2019 WATER CONSERVATION PLAN

CITY OF SAN ANGELO WATER UTILITIES

SEPTEMBER 3, 2019

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Importance of Water Conservation

Although many people see water as an abundant source it isn't. According to National Geographic, the Earth is covered in 70 percent water, but we can only drink three percent of that water, out of that three percent only one percent of that water is accessible, water can be trapped in glaciers and snowfields, or polluted. This small amount of water is meant to be shared with 7.7 billion people.

Due to geography, climate, engineering, regulation, and competition, water can be hard to come by at times. As recent as August 2018, San Angelo was in Drought Level 1 restrictions, meaning we had less than 24 months of water left. The United Nations estimates, that by 2025 an estimated two-thirds of the world's population will be living in water-stressed regions, as a result of use, growth, and climate change. According to Texas Living Waters, Texas' population is expected to double by 2050, unfortunately, we can't say the same about our water supply.

By conserving water now, using it effectively, and teaching the future generations to do the same we can help ensure there is enough water for us and future generations. Although it sounds like an impossible feat, it is possible. Many cities have made great strides to reducing their water consumption, and some studies show these cities are using 21% less water than we were in 2000! This is a great accomplishment considering how much the population has grown and the changes in Texas. This was made possible by legislative action that set standards on water products, municipalities starting and implementing water conservation plans, and everyday people doing their part.

The goal of our Water Conservation Plan is to ensure water use efficiency within San Angelo. We will talk about our goals, including how we want to reduce water consumption and water loss, we will talk about what we are currently doing to help reduce both of those, and finally what we hope to do to further reduce water consumption and water loss.

Introduction

The City of San Angelo lies in the midst of West Texas ranching country. Located in Tom Green County, the current population is approximately 100,119 people, with a predicted increase to over 148,090 people by 2070 (population provided by the 2021 Region F Water Plan). San Angelo is also home to three lakes, as well as the Concho River, which runs through the heart of the City.

The City provides water to approximately 37,000 residential, commercial, and wholesale accounts. In addition to water from local sources, including Lake Nasworthy, Twin Buttes Reservoir, O.C. Fisher Reservoir, and the Concho River system, the City purchases water from the Colorado River Municipal Water District's (CRMWD's) Lake E.V. Spence and Lake O.H. Ivie. The City also has groundwater rights in McCulloch, Concho, and Menard counties collectively referred to as the Hickory well field.

History and Context

The City has a long history of progressive water resource planning. In keeping with that tradition, and ensuring that future generations will have adequate water supplies, the City promotes water conservation and updates their Water Conservation Plan every five years as required by the Texas Water Development and Texas Commission on Environmental Quality. Conserving existing supplies can help to reduce and delay the need for additional water supplies. In order to reduce per capita demand in the future, the City promotes various water conservation programs designed to educate citizens on the benefits of efficiency.

The 2019 Water Conservation Plan takes into account new technology, new best management practices, and studies done on the City. Two studies were done since the last Water Conservation Plan; one in 2015 by Alan Plumber Associates, Inc. (APAI), and another in 2017 by Averitt and Associates. APAI evaluated the effectiveness of future conservation strategies. This evaluation consisted of feasibility, economic analysis, research, and recommendations. In accordance with our goals, a selected few are to be implemented as part of this Water Conservation Plan. Averitt & Associates, a consulting firm started by former Senator Kip Averitt, conducted a statewide study on water conservation goals and projections on behalf of the Texas Water Development Board.

The Water Conservation Coordinator included several programs in the 2014 Water Conservation Plan. The 2019 plan includes new and existing programs such as:

- The System Water Audits and Water Loss reports, allow us to reliably track water uses and provide the information to address unnecessary water and revenue losses;
- The Metering of All-New Connections and Retrofit of Existing Connections has been established to create billing equity among customers, have universal metering, reduce water waste, and reduce flows to wastewater facilities;
- The Automated Meter Reading Proactive Leak Investigation program has reliably gathered information regarding continuous flow and stopped leaks;

- The Water Conservation Pricing has been implemented to discourage the inefficient use of water, and to reward those who use less;
- The Prohibition on Wasting Water is aimed at customers who continue to waste water;
- Public Information affects water consumption as customers learn about water resources, the wise use of water, conservation programs, and change behavior;
- And finally, Bosque and Kirby Park have both been updated to have irrigation systems supplied by rain harvesting tanks.

Water Supply Summary

Lake Nasworthy, the oldest major water supply reservoir in the City's system, was completed in 1930. The City owns and operates the reservoir. Most of the drainage area of Nasworthy is controlled by Twin Buttes Reservoir, which was built by the Bureau of Reclamation in 1962. The storage in Twin Buttes is divided into two pools connected by a 3.22-mile equalization channel. Below elevation 1925.0 feet above sea level, the two pools function as separate reservoirs. In October of 2018, Twin Buttes' north and south pools reached "equalization", making it one pool; this was the first time the pools connected in 24 years. The City holds water rights in both Nasworthy and Twin Buttes. The U.S. Army Corps of Engineers owns the third major reservoir in the San Angelo system, O.C. Fisher, which was completed in 1951. The Upper Colorado River Authority (UCRA) holds all water rights in Fisher. In turn, the Fisher water rights are contracted to the City. In addition to the local supply, the City purchases water from two reservoirs owned and operated by Colorado River Municipal Water District (CRMWD): O.H. Ivie Reservoir and Lake E.V. Spence.

During the drought in the 1960s and early 1970s, the City began investigating sources of groundwater in the San Angelo area. As a result of this investigation, the City obtained groundwater rights associated with 37,633 acres of land in McCulloch, Concho, and Menard counties. The water is produced from the Hickory sandstone aquifer, which lies approximately 2,200 to 3,000 feet below the surface. The Hickory well field is located within the jurisdiction of the Hickory Underground Water Conservation District No. 1 (HUGWCD). The City received a permit from the District to produce and export water. The District has placed a one-mile spacing minimum and 500 gallons per minute capacity on the City's wells, as well as limits on the amount to be produced from the well system on an annual basis.

Once the effects of the 2011 drought were assessed, the decision was made to expand the production capacity of the Hickory well field. The City of San Angelo is in the process of

constructing facilities to expand its right to drill and produce water from the Hickory Aquifer in accordance with a permit issued by the HUGWCD. This will allow the City access to additional water for emergency conditions or in drought conditions.

The City is currently in the process of diversifying its water portfolio with the Concho River Project. The Concho River Project involves releasing highly treated water from the City's wastewater treatment plant into the Concho River. The water would travel through the "natural pipeline," where nature would act as an environmental buffer and will partially treat the water. The City will recoup the water farther downstream, then treat it to meet drinking standards. When completed, the project will produce about 7.5 million gallons a day. Upon completion, the City will have water supplied from surface water (from our reservoirs and lakes), groundwater (from Hickory Aquifer), and reclaimed water (from the Concho River Project).

Geography

Located in central Texas, San Angelo is considered to have a semi-arid climate. The lack of rain and surface water make water conservation ever more significant. Despite not always experiencing a drought, residents are always alerted to current water supply levels, watering restrictions, and rainfall patterns.

At times, the City has had to activate the drought contingency plan. Thankfully, the City of San Angelo made a successful effort to lower consumption during times of constrained water resources. As Corral-Verdugo et al., found in their 2002 study, water conservation is most effective when individuals are aware of water resources dilemmas.

Historical Monthly and Annual Rainfall Data

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
2015	2.03	0.23	1.66	1.82	9.12	3.55	0.55	1.28	0.45	2.44	1.39	2.26	26.78
2016	0.03	0.77	3.33	5.1	6.4	7.02	-	2.87	5.24	1.49	2.73	0.74	35.72
2017	1.48	1.23	0.25	1.46	2.06	1.52	1.69	2.41	3.46	0.81	0.98	1.13	18.48
2018	0.01	1.36	1.2	0.13	6.03	0.56	0.64	3.6	6.66	11.37	0.03	2.47	34.06

Utility Profile

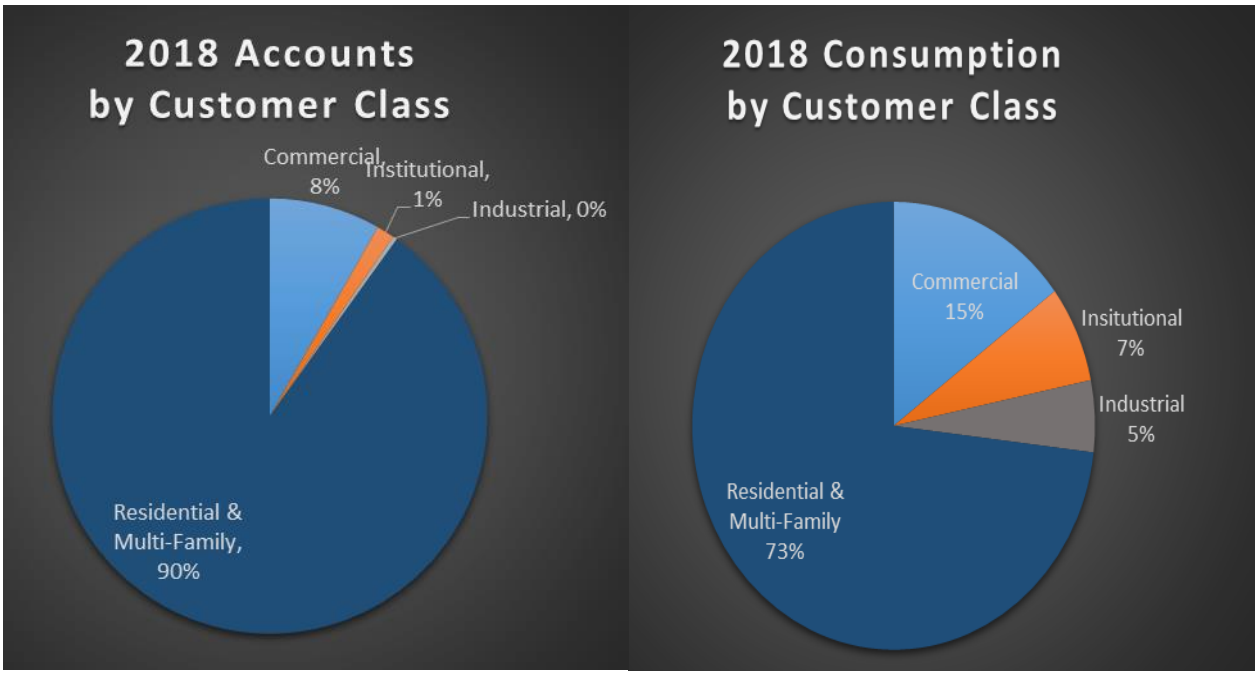
Water consumption in the City of San Angelo is driven by a wide variety of domestic, commercial, industrial, and institutional needs. With more than 35,000 accounts, the City is responsible for addressing a wide variety of factors that influence water availability and demand.

As such, the City analyzes consumption patterns and develops goals in order to prevent water supply shortfalls.

A. Consumption by Customer Class in Thousand Gallons

Although, residential and multi-family accounts make up 90 percent of all accounts they only consumed 73 percent of all water demanded in 2018. Commercial accounts only make up eight percent of accounts but account for 15 percent of consumption, institutional accounts make up one percent of all accounts and account for seven percent consumption, and industrial accounts make up less than one percent of accounts but account for five percent of consumption.

Consumption in Thousand Gallons				
Fiscal Year	2015	2016	2017	2018
Residential	2,025,793	2,009,983	2,196,878	2,085,576
Commercial	462,281	467,562	492,301	534,662
Multi-family	386,679	420,210	437,990	422,052
Institutional	378,822	383,884	438,404	349,522
Industrial	114,610	94,995	121,023	188,238
Agriculture	0	1,695	3,840	12,811
Total	**3,368,185**	**3,378,329**	**3,690,436**	**3,592,861**



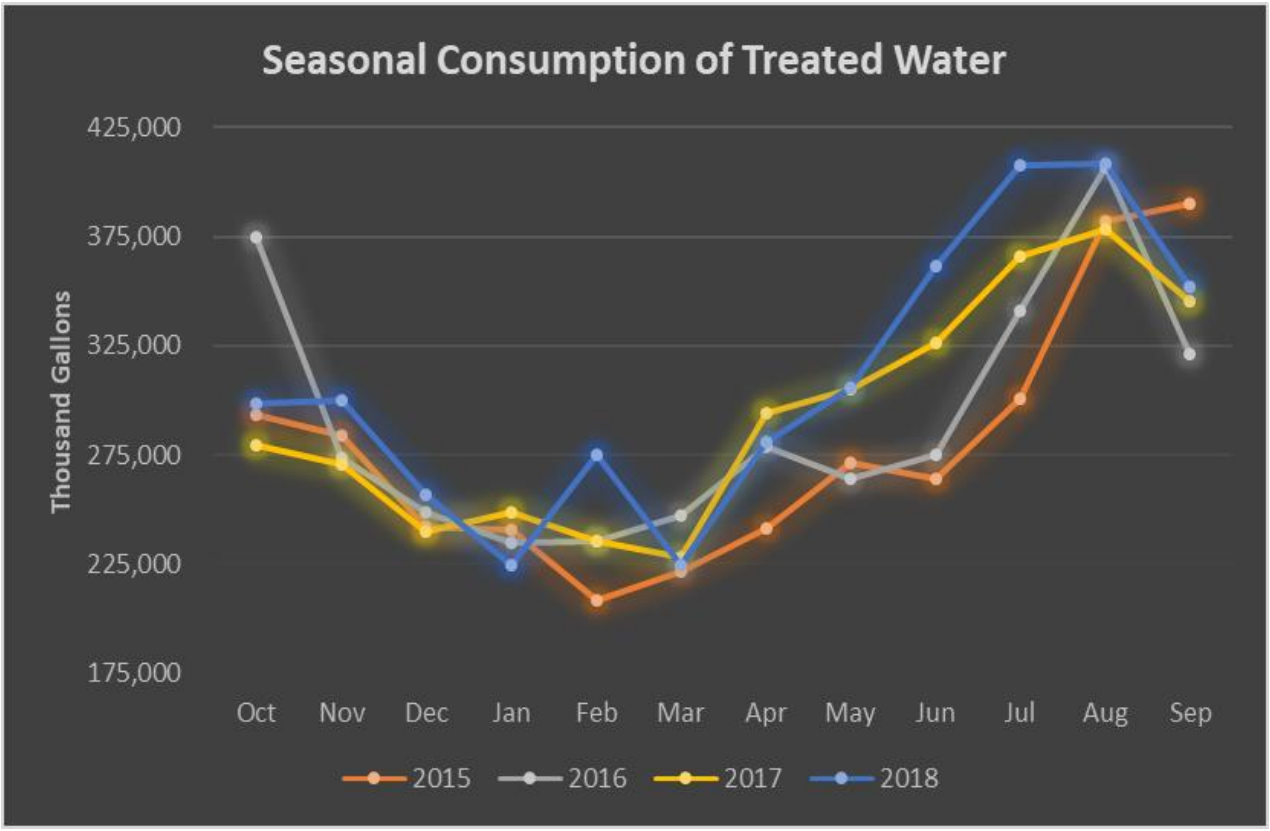
B. Accounts by Customer Class

In 2018, residential and multi-family accounts made up 90 percent of all accounts, commercial made up 8 percent, institutional 1 percent, and industrial less than 1 percent.

Fiscal Year	2015	2016	2017	2018
Residential	31,145	30,314	30,650	30,703
Commercial	2,930	2,889	2,898	2,900
Multi-Family	729	713	718	701
Institutional	465	485	471	474
Industrial	159	120	115	110
Agriculture	0	19	6	19
Total	35,428	34,540	34,858	34,907

C. Seasonal Water Demand

Like other Texas cities, the City's demand goes up during the summer months and lowers in the winter months. August is typically the hottest month and therefore the demand is the highest. August for the past four years has averaged at 389 million gallons consumed for the month. During January, the City sees a decline in water consumption, the average consumption for the month for the past four years has been 240 million gallons consumed. The annual daily average is 13 million gallons per day, during summer peak it is 22 million gallons per day, and winter 10 million gallons a day.



D. Targets and Goals

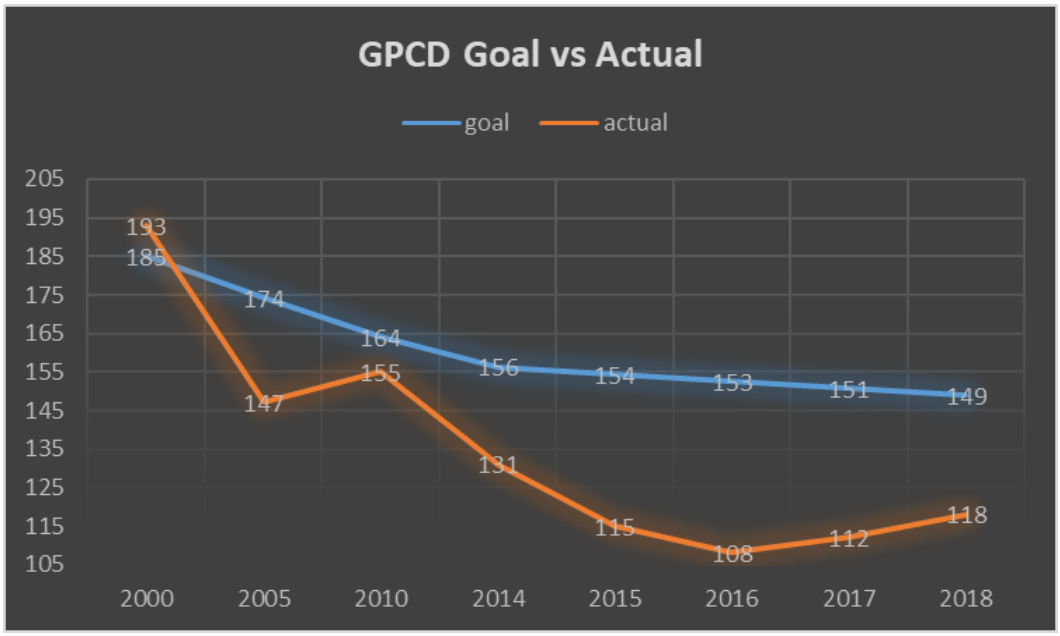
The City of San Angelo's Water Conservation Plan is focused on two efficiency goals. The first and most immediate goal is to reduce summertime peak pumping. The second goal is to reduce overall per capita consumption by 1.2 percent per year starting from the City's 2000 consumption of 185 gallons per capita per day (GPCD). This will assist the City with water supply constraints due to weather and hydrological challenges.

The table below shows recent per capita consumption and the goal of 137 GPCD by 2025, and 79 gallons by 2070. Goals have been met and exceeded in 2005, 2010 and 2015, as a result of a combination of conservation efforts, including public education and restrictions on outdoor water use, implemented as part of the City's Water Conservation Plan. Continuing to maintain this success is the principle goal of the City's conservation efforts. Total GPCD represents all water pumped, less wholesale customer usage, divided by the total population.

Due to future expected economic and population growth we kept the city's previous goal of water consumption reduction by 1.2 percent annually starting from the City's 2000 consumption of 185 gallons per capita per day (GPCD). We also took into account the possibility of future expansion of commercial industries, which increase population and water demand.

Water Consumption Goals (GPCD)

Year	2005	2010	2015	2020	2025
Goal	174	163	152	140	137
Actual	147	137	115	-	-



Averitt & Associates Study

In 2017 Averitt & Associates conducted a study to estimate how much water had been conserved due to conservation efforts and project future conservation and goals. Averitt & Associates used 2015 as the baseline to determine and project the conservation amount the City of San Angelo benefitted from due to conservation activities and compared it to our regional goals.

The study found that the City will exceed their conservation goals until 2070, the last year they projected. The City is currently exceeding goals in GPCD, and we should exceed our goals until 2024, the last year the study projected. They estimated that we would fall short 2022 to 2024 for water loss GPCD, the last years projected, but we are actually exceeding their projected goals, so a shortfall is not anticipated by us for those years. Due to water loss reduction, we had a savings of 110 million gallons (MG) in 2015. Due to water rate increases, we had 126 MG savings and it is expected to have continuous growth.

Averitt & Associates suggestion to save more water was to provide an advanced metering infrastructure (AMI) customer engagement portal. The portal would provide customers with their water use data and allow them to compare it to other customers' usage. They believe this would change customers' behavior and would provide an estimate of 20% savings.

On-Going Best Management Practices

Water consumption in the City of San Angelo is driven by a wide variety of domestic, commercial, industrial, and institutional needs. Best Management Practices (BMPs) have been developed to both improve water use efficiency for the San Angelo Water Utilities and for programs to assist the City's water customers to efficiently use water. BMPs have been implemented as part of the City's ongoing water conservation effort. Future BMPs will be evaluated and implemented as a condition of a positive evaluation.

1. System Water Audit and Water Loss Reports

A. Description

Water loss audits and water loss reports are effective methods of accounting for all water usage by a utility within its service area. The City of San Angelo performs an annual estimate of system water efficiency by comparing water delivered to the treatment plant, potable water produced, and water sold. This audit includes estimates of water loss to leaks in the system and water used in firefighting.

Performing a reliable water audit is the foundation of production-side water resource management and loss control in public drinking water systems. The structured approach of a water audit allows the utility to address unnecessary water and revenue losses. The resulting information from a water audit will be valuable in setting performance indicators, goals, and priorities to cost-effectively minimize water losses.

B. Implementation

Compiling a water audit is a two-step approach, a top-down audit followed by a bottom-up audit.

The first step, the top-down audit, is a desktop audit using existing records and some estimation to provide an overall picture of water losses. Representatives from management, distribution, production, customer service, and conservation have an essential role to play in this program. This working group is responsible for gathering relevant data and identifying current practices.

The second step of the audit, the bottom-up approach, involves a detailed investigation into actual policies and practices of the utility. This involves a more detailed review of utility policies that affect water losses. It will better explore methods for developing better estimates of water use by the fire department and for line flushing. The utility will also evaluate leakage repair records.

C. Schedule

No less than once every five years, and more often if the internal water audit standard is not achieved, the utility will:

- Gather the necessary information for conducting the audit;
- Review the Texas Water Development Board's new guidelines for water audits;
- Consider new water audit standards based upon keeping real water losses below a specific percent or to achieve an infrastructure leakage index (ILI) below three.

This is a long process that encompasses the whole utility revising meter testing and repair practices, reducing unauthorized water use, improving accounting for unbilled water, and implementing effective water loss management strategies.

D. Documentation

To track this program, the Water Utilities will collect and maintain the following documentation:

- A copy of each annual system audit,
- The ILI and percentage losses for each year,
- A list of actions taken in response to audit recommendations, and
- The annual revenue lost to water losses.

E. Determination of Water Savings

Potential water savings are an integral part of the water loss audit process and can be tracked by comparing trends from the annual water loss audits. Based on the results of the audit, the utility sets goals for reducing its losses.

Total Water Loss as a Percentage

Year	2015	2016	2017	2018
Losses	14.32%	8.29%	3.33%*	12.86%

*When calculating the 2017 water loss, a calculation error was encountered and was not discovered until 2018. The water loss percentage should be about 8.86%

Although water losses have been fluctuating over the years, there are many factors that could affect such a discrepancy. These include total precipitation for the year, the growing nature of the City, and aging of pipes and infrastructure. Efforts are being made to reduce waste through the audit and loss reports and analysis.

F. Cost-Effectiveness Considerations

Direct costs that should be considered in implementing this program include the initial and ongoing administrative costs for performing and updating the water audits and capital costs for items such as leak detection equipment and billing system upgrades.

A recommended method to make cost-effectiveness decisions is based on the economic value of real losses and apparent losses. Real losses are losses due to leaks and are valued at actual costs to produce and deliver the water. The amount of lost revenue due to real losses, based on the utility's marginal production cost, valued at the retail rate charged to customers, can be compared to the costs of reducing the sources of loss.

2. Metering of All-New Connections and Retrofit of Existing Connections

A. Description

The purpose of this program is to ensure that all aspects of meter installation, replacement testing, and repair are managed optimally for water use efficiency. The Water Utilities installs the meters; building inspection confirms that the building code is met. Metering all new connections and retrofitting existing connections it allows for universal metering of all users of municipally treated water. This program improves water consumption accountability.

The meter program has several elements:

- Required metering of all new connections and existing connections, excluding fire services.
- A policy for installation of adequate, proper-sized meters as determined by a customer's current or projected water use patterns.
- Direct utility metering of each new duplex, triplex, and fourplex unit, whether each is on its own separate lot or there are multiple buildings on a single lot.
- Metering of all utility and publicly owned facilities, as well as customers.
- Use of construction meters to account for water used in new construction.
- Implementation of the State requirements in HB 2404, passed by the 77th Legislature Regular Session and implemented through Texas Water Code 13.502, which requires all new apartments be either directly metered by the utility or submetered by the owner.

- Annual testing and maintenance of meters larger than two inches. Regular replacement of five-eighth and three-quarter inch meters that are 15 years or more in service.
- An effective monthly meter-reading program where readings are not estimated except due to inoperable meters or extenuating circumstances.

B. Implementation

A Meter Repair and Replacement Program following the methodology and frequency currently recommended in industry practices and specified by the AWWA is in place.

The Water Utilities ensures the maximum amount of water consumption is accounted for, and the high quality of metering is maintained, through the regular review of metering data and policies.

The City performs a proactive meter-testing program and repairs and identifies meters. The customer service staff also monitors irregularities in customers' water usage and notifies them when a leak is suspected.

C. Schedule

The utility maintains the program on an ongoing basis. At a minimum, an annual benchmark is in place for measuring implementation and effectiveness.

D. Documentation

To track the effectiveness of the Metering Program, the Water Utility gathers the following documentation:

- Copy of meter installation guidelines based upon customer usage levels;
- Copy of meter replacement policy;
- Records of number and size of meters replaced annually;
- Estimate of water accounted for through the meter replacement program and repair program;
- Monthly records of water pumped versus billed water consumption.

E. Determination of Water Savings

Every year the utility should estimate its annual water saving from the BMP. Savings can be estimated based upon a statistical sample analyzed as part of the meter-testing program. Project potential savings into future years and include in utility water savings targets and goals.

Every year the Water Utilities will estimate its annual water saving from analyzing customer consumption. Since customer consumption is reflected within their monthly statements, customers become aware of not only their spending but also their usage. The utility encourages low consumption through a tiered rate structure. As depicted below, the utility experiences a high count of customers using 3,000 gallons or less monthly:

Number of Accounts Receiving Conservation Credits

Year	2014	2015	2016	2017	2018
Jan	10,491	9,761	10,048	6,492	11,337
Feb	9,941	11,085	9,944	6,238	9,739
Mar	11,580	11,889	9,790	6,902	11,248
Apr	9,976	10,768	8,575	5,290	9,838
May	9,976	9,855	8,844	6,283	9,782
Jun	8,706	10,349	8,295	6,281	8,668
Jul	9,577	8,903	6,883	5,525	8,183
Aug	7,714	7,818	5,880	8,322	8,817
Sep	8,376	6,921	8,229	9,612	9,144
Oct	8,932	7,969	8,691	10,215	13,300
Nov	9,307	9,453	9,825	10,744	14,140
Dec	10,525	10,756	9,572	11,907	14,553

F. Cost-Effectiveness Considerations

Capital costs to the utility in implementing this program may include the costs of installing new meters and retrofitting older ones, as well as one-time or periodic costs such as the purchase of meter testing and calibration equipment. A replacement meter can run from as little as $50 for a residential meter to several thousand for larger compound meters. Meter testing and repair is done by utility staff. A typical residential meter test can be performed for $40 per the City Code of Ordinances.

3. Automated Meter Reading (AMR) Proactive Leak Investigation

A. Description

The City of San Angelo Water Utilities began the Automated Meter Reading (AMR) installation project in September 2010. Approximately 36,000 meters have been converted with the majority of these meters being 5/8". AMR's are an effective method of accounting for all water usage by a utility within its service area since it automatically reads meters continuously. This program improves reading of meters and leads to reduced "water loss" as leaks become easier to detect.

The Automated Meter Reading (AMR) software allows staff to investigate potential leaks. In 2017 customer service began proactive leak investigation. Using the software, staff search for unusual water flow patterns, notify customers promptly of possible leaks and provide them time to have the leak fixed before their usage becomes too high. With this program, the utility measures to determine and control water loss; therefore, experiencing a reduction of water loss from metered connections.

B. Implementation

The following describes the leak investigation process:

1. A Leak Event Report will be created using the AMR software monthly by route
2. A different route will be worked on a monthly basis.
   Example: (Month 1 – Route 1, Month 2 – Route 2, etc.)
3. Accounts listed on the report will be assigned to staff the beginning of every month to complete by the end of the month
4. Staff will investigate accounts and call customers to proactively notify them of a potential leak
5. If a voicemail is left for the customer, an additional mail notice will be delivered to the customer
6. Staff will update the customer account with action taken, notes and other pertinent information
7. Proactive leak investigations and notices will be reported to Supervisor monthly for review

C. Schedule

The utility implemented this program in 2017 and has maintained it on an ongoing basis with monthly proactive reports being run.

D. Documentation

For this program the utility will track:

- The number of continuously flowing meters
- The number of customers contacted
- The number of leak adjustments
- The number of leaks repaired
- The number of new readers installed

E. Determination of Water Savings

The water savings can be calculated by subtracting meter readings before the leak from meter readings after the leak.

F. Cost-Effectiveness Considerations

Evaluation of AMR Program

Quantity	Value
Number of AMR's	35,023
Number of Leaks Caught per Year	6,275
Number of Customers Contacted per Year	6,275
Total Annual Savings Potential (gal)	86,745,600
San Angelo Population	100,700
Per Capita Water Savings (gpcd)	2.4
Estimated Cost per AMR Installation	$415
Administrative Time Spent per Year (hours)	416
Administrative Cost per Hour	$15
Cost over Gallon Saved ($/gal)	$0.17

4. Water Conservation Pricing

A. Description

The City has a tiered rate structure for residential customers, also known as a volumetric charge, or an inclining block rate structure, which increases the cost as consumption rises. This is

designed to encourage water conservation. Non-residential customers have an increasing meter fee assessed with larger meter sizes. The non-residential schedule includes a seasonal increase in the rate for summer usage of landscape water. Conservation pricing provides incentives to customers to reduce both average and peak use.

B. Implementation

The City's priority is a rate design that encourages customers to reduce discretionary water use. To remain effective, the rates need to be reviewed and possibly adjusted periodically to take inflation into account, future increases in operating costs, and other relevant costs and expenses.

C. Schedule

The City's current water rates are tiered rate structured and were adopted as a part of the 2015-2016 Rate Study that implemented the five-year rate increase. Conservation rate structures are designed to promote efficient water use by customers.

D. Documentation

To track this program, the Water Utilities maintains the following documentation:

- A copy of the legally adopted rate ordinance;
- Billing and customer records that include annual revenues by customer class for the reporting period;
- Monthly customer count and water consumption by customer class.

E. Determination of Water Savings

In implementing a conservation pricing structure, consideration will be given to the factors that result in a reduction in water use. The Water Price Elasticity for Single Family Homes (TWDB, 1998) study found long-term price elasticity of -0.20 in three Texas cities, which translates into a reduction of two percent in water use for a 10 percent increase in price.

F. Cost-Effectiveness Considerations

The water conservation pricing is cost-effective because it assures the financial health of the utility while also discouraging high consumption. The City might face one-time costs when implementing this BMP.

5. Prohibition on Wasting Water

A. Description

Prohibited Water Wasting BMP is aimed to help users understand the value of water, and educate them on simple ways to conserve water. Water Waste Prohibition measures are enforceable actions aimed at preventing specific wasteful activities, including:

- Water waste during irrigation;
    a. Water running along the curb of the street for a distance of 150 feet;
    b. Irrigation heads or sprinklers spraying directly on paved surfaces such as streets, driveways, parking lots, and sidewalks;
    c. Operation of an irrigation system with broken heads;
    d. Spray irrigation during summer months between the hours of noon and 6 p.m.
- Failure to fix outside faucet leaks;
- Service line leaks (on the customer side of the meter); and
- Sprinkler system leaks.
- Watering frequency, the use of treated or raw city water, graywater or reclaimed water for watering lawns, landscaped areas, trees, gardens, golf courses (except greens), shrubs or other plants being grown outdoors (not in a nursery) shall be allowed at a frequency of twice every seven days during the period of April 1 through October 31 and once every seven days during the period of November 1 through March 31. Golf course greens may be watered once per day year round.

B. Implementation

The frequency of outside watering is restricted, depending upon the time of year, the time of day and the drought stage in effect. It is always a violation to allow water to run more than 150 feet down any street, gutter, alley or ditch. To report watering violations residents can call or report online.

Violations of any provisions of the water conservation and drought contingency plan may be enforced as follows, per the Code of Ordinances:

1. First violation. Any person or entity as defined under this chapter may be given a verbal or written warning.

2. Second and subsequent violations.

A. Violation of any provision of the water conservation and drought contingency plan constitutes a class C misdemeanor offense for which a citation may be issued.

B. Second and subsequent violations shall be punishable by a maximum fine of up to two thousand dollars ($2,000.00) per day per violation as provided by section 1.01.009 of the Code of Ordinances of the City.

C. Proof of a culpable mental state is not required for a conviction of an offense under this section. Each day any person or entity fails to comply with the water conservation and drought contingency plan is a separate violation.

3. Third and subsequent violations.

A. For third and subsequent violations of the water conservation and drought contingency plan, the Water Utilities Director shall, upon due notice to the customer, be authorized to discontinue water service to the premises where such violations occur. Services discontinued or disconnected under such circumstances shall be restored only upon payment of charges as provided for in article 11.02, division 2.

B. Compliance with any provision of the water conservation and drought contingency plan may be enforced by civil court action as provided by state and federal law.

C. Schedule

The first water waste provisions on San Angelo's City Ordinances were introduced in the mid-1980s. In 2014, the City instated prohibited watering hours and a limit on watering frequency.

D. Documentation

To track this program, the Water Utilities maintains the following documentation:

- Copy of water waste prohibition ordinances enacted in the service area; and
- Records of enforcement actions including public complaints of violations and utility responses.

E. Determination of Water Savings

Total water savings for this program can be estimated from each water-wasting measure eliminated through the actions taken under this program. The Water Utilities will continue developing tracking methods to determine overall water savings through the water waste prohibition efforts in future years.

F. Cost-Effectiveness Considerations

Evaluation of Prohibition on Wasting Water

Quantity	Value
Number of Households	28,839
Average Sprinkler Water Use (gpm)	3
Total Watering Days/Week	1
Total Violations per Year	97
Total Savings per Year (gallons)	907,920
San Angelo Population	100,700
Per Capita Reduction (gpcd)	0.02
Administrative Cost	$1,500
Estimated Admin Cost per Violation	$15
Cost over Gallons Saved ($/gal)	$0.01

6. Water Conservation Coordinator

A. Description

The City's Water Conservation Coordinator oversees and manages conservation efforts within the utility's service area. The Coordinator is responsible for creating and implementing the utility's water conservation and drought contingency plans by developing programs, designing marketing strategies, and promoting campaigns with staff and local partners.

Water conservation programs are directed to school children; and, to the general public through media awareness campaigns, public events, and partnership with other entities. Other duties include evaluation of the annual conservation budget; preparation and submittal of annual conservation status reports; implementation of the utility's conservation program; and management of the conservation staff, consultants, and contractors, when appropriate.

B. Implementation

Conservation Coordinator duties include the following:

- Manage and implement utility conservation programs;

- Prepare annual conservation budget;
- Document water conservation program status as it relates to state requirements;
- Develop public outreach and marketing strategies for water conservation;
- Communicate and promote water conservation practices to customers;
- Serve as media contact and public information spokesperson for the utility on conservation issues;
- Oversee consultants and contractors assisting in implementing water conservation programs;
- Coordinate with partnering agencies and utility staff;
- Participate in regional water planning conservation and drought period initiatives; and
- Assist in preparing presentations to the Water Advisory Board Council and City Council.

C. Schedule

The City of San Angelo Water Utilities first hired a Conservation Manager in 2004. The Water Utilities now employs a Conservation Coordinator on a permanent basis per Texas House Bill 1648, passed on May 26, 2017.

D. Documentation

The City of San Angelo Water Utilities gathers the following documentation:

1. Description of the Conservation Coordinator position;
2. Reports on progress of water conservation programs implementation, costs and water savings.

E. Determination of Water Savings

The Coordinator assists in the implementation of practices and is essential to the success of efforts the utility chooses to undertake. This practice can be quantified through the implementation of the whole range of conservation programs that are offered by the utility.

F. Cost-Effectiveness Considerations

Since the water savings are not quantified it is difficult to analyze the cost-effectiveness. There will be non-financial benefits as a result of hiring a Conservation Coordinator such as enhanced public image through increased outreach and visibility in emphasizing conservation programs. The salary and associated overhead expenses for the Coordinator are the primary costs incurred.

7. Public Information

A. Description

San Angelo Water Utilities employs several methods of media resources to present a compelling and consistent message about the importance of water use efficiency and the managing and sustaining of existing water supplies. The goal of the public information program is to positively change behavior and raise awareness among customers and citizens of regional water resources. One example of such efforts is the Water My Yard program thru the Texas AgriLife Extension Service that Water Utilities sponsors. The City tries to reach customers through all types of media be it by, television, radio, print campaigns (i.e. leaflets, inserts, etc.), and social media.

B. Implementation

San Angelo Water Utilities employs a multi-tiered media campaign to bring about water resources awareness and to instill the importance of conservation in the community. This includes, but is not limited to, budgeting funds for television, radio, and print campaigns (i.e. leaflets, etc.) promoting water use efficiency; and, airing conservation programming on local television channels, Facebook, YouTube, City website and City Channel 17.

C. Schedule

The multi-tiered media campaign was initiated in 2004 and continues as an ongoing effort. As technology and social media advance, the City adapts to use them to their advantage.

D. Documentation

To track the progress of this program, San Angelo Water Utilities gathers the following documentation:

- Number of outreach events and attendance;
- Number of news programs or advertisements;
- Total population in the service area and the estimated number of audience reached; and
- The total budget for water conservation public information.

E. Determination of Water Savings

Water savings due to public information efforts are difficult to quantify. Water savings for other public information programs that result in specific actions by customers such as changes in irrigation scheduling or reduction in water waste occurrences may be quantified through surveys or analysis of water waste reporting in future years.

F. Cost-Effectiveness Considerations

There will be non-financial benefits as a result of Public Information campaigns such as enhanced public image through increased outreach and visibility in emphasizing conservation programs. The publishing and marketing expenses are the primary costs incurred. In addition, administrative costs are associated with the program. If communication strategies are successful, participants could learn how individual actions make a difference. However, to track the program's effectiveness, a study or survey would have to be conducted.

8. School Education

A. Description

School education programs, although difficult to relate to a quantifiable water saving, nevertheless enhance a utility's public image, contribute to the attainment of Texas state education goals by students, increase customer goodwill, and increase the viability of the utility's overall water conservation efforts. The message conveyed by students to their families based upon greater knowledge of water sources and conservation can result in behavioral changes leading to both short- and long-term water savings.

B. Implementation

San Angelo Water Utilities historically participated in the Major Rivers education program. Piloted in 2004, the self-contained Major Rivers curriculum, incorporated into 4th-grade classes, met the requirements of Texas Essential Knowledge and Skills (TEKS). The program now correlates to the State of Texas Assessments of Academic Readiness test (STAAR) for 4th and 5th graders. The program educated students on water conservation, supply, treatment, distribution, and conservation. The program offered academic and hands-on activities in math, language arts, science, and social studies, with a teacher's guide geared to the interdisciplinary curriculum, as well as an introductory video and home information leaflets. The program included pre- and post-test evaluations. In addition, teachers received continuing education credits for participating in Major Rivers' workshops.

The Water Utilities department is working on building a partnership with the San Angelo Independent School District to seamlessly incorporate water conservation into new curriculums. The Water Conservation Coordinator will serve as a consultant to the School District and integrate water conservation lessons into the science curriculum of select grade levels.

C. Schedule

The San Angelo Water Utilities will continue to offer other types of educational programs on an ongoing basis, subject to available staffing and funding.

D. Documentation

To track the progress of this program, the utility collected the following documentation:

- Number of school presentations made during the reporting period;
- Number of students reached by presentations and by curriculum;
- Number and type of curriculum materials developed and/or provided by the utility;
- Results of evaluation tools used, such as pre- and post-tests, student surveys, teacher surveys;
- Copies of program marketing and educational materials; and
- The annual budget for school education programs related to conservation.

E. Determination of Water Savings

Water savings for school education programs are difficult to quantify. An attempt may be made to evaluate this program through surveys of participants.

F. Cost-Effectiveness Considerations

This program will offer many benefits at a low cost to the utility. The only associated cost will be the administrative cost for curriculum consulting. The partnership between the San Angelo Independent School District and the Water Utility will change behavior in school-age children. In turn, this will offer the opportunity for the students to teach their families about water conservation practices as well.

9. Park Conservation

A. Description

Park irrigation conservation practices, as well as the wise use of water in the operation and maintenance of park facilities, can effectively reduce water demands. Under this program, the City Parks Department coordinates irrigation and water use practices with Water Utilities to conserve water at City parks.

The City Parks Department developed water conservation policies and procedures that cover all irrigated parks under its jurisdiction. Under this program, the park manager implements a watering regimen that uses only the amounts of water necessary to maintain the viability of the turf and landscape material appropriate for the use of the park. Water is only applied to areas that are essential to the use of the park. Furthermore, there is substantial use of drip irrigation for the City's trees, shrubs, gardens, and some turf. The park manager may cease irrigation of areas that do not affect the use of the park by the public during times of drought or shortage. An ET Network weather station has been installed at the soccer field off Glenna St. for increased weather data collection.

All park facilities are metered. Water wasting during park irrigation is continually monitored, including water running in gutter, irrigation heads or sprinklers spraying directly on paved surfaces, operation of automatic irrigation systems without a functioning rain shut-off device, operation of an irrigation system with broken heads, and irrigation during summer months between the hours of noon and 6 p.m. The parks department has implemented a new irrigation central control system. With this new central control system, City staff is able to monitor irrigation systems from one central location in real time directly affecting the irrigation staffs ability to find and make repairs in a more efficient time frame.

Implementation of rain harvest tanks at the Bosque and Kirby Park are complete. Playground equipment and facilities such as recreational facilities, tennis courts, basketball courts, and park and pool buildings are cleaned with the amounts of water needed for human health and safety purposes. Faucets and toilets in park facilities are retrofitted with efficient fixtures whenever possible.

B. Implementation

Prior to changes of a specific park conservation plan, the Water Utilities participated in a series of planning meetings with park management to discuss water conservation issues and to prepare a scope of action for the plan. The Water Utilities works closely with City Parks Department staff to update the conservation plan as needed, including a water survey of selected park irrigation systems and practices. The water-use survey, at a minimum, should include measurement of the irrigated turf areas; irrigation system checks and distribution uniformity analysis and review of irrigation schedules or development of schedules as appropriate.

C. Schedule

To accomplish this program, the utility has developed a plan in conjunction with the Parks Department and maintains it on an ongoing basis.

D. Documentation

To track the progress of this program, the Water Utilities gathers the following documentation:

- Metered water readings before and after any changes are implemented;
- Changes to irrigation systems, retrofits, or upgrades, regular leak detection, and maintenance policies, and estimated water savings from conservation practices.
- Water savings attributable to changes implemented;
- Costs of irrigation system upgrades if applicable.

E. Determination of Water Savings

Water savings will be estimated from each water-wasting measure eliminated through the actions taken under this program. For the replacement of inefficient equipment, the water savings are the difference in use between the new or upgraded equipment and the inefficient equipment. For landscape water waste, the savings can be calculated based on estimated savings from each water waste incident. For an irrigation survey, water savings can be expected in the range of 15 percent to 25 percent for park irrigation operations.

F. Cost-Effectiveness Considerations

Benefits to the City would be a reduction in water, as well as reductions in energy consumption as a result of reduced pumping of groundwater or surface water.

Proposed Water Conservation Programs

As part of the 2015 Rate Study, Alan Plummer Associates, Inc. (APAI) performed a study regarding potential conservation programs. APAI evaluated the effectiveness of future conservation strategies. This evaluation consisted of feasibility, economic analysis, research, and recommendations. In accordance with our goals, a few are to be implemented as part of this Water Conservation Plan.

1. Showerhead and Aerator Distribution

A. Description

The City will distribute showerheads, kitchen and bathroom faucet aerators in the residential sector. Three types of low flow plumbing devices are included under this program: showerheads rated at 1.75 gallons per minute (gpm) or less; kitchen faucet aerators of 2.2 gpm or less; and bathroom faucet aerators of 1.5 gpm or less.

Given the expected life of a showerhead (approximately five years), it is unlikely that many showerheads with flow rates over 2.5 gpm still exist in San Angelo residences. Today, new high-efficiency showerheads use the Venturi effect, air induction, and other methods to provide higher-quality spray patterns at lower volumes. These high-efficiency showerheads operate at flow volumes ranging from 1.0 to 2.0 gpm.

B. Implementation

Under this program, the San Angelo Water Utilities will include the following possibilities:

- Develop a program to distribute plumbing devices in residential facilities or, alternatively, provide incentives or kits for installation;
- Identify single-family (SF) residences participating in the program.

Under this program, qualifying customers receive the following fixtures:

- Two high-efficiency showerheads
- Two lavatory faucet aerator
- One high-efficiency kitchen faucet aerator

In order to qualify for this program, customers must meet the following requirements:

- Customer must not have previously received free showerheads and aerators during the past five years.

- If the home is rented, the customer must complete and turn in a landlord consent form
- Customer must agree to have the showerheads and aerators installed within 30 days of receiving them.

In selecting a product for distribution, it will be necessary to solicit proposals from qualified vendors. In evaluating bids, it is extremely important that products be evaluated on quality and in terms of dollars per unit of water saved. A higher-cost product with higher water savings potential may have a lower cost per unit than a lower-cost unit with diminished water savings potential. Evaluating products based on cost per unit will ensure the greatest savings at the lowest cost per unit for the City of San Angelo. Each year 10 percent of eligible single-family homes and 10 percent of eligible multi-family units should be retrofitted to maintain program development. Continue until 50 percent of eligible single-family houses and multi-family units are retrofitted.

C. Schedule

During the first 12 months, the City will plan a program including stakeholder meetings as needed. The City will develop a plan for educating homeowners, apartment owners and managers, plumbers, and realtors about this program; and initiate the program.

D. Documentation

To track the progress of this BMP, the Water Utilities will gather the following documentation:

An inventory of the number of single-family and multi-family buildings completed prior to 1995, which are targeted by this BMP; and

For each year of implementation, the records of the number of showerheads, bathroom faucet aerators, kitchen faucet aerators installed in residences.

E. Determination of Water Savings

Based on existing showerhead flow rates of 2.5 gpm, 2.6 persons per home, 1.5 showerheads per home and seven minutes of shower time per person per day, annual water savings per showerhead are calculated at 6,643 gallons.

Based existing lavatory faucet flow rates of 2.2 gpm, 2.6 persons per home, 1.5 lavatories per home and five minutes of lavatory sink time per person per day, annual water savings per lavatory faucet aerator are calculated at 5,694 gallons.

Based on existing kitchen faucet flow rates of 2.2 gpm, one kitchen sink per home and a total of 10 minutes of use per day, annual water savings per kitchen faucet aerator are calculated at 2,555 gallons.

Based on an assumed participation of 3,000 residential units per year, total annual savings are estimated at 45,447,000 gallons per year.

Retrofit Device Savings Table

Device	Initial Savings (gpd per device)	Device Life Span (Savings)
Aerators	5.5 gpd	5 years

F. Cost-Effectiveness Considerations

Additional benefits to the City of San Angelo would be a reduction in water and wastewater treatment costs, as well as reductions in energy consumption as a result of reduced pumping of groundwater or surface water.

Evaluation of Residential Showerhead and Aerator Distribution

Quantity	Value
Number of Participating Residential Units per Year	3,000
Number of Residents per Account	2.6
Number of Showers per Resident per Day	1
Average Number of Minutes per Shower	7
Total Shower Minutes per Home per Day	18.2
Existing Showerhead Flowrate (gal/min)	2.5
Efficient Showerhead Flowrate (gal/min)	1.5
Potential Water Savings (gal/min)	1.0
Showerhead Savings per Account (gal/yr)	6,643
Lavatory Aerator Use per Resident in Minutes per Day	5
Total Lavatory Aerator Minutes per Home per Day	13
Existing Lavatory Faucet Flowrate (gal/min)	2.2
Efficient Lavatory Aerator Flowrate (gal/min)	1.0
Lavatory Faucet Savings per Account (gal/yr)	5,694
Kitchen Faucet Minutes per Day	10
Existing Kitchen Faucet Flowrate (gal/min)	2.2
Efficient Kitchen Aerator Flowrate (gal/min)	1.5
Kitchen Faucet Savings per Unit (gal/year)	2,555
Total Savings per Residential Unit (gal/yr)	14,892
Total Potential Savings (gal/yr)	44,676,000
Total Savings Potential (kgal/yr)	44,676
Product Cost ($/Kit)	$20.00
Admin Cost ($/Kit)	$5.00
Equipment Life (yr)	5
Kits per Residential Unit	1
Kits Distributed per Year	3,000
San Angelo Population	100,700
Per Capita Reduction Potential (gpcd)	1.2
Potential Water Savings (ac-ft/yr)	138
Product Cost	$60,000
Administrative Cost	$15,000
Unit Cost over Projected Life (5 years) ($/kgal)	$0.33

2. Residential High-Efficiency Toilet Rebate Program

A. Description

High-Efficiency Toilet (HET) replacement programs are an effective method of achieving water efficiency in the residential sector. HETs are toilets that use 1.6 gpf or less. Under this program,

the Water Utilities will develop and implement a program to replace existing toilets using 3.5 gpf or more in single-family and multi-family residences. It is estimated that approximately 70% of existing housing units have toilets that operate at 3.5 gpf or more. To accomplish this program, the Water Utilities staff will first identify single-family residences constructed during or prior to 1995.

In San Angelo, the median housing age for active, standard residential premises is about 40 years. This was estimated using the distribution of housing ages and the number of active residential accounts. Alan Plummer Associates Inc. estimates that there are approximately 53,000 toilets associated with residential units within the City of San Angelo. The average calculated flush volume across all residential toilets is 3.3 gallons per flush (gpf). This assumes that all toilets installed after 1994 operate at 1.6 gpf and that 20% of toilets installed prior to 1994 have already been replaced with units operating at 1.6 gpf or less.

It is further estimated that there are approximately 36,800 toilets with flush volumes equal to or greater than 3.5 gpf. Only these 36,800 toilets would be eligible for the toilet replacement rebate.

Estimated Housing Age for Active, Standard Residential Accounts

Years Constructed	Estimated Number of Units Constructed*	Estimated Number of Units Constructed (%)
1939 or earlier	3,561	9%
1940–1949	3,033	7.7%
1950–1959	6,389	16.2%
1960–1969	5,673	14.4%
1970–1979	7,872	20%
1980–1989	5,954	15.1%
1990–1994	1,670	4.2%
1994–1999	2,504	6.4%
2000–2004	1,902	4.8%
2005 or later	792	2%
Total	37,351	100.0%

B. Implementation

The Water Utility will budget for the program. It will set up an efficient method to market the program, and distribute applications. Once applications are submitted with all necessary information and receipts; the "rebate" or incentive credit will be applied to the customer's account.

C. Schedule

During the first 12 months, the City will plan a program including stakeholder meetings as needed. The City will develop a plan for educating homeowners, apartment owners and managers, plumbers, and realtors about this program; and initiate the program.

D. Documentation

To track this program, the Water Utilities will gather the following documentation:

- The eligible number of residences in the service area;
- The average number of toilets per residence;
- The average persons per household for residences;
- The number of HET installations credited to the program participant's replacement program, by year, including brand and model of toilets installed;
- Estimated cost per HET replacement, if applicable; and
- Estimated water savings per HET replacement.

E. Determination of Water Savings

Based on an average flow rate of 4.1 gpf and 2.6 persons per residential unit, the average annual savings per toilet replaced is calculated at 10,700 gallons per year.

F. Cost-Effectiveness Considerations

Replacing 1,000 units of existing high flow residential toilets with HETs (1.6 gallons per flush) is projected to conserve 50 acre-feet per year at product costs to the City of $90,000 and administrative processing cost of $3,000. These savings would be permanent: at the end of the useful life of the replaced toilets, only HETs or better will be available for purchase.

Additional benefits to the City of San Angelo would be a reduction in water and wastewater treatment costs, as well as reductions in energy consumption as a result of reduced pumping of groundwater or surface water.

Quantity	Value
Number of Units with Inefficient Toilets	24,533
Total Number of Inefficient Toilets	36,800
Number of Residents per House	2.6
Number of Flushes per Resident per Day	6
Current Flush Volume (gal/flush)	4.1
New Flush Volume (gal/flush)	1.28
Savings (gal/flush)	2.82
Total Savings Potential (gal/yr)	16,057,080
Total Savings Potential (kgal/yr)	16,057
Estimated Cost per HET	$90
Equipment Life in Years	20
San Angelo Population	100,700
Per Capita Reduction (gpcd)	.44
Number of Toilets Replaced	1,000
Potential Water Savings (ac-ft/yr)	50
Product Cost	$90,000
Administrative Cost	$15,000
Cost per kGal Saved Over Project Life (20 years) ($/kgal)	$0.33

3. Residential Efficient Washing Machine Rebate Program

A. Description

With this rebate, the Water Utilities encourages customers to purchase efficient clothes washers compliant with the Department of Energy's ENERGY STAR program. Certified clothes washers use six gallons per cubic feet of water per load, compared to the 13 gal/ft^3 used by an older machine.

Manufacturers started producing efficient clothes washer models in the late 1990s in anticipation of rules being adopted by the Department of Energy ("DOE") setting higher efficiency standards. Since 2012, the water efficiency of clothes washers has only improved. The energy savings are a result of more efficient motors, less energy required for heating hot water as less hot water is used, and shorter drying time because the spin cycle on efficient washers is much faster.

To be effective, the rebate offered should bridge at least one-half of the gap in the price difference between the efficient machines and conventional ones. The price difference is an important part of the buying decision for customers.

Incentives will only be given to those customers who install washers that qualify as water efficient. A list of efficient washers is maintained and regularly updated on the City of San Angelo website. Efficient washers are also labeled at major retailers.

B. Implementation

The program will be offered to customers in single-family homes (including duplexes and triplexes) that have in-unit washer connections. Organize stakeholder meetings. Develop a marketing plan for educating customers, appliance stores, and realtors about this program. Initiate the program.

Under the rebate program, customers would purchase a qualified machine from a list maintained and updated found at the City of San Angelo's website and the following link: https://www.energystar.gov/productfinder/product/certified-clothes-washers/results

After purchasing the machine, customers would send in their application with a copy of the original receipt and water bill. For verification purposes, receipts should include some information related to the brand and model number of the machine purchased as well as a TC number. This will help to ensure that the receipts are not shared between two or more customers. Upon approval, the customer would receive a rebate, which would be applied directly to their water bill.

C. Schedule

Based on the approach selected, the following schedule will be followed: Plan, implement, and market an efficient clothes washer incentive program within 12 months of adopting this program.

D. Documentation

To track this program, the Water Utilities will gather the following documentation:

- The number of single-family homes and multi-family units with in-unit washer connections;
- The average number of persons per household for single-family homes and for multi-family residences;

- The number of efficient clothes washer incentives issued each year, by year, including brand, model, and water factor of each efficient washer;
- Estimated water savings per efficient washer; and
- Average total washer sales per year in the service area.

E. Determination of Water Savings

Based on 2,160 participating customers, total potential water savings are estimated at 14 million gallons per year.

F. Cost-Effectiveness Considerations

Based on an assumed labor rate of $15 per hour, it is estimated that the residential clothes washer rebate program would require 300 hours of additional labor. At a total cost of $200,000, the residential clothes washer rebate program cost per gallon is calculated at $0.01. Additional benefits to the City of San Angelo would be a reduction in water and wastewater treatment costs as well as reductions in energy consumption as a result of reduced pumping groundwater or surface water.

Evaluation of Residential Clothes Washer Rebates

Quantity	Value
Number of Households	28,839
Number of Households with Older Machines (75%)	21,630
Average Cubic Feet per Machine	3.4
Total Loads per Household/Week	5
Avg. Water Factor of Existing Machine (gal/cubic foot)	13.3
Water Factor of New Machine (gal/cubic foot)	6
Total Savings per Load (gal/cubic foot)	7.3
Total Savings per Week (gallons)	124
Total Savings per Year (gallons)	6,453
Total Participants per Year	2,000
Total Annual Savings Potential (gal)	12,906,400
Total Savings Potential (kgal)	12,906
Estimated Rebate Cost per Washer	$100.00
Estimated Admin Cost per Rebate	$15.00
Equipment Life in Years	10
San Angelo Population	100,700
Per Capita Reduction (gpcd)	0.35
Number of Rebates per Year	2,163
Potential Water Savings (ac-ft/yr)	40
Rebate Cost	$216,300
Administrative Cost	$2,163
Cost per kGal Saved Over Project Life	$1.78

4. Landscape Irrigation Conservation and Incentives

A. Description

Landscape irrigation Conservation and Incentives is a BMP meant to reduce outdoor water usage, maintain a healthy landscape, and avoid run-off. Water Sense estimates, that 60 percent of household water usage in dry climates, is used outside. Of this 60 percent, they estimate that as much as 50 percent of water used to irrigate is wasted due to evaporation, wind, and runoff caused by inefficient irrigation methods and systems. Using this BMP, the Water Utilities may provide customers with customer support, education, incentives, and assistance in making their landscape water-use efficient.

In order to participate, customers would have to follow certain criteria including but not limited to the following, recommendation by APAI:

- No more than 50 percent of the landscape may be planted in turf. Turf can be Bermuda, buffalo, or zoysia varieties only. Turf requires the greatest percentage of a property's irrigation demand, and limiting the amount of turf will help to ensure anticipated water savings.
- The customer must sustain the conversion for a minimum period of time. Requiring the customers to sustain the landscape conversion is as important as requiring a customer to maintain a domestic fixture for which a rebate was provided.
- If a permanent irrigation system is installed, it must pass a free irrigation audit performed by the City of San Angelo prior to receiving a rebate. In many cases, the overwatering of a landscape has more to do with the irrigation system's inefficiencies than with the type of landscape installed. Requiring an irrigation system audit will help to significantly reduce overwatering of the newly installed landscape and will help to ensure that the irrigation system matches the new landscape as well.
- A minimum of four inches of soil must be present under the turf. Requiring a minimum of four inches of soil will significantly improve the landscapes moisture-holding capacity and help reduce the requirement for supplemental watering.
- Shrubs and flowers must be selected from an approved plant list.
- A minimum of one shade tree selected from an approved tree list for lots less than 6,000 sq. ft. and two shade trees in larger lots should be required.
- No more than five percent of the landscape may be planted in annuals or unapproved plants (including vegetables).

When appropriate, the Water Utilities will consider offering the following services:

- Training in efficiency-focused landscape maintenance and irrigation system design;
- Financial incentives (such as rebates, and grants) to improve irrigation system efficiency and to purchase and/or install water-efficient irrigation systems;
- Financial incentives to replace high water-use plants with low water use plants;
- Rebates and incentives to purchase rain sensors or soil-moisture sensors; and
- Notices at the start and end of the irrigation season alerting customers to check irrigation systems and to make repairs and adjustments as necessary.

B. Implementation

This BMP is aimed towards customers with large landscapes who use more than 20,000 gallons per month in the summer. The City will approach local media, as well as post on their social media to notify the public about the program. The City would also contact public/private non-

profit partnerships such as gardening clubs, and green industry businesses to help market the program and leverage resources.

The City would verify that interested customers know the requirements and have an interest in applying the suggested methods. Once they install the suggested methods water personnel would conduct an irrigation audit to make sure requirements for the landscape are being met. Evaluations and/or rebate processing could be done by the Water Utilities staff or be outsourced. If a Water Utilities chooses to perform the evaluations using in-house staff, they may take advantage of irrigation evaluation training programs provided by the Texas A&M School of Irrigation or the Irrigation Association. The Water Utilities will need to ensure that landscape irrigation system specifications are coordinated with local building codes.

One year after conducting an irrigation audit, the City may conduct a customer-satisfaction survey to gauge the implementation rate of recommended modifications and evaluate customer satisfaction.

C. Schedule

During the first 12 months, the City will plan to have stakeholder meetings as needed and educate homeowners on the program and requirements. Upon the City's approval of participants, they would landscape their homes according to set standards.

D. Documentation

To track this BMP, the Water Utilities will gather the following documentation:

- Number of surveys offered and number of surveys accepted and completed;
- Number, type, and dollar value of incentives, rebates, and loans offered to and accepted by customers;
- Estimated water savings achieved through customer surveys; and
- Estimated landscape area converted and water savings achieved through low water landscape design and conversion program.
- Number of customers who sustain the conversion for a minimum period of time.
- Number of permanent irrigation systems installed.

E. Determination of Water Savings

Landscape surveys as described in this document are assumed to result in a 15 percent reduction in water demand for landscape uses by surveyed accounts. The Water Utilities will provide estimates of water savings from landscape irrigation survey programs based upon actual metered data. The water budget calculation is as follows, provided by APAI:

Evaluation of Landscape Rebates

Quantity	Value
Number Households	28,839
Percentage of Homes that Exceed 8kGal/Mo in Summer	50%
Target Participation (% of Homes that Exceed 8 kGal/Mo in	10%
Participating Homes per Year	500
Converted Area (sq. ft. / home)	500
Weekly Irrigation Application Rate (in)	1.5
Estimated Water Savings (in.)	0.75
Estimated Water Savings (gal/week/home)	375
Number of Irrigable Weeks	24
Average Water Savings per Home (gal/yr)	9,000
Total Potential Savings (gal/yr)	4,500,000
Total Potential Savings (kGal/yr)	4,500
Rebate Cost ($/sq ft)	$0.25
Average Rebate per Home	$125
Estimated Admin Cost per Rebate	$15
Projected Life in Years	10
San Angelo Population	100,700
Per Capita Reduction Potential	0.2
Potential Water Savings (ac-ft/yr)	13.8
Rebate Total Cost	$62,500
Administrative Total Cost	$7,500
Unit Cost Over 10 year life($/kGal)	$1.56

F. Cost-Effectiveness Considerations

There may be other one-time costs such as purchase of leak detection equipment and meters. Marketing and outreach costs range from $5 to $15 per survey. Administrative and overhead costs range from 10 to 20 percent of labor costs.

5. Water Survey for Single-Family and Multi-Family Customers

A. Description

The Water Survey Program conducts surveys of single-family and multi-family customers and provides them suggestions and methods to reduce indoor water use. These methods can include but not limited to replacement of inefficient showerheads, toilets, aerators, clothes washers, and dishwashers, and automatic irrigation systems if applicable.

The most efficient way of starting the program would be to offer surveys to the highest water users in single-family and multi-family accounts. Multi-family accounts would be analyzed on usage per unit. Surveys can be conducted by trained Water Utilities staff, an outside contractor, or by customers using a printed or online survey.

For the indoor water use survey, a form can be used to provide the information on water reductions that would be achieved with each type of equipment change and the length of the payback period, taking into account any Water Utilities incentives that may be available. If it is an onsite survey, showerhead and faucet aerators may be changed during the survey.

B. Implementation

Under this program, the Water Utilities will identify single family and multi-family customers who average the highest in water usage. Once identifying possible participants the City would offer the survey via mail, telephone calls, electronically or other appropriate methods of communication. The incentives to participants would be to become more water-efficient, which in term would lower their monthly water bills. If any other incentives are going on like toilet rebates, or distribution of showerhead and aerator kit, etc., they would also be notified.

Once a customer agrees to participate, the utility staff will collect the following information in the survey:

1. Calculation of the ratio of summer to winter use based on a review of the customer water bills;
2. Number and flush volume for each toilet;
3. If any 1.6 gpf toilets are flushing at greater than 1.6 gpf due to the replacement of early closure flapper with standard flapper;
4. If any toilets are leaking around the flapper or over the overflow tube;
5. Showerhead and aerator flow rates in gallons per minute (“gpm”) when the valve is fully open;
6. Estimated capacity of current clothes washers;

7. If a customer has a swimming pool, the frequency, and duration of backwash. Check fill valve and float to determine if working properly. Ask the customer if they have noticed any leakage from the pool; and
8. Ask customer who is responsible for changing the schedule and how often that occurs, if the system is turned off in winter months and if turfgrass areas are overseeded in winter.

Based on the information from the survey, the utility will develop a list of recommended changes or improvements.

To assure that the water savings measures recommended during and after the survey are achieved, the Water Utilities will follow up with the customer to determine which were actually implemented.

C. Schedule

Based on the approach selected, the following schedule will be followed: Develop and implement a plan to target and market water-use surveys to residential customers using more than 20,000 gallons per month in summer months and multi-family customers in the first year after implementing this BMP. Marketing efforts will be repeated until goals are met.

D. Documentation

To track this BMP, the Water Utilities will gather the following documentation:

1. Number of residential customers;
2. Number of single-family customers using more than 20,000 gallons per month during summer months;
3. Number of multi-family customers;
4. Number of surveys offered and number of surveys completed by customer type; and

E. Determination of Water Savings

Saving should be based on measures implemented by each customer. Savings are calculated by multiplying the number of each type of measure implemented by the savings for that measure as listed below.

Single-Family Home

- Irrigation Audit: Actual Water Utilities survey results or 26 gallons per day (gpd") per house.
- Showerhead and aerator replacements: 5.5 gpd per person

Multi-Family Community

- Irrigation Audit: Actual Water Utilities survey results or 15 percent of outdoor water use or 208 gpd
- Showerhead and aerators: 5.5 gpd per person

Savings for resetting toilet tank levels, toilet leak repair, and flapper replacement will be estimated during the water survey.

F. Cost-Effectiveness Consideration

Surveys can be performed by City staff or by contractors. Labor costs for a single-family range from $50 to $150 and multi-family family surveys start off at $100. If showerhead, aerators, or flappers are installed cost should also be considered.

6. Rainwater Harvesting

A. Description

Rainwater harvesting (RWH) conservation programs are an effective method of reducing potable water usage while maintaining healthy landscapes and reducing problems due to excessive runoff. Using this BMP, the Water Utilities may provide customers with support, education, incentives, and assistance in proper installation and use of RWH systems. RWH systems will be most effective if implemented in conjunction with other water efficiency measures including water-saving equipment and practices. Incentives may include rebates for purchase and installation of water-efficient equipment.

B. Implementation

The Water Utilities will consider also approaching local weather announcers, radio gardening show hosts, and newspaper columnists for assistance in notifying the public about the program. Public/private partnerships with non-profits such as gardening clubs, neighborhood associations, and Tom Green Cooperative Extension office and/or with green industry businesses such as rainwater harvesting companies and local sustainable building groups are potential avenues to market the program and leverage resources.

Incentives may include rebates for RWH systems, recognition for RWH systems through signage, award programs, and certification of trained landscape company employees and volunteer representatives to promote the program.

The initial step in assisting customers with landscape irrigation systems is a thorough evaluation of the potential water capture of a RWH system. The water customers who participate in this program will need to maintain and operate their irrigation systems in a water-efficient manner.

The Water Utilities will ensure that RWH system specifications are coordinated with local building and plumbing codes. Water Utilities staff will also be trained to provide irrigation

audits. The American Rainwater Catchment Systems Association lists evaluation training for RWH programs.

C. Schedule

Based on the approach selected, the following schedule will be followed: Incentive approach in the first year, plan the program including stakeholder meetings as needed. Develop a plan for educating potential homebuyers, developers, plumbers, green industry trade groups, landscape architects and realtors about this program. After the first year, implement the program.

D. Documentation

To track this BMP, the Water Utilities will gather the following documentation for each year of operation:

- The number of new RWH developments for which design planning started after the adoption of this BMP;
- The number and type of RWH installations completed each year;
- The estimated rainwater and condensate use in each RWH installation;
- Aggregate water capacity of RWH sites;
- Number, type, and dollar value of incentives, rebates, or loans offered to and accepted by customers; and
- Estimated water savings achieved through customer surveys.

E. Determination of Water Savings

Based on 1,000 participants a year, with at least one 55 gallon size barrels, and an average of 20 inches of rain a year we expect at least 1.1 million gallons of water saved a year. Most rain barrels range between 35 to 150 gallons in size, 55 in a very low average so water savings will most likely be more.

F. Cost-Effectiveness Considerations

Based on an assumed labor rate of $15 per hour, it is estimated that the rainwater harvesting rebate program would require 300 hours of additional labor. At a total cost of $40,000 the rainwater harvesting rebate program cost per gallon is calculated at $0.02. Additional benefits to the City of San Angelo would be a reduction in water and storm sewer costs as well as reductions in energy consumption as a result of reduced pumping groundwater or surface water.

Evaluation of Residential Clothes Washer Rebates

Quantity	Value
Number of Houses	28.839
Average Roof Size (Sq. ft)	1,000
Average Rain Fall San Angelo (In)	20
Minimum Rain Barrel Size (Gal)	55
Number of Rebates	1000
Rebate per barrel	$25
Total Savings Potential per inch of rain	55,000
Total Savings Potential per year	1,100,000
Total Savings Potential (kgal/yr)	1,100
Total Rebate Cost	$25,000
Estimated Admin Cost per HET	$15
Total Admin Cost	$15,000
Equipment Life in Years	20
San Angelo Population	100,700
Per Capita Reduction (gpcd)	.03
Potential Water Savings (ac-ft/yr)	3
Cost per kGal Saved Over Project Life (20 years)	$1.82

7. New Construction Graywater

A. Description

Graywater has commonly been used in Texas. The most common example is using washing machine water for lawn or garden irrigation. Until 2003, Texas statutes contained very restrictive provisions for using graywater, primarily due to concerns about public health. In 2003, the Texas Legislature adopted House Bill (HB) 2661 which provides a more comprehensive definition of graywater and provisions for facilitating the use of graywater in a safe manner.

Graywater is defined in Texas as wastewater from clothes washers, showers, bathtubs, handwashing sinks, and lavatories not used for the disposal of hazardous or toxic ingredients. Graywater cannot include water from clothes washers used for washing diapers, sinks used for food preparation, toilets, or urinals.

HB 2661, passed by the 78th Legislature Regular Session, added a provision that allows graywater use without treatment of up to 400 gallons per day at a private house for landscape irrigation, gardening or composting as long as the graywater:

1. Is used by the occupants of the residence for gardening, composting, or landscaping;
2. Is collected using a system that overflows into a sewage collection system or on-site wastewater treatment and disposal system;
3. Is stored in tanks that are clearly labeled and that have restricted access;
4. Uses a purple pipe or purple tape around the pipe;
5. Is not allowed to pond or run off across property lines; and
6. Is distributed by a surface or subsurface system that does not spray into the air unless the graywater receives additional treatment.

HB 2661 also encourages builders of new homes to install dual piping that provides the capacity to collect graywater from allowable sources and to install subsurface graywater systems around the foundation of new houses to minimize foundation movement and cracking. This approach may also provide irrigation for landscaping planted up to four feet from the foundation.

New duplexes, triplexes, townhomes, condo units, and apartments may all be designed for utilization of graywater. Graywater generated from office buildings and other commercial buildings, primarily through faucet use, may be used for landscape irrigation. HB 2661 requires the Texas Commission on Environmental Quality to adopt rules for graywater use for commercial purposes as well as for industrial purposes.

In many cases, the quantity of water available as graywater is declining due to water efficiency gains from water conserving showerheads, faucet aerators, and clothes washers. In a new home, which would have efficient plumbing fixtures, the amount of graywater produced will range from 22 to 30 gallons per person per day. For an average size household of 2.7 persons that might be sufficient in most cases for both foundation stabilization and landscape irrigation in a four-foot strip around a 2,500 square foot house.

The suitability of graywater for irrigation will vary, and if graywater is the primary source for irrigation, a low water use landscape should be used. Irrigation systems should consider soil depth, soil permeability, and flooding characteristics. Application options include drip, flood and subsurface irrigation. It is not appropriate to use spray irrigation unless the graywater is highly treated.

B. Implementation

Implementation of this BMP includes following rules pertaining to graywater adopted by TCEQ as well as any local City or County Health Department rules. To promote this BMP, stakeholder meetings will be held with builders, developers, realtors, and other impacted groups. Under this BMP, the Water Utilities will consider;

1. Implementing an incentive plan to encourage builders and owners of new homes and/or multi-unit properties to install plumbing that separately collects graywater from eligible sources and distributes the graywater through a subsurface irrigation system around the foundation of the residence or building or for other landscape use. It may be effective for

2. This BMP to be part of a Green Builder type rating system that also includes WaterWise landscaping, adequate soil depth, and rainwater harvesting;

C. Schedule

In the first year, plan the program including stakeholder meetings as needed. Develop a plan for educating and training potential homebuyers, developers, plumbers, landscape professionals and realtors about this program. After the first year, implement the program.

D. Documentation

To track the progress of this BMP, the Water Utilities will gather the following documentation for each year of implementation:

1. Depending on which sectors the Water Utilities has decided to focus on, the number of new homes and/or multi-unit properties and/or certain new commercial developments such as office parks started and completed after the adoption of this BMP;

2. The number and type of graywater installations completed each year; and

3. The estimated graywater use in each graywater installation.

E. Determination of Water Savings

Water savings will vary depending on the type of installation and will likely be unique to each customer installing a graywater system. There may also be some cases where graywater use will provide more water for a purpose that is currently being met with potable water. Only the reduction in potable water use will be calculated as the actual savings. In general, calculate water savings as follows:

1. For single-family units, calculate gallons of potable water use replaced by graywater and multiply this estimated potable water savings per house times the number of houses installing a graywater system.

2. For commercial and other properties, calculate gallons of potable water use replaced by graywater. In some cases, water savings for commercial developments can be calculated based on the number of employees and graywater discharge per employee.

F. Cost-Effectiveness Considerations

This program would allow participants to lower their water and sewer bill since they are reusing water. It would also help lower costs for the City since they wouldn't have to retreat the water that participants are reusing. The only costs would be incurred by the participants installing graywater systems.

8. Conservation Programs for Industrial, Commercial, and Institutional Accounts

A. Description

27 percent of all water consumption for the City of San Angelo, comes from industrial, commercial, and institutional accounts (ICI). Therefore, it is important to have conservation programs and incentives in place for them to take advantage of. This BMP would start off by identifying the higher water usage customers and sectors with the highest conservation potential. Different industries have unique opportunities for water savings, but similarities of water use create an opportunity for an ICI Water Conservation Program.

The APAI evaluation suggested the City offer a rebate of $300 per acre-foot of water over the projected life of the equipment or 50 percent of the cost of the improvement whichever is less. ICI rebates in a year would be $100,000. This would allow the City to achieve and maintain annual savings of 33.3 acre-feet per year over a period of 10 years.

Since ICI customers have an array of use of water, APAI recommends implementation of a rebate program based on equipment life, installed costs of equipment, and achievable water savings. If the City follows these recommendations we can offer rebates based on the individual merits associated with each project.

B. Implementation

Implementation will consist of at least the following actions:

1. Identify ICI Accounts.
    a. Find the highest water users in each category.
2. Conduct water use surveys and implement incentives based on cost-effectiveness or ease of program implementation.
3. Adjust programs to achieve annual water-use savings.

C. Schedule

Based on the approach selected, the following schedule will be followed:

1. Within the first 12 months of implementing this BMP, identify industrial, commercial, and institutional accounts and sort them by water use; and
2. Offer water-use surveys to ICI accounts.

D. Documentation

To track this BMP, the Water Utilities will provide the following documentation:

1. The number of customers and amount of water used within the commercial, industrial, and institutional customer classes;
2. A description of the plan to market water-use surveys to ICI accounts;
3. The number of ICI customers offered water-use surveys during the reporting period and the number of water-use surveys completed during the reporting period;
4. The number of follow-ups completed during the reporting period;
5. The type and number of water-saving recommendations implemented; and
6. If utilizing other programs in lieu of the water-use survey and customer incentives program, a description of the programs and estimated water-use reductions achieved through these programs. The Water Utilities will document how savings were realized and the method and calculations for estimating savings.

E. Determination of Water Savings

Water savings will vary due to the industry and type of installations or retrofits completed.

F. Cost-Effectiveness Considerations

These calculations by APAI, are based on a $112,000 budget, they estimate that minimum savings are 10.9 million gallons per year. The water savings are based on 10-year equipment life, this would also reduce revenues by at least $229,114 per year at current water and wastewater rates according to APAI. Other benefits include a reduction of water and wastewater treatment costs for the City, as well as a reduction in energy consumption as a result of reduced pumping of groundwater and surface water.

Quantity	Value
Rebate Budget	$100,000
Maximum Unit Cost ($/ac-ft)	$300
Minimum Potential Savings (gal/year)	10,861,700
Minimum Potential Savings (kGal/year)	10,862
Equipment Life in Years	10
Number of Rebates	Variable
Potential Annual Water Savings (ac-ft/yr)	33.3
Annual Rebate Costs	$100,000
Annual Administrative Cost	$12,000
Unit Cost Over Project Life($/kGal)	$1.03

9. Partnerships with Nonprofit Organizations

A. Description

Organizations such as Texas A&M AgriLife, Master Gardeners, Master Naturalist, and other environmental organizations with water conservation sympathies can be a great resource to communicate water conservation education to their regular and expanded audiences. Organizations of all types can be included, even organizations that normally don't have water conservation goals. Organizations that help or target lower-income households or senior citizens can help their audiences by providing information on services that are available related to water conservation (for example, high-efficiency toilets and leak repairs).

B. Implementation

The first step to implementing this BMP would be to contact the organizations with volunteers and encourage them to deliver a packaged program. Another possibility which might be more effective in most cases would be to, communicate with the organization with a goal in mind and

work with them and volunteers to develop a package to meet the desired goals. Volunteers and organizations are great assets, since they know their target audience's capabilities and would know how best to approach the audience and work toward meeting the goal. Training should still be provided to volunteers to complement and enhance their skills.

Financial arrangements may only involve expenses and training materials. In order to ensure administrative attention and possibly accelerate progress, understaffed and/or cash-strapped groups should be provided with funds upfront and linked to audience contacts.

C. Schedule

If volunteer organizations are organized and already have operating educational goals in place, it is possible to expect recruitment, negotiations, contracting, training, and program results in 12 months.

D. Documentation

Documentation can vary from organization to organization depending on their goals and water conservation activities they hold. Documentation can include but isn't limited to:

- Number of audience contacts
- Number of newsletter sign-ups

E. Determination of Water Savings

Determination of water savings will vary from different needs the Water Utilities must provide for organizations. They will also vary on the type of program or outreach event they hold.

F. Cost-Effectiveness Considerations

Partnerships with volunteer organizations have the advantage of expanding the water conservation team. When volunteers are properly trained in conservation techniques and believe in water conservation, they can reach hundreds of other individuals with varying degrees of effectiveness. The cost of using volunteers is very low compared to the cost of paid staff. Well trained volunteers can be nearly as effective as paid staff.

Wholesale Customer Conservation

Summary

Communication will be maintained with wholesale customers to ensure that the City's retail and wholesale customers are being treated in an equitable fashion, and for optimum implementation of the plan. The City offers wholesale customers the opportunity to cosponsor conservation education and information activities.

Wholesale Customer Targets and Goals

The City of San Angelo serves three wholesale customers with treated water. Due to the fact that the City's wholesale customers have other sources of water in addition to the water provided by the City, we were unable to provide accurate targets and goals.

Metering, Monitoring and Records Management

The City meters all treated water delivered to its wholesale customers. The meters are read on a monthly basis for billing purposes.

A summary report is prepared, which aggregates all meter readings from wholesale treated water meters.

Leak Detection and Repair

The treated water wholesale customers are supplied from portions of the City's distribution system. The meter location is the point of sale after which the water enters the customer's system, which is the customer's responsibility to operate and maintain. The portions of the City's distribution system that serve these wholesale customers are subject to the same leak detection and repair program described in On-Going Best Management Practices-System Water Audit and Water Loss.

Contractual Requirements

The City has in place contracts with the various wholesale customers. All of these contracts contain language relating to water conservation in drought situations. Each contract has a section requiring the customer to accept shortages in supply, should natural or unforeseen circumstances prevent the City from delivering the water. One of these contracts is in force, as is for 40 years from the mid-seventies, prior to when the State had conservation planning requirements. As the need to modify each contract arises, the City will include contract language requiring conformance with applicable regulations concerning water conservation.

Targets and Goals

The City has no enforcement mechanism to impose conservation targets and goals upon its wholesale customers at this time. Achieving these goals must be through cooperative efforts to maintain and improve system efficiencies, to educate customers to the importance of conservation, and to enforce existing plumbing regulations within the municipal boundaries of each entity. To assist in meeting these goals, the City plays an active role in Region F water resource planning, working with wholesale customers on a voluntary basis on water conservation programs like those described in Public Information, School Education, and Water-wise Landscape Design and Conversion Program.

The City will assist its wholesale customers in voluntarily meeting goals through cooperative efforts like those mentioned above. All wholesale customers will be encouraged to operate efficiently and to keep water loss rates below 10 percent.

Drought Contingency Plan

Triggering a Drought Stage

Section 11.05 of the City of San Angelo Code of Ordinances contains provisions defining drought trigger stages and enforceable water management measures. When local reservoirs are below full but above drought condition levels, the local and non-local sources will be listed.

The required minimum daily groundwater production coupled with the total amount of surface water available, as determined by the Water Utilities Director, to the city from its developed water sources for drought level 1 is less than a 24-month supply, drought level 2 is less than 18-months, and drought level 3 is less than 12 months.

During drought conditions, the primary source of supply will be non-local sources, subject to the maximum amount available from each source, with the remaining amount of water coming from the local system or underground sources that the City may develop.

Whenever the total amount of water available to the City falls below the minimum criteria established for each Water Supply Stage Level, the City shall be deemed to have entered a Drought Stage for management of its water supplies.

In the event of a *water demand emergency*, the quantity of water usage from the city's water distribution system reaches a level that exceeds the amount which may be treated or safely delivered through the system, the Water Utilities Director shall notify the City Manager and the City Council of such an occurrence. The City Council shall be authorized to limit the use of water by the passage of a resolution outlining such limitations, which shall remain in effect until the water demand emergency can be met. Upon initiation of a water demand emergency, the Water Utilities Director shall provide notice to the Executive Director of the TCEQ and shall notify the news media.

In the event of a *water supply emergency*, a water system failure or emergency (i.e., pressure zone deficiencies, chemical spills, broken water mains, power outages, failures of storage tanks or other equipment, treatment plant breakdown and/or water contamination) which limits the amount of water which may be treated or safely delivered through the system, the Water Utilities Director shall notify the City Manager and City Council of such occurrence. The City Council shall be authorized to limit the use of water by the passage of a resolution outlining such limitations, which shall remain in effect until the water supply emergency can be met. Upon

initiation of a water supply emergency, the Water Utilities Director shall provide notice to the Executive Director of the TCEQ and shall notify the news media.

Water Supply Stages

Drought Level I.

- The minimum criteria for this drought stage shall be the following: The required minimum daily groundwater production coupled with the total amount of surface water available, as determined by the Water Utilities Director, to the city from its developed water sources is less than a 24-month supply.
- In addition to the conservation measures stated in section 11.05.002 of this article, the following additional water conservation measures shall be in force during Water Supply Stage - Drought Level I.
    - The use of treated or raw city water for watering lawns, gardens, landscaped areas, trees, shrubs, golf courses (except greens) or other plants being grown outdoors (not in a nursery) shall be prohibited at all times; provided, however, a person may do such watering which shall be once every seven days during the period of April 1 through October 31 and once every 14 days during the period of November 1 through March 31 except during the "prohibited watering hours" as stated in section 11.05.002.
    - Golf courses greens may be watered daily except during the "prohibited watering hours" as stated in section 11.05.002.
    - Watering of "new landscape" shall be allowed in accordance with the provisions as stated in section 11.05.002 for "new landscape."
- A multiplier shall be assessed to the volumetric water fees as set forth in section A8.002(a)(7) of this code.

Drought Level II

- The minimum criteria for this drought stage shall be the following: The required minimum daily groundwater production coupled with the total amount of surface water available, as determined by the Water Utilities Director, to the city from its developed water sources is less than an 18-month supply.

- In addition to the conservation measures stated in section 11.05.002 of this article, the following additional water conservation measures shall be in force during Water Supply Stage - Drought Level II:
    - The use of treated or raw city water for watering lawns, gardens, landscaped areas, trees, shrubs, golf courses (except greens) or other plants being grown outdoors (not in a nursery) shall be prohibited at all times; provided, however, a person may do such watering which shall be once every seven days during the period of April 1 through October 31 and once every 14 days during the period of November 1 through March 31 except during the "prohibited watering hours" as stated in section 11.05.002.
    - Golf course greens may be watered daily except during the "prohibited watering hours" as stated in section 11.05.002.
    - Watering of "new landscape" shall not be allowed as stated in section 11.05.002 for "new landscape."
- A multiplier shall be assessed to the volumetric water fees as set forth in section A8.002(a)(7) of this code.

Drought Level III

- The minimum criteria for this drought stage shall be the following: The required minimum daily groundwater production coupled with the total amount of surface water available, as determined by the Water Utilities Director, to the city from its developed water sources is less than a 12-month supply.
- In addition to the water conservation measures stated in section 11.05.002 of this article, the following water conservation measures shall be in force during Water Supply Stage - Drought Level III:
    - The use of treated or raw city water for watering of lawns, gardens, landscaped areas, golf courses (including greens), shrubs or other plants being grown outdoors is prohibited. Hand watering or drip irrigation of trees and foundations may be done on days and at times as established by the City Council.
    - The use of treated or raw city water to fill, refill or maintain the level of any fountain or swimming pool is prohibited.

- Washing of automobiles, trucks, trailers, boats, or other types of vehicles or mobile equipment is prohibited except, if the health, safety, and welfare of the public is contingent upon vehicle cleaning, as determined by the Director of City Health Services, then the washing of such vehicles shall be allowed.

- A multiplier shall be assessed to the volumetric water fees as set forth in section A8.002(a)(7) of this code.

Initiation and Termination Procedure

The Water Utilities Director shall notify the City Manager and City Council upon entering the threshold of a drought stage. The Council shall implement each stage by resolution. Such resolution shall be published one time in the local newspaper. The criteria for each stage and the water management measures which shall be enforced are listed in the Water Supply Stages section.

The Water Utilities Director for the City will act as the administrator of the water conservation and drought contingency plan. The administrator will oversee the execution and implementation of all elements of the program. The administrator will be responsible for supervising the promulgation and retention of adequate records for program verification.

The Water Conservation Plan will be maintained for the duration of the City's financial obligation to the Texas Water Development Board.

Targets and Goals

The San Angelo Drought Contingency Ordinance is designed to reduce water demand through the imposition of specific water use restrictions and the use of bill surcharges for customers depending upon the level of the reservoir system storage. At each successive condition, the water use reduction goals increase. More restrictive measures are mandated as reservoir storage decreases, the demand reduction measures are summarized in Drought Water Reduction Targets below.

Drought Water Reduction Targets

Level	Reservoir Storage Level	Target Demand Reduction
Level 1	24 months' supply	10%
Level 2	18 months' supply	15%
Level 3	12 months' supply	25%

Variance Procedures and Exceptions

Section 11.05.004 of the City code lays out the procedures for requesting and receiving a variance to the enforceable provision of Water Conservation and Drought Contingency Ordinance.

A person desiring an exemption from any provision of the restrictions must file a petition for a variance with the City Manager. All petitions for variances must be reviewed and acted upon by the City Council. The petition is required to contain certain specific information detailed by ordinance including alternative conservation measures implemented by the petitioner as a condition of receiving the variance. The City Council may also impose other requirements as a condition of granting the variance.

Enforcement and Wholesale Provisions

Section 11.05.002 of the ordinance provides for the Water Utilities Director of the City as the manager of the Water Conservation Plan.

Wholesale customers of the City are required to adopt applicable provisions of the City's Water Conservation and Drought Contingency Plan. Contracts for the sale of water already in effect will be revised to reflect the applicable provisions of the City's most current Water Conservation and Drought Contingency Plan when the contracts are renewed. Violations of the ordinance are misdemeanors under City code, and specific penalties are described in Section 11.05.006 of the code.

Informing and Educating the Public

The Water Utilities Director will provide reports to the news media with information regarding current water supply conditions, projected water supply, and demand conditions if the current drought conditions continue, and consumer information on water conservation measures and practices. Information describing each water supply stage trigger point and drought level restrictions on water use shall be prepared and published on the City's website.

Appendix A Utility Profile- Texas Water Development Board

Texas Water Development Board

UTILITY PROFILE FOR RETAIL WATER SUPPLIER

CONTACT INFORMATION

Name of Utility: City of San Angelo

Public Water Supply Identification Number (PWS ID): TX2260001

Certificate of Convenience and Necessity (CCN) Number: 10242

Surface Water Right ID Number: 88, 407, 457, 1191, 1266, 1298-B, 1318-D, 1319-C, 1323, 1325-A, 1326, 1333-A, 1337-A, 1348-B, 1357-A, 1401, 2311

Wastewater ID Number: 20097

Contact: First Name: Allison Last Name: Strube

Title: Water Utilities Director

Address: 301 W. Beauregard City: San Angelo State: TX

Zip Code: 76903 Zip+4: Email: allison.strube.cosatx.us

Telephone Number: 3256574209 Date: 4/26/2019

Is this person the designated Conservation Coordinator? ○ Yes ◉ No

Coordinator: First Name: Maria Last Name: Padilla

Title: Water Conservation Coordinator

Address: 301 W. Beauregard City: San Angelo Zip Code: 76903

Email: maria.padilla@cosatx.us Telephone Number: 325-657-4330

Regional Water Planning Group: F

Groundwater Conservation District:

Our records indicate that you:

☑ Received financial assistance of $500,000 or more from TWDB

☑ Have 3,300 or more retail connections

☑ Have a surface water right with TCEQ

A. Population and Service Area Data

1. Current service area size in square miles: 60

Texas Water Development Board

UTILITY PROFILE FOR RETAIL WATER SUPPLIER

Attached file(s):

File Name	File Description
San Angelo Service Area.pdf	
GIS Map San Angelo.pdf	

2. Historical service area population for the previous five years, starting with the most current year.

Year	Historical Population Served By Retail Water Service	Historical Population Served By Wholesale Water Service	Historical Population Served By Wastewater Water Service
2018	100,119	1,400	88,605
2017	100,700	1,400	89,120
2016	100,450	2,175	88,898
2015	98,975	2,175	89,078
2014	97,492	3,200	87,743

3. Projected service area population for the following decades.

Year	Projected Population Served By Retail Water Service	Projected Population Served By Wholesale Water Service	Projected Population Served By Wastewater Water Service
2020	103,243	1,825	91,370
2030	116,437	1,931	103,047
2040	123,653	2,019	109,433
2050	131,315	2,097	116,214
2060	139,451	2,170	123,414

4. Described source(s)/method(s) for estimating current and projected populations.

2021 Regional Water Plan TWDB

Attached file(s):

File Name	File Description
2021 Regional Water Plan-Population Projections.pdf	2021 Regional Water Plan- Population Projections for 2020-2070

Texas Water Development Board

UTILITY PROFILE FOR RETAIL WATER SUPPLIER

B. System Input

System input data for the previous five years.
Total System Input = Self-supplied + Imported – Exported

Year	Water Produced in Gallons	Purchased/Imported Water in Gallons	Exported Water in Gallons	Total System Input	Total GPCD
2018	4,434,688,889	0	129,812,467	4,304,876,422	118
2017	4,231,538,384	0	167,289,691	4,064,248,693	111
2016	4,124,193,939	0	153,548,958	3,970,644,981	108
2015	4,312,668,687	0	162,888,598	4,149,780,089	115
2014	4,706,251,513	0	203,218,000	4,503,033,513	127
Historic Average	4,361,868,282	0	163,351,543	4,198,516,740	116

C. Water Supply System

1. Designed daily capacity of system in gallons: 42,000,000
2. Storage Capacity
   - 2a. Elevated storage in gallons: 4,250,000
   - 2b. Ground storage in gallons: 12,900,000

Texas Water Development Board

UTILITY PROFILE FOR RETAIL WATER SUPPLIER

D. Projected Demands

1. The estimated water supply requirements for the next ten years using population trends, historical water use, economic growth, etc.

Year	Population	Water Demand (gallons)
2020	103,243	5,840,552,302
2021	104,562	5,897,023,281
2022	105,882	5,953,493,250
2023	107,201	6,009,963,219
2024	108,521	6,066,433,188
2025	109,840	6,122,903,157
2026	111,159	6,179,373,126
2027	112,479	6,235,843,095
2028	113,798	6,292,313,064
2029	115,118	6,348,783,033

2. Description of source data and how projected water demands were determined.

We used the TWDB population and Water Demand projections

Attached file(s):

File Name	File Description
2021 Regional Water Plan-Population Projections.pdf	
Water Demand Projections San Angelo.pdf	

Texas Water Development Board

UTILITY PROFILE FOR RETAIL WATER SUPPLIER

E. High Volume Customers

1. The annual water use for the five highest volume **RETAIL customers.**

Customer	Water Use Category	Annual Water Use	Treated or Raw
Goodfellow Air Force Base	Institutional	121,469,000	Treated
Robinson Premium Beef	Industrial	59,043,000	Treated
Shannon Medical Center	Institutional	53,178,000	Treated
Angelo State University	Institutional	43,844,000	Treated
Tom Green County Jail	Institutional	23,877,000	Treated

2. The annual water use for the five highest volume **WHOLESALE customers.**

Customer	Water Use Category	Annual Water Use	Treated or Raw
Upper Colorado River Authority	Municipal	60,093,000	Treated
Millersview-Doole	Municipal	2,406,000	Treated

F. Utility Data Comment Section

Additional comments about utility data.

Texas Water Development Board

UTILITY PROFILE FOR RETAIL WATER SUPPLIER

Section II: System Data

A. Retail Water Supplier Connections

1. List of active retail connections by major water use category.

Water Use Category Type	Total Retail Connections (Active + Inactive)	Percent of Total Connections
Residential - Single Family	30,703	87.96 %
Residential - Multi-Family	701	2.01 %
Industrial	110	0.32 %
Commercial	2,900	8.31 %
Institutional	474	1.36 %
Agricultural	19	0.05 %
Total	34,907	100.00 %

2. Net number of new retail connections by water use category for the previous five years.

	Net Number of New Retail Connections						
Year	**Residential - Single Family**	**Residential - Multi-Family**	**Industrial**	**Commercial**	**Institutional**	**Agricultural**	**Total**
2018	53	0	0	0	3	7	63
2017	336	5	6	0	0	1	348
2016	0	0	0	0	6	5	11
2015	1,142	18	87	0	13	0	1,260
2014	621	0	5	97	132	0	855

Texas Water Development Board

UTILITY PROFILE FOR RETAIL WATER SUPPLIER

B. Accounting Data

The previous five years' gallons of RETAIL water provided in each major water use category.

Year	Residential - Single Family	Residential - Multi-Family	Industrial	Commercial	Institutional	Agricultural	Total
2018	2,085,576,000	422,052,000	188,238,000	534,662,000	349,522,000	12,811,000	3,592,861,000
2017	2,196,878,000	437,990,000	121,023,000	492,301,000	438,404,000	3,840,000	3,690,436,000
2016	2,009,983,000	420,210,000	94,995,000	467,562,000	383,884,000	1,695,000	3,378,329,000
2015	2,025,793,000	386,679,000	114,610,000	462,281,000	378,822,000	0	3,368,185,000
2014	1,963,539,000	437,289,000	113,602,000	522,679,000	359,900,000	0	3,397,009,000

C. Residential Water Use

The previous five years residential GPCD for single family and multi-family units.

Year	Residential - Single Family	Residential - Multi-Family	Total Residential
2018	69	0	69
2017	72	0	72
2016	66	0	66
2015	67	0	67
2014	67	0	67
Historic Average	68	0	68

Texas Water Development Board

UTILITY PROFILE FOR RETAIL WATER SUPPLIER

D. Annual and Seasonal Water Use

1. The previous five years' gallons of treated water provided to RETAIL customers.

Month	Total Gallons of Treated Water				
	2018	2017	2016	2015	2014
January	224,279,000	248,764,000	234,919,000	241,067,000	262,979,000
February	275,224,000	235,687,000	235,431,000	208,777,000	261,802,000
March	224,593,000	228,648,000	247,275,000	221,896,000	237,377,000
April	280,850,000	294,535,000	278,779,000	241,257,000	264,595,000
May	305,754,000	305,478,000	263,916,000	271,426,000	271,850,000
June	361,763,000	326,745,000	274,956,000	263,922,000	296,621,000
July	407,415,000	365,733,000	340,730,000	300,971,000	384,169,000
August	408,688,000	378,609,000	406,701,000	382,037,000	379,637,000
September	351,691,000	345,724,000	320,999,000	389,903,000	338,228,000
October	234,896,000	298,829,000	279,694,000	374,550,000	328,228,000
November	256,441,000	300,098,000	270,498,000	273,325,000	294,817,000
December	248,456,000	256,977,000	239,667,000	248,762,000	252,996,000
Total	3,580,050,000	3,585,827,000	3,393,565,000	3,417,893,000	3,573,299,000

Texas Water Development Board

UTILITY PROFILE FOR RETAIL WATER SUPPLIER

2. The previous five years' gallons of raw water provided to RETAIL customers.

Month	Total Gallons of Raw Water				
	2018	2017	2016	2015	2014
January	345,510,000	293,163,000	326,994,000	340,179,000	336,775,000
February	295,820,000	268,664,000	339,826,000	299,895,000	315,750,000
March	347,457,000	348,730,000	354,549,000	341,298,000	356,830,000
April	384,613,000	351,760,000	345,124,000	357,110,000	368,666,000
May	409,643,000	406,160,000	362,786,000	359,360,000	376,995,000
June	500,996,000	441,526,000	370,712,000	407,329,000	377,926,000
July	542,583,000	477,303,000	490,453,000	454,506,000	480,087,000
August	448,083,000	406,861,000	435,066,000	557,146,000	500,818,000
September	346,833,000	391,084,000	336,414,000	500,882,000	422,317,000
October	333,866,000	376,706,000	366,820,000	431,913,000	437,507,000
November	322,587,000	333,749,000	308,967,000	351,536,000	348,637,000
December	306,401,000	308,997,000	296,109,000	335,298,000	336,922,000
Total	4,584,392,000	4,404,703,000	4,333,820,000	4,736,452,000	4,659,230,000

3. Summary of seasonal and annual water use.

	Summer RETAIL (Treated + Raw)	Total RETAIL (Treated + Raw)
2018	2,669,528,000	8,164,442,000
2017	2,396,777,000	7,990,530,000
2016	2,318,618,000	7,727,385,000
2015	2,365,911,000	8,154,345,000
2014	2,419,258,000	8,232,529,000
Average in Gallons	2,434,018,400.00	8,053,846,200.00

Texas Water Development Board

UTILITY PROFILE FOR RETAIL WATER SUPPLIER

E. Water Loss

Water Loss data for the previous five years.

Year	Total Water Loss in Gallons	Water Loss in GPCD	Water Loss as a Percentage
2018	554,691,517	15	12.89 %
2017	135,326,134	4	3.33 %
2016	328,992,919	9	8.29 %
2015	594,050,838	16	14.32 %
2014	288,744,594	8	6.41 %
Average	380,361,200	10	9.05 %

F. Peak Day Use

Average Daily Water Use and Peak Day Water Use for the previous five years.

Year	Average Daily Use (gal)	Peak Day Use (gal)	Ratio (peak/avg)
2018	22,368,334	29016608	1.2972
2017	21,891,863	26051923	1.1900
2016	21,170,917	25202369	1.1904
2015	22,340,671	25716423	1.1511
2014	22,554,873	26296282	1.1659

G. Summary of Historic Water Use

Water Use Category	Historic Average	Percent of Connections	Percent of Water Use
Residential - Single Family	2,056,353,800	87.96 %	59.00 %
Residential - Multi-Family	420,844,000	2.01 %	12.07 %
Industrial	126,493,600	0.32 %	3.63 %
Commercial	495,897,000	8.31 %	14.23 %
Institutional	382,106,400	1.36 %	10.96 %
Agricultural	3,669,200	0.05 %	0.11 %

Texas Water Development Board

UTILITY PROFILE FOR RETAIL WATER SUPPLIER

H. System Data Comment Section

Section III: Wastewater System Data

A. Wastewater System Data

1. Design capacity of wastewater treatment plant(s) in gallons per day: 13,200,000

2. List of active wastewater connections by major water use category.

Water Use Category	Metered	Unmetered	Total Connections	Percent of Total Connections
Municipal	28,269	0	28,269	91.49 %
Industrial	53	0	53	0.17 %
Commercial	2,311	0	2,311	7.48 %
Institutional	266	0	266	0.86 %
Agricultural	0	0	0	0.00 %
Total	30,899	0	30,899	100.00 %

3. Percentage of water serviced by the wastewater system: 88.50 %

Texas Water Development Board

UTILITY PROFILE FOR RETAIL WATER SUPPLIER

4. Number of gallons of wastewater that was treated by the utility for the previous five years.

Month	Total Gallons of Treated Water				
	2018	2017	2016	2015	2014
January	226,316,000	226,316,000	246,471,000	263,413,000	248,250,000
February	223,085,000	213,997,000	240,006,000	234,242,000	227,922,000
March	247,252,000	232,368,000	258,145,000	260,196,000	242,936,000
April	222,112,000	224,457,000	254,744,000	248,146,000	231,483,000
May	272,455,000	222,524,000	252,924,000	264,765,000	266,670,000
June	242,683,000	236,054,000	285,367,000	262,835,000	242,752,000
July	242,295,000	232,751,000	252,709,000	271,769,000	253,776,000
August	243,369,000	248,408,000	246,409,000	271,176,000	267,441,000
September	259,241,000	251,813,000	252,944,000	260,569,000	262,995,000
October	329,803,000	235,204,000	240,936,000	268,844,000	259,609,000
November	274,558,000	230,549,000	238,111,000	251,833,000	257,650,000
December	272,733,000	226,236,000	230,637,000	260,755,000	250,103,000
Total	3,055,902,000	2,780,677,000	2,999,403,000	3,118,543,000	3,011,587,000

5. Could treated wastewater be substituted for potable water?

(●) Yes ( ) No

B. Reuse Data

1. Data by type of recycling and reuse activities implemented during the current reporting period.

Type of Reuse	Total Annual Volume (in gallons)
On-site Irrigation	
Plant wash down	
Chlorination/de-chlorination	
Industrial	
Landscape irrigation (park,golf courses)	
Agricultural	3,055,902,000
Discharge to surface water	
Evaporation Pond	
Other	
Total	3,055,902,000

UTILITY PROFILE FOR RETAIL WATER SUPPLIER

C. Wastewater System Data Comment

Additional comments and files to support or explain wastewater system data listed below.

Appendix B Ordinance Language: City of San Angelo Water Conservation and Drought Contingency Plan

CERTIFICATE

STATE OF TEXAS	§	
	§	**KNOW ALL BY THESE PRESENTS**
COUNTY OF TOM GREEN	§	

I, Julia Antilley, City Clerk for the City of San Angelo, Texas, hereby certify that the City Council of the City of San Angelo, at its regular meeting on September 4, 2019, adopted the 2019 Water Conservation Plan, as recorded on Page 380 of Volume 2019 of the official City Council Minute Records.

IN WITNESS WHEREOF, I have hereunto set my hand and the seal of said City this 10th day of September, 2019.

THE CITY OF SAN ANGELO

JULIA ANTILLEY, CITY CLERK

ARTICLE 11.05 - WATER CONSERVATION AND DROUGHT CONTINGENCY PLAN[9]

Footnotes:

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State Law reference— Drought contingency plans, V.T.C.A., Water Code, sec. 11.1272.

Sec. 11.05.001 - Purpose

The purpose of the water conservation and drought contingency plan is to encourage water conservation at all times and to establish a procedure for identifying, classifying and handling a water supply and/or a water demand emergency effectively and efficiently.

- (Ordinance adopted 2-7-12)

Sec. 11.05.002 - Water conservation measures

The city will utilize the following strategies to encourage, promote and require citizens to conserve water at all times.

(1) *Conservation plan* . The "City of San Angelo Water Conservation Plan," as adopted by Council, on file in the office of the city clerk, and available for public inspection, is adopted and incorporated herein.

(A) *Implementation* . The director of water utilities will act as the administrator of the water conservation plan. The administrator will oversee the execution and implementation of all elements of the program and will be responsible for supervising the promulgation and retention of records for program verification.

(2) *Plumbing code* . The city plumbing code has provision for water-conserving plumbing devices. The city will enforce the requirements of the code to ensure the use of water-saving devices.

(3) *Universal metering* . All users of municipal treated water, except for fire sprinkler lines, will be metered.

(4) *Water supply meters* . The city metering devices will record water use with an accuracy of plus or minus five percent in order to measure and account for the amount of raw water diverted from the source of supply.

(5) *Restaurants* . Restaurants shall not serve water to their customers except when specifically requested by the customer.

(6) *Waste of water* . As defined below, shall be prohibited.

(A) Allowing treated or raw city water, greywater, reclaimed water or well water to run off property to a gutter, street, alley, ditch or drainage facility and drain for more than 150 feet downgrade of the point of entry into such gutter, street, alley, ditch or drainage facility.

(B) Failure to repair a controllable leak.

(7) *Prohibited watering hours* . The use of treated or raw city water, greywater or reclaimed water for watering lawns, gardens, landscape areas, trees, golf courses, shrubs or other plants being grown outdoors (not in a nursery) shall be prohibited between the hours of 12:00 noon and 6:00 p.m. daily from April 1 through October 31.

(8) *Watering frequency* . The use of treated or raw city water, greywater or reclaimed water for watering lawns, landscape areas, trees, gardens, golf courses (except greens), shrubs or other plants being grown outdoors (not in a nursery) shall be allowed at a frequency of twice every seven days during the period of April 1 through October 31 and once every seven days during the period of November 1 through March 31. Golf course greens may be watered once per day year round.

(9) *New landscape* . Watering of newly seeded or sodded lawns or newly planted trees, shrubs or landscape plants will be allowed at the following frequency provided written notification is given to the city code compliance division or water conservation division of the watering schedule:

(A) Days 1—14 from planting: three times per day every day of such period at any time of day.

(B) Days 15—28 from planting: twice per day every day of such period at any time of day.

(10) *Allowable application rates* . The maximum amount of treated or raw city water, greywater or reclaimed water applied to established lawns, landscape plants, golf courses (except greens) or shrubs shall not exceed one inch per week.

(11) *Drip irrigation* . Landscape or foundation watering with a drip irrigation system such as a soaker hose, deep root watering system, drip pipe or tape, or bubbler shall be permitted on any day and at any time of day provided that the total amount of water applied shall not exceed one inch per week. For the purpose of this article, drip irrigation shall mean a water-saving irrigation system designed to emit water at low volumes and low pressures directly onto or below the soil surface without airborne streams or droplets.

(12) *Hand watering* . Hand watering of lawns, gardens, landscape areas, trees, shrubs or other plants being grown outdoors or foundations may be done on any day, except during the prohibited watering hours, provided the allowable application rate is not exceeded. Hand watering shall be watering with a hose that is hand-held for the duration of the irrigation event, or watering with a container of five gallons or less.

(13) *Excessive usage of water* . Excessive usage of water as defined below shall be prohibited and shall be a violation of the water conservation and drought contingency plan:

(A) Any use of water by a customer in excess of the maximum allowable application rates under subsection (10) above.

(14) *Contracts with other political subdivisions, water supply corporations or water suppliers* . Any political subdivision, water supply corporation, or water supplier that contracts with the city for the purchase of water shall adopt applicable provisions of the city's water conservation and drought contingency plan. Contracts for the sale of water that are already in effect will be revised to reflect the applicable provisions of the city's most current water conservation and drought contingency plan when the contracts are renewed or extended. To the extent of the city's legal authority, the city shall require the city's wholesale customers to issue a public notice advising their water customers of required drought management measures declared in the city as follows in section 11.05.003.

(A) In the event that the triggering criteria specified in section 11.05.003(f) of the plan for Water Supply Stage - Drought Level III have been met, the city manager is hereby authorized to initiate allocation of water supplies on a pro rata basis in accordance with Texas Water Code section 11.039 and according to the following water allocation policies and procedures.

(B) A wholesale customer's monthly allocation shall be a percentage of the customer's water usage baseline. The percentage will be set by resolution of the city council based on the administrator's assessment of the severity of the water shortage condition and the need to curtail water diversions and/or deliveries and may be adjusted periodically by resolution of the city council as conditions warrant. Once pro rata allocation is in effect, water diversions by or deliveries to each wholesale customer shall be limited to the allocation established for each month.

(C) Upon initiation of pro rata water allocation, the water utility director shall provide notice, by certified mail, to each wholesale customer informing them of their monthly water usage allocations and shall notify the news media and the executive director of the state commission on environmental quality.

(15) *Water demand emergency* . In the event the quantity of water usage from the city's water distribution system reaches a level that exceeds the amount which may be treated or safely delivered through the system, the water utilities director shall notify the city manager and the city council of such an occurrence. The city council shall be authorized to limit the use of water by passage of a resolution outlining such limitations, which shall remain in effect until the water demand emergency can be met. Upon initiation of a water demand emergency, the water utility director shall provide notice, by certified mail, to the executive director of the state commission on environmental quality and shall notify the news media.

(16) *Water supply emergency* . In the event of a water system failure or emergency (i.e., pressure zone deficiencies, chemical spills, broken water mains, power outages, failures of storage tanks or other equipment, treatment plant breakdown and/or water contamination) which limits the amount of water which may be treated or safely delivered through the system, the water utilities director shall notify the city manager and city council of such occurrence. The city council shall be authorized to limit the use of water by passage of a resolution outlining such limitations, which shall remain in effect until the water supply emergency can be met. Upon initiation of a water supply emergency, the water utility director shall provide notice, by certified mail, to the executive director of the state commission on environmental quality and shall notify the news media.

(17) *Public information* . The water utilities director will provide regular public education and information about the importance of year-round water efficiency as delineated in the plan, and will provide general information about water supply conditions and drought plan provisions on at least an annual basis. The purpose of this effort shall be to keep the citizenry informed about the drought and conservation plans and their importance to the city's water supply.

- (Ordinance adopted 2-7-12; Ordinance adopted 2-21-12, § 1; Ordinance adopted 5-6-14; Ordinance adopted 11-4-14; Ordinance adopted 5-3-16, § 1)

Sec. 11.05.003 - Drought stages and water management measures

(a) *Water supply sources* . The city has several water supply sources that it can draw upon to meet its needs. Local surface water sources include Lake Nasworthy, Twin Buttes Reservoir, O.C. Fisher Reservoir and the South Concho River. Nonlocal surface water supplies are available to the city from O.H. Ivie Reservoir and Spence Reservoir. The city has a groundwater source in the Hickory Aquifer. When local reservoirs are full, the city's primary water supply will be from these reservoirs along with nonlocal or groundwater sources as needed. When local reservoirs are below full but above drought trigger points, the local sources may be utilized along with water brought in from nonlocal sources or groundwater sources. During drought conditions, the primary source of supply will be nonlocal sources, subject to the maximum amount available from each source, with the remaining amount of water coming from the local sources or groundwater sources that the city may develop.

(b) *Drought trigger point* . Whenever the total amount of water available to the city falls below the minimum criteria established for each water supply stage level, the city shall be deemed to have entered a drought stage for management of its water supplies. The water utilities director shall notify the city manager and city council upon entering the threshold of a drought stage. The council shall implement each stage by resolution. A notice of such resolution shall be published one time in the local newspaper. The criteria for each stage and the water management measures which shall be enforced are as follows in subsections (d) to (f).

(c) *Public information* . The water utilities director will provide reports to the news media with information regarding current water supply conditions, projected water supply and demand conditions if the current drought conditions continue, and consumer information on water conservation measures and practices. Information describing each water supply stage trigger point and drought level restrictions on water use shall be prepared and published on the city's website.

(d) *Water supply stage - Drought Level I* .

(1) The minimum criteria for this drought stage shall be the following: The required minimum daily groundwater production coupled with the total amount of surface water available, as determined by the water utilities director, to the city from its developed water sources is less than a 24-month supply.

(2) In addition to the conservation measures stated in section 11.05.002 of this article, the following additional water conservation measures shall be in force during Water Supply Stage - Drought Level I.

(A) The use of treated or raw city water for watering lawns, gardens, landscape areas, trees, shrubs, golf courses (except greens) or other plants being grown outdoors (not in a nursery) shall be prohibited at all times; provided, however, a person may do such watering which shall be once every seven days during the period of April 1 through October 31 and once every 14 days during the period of November 1 through March 31 except during the "prohibited watering hours" as stated in section 11.05.002.

(B) Golf courses greens may be watered daily except during the "prohibited watering hours" as stated in section 11.05.002.

(C) Watering of "new landscape" shall be allowed in accordance with the provisions as stated in section 11.05.002 for "new landscape."

(3) A multiplier shall be assessed to the volumetric water fees as set forth in section A8.002(a)(7) of this code.

(e) *Water supply stage - Drought Level II* .

(1) The minimum criteria for this drought stage shall be the following: The required minimum daily groundwater production coupled with the total amount of surface water available, as determined by the water utilities director, to the city from its developed water sources is less than an 18-month supply.

(2) In addition to the conservation measures stated in section 11.05.002 of this article, the following additional water conservation measures shall be in force during Water Supply Stage - Drought Level II:

(A) The use of treated or raw city water for watering lawns, gardens, landscape areas, trees, shrubs, golf courses (except greens) or other plants being grown outdoors (not in a nursery) shall be prohibited at all times; provided, however, a person may do such watering which shall be once every seven days during the period of April 1 through October 31 and once every 14 days during the period of November 1 through March 31 except during the "prohibited watering hours" as stated in section 11.05.002.

(B) Golf course greens may be watered daily except during the "prohibited watering hours" as stated in section 11.05.002.

(C) Watering of "new landscape" shall not be allowed as stated in section 11.05.002 for "new landscape."

(3) A multiplier shall be assessed to the volumetric water fees as set forth in section A8.002(a)(7) of this code.

(f) *Water supply stage - Drought Level III* .

(1) The minimum criteria for this drought stage shall be the following: The required minimum daily groundwater production coupled with the total amount of surface water available, as determined by the water utilities director, to the city from its developed water sources is less than a 12-month supply.

(2) In addition to the water conservation measures stated in section 11.05.002 of this article, the following water conservation measures shall be in force during Water Supply Stage - Drought Level III:

(A) The use of treated or raw city water for watering of lawns, gardens, landscape areas, golf courses (including greens), shrubs or other plants being grown outdoors is prohibited. Hand watering or drip irrigation of trees and foundations may be done on days and at times as established by the city council.

(B) The use of treated or raw city water to fill, refill or maintain the level of any fountain or swimming pool is prohibited.

(C) Washing of automobiles, trucks, trailers, boats, or other types of vehicles or mobile equipment is prohibited except, if the health, safety and welfare of the public is contingent upon vehicle cleaning, as determined by the director of city health services, then the washing of such vehicles shall be allowed.

(3) A multiplier shall be assessed to the volumetric water fees as set forth in section A8.002(a)(7) of this code.

- (Ordinance adopted 2-7-12; Ordinance adopted 2-21-12, § 2; Ordinance adopted 8-6-13; Ordinance adopted 5-3-16, § 1; Ordinance adopted 8-2-16)

Sec. 11.05.004 - Exceptions and variances

(a) *Authority of city council* . The city council may allow exceptions to any of the provisions of this article. The council may place conditions on any exception.

(b) *Exceptions to watering restrictions* . There shall be an exception to the prohibitions of this article regarding watering restrictions:

(1) Use of water for installing, testing and repairing sprinkler systems.

(2) Watering frequency and schedules for public parks, athletic facilities, schools, colleges and cemeteries shall be as approved by the city council.

(c) *Variances* .

(1) A person desiring an exemption from any provision of this article shall file a petition for variance with the city manager. All petitions for variances shall be reviewed and acted upon by the city council. The petition shall include at a minimum the following information:

(A) Name and address of the petitioner(s).

(B) Purpose and estimated amount of water use.

(C) Specific provision(s) of this article from which the petitioner is requesting an exemption.

(D) Detailed statement as to how the specific provision of this article adversely affects the petitioner or what damage or harm will occur to the petitioner or others if the petitioner complies with this article.

(E) Description of the relief requested.

(F) Period of time for which the variance is sought.

(G) Alternative water use restrictions or other measures the petitioner is taking or proposes to take to meet the intent of this article and the effective date of such other measures.

(H) Other pertinent information.

(I) A statement that petitioner has not within the last six months intentionally violated the current ordinance for which a variance is sought or, if such violations have occurred, a statement setting out all reasons why such ordinance was violated.

(2) The city council may grant a variance from the requirements of this article after determining that, because of special circumstances applicable to the applicant, compliance with this article:

(A) Cannot be technically accomplished during the expected duration of the water supply shortage or other condition for which this article is in effect;

(B) Will cause undue hardship on a program or service offered by a public entity; or

(C) Substantially threatens the applicant's primary source of income.

(3) Additionally, the city council may grant a variance from the requirements of this article if it determines that the applicant can implement alternative water use restrictions which meet or exceed the intent of this article. The city council shall approve specific alternative water use restrictions.

(4) Any variance granted by the city council may be revoked after a determination by the city council that revocation is necessary for the public health and safety or upon a finding that the

holder of a variance allowing alternative water use restrictions has not complied with such alternative restrictions.

- (Ordinance adopted 2-7-12; Ordinance adopted 9-27-12)

Sec. 11.05.005 - Implementation and service restrictions

(a) *Implementation* .

(1) The water utilities director for the city will act as the administrator of the water conservation drought contingency plan. The administrator will oversee the execution and implementation of all elements of the program. The administrator will be responsible for supervising the promulgation and retention of adequate records for program verification.

(2) The water conservation plan will be maintained for the duration of the city's financial obligation to the state under the state revolving loan fund program.

(b) *Contracts with other political subdivisions, water supply corporations or water suppliers* . Any political subdivision, water supply corporation, or water supplier that contracts with the city for the purchase of water shall adopt applicable provisions of the city's water conservation and drought contingency plan. Contracts for the sale of water that are already in effect will be revised to reflect the applicable provisions of the city's most current water conservation and drought contingency plan when the contracts are renewed.

(c) *Service restrictions* . The water conservation and drought contingency plan shall be enforced by the following service restrictions:

(1) Water service taps will not be provided to customers not meeting the plan requirements.

(2) The inclining block water rate structure should encourage retrofitting of old plumbing fixtures which use large quantities of water.

(3) Customers who do not pay their water bills shall be subject to discontinuance or disconnection of service.

(4) The building inspection department will not certify new construction which fails to meet the plan requirements.

- (Ordinance adopted 2-7-12)

Sec. 11.05.006 - Enforcement

(a) Violations of any provisions of the water conservation and drought contingency plan may be enforced as follows:

(1) *First violation* . Any person or entity as defined under this chapter may be given a verbal or written warning.

(2) *Second and subsequent violations* .

(A) Violation of any provision of the water conservation and drought contingency plan constitutes a class C misdemeanor offense for which a citation may be issued.

(B) Second and subsequent violations shall be punishable by a maximum fine of up to $2,000.00 per day per violation as provided by section 1.01.009 of the Code of Ordinances of the city.

(C) Proof of a culpable mental state is not required for a conviction of an offense under this section. Each day any person or entity fails to comply with the water conservation and drought contingency plan is a separate violation.

(3) *Third and subsequent violations* . For third and subsequent violations of the water conservation and drought contingency plan, the water utilities director shall, upon due notice to the customer, be authorized to discontinue water service to the premises where such violations occur. Services discontinued or disconnected under such circumstances shall be restored only upon payment of charges as provided for in article 11.02, division 2.

(b) Compliance with any provision of the water conservation and drought contingency plan may be enforced by civil court action as provided by state and federal law.

- (Ordinance adopted 2-7-12)

Appendix C Water Rates-Current Rate Structure

Section A8.002 - Monthly water rates; sanitary sewer discharge charges; industrial waste charges; sewer tap charges

All persons supplied with water by the city shall be billed for water at the following monthly rates for water supplied on or after January 1, 2016:

- *Rate schedule*:
    - Inside the city, fixed charge - meter size:

	2016	2017	2018	2019	2020
⅝"	$21.37	$23.88	$26.68	$28.62	$30.69
1"	$25.86	$28.90	$32.29	$34.63	$37.15
1½"	$30.38	$33.96	$37.94	$40.70	$43.65
2"	$40.07	$44.78	$50.04	$53.67	$57.56
3"	$117.01	$130.76	$146.13	$156.72	$168.08
4"	$146.09	$163.26	$182.44	$195.67	$209.85
6"	$212.67	$237.66	$265.59	$284.84	$305.49
8"	$288.28	$322.15	$360.01	$386.11	$414.10

    - Residential volumetric, rate per 1,000 gallons (single-family residence, duplex, or other individually metered residential unit. Residential usage shall be the combined usage of the building meter and any landscape meter(s) serving the tract.):

	2016	2017	2018	2019	2020
0—2	$2.74	$3.00	$3.30	$3.54	$3.80
3—5	$3.99	$4.38	$4.81	$5.16	$5.54
6—15	$4.66	$5.12	$5.62	$6.03	$6.47
16—39	$4.99	$5.48	$6.02	$6.45	$6.92
>39	$9.13	$10.03	$11.02	$11.82	$12.68

- Nonresidential volumetric, rate per 1,000 gallons (commercial, apartment, mobile home park, fire hydrants, industrial, hotel/motel, hospital, school, and government):

2016	2017	2018	2019	2020
$4.62	$5.27	$6.01	$6.45	$6.92

- Landscape volumetric, rate per 1,000 gallons:

	2016	2017	2018	2019	2020
Winter					
0—89	$4.46	$5.09	$5.81	$6.23	$6.68
>89	$9.98	$11.39	$12.99	$13.93	$14.94
Summer					

0—89	$4.66	$5.32	$6.07	$6.51	$6.98
>89	$10.43	$11.90	$13.58	$14.56	$15.62

* For all landscape meters at schools, colleges, parks, or other city-owned facilities all usage will be billed at the "0—89" rate.

- Manufacturing companies which depend on water use for the construction, manufacturing, assembly or processing of products, such as creameries, medical sutures, wood and cotton processing, packing plants, commercial laundries, and carwashes, shall pay the industrial water rate.
- Angelo State University, San Angelo Independent School District, Tom Green County, Goodfellow Air Force Base and the city shall pay the governmental/schools rate.
- Where the city pays all pumping and distribution costs of untreated water, an additional charge shall be added to the untreated water rate in an amount equal to the average cost per one thousand (1,000) gallons for pumping and distributing said water.
- The charge for fire sprinkler service shall be one dollar ($1.00) per inch diameter of the main fire service feed line. This charge shall be for each line service per month.
- The charge for water service to users outside the city limits shall be one and one-half (1½) times the rate charged to users within the city limits.
- The water rate schedule shall also be adjusted as set out below pursuant to section 11.05.002 of this code entitled "water conservation measures."
    - *Drought level 1*.
        - Residential

0-2	1.0
3-5	1.05
6-15	1.05
16-39	1.10
>39	1.20

        - Nonresidential: 1.05.
        - Landscape (winter and summer): 1.10.
        - Fire hydrants: 1.00.

- Untreated Water: 1.00.

- *Drought level 2*.
  - Residential:

0—2	1.10
3—5	1.10
6—15	1.20
16—39	1.20
>39	1.30

  - Nonresidential: 1.05.
  - Landscape (winter and summer): 1.20.
  - Fire hydrants: 1.00.
  - Untreated water: 1.10.

- *Drought level 3*.
  - Residential:

0—2	1.20
3—5	1.20
6—15	1.30
16—39	1.30
>39	1.40

- Nonresidential: 1.10.
- Landscape (winter and summer): 1.30.
- Fire hydrants: 1.00.
- Untreated water: 1.20.

Any person contributing wastewater to the city's sanitary wastewater system shall be billed for wastewater so contributed at the following monthly rates on or after January 1, 2016:

- *Base fee.*

Meter Size	2016	2017	2018	2019	2020
⅝"	$22.24	24.96	$28.02	$28.86	$29.72
1"	$25.74	28.89	$32.43	$33.40	$34.41
1½"	$29.27	32.86	$36.89	$37.99	$39.13
2"	$36.81	41.32	$46.38	$47.77	$49.20
3"	$96.71	108.56	$121.86	$125.52	$129.28
4"	$119.36	$133.98	$150.39	$154.90	$159.55
6"	$171.20	$192.18	$215.72	$222.19	$228.85
8"	$230.09	$258.28	$289.91	$298.61	$307.57

- *Usage fee.*
    - *Single-family residence* :
        - A fixed monthly amount of usage shall be established for each user by averaging the user's billed water consumption for the previous months of December, January, and February. The fixed monthly average shall be recalculated each year on March 1st. If a user does not have three months of water consumption history that can be used in the averaging, then the amount of data available will be utilized.

- Blocks (1,000 gallons):

	2016	2017	2018	2019	2020
4—15 (maximum)	$2.81	3.15	$3.54	$3.64	$3.75

The monthly usage fee shall be as stated above per each 1,000 gallons of average water usage above 4,000 gallons up to a maximum of 15,000 gallons average usage. This charge applies to wastewater that does not exceed the strength of normal domestic wastewater as defined in section 11.02.121 of this code.

- A user may separately meter usage of water for outside irrigation. Such separately metered water shall not be utilized in calculating wastewater fees.

o *Multifamily residence* (duplex, apartment house, mobile home park, boardinghouse), San Angelo public schools, Angelo State University, and Goodfellow Air Force Base.

- A fixed monthly amount of usage shall be established for each user by averaging the user's billed water consumption for the previous months of December, January, and February. The fixed monthly average shall be recalculated each year on March 1st. If a user does not have three months of water consumption history that can be used in the averaging, then the amount of data available will be utilized.
- Blocks (1,000 gallons):

	2016	2017	2018	2019	2020
4 and above	$2.81	3.15	$3.54	$3.64	$3.75

The monthly usage fee shall be as stated above per each 1,000 gallons of average water usage above 4,000 gallons. This charge applies to wastewater that does not exceed the strength of normal domestic wastewater as defined in section 11.02.121 of this code.

- A user may separately meter usage of water for outside irrigation. Such separately metered water shall not be utilized in calculating wastewater fees.

- *Commercial, industrial, hospitals, churches, hotels, motels, and governmental users* (with the exception of those governmental users in subsection (B) above).

  - Blocks (1,000 gallons):

	2016	2017	2018	2019	2020
4 and above	$2.81	3.15	$3.54	$3.64	$3.75

The monthly usage fee shall be as stated above per each 1,000 gallons of water usage above 4,000 gallons. This charge applies to wastewater that does not exceed the strength of normal domestic wastewater as defined in section 11.02.121 of this code.

- A user may separately meter usage of water that does not enter the sewer. Such separately metered water shall not be utilized in calculating wastewater fees.

- *Swimming pools* :

2016	2017	2018	2019	2020
$2.81	3.15	$3.54	$3.64	$3.75

Any user with a swimming pool will be charged as stated above per month for each swimming pool which discharges backwash waters or drainage water into the city's sanitary wastewater system.

Appendix D Water Conservation Plan 5 and 10 Year Goals for Water Savings

Water Conservation Plan Goals Table
TWDB Form No.1964
Revised 12/14/2012 1:53 PM

Texas Water Development Board

WATER CONSERVATION PLAN
5- AND 10-YR GOALS FOR WATER SAVINGS

Facility Name: COSA- Water Utilities

Water Conservation Plan Year: 2019

	Historic 5yr Average	Baseline	5-yr Goal for year 2024	10-yr Goal for year 2029
Total GPCD[1]	116	118	138	130
Residential GPCD[2]	68	69	68	65
Water Loss (GPCD)[3]	10	15	13	10
Water Loss (Percentage)[4]	9 %	13 %	9 %	8 %

1. Total GPCD = (Total Gallons in System ÷ Permanent Population) ÷ 365
2. Residential GPCD = (Gallons Used for Residential Use ÷ Residential Population) ÷ 365
3. Water Loss GPCD = (Total Water Loss ÷ Permanent Population) ÷ 365
4. Water Loss Percentage = (Total Water Loss ÷ Total Gallons in System) x 100; or (Water Loss GPCD ÷ Total GPCD) x 100

Due to future expected economic and population growth we kept the city's previous goal of water consumption reduction by 1.2 percent annually starting from the City's 2000 consumption of 185 gallons per capita per day (GPCD). We also took into account the possibility of future expansion of commercial industries, which increase population and water demand of Total GPCD while still reducing the residential GPCD and Water Loss GPCD over the next 10 years.

Appendix E Certificate of Convenience and Necessity

Public Utility Commission of Texas

By These Presents Be It Known To All That

CITY OF SAN ANGELO, TEXAS

having duly applied for certification to provide water utility service for the convenience and necessity of the public, and it having been determined by this Commission that the public convenience and necessity would in fact be advanced by the provision of such service by this Applicant, is entitled to and is hereby granted this

Certificate of Convenience and Necessity

numbered 10242 , to provide water utility service to that service area or those service areas designated by final Order or Orders duly entered by this Commission, which Order or Orders are on file at the Commission offices in Austin, Texas; and are matters of official record available for public inspection; and be it known further that these presents do evidence the authority and the duty of this Grantee to provide such utility service in accordance with the laws of this State and the Rules of this Commission, subject only to any power and responsibility of this Commission to revoke or amend this Certificate in whole or in part upon a subsequent showing that the public convenience and necessity would be better served thereby.

Issued at Austin, Texas, this 1st day of November, 1979.

Philip F. Ricketts
SECRETARY OF THE COMMISSION