freshfields, Canyons or Anthology Developments	-	1 - Each at 2.2 MGD	3 - Each at 2.2 MGD	2 - Each at 2.2 MGD
RHWPF	Modular Expansion of Existing RHWPF	-	10 MGD	10 MGD	10 MGD

Notes:
[1] Currently under design
[2] Included as part of the NWRF Phase 1 Expansion
[3] Included as part of the NWRF Phase 3 Expansion
[4] Included as part of the SWRF Phase 2 Decommissioning
[5] The timing for these well facilities will be dependent upon the actual decrease in capacity of the existing Denver Basin wells.

SECTION 3
PROPOSED FACILITIES PROFILE

3.1 FACILITY NEEDS AND PRELIMINARY CAPACITY FORECASTS

As PWSD's Denver Basin groundwater source continues to decline, PWSD continues to develop more wells to provide additional capacity. Acknowledging groundwater as a limited resource, PWSD has developed surface water storage, Rueter-Hess Reservoir, and the Rueter-Hess Water Treatment Facility.

New developments are also planned, with associated additional infrastructure for water and wastewater service. Additional infrastructure will include transmission mains, potable water storage tanks, and various wastewater collection and treatment facilities.

Table 3-1 summarizes information on anticipated improvements and capacity forecasts. Improvements and capacity forecasts are based on the demand outlined in the 2014 Master Plan.

Table 3-1 Future Maximum Day Water Supply Facility Improvements (2014 PWSD Water & Wastewater Master Plan)

Year	Max Day Demand	Denver Basin Wells With Extended Pumping[1]	Additional Denver Basin Wells	Alluvial Wells[2,3]	Additional WPF Capacity	WPF Supply	WISE Supply	Total Supply Capacity	Excess Capacity
	MGD								
2014	16.9	15.4	-	6.5	-	-	-	21.9	5.0
2015	17.3	14.8	-	6.5	10.0	-	-	21.3	4.0
2016	17.9	14.2	-	-	-	10.0	-	24.2	6.3
2017	18.4	13.6	-	-	-	10.0	1.1	24.7	6.3
2018	19.2	13.1	-	-	-	10.0	1.1	24.1	4.9
2019	20.0	12.5	2.2	-	-	10.0	1.1	23.6	3.6
2020	20.8	14.2	-	-	-	10.0	1.1	25.3	4.5
2021	21.8	13.7	2.2	-	-	10.0	1.1	24.7	2.9
2022	22.8	15.3	-	-	-	10.0	1.1	26.4	3.6
2023	23.7	14.7	2.2	-	-	10.0	1.1	25.8	2.1
2024	24.8	16.3	2.2	-	10.0	10.0	1.1	27.4	2.6
2025	25.7	17.9	-	-	-	20.0	1.1	38.9	13.2
2026	26.6	17.1	-	-	-	20.0	1.1	38.2	11.6
2027	27.5	16.5	-	-	-	20.0	1.1	37.5	10.0
2028	28.4	15.8	-	-	-	20.0	1.1	36.9	8.5
2029	29.3	15.2	-	-	-	20.0	1.1	36.2	6.9
2030	30.1	14.6	-	-	-	20.0	1.1	35.6	5.5
2031	31.0	14.0	-	-	-	20.0	1.1	35.1	4.1
2032	31.8	13.4	-	-	-	20.0	1.1	34.5	2.7
2033	32.5	12.9	2.2	-	-	20.0	1.1	34.0	1.5
2034	33.2	14.6	2.2	-	10.0	20.0	1.1	35.6	2.4
2035	34.0	16.2	-	-	-	30.0	1.1	37.3	3.3
Build-Out	46.2	13.3	-	-	10.0	40.0	1.1	54.4	8.2

Notes:
[1] Assumes a Denver Basin well capacity loss of 4% per year until 2040.
[2] The limitation on the existing Regional booster station is 4,500 gpm even though the well capacity is greater.
[3] Alluvial Wells pump directly to the distribution system presently. They are assumed to come off line from direct pumping to distribution system in 2016.

INCREMENTAL COST ANALYSIS

A simple incremental cost analysis was prepared using a modified version of CWCB Worksheet 3-3. The incremental cost analysis was based on the following:

- A 20-year analysis term;
- The forecasted average day demand (ADD) is based on the CWCB Worksheet 2-1 calculation methods;
- The annual operation and maintenance costs listed are based on 2015 expenses;

- The annual operation costs include chemicals, power, and labor;
- The annual maintenance costs include parts, equipment, and labor;
- The annual capital costs reflect anticipated costs for major improvement projects, including wells, and a five-million-gallon potable water storage tank; and
- Present Worth costs are used because Future Worth cost information is not applied elsewhere in this document

CWCB Worksheet 3-3 Cost of Supply-Side Facilities (modified worksheet format)

Year	Year	Forecasted ADD[1], Kgal	Operation[3] Costs, $/Kgal	Operation and Maintenance[4] Costs, $	Capital[5] Costs, $	Present Worth[2] Total Costs[6], $
0	2016	8,000	1,379	11,030,000	6,830,000	17,860,000
1	2017	8,240	1,413	11,640,000	4,890,000	16,530,000
2	2018	8,580	1,449	12,430,000	8,640,000	21,070,000
3	2019	8,960	1,438	12,880,000	7,750,000	20,630,000
4	2020	9,310	1,472	13,700,000	7,370,000	21,070,000
5	2021	9,760	1,511	14,750,000	7,810,000	22,560,000
6	2022	10,220	1,532	15,660,000	10,200,000	25,860,000
7	2023	10,630	1,520	16,160,000	21,080,000	37,240,000
8	2024	11,100	1,506	16,720,000	20,790,000	37,510,000
9	2025	11,490	1,501	17,248,352	20,790,000	38,038,352
10	2026	11,860	1,500	17,793,400	20,790,000	38,583,400
11	2027	12,320	1,490	18,355,671	20,790,000	39,145,671
12	2028	12,720	1,489	18,935,710	20,790,000	39,725,710
13	2029	13,100	1,491	19,534,078	20,790,000	40,324,078
14	2030	13,480	1,495	20,151,354	20,790,000	40,941,354
15	2031	13,860	1,500	20,788,137	20,790,000	41,578,137
16	2032	14,220	1,508	21,445,042	20,790,000	42,235,042
17	2033	14,560	1,519	22,122,705	20,790,000	42,912,705
18	2034	14,870	1,535	22,821,782	20,790,000	43,611,782
19	2035	15,190	1,550	23,542,950	20,790,000	44,332,950
20	Buildout	20,720	1,172	24,286,907	20,790,000	45,076,907

Notes:

1. 'ADD' = Average Day Demand.
2. All costs are represented in Present Worth.
3. Operation Costs are anticipated to increase by approximately 5 percent annually to account for increased power and pumping costs, and do not include inflation due to the present worth analysis.
4. Maintenance Costs are anticipated to increase by approximately 2 percent annually to account for increased material costs, and do not include inflation due to the present worth analysis.
5. 'Capital Costs' include costs for new well facilities, the meter replacement and AMI system purchase and installation, and the 5-million-gallon potable water storage tank.
6. 'Total Costs' are the sum of the operation, maintenance, and capital costs.

SECTION 4
WATER CONSERVATION GOALS

4.1 WATER CONSERVATION GOALS

In order to make wise use of existing and future water resources, PWSD is continuing to implement water-wise best management practices, while maintaining its close monitoring of water use through production and consumption analysis coupled with other system performance data.

Goals for this plan were developed using the 2009 Water Conservation Plan, the 2014 Water and Wastewater Master Plan, the 2015 Long-Term Supply Plan, the 2014 Rate, charge and Cost of Service Study, the 2015 Colorado Water Plan, as well as updated demand and population trends. While weather and precipitation are a significant contributing factor, based on continued efficiency/conservation efforts, a projected reduced average billed GPCD that exceeds these prior established goals, could be expected by 2025.

2016 Water Efficiency Plan Goals

PWSD intends to identify goals that uphold the vision, mission and values of the organization that focus on each area of water use efficiency and conservation, including education, regulations, incentives and water rates.

GOAL 1: Support the conservation, efficient use and management of existing and future resources

OBJECTIVES: Meet/exceed efficiency and conservation targets as determined by:

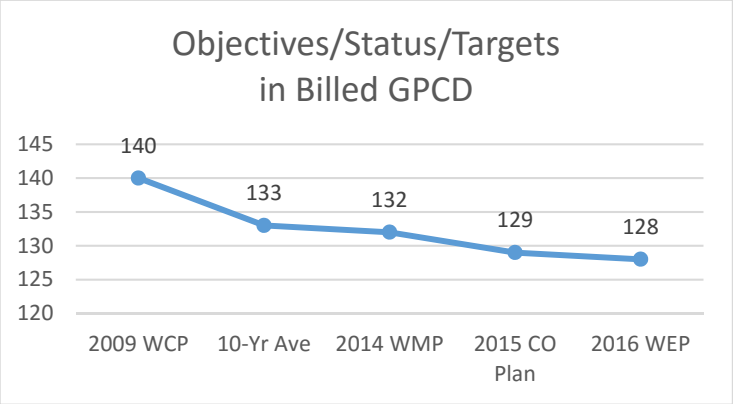
1. PWSD's previous Water Conservation Plan 2009 (140 GCPD by 2018)
2. PWSD's Water & Wastewater Master Plan 2014 (132 GPCD by 2035-buildout)
3. The State of Colorado Water Plan for the Denver Metro area (129 GPCD by 2050)
4. Updated demand and population trends (through 2015) (128 GPCD by 2023)

Table 4-1 Water Efficiency Objectives/Status

Source Document	GPCD Target	Evaluation Period	Timeline to Achieve	Status
2009 WCP	140	2000-2007	2018	133 GPCD (Exceeded)
2014 WMP	132	2003-2012	2035	133 GPCD (+1 GPCD)
2015 State Water Plan	129	N/A	2050	133 GPCD (+4 GPCD)
2016 WEP	128	2009-2016	2023	133 GPCD (+5 GPCD)

Figure 4-1 Objectives/Status/Targets in GPCD (Billed)

Figure 4-1 demonstrates efficiency targets that have been outlined in previous planning documents, current average billed demands, and projected GPCD targets.



TASKS:

1. Implement a meter replacement and AMI program that is estimated to reduce non-revenue water between 2% to 3.5% by 2023 by increasing metering accuracy and real time usage monitoring.
2. Maximize reuse water by capturing advanced wastewater treatment (AWT) effluent from reclamation facilities, where flows are diverted and ultimately pumped into RHR for storage.
3. Implement programs that reduce water loss and non-revenue water including:
    a. Meter all services (install meters on currently unmetered irrigated areas.)
    b. Migrate meter reading cycle closer to bill issuance in order to increase accuracy of water mass balance analysis.
    c. Streamline non-revenue water tracking using technological solutions, including automating un-billed metered usage via the billing system/evaluate the use of AWWA M36 Water Balance, and/or identify alternate audit.
    d. Revise meter set process in order to set meters as early as possible in the construction process.
    e. Employ AMI resources to proactively assist with distribution-side leak detection.
    f. Install a bulk water station to reduce unauthorized access to hydrants (targeted for 2016-2017.)

GOAL 2: Promote wise water use awareness

OBJECTIVES:

1. Implement an AMI solution that leverages a robust customer portal that is accessed by 30% of PWSD customers by 2023 in order to better manage their water consumption.
2. Implement educational and incentive campaign based on annual approved funding.
3. Maintain effective partnerships that promote wise water use.

TASKS:

1. Implement comprehensive communication campaign associated with AMI implementation and customer portal launch; monitor number and consumption changes of registrants; implement outreach campaign based on adoption rates.
2. Benchmark customer access to programs and educational materials.
3. Implement HOA dedicated irrigation customer audit and outreach program.
4. Leverage communication horsepower of agencies such as South Metro Water Supply Authority Conservation Committee, Center for ReSource Conservation, AWWA and other local, regional and national organizations.
5. Update water conservation areas of PWSD website.
6. Continue Slow the Flow Audits – scope of each annual program consistent with other efficiency objectives and program results.
7. Continue enforcement of waste prohibition regulations.
8. Continue to work with regional cooperative agencies towards development of common core guidelines for landscape and irrigation design standards, design professional registration, and installation professional registration.

GOAL 3: Maintain fiscal stability

OBJECTIVES:

1. Continue to implement cost of service rates that promote wise water use, and evaluate tiered structures that de-incentivize water waste.
2. Monitor conservation impacts.
3. Continue to base system development fees for irrigation customers on square footage and water demand of plant materials, thus encouraging the use of water efficient plant materials.

TASKS:

1. Evaluate customer usage characteristics monthly, review impact relative to consumption and revenue projections.
2. Develop and implement a strategy moving toward a water budget rate structure for dedicated irrigation accounts.
3. Implement HOA dedicated irrigation customer audit and outreach program in concert with continued rate evaluation.

Goal 4: Meet State of Colorado-CWCB reporting requirements

OBJECTIVES:

1. Complete annual 1051 reporting.
2. Implement and update WEP.

TASKS:

1. Create standard template for gathering quality information for report parameters that is updated on a monthly basis, targeting annual submission of report in January of following year (requirement is by June.)
2. Update and adopt 2016 WEP, budget, implement and track efficiency of programs.
3. Target next update of WEP for adoption in 2023.

4.2 GOAL DEVELOPMENT PROCESS

The PWSD's water conservation goals were developed considering:

- PWSD Board directives;
- Customer feedback and efficacy of various water conservation programs;
- Historic and current water use trends;
- Long-term supply planning objectives;
- Water master planning objectives;
- Financial impacts, fiscal stability and sustainability; and
- Regional conservation, efficiency and supply planning objectives.

SECTION 5
CONSERVATION MEASURES AND PROGRAMS

5.1 CONSERVATION MEASURES AND PROGRAMS

PWSD's existing water conservation measures and programs are described in Section 1.7, and are noted in CWCB Worksheets 5-1 and 5-2 below by the answer "Yes" in the "Already Implemented?" column.

Prospective new water conservation measures and programs are noted in CWCB Worksheets 5-1 and 5-2 below by the answer "No" in the "Already Implemented?" column.

CWCB Worksheets 5-1 and 5-2 Conservation Measures and Programs Identified in the Planning Process

Measure or Program	Already Implemented?	Evaluated in this Plan?	Comments
DEMAND-SIDE MEASURES			
Water-efficient fixtures and appliances			
Toilets	No	Yes	Determined return does not support implementation.
Urinals	No	Yes	Determined return does not support implementation.
Showerheads	Yes	Yes	Refer to Section 1.7 [1]
Faucets	Yes	Yes	Refer to Section 1.7 [1]
Washing machines	No	Yes	Determined return does not support implementation.
Rotary Sprinkler Nozzles	Yes	Yes	Refer to Section 1.7
Irrigation Controllers	Yes	Yes	Refer to Section 1.7
Landscape efficiency			
Low water use landscapes	Yes	Yes	Refer to Section 1.7
Drought-resistant vegetation	Yes	Yes	Refer to Section 1.7
Efficient irrigation	Yes	Yes	Refer to Section 1.7
Industrial and commercial efficiency			
Water-efficient processes	Yes	Yes	Refer to Section 1.7
DEMAND-SIDE PROGRAMS			
Education/information dissemination			
Public education	Yes	Yes	Refer to Section 1.7
School programs	Yes	Yes	Refer to Section 1.7
Informative & understandable water bill	Yes	Yes	Refer to Section 1.7
Water bill inserts	Yes	Yes	Refer to Section 1.7
Technical Assistance			
Customer water use audits	Yes	Yes	Refer to Section 1.7
Targeted at large landscapes	Yes	Yes	Refer to Section 1.7; individual customer audits could be offered cost-effectively through the Center for ReSource Conservation's Slow the Flow program.

Measure or Program	Already Implemented?	Evaluated in this Plan?	Comments
Water conservation expert available	Yes	Yes	PWSD has conservation expert on staff.
Rate structures & billing systems designed to encourage efficiency			
Volume billing	Yes	Yes	Refer to Section 1.7
Conservation (tiered) rate structure	Yes	Yes	Refer to Section 1.7
Increased (monthly) billing frequency	Yes	Yes	Refer to Section 1.7
Regulations/Ordinances			
Addressing landscapes			
Turf restrictions	Yes	Yes	Refer to Section 1.7
Landscape design/layout	Yes	Yes	Refer to Section 1.7
Soil preparation	Yes	Yes	Refer to Section 1.7
Irrigation equipment	Yes	Yes	Refer to Section 1.7; expanded use of evapotranspiration-based controllers and rain sensors would reduce irrigation water use.
Water waste prohibition	Yes	Yes	Refer to Section 1.7
Incentives			
Rebates	No	Yes	Rebates on water-consuming appliances can be offered to offset the consumer's purchase cost of more water-efficient appliances.
Give-aways	Yes	Yes	Refer to Section 1.7
SUPPLY-SIDE MEASURES			
Water reuse systems			
Reuse of tertiary-treated reclaimed water	Yes	Yes	Refer to Section 1.7; existing major infrastructure projects are anticipated to significantly improve water reuse.
Distribution system efficiency			
Leak repair	Yes	Yes	Refer to Section 1.7
SUPPLY-SIDE PROGRAMS			
Distribution system efficiency			
Leak identification	Yes	Yes	Refer to Section 1.7; acoustic leak detection with AMI program
Meter source water	Yes	Yes	Refer to Section 1.7
Meter service connections	Yes	Yes	Refer to Section 1.7
Meter testing and replacement	Yes	Yes	Refer to Section 1.7
Improved water accounting	Yes	Yes	Refer to Section 1.7
Analysis of non-revenue water	Yes	Yes	Refer to Section 1.7; additional PWSD staff time is invested to analyze non-revenue water uses and potential efficiency improvements.
Meter Replacement and AMI	No	Yes	Project will begin June 2016
Irrigation tap budget rate structure	No	Yes	Structure will be implemented in October 2016

Note: [1] Water efficient fixtures are 2.5 gallon per minute faucets and shower heads at a pressure of 80 pounds per square inch.

Following is a summary of expansion options for currently-implemented water conservation measures or programs listed in CWCB Worksheets 5-1 and 5-2 and also new programs.

Customer water use audits targeted at large landscapes**:** Water use audits can range from do-it-yourself kits to a professional water auditor visiting a specific location to perform a custom

audit. The Center for ReSource Conservation (CRC), a Colorado non-profit organization, is an industry-recognized program that provides professional water auditing services through a program called Slow the Flow. PWSD has contracted with CRC to provide irrigation audits to large-use customers with excessive irrigation as well as residential customers with high-use. PWSD has doubled the number of audits it provides to customers in 2016.

Couples with the CRC audits, PWSD will continue its program providing large irrigation customers with geospatial mapping of irrigated areas along with evapotranspiration based targeted plant material demands, customers are provided with a water use target that they can manage to on a monthly basis.

Water reuse systems**:** Leveraging of the Rueter-Hess Reservoir and Water Purification Facility provide additional reuse capacity through significantly increased storage and treatment systems.

Leak identification**:** PWSD currently repairs leaks in its distribution system. Various detailed leak detection programs are available that can identify smaller leaks, including acoustic leak detection. Acoustic monitoring is being considered as part of the AMI system.

Analysis of non-revenue water**:** PWSD will perform evaluation of processes and analysis regarding the development of water losses and non-revenue water. Integration of water balance equation and American Waterworks Association recommended best practices for water auditing, identification of water loss and non-revenue water is being implemented. It is anticipated that metering accuracy will increase with the meter replacement project. Bulk permitted construction water use is metered, and has been recently integrated with the PWSD's billing records. Fire suppression is accounted for via flow calculations. Hydrant flushing water is also accounted for via flow calculations. Construction water for mainline infrastructure is logged throughout the construction process.

Rebates**:** Rebates to install or retrofit PWSD approved multi-stream, multi-trajectory rotary sprinkler heads reimbursed at up to $5 per head with a maximum of $100 per single family home or commercial lot, and $500 maximum per Homeowners Association or multi-family development. Rebates to install PWSD approved rain sensors at 50% of cost of sensor with a maximum of $50 per controller. Rebates to install PWSD approved SMART controllers at $50 per single family home, commercial property, or Homeowners Association. With the implementation of the AMI system that will capture hourly consumption data, PWSD staff will be able to determine more accurately how the rebate program is working which will directly impact how the rebate program is administered in the future.

Meter replacement and AMI Project**:** PWSD is embarking on a system-wide meter replacement and AMI project. The intent with this program is to capture District-wide low flow water consumption (<1/4 gpm) and monitor the water loss numbers to see if these new electronic meters indeed do reduce water loss numbers due to increased data collection capabilities. The AMI system will collect multiple consumption readings on all meters in the system on a daily

basis, and will allow PWSD to reduce non-revenue water by more accurately identifying hydraulic variances and distribution line losses, as well as more accurately manage demand. It will be offered to customers in order to empower water users to more closely manage their own water consumption.

Pursuit of Long-Term Water Supply and Master Planning Goals**:** PWSD is committed to develop and implement its long-term water vision, as outlined in its master planning documents.

5.2 Screening Criteria

The following criteria were used to evaluate the proposed water conservation measure and program options, both for the initial screening described in Section 5.3, are listed in Table 6-1 as the primary screening criteria associated with measures and programs in Section 6.2.

Criteria 1: Existing measure or program

The measure or program is a standard practice that has already been implemented, and will be a key part of operating the water system in the future. The measure or program is not evaluated in the Water Conservation Plan, but is included in the final list of measures or programs to be implemented.

Criteria 2: Community improvement

The measure or program provides an environmental, aesthetic, educational, or otherwise cultural improvement to the community that cannot be measured in economic terms.

Criteria 3: Cost / Cost-effectiveness

The measure or program may have a high implementation or maintenance cost. This criterion also considers the cost of PWSD labor required to implement and maintain measures and programs.

5.3 Conservation Measure and Program Screening

The following conservation measures and programs were removed from further consideration at this time.

Washing machines**:** Plumbing codes do not currently require low water use washing machines. Institution of a low water use washing machine requirement would have significant regulatory implications for the PWSD, as it is the Town of Parker's responsibility to manage construction requirements. However, PWSD may consider a high efficiency washing machine rebate in the future.

Rebates for indoor water fixtures**:** PWSD has evaluated rebates on appliances in the past, and has determined they are currently not as effective as irrigation equipment retrofit rebates. As identified above, this program will be considered for re-evaluation in the future.

SECTION 6
EVALUATION AND SELECTION OF CONSERVATION MEASURES AND PROGRAMS

6.1 EVALUATION CRITERIA

Please refer to Section 5.2 for evaluation criteria information.

6.2 MEASURES AND PROGRAMS SELECTED FOR EVALUATION

The measures and programs selected for evaluation are listed in Table 6-1. Criteria used to screen measures and programs are defined in Section 5.2. The measures and programs include existing activities because PWSD plans to continue all existing programs.

Table 6-1 Initial List of Water Conservation Activities Selected for Evaluation

Water Conservation Measures and Programs	Primary Screening Criteria Used
Water-efficient fixtures and appliances	
Low water use requirements for new fixtures	1, 3
Landscape efficiency	
Low water use landscapes (includes drought tolerant vegetation)	1
Drought-resistant vegetation	1
Efficient irrigation	1
Education/information dissemination	
Public education	1, 2
School programs	1, 2
Informative & understandable water bill	1
Water bill inserts	1
Technical assistance	
Customer water use audits targeted at large landscapes	1, 2, 3
Water conservation expert available	1, 2
Rate structures & billing systems designed to encourage efficiency	
Volume billing	1
Conservation (tiered) rate structure	1
Regulations/Ordinances	
Irrigation equipment	1, 3
Water waste prohibition	1
Incentives	
Give-aways	1
Water reuse systems	
Reuse of tertiary-treated reclaimed water	1, 3
Distribution system efficiency	
Leak repair	1
Leak identification	1, 3
Meter source water	1
Meter service connections	1
Improved water accounting	1
Analysis of non-revenue water	1, 3
Meter Replacement and AMI	1, 3
Irrigation Service Water Budget	1, 3

Table 6-1 shows potential expansion of several existing water conservation activities, noted by activities with primary screening criteria 2 or 3 in addition to 1.

6.3 Estimated Costs and Water Savings of Expansion Conservation Options

Table 6-2 lists anticipated costs and water savings of the expansion water conservation measures and programs identified in Table 6-1.

Table 6-2 Costs and Water Savings of Water Conservation Activities

Water Conservation Measure or Program	Project Duration	Number of Units (annual ongoing cost)	Estimated One-Time Costs	Estimated Annual Water Savings (in Year 1) (gallons)	Estimated Annual Water Savings (in Year 7) (gallons)
Customer water use audits targeted at large landscapes [1]	Ongoing	$15,000	$15,000	33,868,822	33,868,822
Analysis of non-revenue water [2]	Ongoing	0	0	48,483,250	9,696,650
Meter Replacement and AMI [3]	Ongoing	$52,865	$5,879,285	154,797,675	154,797,675
Irrigation Service Water Budget [4]	Ongoing	0	$1,200	16,934,411	16,934,411

Notes: [1] Customer water use audits targeted at large landscapes and assumption is that 10 percent of 2015 large landscaping irrigation water use will be reduced. 2015 irrigation water use was approximately 338 million gallons.

[2] Analysis of non-revenue water savings in Year 1 is assumed to be 50% and Year 7 water savings assumes improved analysis practices which will result in 10% savings. 2014 and 2015 average non-revenue water use was approximately 96,966,500 gallons therefore the annual savings in Year 1 is estimated to be 48,843,250. The cost of this program is incorporated into the AMI program.

[3] Estimated water savings calculated using a 5% reduction in District consumption due to more efficient irrigating and system leak detection. This also includes savings due to low-flow capture and reduced meter inaccuracies. Leak identification is also included in this program and requires a PWSD staff member monitoring the system every day. This will allow quicker leak detection and preventative leak detection. All estimates are conservatively low.

[4] Irrigation Service Water savings is estimated to be 5% of total irrigation use. The Year 7 estimate is conservatively low as PWSD expects more irrigation customers to come on line and therefore use by customer category will be greater.

6.4 Benefits and Cost Comparison

Table 6-3 discusses the anticipated primary benefits and costs of the expansion of water conservation measures and programs identified in Table 6-1.

Table 6-3 Benefits and Costs of Water Conservation Activities

Water Conservation Measure or Program	Benefits	Costs
Customer water use audits targeted at large landscapes	• Reduces water use. • Improves the health of the landscapes.	• Operating cost. • PWSD staff time to administer the program.
Analysis of non-revenue water	• Reduces water use.	• Operation and maintenance cost.
Meter Replacement and AMI	• Improves water management and may reduce losses.	• Capital cost. • PWSD staff time to perform the program.
Irrigation Service Water Budget Rate Structure	• Encourages large water users to be efficient and may reduce water use.	• PWSD staff time and consulting costs to analyze and implement the rate structure.

6.5 Selection of Conservation Measures and Programs

Table 6-4 summarizes the evaluation and selection of the expansion water conservation measures and programs identified in Table 6-1.

Table 6-4 Program Evaluation and Selection Status of Conservation Measures

Water Conservation Measures and Programs	Selected for Implementation	Primary Selection Criteria Applied	Evaluation Narrative
Customer water use audits targeted at large landscapes	Yes	3	PWSD has signed a contract for 2016.
Analysis of non-revenue water	Yes	3	Program will begin with implementation of the AMI Program.
Meter Replacement and AMI	Yes	3	PWSD hired a staff member to manage this in January 2016. Implementation is ongoing and has the potential to result in significant savings.
Irrigation Service Water Budget Rate Structure	Yes	3	Change to flat rate will be effective October 2016. Evaluation of potential water budget rate structure 2017.

Note: 1. Please refer to **Table 6-2** for estimated water savings associated with each measure or program.

Implementing the four selected water conservation activities indicated in Table 6-4 would result in an additional annual savings of approximately 254,084,158 gallons in Year 1. Savings realized in Year 7 is projected to be less as customers are more aware and manage their usage more efficiently as well as District usage becomes more efficient due to the increased data analysis. PWSD estimates the savings in Year 7 (2023) will be 215,297,558. As noted in Section 4.1, PWSD's goal of reducing water use to 132 GPCD would equate to approximately 568,341,500 gallons in year 2025. According to these annual savings estimates that the cumulative savings over the seven year planning period will be 1,642,836,009 gallons. According to this plan, the four selected water conservation activities would not achieve the desired goal of 568,341,500 in 2025, but PWSD staff feels these estimates are conservatively low. Program evaluations will be conducted to identify actual savings, and clarify opportunities where additional savings could potentially be realized.

SECTION 7
EFFICIENCY FORECASTS

7.1 DEMAND FORECAST REVISIONS

This Water Efficiency Plan identified new water conservation activities to be implemented, as summarized in Table 6-4. Water demands before and after implementing the new water conservation activities are listed in CWCB Worksheet 7-1.

CWCB Worksheet 7-1: Modified Demand Forecast in Gallons (using 2014 Water & Wastewater Master Plan GPCD targets)

Line	Item	2015	Year 5 [2]	Year 10 [2]	Year 20 [2]
1	Average-day demand before new conservation activities	7,933,151	9,548,814	11,492,522	14,166,120
2	Average-day demand after new conservation activities [2]		8,958,957	10,903,666	13,576,263
3	Reduction in average-day demand (line 1 less line 2) [3]		589,856	589,856	589,856
4	Maximum-day demand before new conservation activities	16,900,000	18,796,544	22,624,643	27,885,568
5	Maximum-day demand after new conservation activities		18,206,688	22,034,787	27,295,712
6	Reduction in maximum-day demand (line 4 less line 5)		589,856	589,856	589,856
7	Ratio maximum-day to average-day demand before new conservation activities (line 4 divided by line 1)	2.0	2.0	2.0	2.0
8	Ratio maximum-day to average-day demand after new conservation activities (line 5 divided by line 2)		2.0	2.0	2.0

(Additional demand reduction may be realized should the target of 128 GPCD by 2023 be reached.)

Note: [1] Current year average day and maximum day demands are from CWCB Worksheet 2-1 and reflect produced water.
[2] Average-day demand after new conservation activities.
[3] Year 5, 10, and 20 water savings are assumed to equal the Year 7 savings listed in Table 6-2.Reduction in average-day demand is the same for Years 5, 10, and 20 because the total water savings listed in Table 6-2 are assumed to remain the same for these years for the purposes of this evaluation. This is a conservative assumption as the total water savings is anticipated to increase through continuous public awareness improvement and enhanced supply and demand management.

CWCB Worksheet 7-1 shows the 2015 average day and maximum day demands based on the PWSD's existing water conservation activities. PWSD will continue the existing water conservation activities and expand them where feasible as noted in Table 6-1, which will realize the same or improved water conservation in the future.

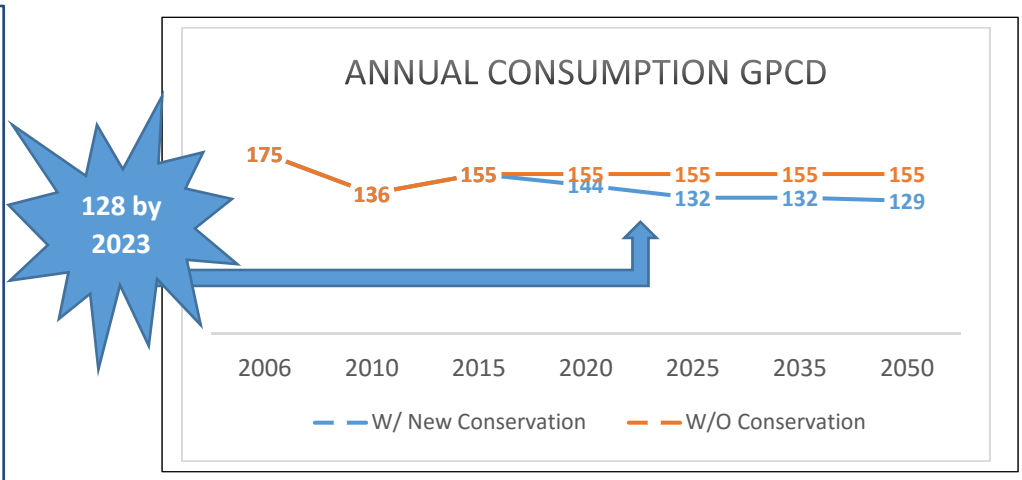
By implementing the new water conservation activities discussed in Table 6-4, the PWSD's average day demand is forecasted to realize significant average day demand reductions. Line 3 shows a forecasted reduction of approximately 589,856 gallons per day. Again, PWSD's Total Consumption GPCD goal from the 2014 Water Master Plan is 132, and are reflected in the above modified demand forecasts. This estimate being conservative, as already outlined, may be exceeded. Additional demand reduction to a GPCD of 128 may be reached by 2023.

No significant impact due to conservation efforts has been factored into the ratio of maximum day to average day demand.

Figure 7-1 presents the impact of the new water efficiency and conservation activities on the PWSD's projected average day demand from the data in **CWCB Worksheet 7-1** Lines 1 and 2.

Figure 7-1 Average Day Projected Demand Impact with New Efficiency/Conservation Activities (using 2014 Water & Wastewater Master Plan GPCD targets)

Note: 128 GPCD is an additional consumption target based on extrapolated consumption using additional trending information from 2013-2015, which is following the evaluation period of 2003-2012 that was used in the development of 132 GPCD in the 2014 Water Master Plan.)



7.2 Revenue Effects

Decreased water use resulting from water conservation efforts, on a per capita basis, could correlate to decreased revenues on a per SFE or DU basis for PWSD. However, decreased water use from efficiencies and conservation will help offset an aggregated increased water demand from population growth. This can reduce or delay the costs required for the construction of capital infrastructure to support new growth. This can also defer increases in operational costs.

Recognizing that potential changes in usage patterns – whether associated with efficiencies, weather, land use densities, or other customer usage characteristics - coupled with potential variances in population growth within the District, will impact demand projections and projected revenues, ongoing integration of conservation impacts will continue to be part of effective development and implementation of cost-of-service oriented water rates, fees and charges.

SECTION 8

PUBLIC REVIEW AND IMPLEMENTATION PLAN

Objectives of this Plan are integrated into planning documents, as well as engineering and operational activities within the District. The Customer Care Department is primarily responsible for the implementation of this Plan. PWSD continues to allocate funding and staffing resources to achieve the water efficiency objectives as outlined in this Plan.

PWSD's approach to incorporate education, regulations, incentives and rates/fees facilitates customer engagement by design. Public participation is critical to the success of wise water use and conservation.

8.1 IMPLEMENTATION SCHEDULE

CWCB Worksheet 8-1 provides implementation schedule guidelines for the PWSD's water conservation activities. PWSD's Customer Relations Manager is responsible for coordinating and monitoring the selected water conservation activities.

CWCB Worksheet 8-1: Implementation Schedule for Measures and Programs

Line	Measure/Program	Required action	Beginning date	Completion date	Notes
1	Low water use landscapes	Continue the existing activity.	Existing	Ongoing	VIA SDF's &Rates/Fees
2	Drought-resistant vegetation	Continue the existing activity.	Existing	Ongoing	Via SDF's/Rates & Fees
3	Efficient irrigation	Continue the existing activity.	Existing	Ongoing	Rules/Rates/Fees
4	Water-efficient processes	Continue the existing activity.	Existing	Ongoing	
5	Public education	Continue the existing activity.	Existing	Ongoing	
6	School programs	Continue the existing activity.	Existing	Ongoing	Leverage SMWRA
7	Informative & understandable water bill	Continue the existing activity.	Existing	Ongoing	Enhance w/new bill design
8	Water bill inserts	Continue the existing activity.	Existing	Ongoing	Tidbit/fliers
9	Customer water use audits targeted at large users	Continue the existing activity.	Existing	Ongoing	Leverage Slow the Flow
10	Customer water use audits targeted at large landscapes	Continue the existing activity.	Existing	Ongoing	Coordinate with rate revisions
11	Water conservation expert available	Continue the existing activity.	Existing	Ongoing	Leverage existing staff expertise
12	Volume billing	Continue the existing activity.	Existing	Ongoing	Enhance w/AMI
13	Conservation (tiered) rate structure	Continue the existing activity.	Existing	Ongoing	Evaluate Irrigation water budget
14	Increased (monthly) billing frequency	Continue the existing activity.	Existing	Ongoing	Minimize read/bill cycle
15	Electronic meters	See AMI	June 2016	Ongoing	
16	AMI/Meter Replacement	Implement CIP	June 2016	Ongoing	

Line	Measure/Program	Required action	Beginning date	Completion date	Notes
20	Irrigation equipment	Enforce PWSD's ordinance requiring existing homes to use rain sensors and HOA's and commercial properties to use ET-based controllers as of August 1, 2012.	Existing	Ongoing	Tied to acceptance
21	Water waste prohibition	Continue the existing activity.	Existing	Ongoing	Rules/Regs
22	Give-aways – Home water audit kits	Continue the existing activity.	Existing	Ongoing	
23	Give-aways – Low flow shower heads	Continue the existing activity.	Existing	Ongoing	
24	Give-aways – Water restricting faucet aerators	Continue the existing activity.	Existing	Ongoing	
25	Reuse of tertiary-treated reclaimed water	Continue the existing activity. Continue progress on the Rueter-Hess Reservoir and the Water Treatment Plant construction projects.	Existing	Reservoir: 2011, WPF: 2015, Reuse: Ongoing	Maximize reuse to reservoir
26	Leak repair	Continue the existing activity.	Existing	Ongoing	
28	Leak identification	Continue the existing activity.	Existing	Ongoing	Leverage AMI
29	Meter source water	Continue the existing activity.	Existing	Ongoing	
30	Meter service connections	Continue the existing activity.	Existing	Ongoing	Identify/manage special agreements
31	Meter testing and replacement	Continue the existing activity.	Existing	Ongoing	2016-2023 Replacement Program
32	Improved water accounting	Continue the existing activity.	Existing	Ongoing	Integrated business solutions
33	Analysis of water loss and non-revenue water	Expand PWSD staff time spent analyzing non-revenue water uses to reduce water loss where possible.	Existing	Ongoing	Integrated business solutions

8.2 PUBLIC REVIEW AND ADOPTION

On July 14, 2016, PWSD's Board of Directors authorized the 2016 Water Efficiency Plan to be released in its draft form for public comment. The 60-day public comment period was from July 28, 2016 through September 26, 2016. The draft Plan was available on the PWSD's website, and hard copies were available from the PWSD's main office at 18100 E. Woodman Drive, Parker, CO 80134. The public review period was advertised on the PWSD's website, in the Douglas County News Press newspaper, and in the Parker Chronicle newspaper. A copy of each of these notices is included in **Appendix B**. No public comments were received.

The draft Plan was also submitted to the CWCB for review. The CWCB provided conditional approval of the Plan, providing recommended revisions and updates. A copy of this conditional approval is also provided in **Appendix B**.

On December 8, 2016, the 2016 Water Efficiency Plan was presented to the PWSD Board of Directors for first reading, with second reading, and final Plan adoption by resolution, pending Board approval, on January 12, 2017.

Following Board approval of the final document, the plan will be submitted to the CWCB for final approval.

8.3 Monitoring and Evaluation

In 2015, PWSD adopted the following vision, mission and values to guide the District in fulfillment of the duties and obligations to the District's customers. The values highlighted below are demonstrated through the goals and objectives outlined in this Plan.

Figure 8-1 PWSD Vision, Mission, and Values

PWSD will continue to monitor its water efficiency activities as outlined herein to ensure the programs are being implemented efficiently and to maximum benefit. Monitoring will include annual evaluation of activities relative to production, customer usage characteristics, and weather impacts, and shall include customer feedback to identify program efficacy. Program activities will be determined and funded as part of the budgeting process which is performed on an annual basis. Departments actively engaged with program implementation include Engineering, Water Resources, Enterprise Services and Business Solutions.

8.4 EFFICIENCY PLAN UPDATES

PWSD integrates water usage characteristics into all major master planning and rate and fee development efforts. The WEP and associated goals will be reviewed periodically consistent with development of future planning documents. Goals associated with the WEP will be evaluated on an annual basis. PWSD intends to re-evaluate and reissue this WEP every 7 years, and no later than 2023, where 2023 would be seven years after the previous version in accordance with Colorado Revised Statutes §37-60-126.

APPENDIX A

LANDSCAPE IRRIGATION WORKSHEET

ParkerWater & SANITATION DISTRICT

Landscape/Irrigation Worksheet

Project Name:_____

Landscape/Irrigation Tap address (physical location of tap)_____

Landscape Area	High Water **TURF** (6,000sf = 1 SFE)	Low Water **Native Grass** and **Spray Shrubs & Perennials** (10,000sf = 1 SFE)	**Drip Irrigated** area (20,000sf = 1 SFE)	**Non**-Irrigated area	**Sub-Total** of (calculated) Areas	**PWSD** one SFE per 6000	**SFE Requirement** (Sub-Total Calculation **divided** by 6000 = requirement)
Area #1	_____sf x 1 = _____	_____sf x .6 = _____	_____sf x .3 = _____	____sf x 0 = ____0____	_____sf	6,000	_____SFE's

Worksheet Completed by:_____
Company: _____
Address: _____
Phone #: _____

Owner/Developer:_____
Attn: _____
Billing Address:_____
Phone #: _____

ET Controller (with Rain Sensor)

Manufacturer	
Model number	

Tap Size Requirements:
0 - 1 SFE's requires a 3/4-inch tap
1.1 - 2.0 SFE's requires a 1-inch tap
2.1 - 4.0 SFE's requires a 1 1/2-inch tap
4.1 - 7.0 SFE's requires a 2-inch tap
7.1 - 16.0 SFE's requires a 3-inch tap

APPENDIX B

PUBLIC COMMENT INFORMATION

PUBLIC NOTICE

NOTICE OF PUBLIC COMMENT /REVIEW PERIOD

Notice is hereby given that: Parker Water and Sanitation District (PWSD) is requesting public review and comment of the 2016 DRAFT Water Efficiency Plan. This Plan is available for review and comment from July 28, 2016 through September 26, 2016 at PWSD's administrative office located at 18100 E. Woodman Drive, Parker, CO 80134, as well as online at www.pwsd.org.

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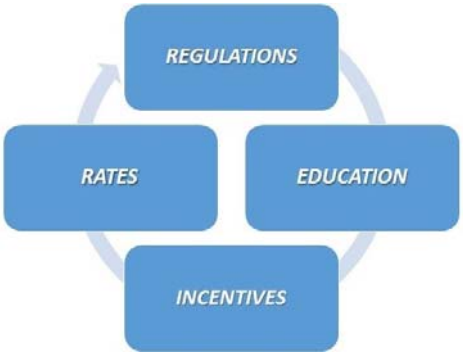
Publisher: Douglas County News-Press


Draft Water Efficiency Plan available for public comment.
Visit the conservation page on our website at
www.pwsd.org.

DRAFT Water Efficiency Plan

Draft Water Efficiency Plan available for public comment



Parker Water and Sanitation District is in the process of updating its water conservation plan, and we would like your input. The draft plan is now available for review and public comment starting July 28, 2016 until September 26, 2016. The public is encouraged to provide written input and suggestions. To view the Draft 2016 Water Efficiency Plan, click here. Comments can be forwarded by email to conservation@pwsd.org.

This Plan is intended to define conservation and water efficiency goals and objectives, as well as outline activities that support successfully meeting those goals. This Plan supports the District's long-term water supply targets and master planning efforts. This Plan has also been developed to meet Colorado Water Conservation Board (CWCB) approval.

CWCB through the Office of Water Conservation and Drought Planning requires that water providers with total demand of 2,000 acre-feet per year (AF/yr) or more develop and implement plans that encourage customers to use water efficiently. Once this Plan is approved by the CWCB, the District not only continues compliance with the State requirements, it maintains eligibility for funding opportunities for water saving programs and measures.

Also...

We want your feedback! Online Conservation Survey

Check out our brief online survey! Help us find out the kind of conservation programs that make a difference to you. This a quick 5-minute survey about programs and activities that impact the way you use water. Your feedback helps us design water efficiency programs that benefit you.

Click here to get started...

NOTICE OF PUBLIC COMMENT/REVIEW PERIOD

Notice is hereby given that: Parker Water and Sanitation District (PWSD) is requesting public review and comment of the 2016 DRAFT Water Efficiency Plan. This Plan is available for review and comment from July 28, 2016 through September 26, 2016 at PWSD's administrative office located at 18100 E. Woodman Drive, Parker, CO 80134, as well as online at www.pwsd.org.

Conservation

Conserving Water

The primary mantra at Parker Water is to look out for our customer's water future, but we can't do it alone. Using water responsibly has become more than the smart thing for everyone to do, it's become a necessity, especially in Colorado.

Each day, the average Parker Water residential customer uses more than one hundred gallons of water. Multiply that by our 45,000 plus population. Now take that number and multiply it by 365 days in a year. Yep! Those numbers REALLY add up fast.

That is why careful research and information-based planning by water experts goes into the community's master plan to secure our water future every step of the way. Learn how you can maximize the efficiency of your water usage at home and at work. The resources are FREE and they are all right here!

Click to learn more about...

Rebates & Irrigation Audits

Water Efficiency Tips

Voluntary Water Restrictions

Local Xeriscape Classes

Irrigation and Lawn Care Guideline

Water Waste Alert!

APPENDIX C

ONLINE SURVEY INFORMATION

Conservation Survey

1. How aware are you of your water use?

- ◯ I am highly aware of how much water I use
- ◯ I am somewhat aware of how much water I use
- ◯ I don't think about how much water I use

2. How interested are you in learning more about conservation and using water more efficiently?

- ◯ Extremely interested
- ◯ Somewhat interested
- ◯ Neither interested nor uninterested
- ◯ Somewhat uninterested
- ◯ Extremely uninterested

3. In what ways would you prefer to learn about conservation? (check all that apply)

- [ ] Bill or bill inserts
- [ ] Websites
- [ ] Social media
- [ ] Classes
- [ ] Public displays (billboards/ads)
- [ ] Other (please specify)

4. What conservation/efficiency activities do you currently practice in your home? (check all that apply)

- [ ] Full washing machine loads only
- [ ] Turn off the water when brushing teeth
- [ ] Limit shower length
- [ ] Use low-flow or ultra low-flow fixtures/appliances
- [ ] Other (please specify)

5. What conservation /efficiency activities do you currently practice outside your home? (check all that apply)

- [ ] Water efficient landscaping/Indigenous plant materials/Xeriscape
- [ ] Irrigation timer/controller
- [ ] Monitor irrigation system for leaks/overspray
- [ ] Use high efficiency irrigation heads (such as rotary nozzles)
- [ ] Use smart controller and/or rain sensor
- [ ] Other (please specify)

6. If available, how likely would it be for you to access your water use information on a secure web-based customer portal?

- ○ Extremely likely
- ○ Somewhat likely
- ○ Neither likely nor unlikely
- ○ Somewhat unlikely
- ○ Extremely unlikely

7. Please check any of the indoor fixture/equipment rebates you are interested in. (check all that apply)

- ☐ Toilets
- ☐ Washing machines
- ☐ Shower heads
- ☐ Aerators
- ☐ Other (please specify)

8. Please check any of the outdoor irrigation system/equipment rebates you are interested in. (check all that apply)

- ☐ Smart irrigation controller
- ☐ Rotary nozzles
- ☐ Rain Sensor
- ☐ Other (please specify)

9. Please check any of the activities you are interested in.
(check all that apply)

- [ ] Irrigation efficiency audit
- [ ] Having conservation/efficiency information available on a website
- [ ] Having classes available
- [ ] School outreach

10. Please share any additional comments, ideas or suggestions related to water conservation.

Done

APPENDIX D

CWCB REVIEW COMMENTS

COLORADO WATER CONSERVATION BOARD
Conservation Plan Submittal Required Plan Elements Checklist

Name of Entity: Parker Water and Sanitation District
Date Submitted: Prelim. 6/7/16

Required Conservation Plan Elements	Completed?
1. Name and contact information	Yes_____ No__x_____ Comment: put in final cover letter
2. Organizations and individuals assisting with plan development	Yes__x___ No_____ Comment: acknowledgements section
3. Quantified annual retail water delivery?	Yes_ x__ No ____ Comment: pg. 9 and pg.28 (2009-2015 by customer class and gpcd)
4. Identified population served by retail water delivery?	Yes___x__ No_____ Comment: pg.9; projections on pg. 26-27
5. Public comment period completed? (60 days or local regulation)	Yes__x___ No_____ Comment: June 2016-August 2016 pg. 53 and Appendix A
6. Signature with authority to commit resources of the submitting entity?	Yes_____ No__x_ Comment: put in final cover letter
7. All required water saving measures and programs considered?	Yes_x__ No_____ Comment:
I. Fixtures and appliances – toilets, urinals, showerheads, faucets, etc.?	Yes__x__ No ___ Comment: give aways like aerators, showerheads,etc
II. Waterwise landscapes, drought resistant vegetation, removal of phreatophytes, efficient irrigation, etc.?	Yes_x__ No_____ Comment: CRC irrigation audits; tap fees that incentivize lower water using landscapes; see rebates for crossover
III. Water efficient industrial and commercial processes?	Yes__x__ No_____ Comment: large landscape audits and separate irrigation meters; commercial customers constitute only 9% of demand so is not specifically focused on outside of landscape regs. and practices
IV. Water reuse systems?	Yes_x_ No_____ Comment:
V. Distribution system leak ID and repair?	Yes__x___ No_____ Comment: **See Below**
VI. Information, public education, audits,	Yes___x__ No_____

Required Conservation Plan Elements	Completed?
demos?	Comment: public education (K-H.S.) through south metro water authority; accessible xeriscape designs; xeriscape materials; efficient irrigation tips on bill; consumption information on bill; information on website; web-based customer portal coming once AMI is in place
VII. Conservation oriented rate structure and billing system?	Yes_x____ No____ Comment: 3 tier inclining block rate structure; system development fees that makes growth pay for growth; will develop a water budget based structure for irrigation only customers
VIII. Regulatory measures designed to encourage water conservation?	Yes_x___ No_____ Comment: water waste ordinance; all new construction with irrigation systems required to use smart (ET) controllers and rain sensors
IX. Incentives, rebates to encourage conservation implementation?	Yes_x___ No_____ Comment: efficient rotary sprinkler heads; rain sensors; smart controllers;
8. Role of water conservation plan in overall water supply planning?	Yes_x____ No_____ Comment: Throughout the document but particularly in section 1.6 where the plan discusses integration of conservation into the long term water supply plan
9. Steps to implement, monitor, review, and revise conservation plan including time period not to exceed 7 years?	Yes__x_ No_____ Comment: pg.54 and Appendix B
10. Estimates of water saved through previous conservation efforts AND water saved through plan implementation?	Yes___x___ No_____ Comment: Future savings are calculated in the form of GPCD and % reduction out to 2035 and 2050. Past savings are not discussed. **See Below**
11. Best management practices for water demand management, water efficiency, and water conservation that may be implemented through land use planning efforts	Yes____x__ No_____ Comment: Plan submitted before required but PWSD does tie landscape codes to meter set and has tap fees that induce efficiencies on the landscape which both could be considered to be bridging the land use-water divide. **See below.**

Plan Review Findings

_____ Approved

____x_____ Conditional Approval

_____ Disapproval with Modifications

Plan review comments:

This plan review was completed by Kevin Reidy of the Colorado Water Conservation Board. Questions about the review, comments provided, the plan review process and the statutory requirements can be directed to Kevin.

PWSD has a conditional approval pending the administrative areas identified in the checklist (denoted with "put in the final cover letter"), the addition of the appendices and the other areas identified below. Once these areas are recitified, submit the final and the conditional can be changed to full approval.

Unaccounted for water: This term pops up in a couple of places in the plan but isn't really used in the industry anymore since all of it can be accounted for by using the newer water loss control methodology. I would probably refer to it as non-revenue water or water loss, in general.

M36 Audit methodology: Will PWSD implement the AWWA methodology in conjunction with AMI implementation? It is mentioned once on pg. 41 under Task 3c. in conservation Goal #1 but not in the implementation section. AMI alone probably won't get you to water loss reduction PWSD is looking for. AMI will just get you better data. There needs to be some concerted effort to analyze the data coming from the new meters.

Estimates of past savings: There doesn't seem to be any follow up to what has happened since the last plan. What kind of savings estimate does PWSD have for conservation efforts since the last plan? How does this square with what was predicted in the last plan? Remember this is just an estimate.

Land Use planning and Water planning: Is there anything else PWSD does to integrate and work with the Town of Parker's land use planners? Would be great to hear any successes Parker has. I know Parker participated in the Land Use Leadership Alliance trainings in 2013 and wondering if any implementation came out of this?