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December 4, 2017

Colorado Water Conservation Board
Office of Water Conservation and Drought Planning
1313 Sherman St #721
Denver, CO 80203

RE: Morgan County Quality Water District Municipal Water Efficiency Plan

ATTN: Reviewing Official

Attached herewith is the Municipal Water Efficiency Plan (Plan) prepared for the Morgan County Quality Water District (MCQWD). This plan was prepared by engineers of Farnsworth Group, and reviewed by the MCQWD and an attorney from Lyons Gaddis.

Annual water production for the past five years, ending with 2015, is summarized in Table 1. A more thorough description of water delivery, as well as source information, is provided in the Plan document. The MCQWD currently serves approximately 6,150 people.

Table 1. Annual Water Production

Year	2011	2012	2013	2014	2015
Water Production (acre-feet)	2,617	3,064	2,781	2,436	2,401

This Plan was accepted at the Annual Board of Directors Retreat on January 16 and 17, 2017. This event was open to public comment. Meeting minutes are included in Appendix B of the Plan.

This plan was completed in accordance with the CWCB Municipal Water Efficiency Plan Guidance Document.

Sincerely,

J.C. Cundall

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Farnsworth GROUP

Water Conservation Plan

MORGAN COUNTY QUALITY WATER DISTRICT

May 2018

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Introduction

A. Purpose

The purpose of this Water Conservation Plan (Plan) is to provide the Morgan County Quality Water District (District or MCQWD) with a living document that will address the use, conservation, and planning of their water resources. This Plan is tailored for the needs and goals of the District and its customers while meeting the requirements of Colorado Revised Statute §37-60-126, the "Water Conservation Act of 2004." The Plan should be reviewed annually to ensure that the conservation programs and activities are meeting the goals this Plan sets forth. Modifications should be made when necessary to reflect the changing goals and policies of the District and its customers.

B. Water Conservation Act of 2004

The Water Conservation Act of 2004 was developed to ensure that water-providing agencies and/or municipalities were using their resources wisely in order to obtain financial assistance from either the Colorado Water Conservation Board (CWCB) or the Colorado Water Resources and Power Development Authority (CWRPDA). In order to show that water resources are being used wisely, the entity providing water must provide a water conservation plan to the State Office of Water Conservation and Drought Planning (OWCDP) for review. The water conservation plan must meet the criteria outlined by the Water Conservation Act of 2004. The OWCDP is also authorized by this act to provide grants to those entities in order to develop their water conservation plans. A guidance document published on the CWCB's website was created to help entities develop an acceptable water conservation plan.

According to the Water Conservation Act of 2004, a Plan must do the following:

- Provide a schedule for Plan implementation.
- Present water saving measures and programs, included as necessary, and to consider at a minimum the following:
    - Water efficient fixtures and appliances, including toilets, urinals, showerheads, and faucets;
    - Low water use landscapes, drought-resistant vegetation, removal of phreatophytes, and efficient irrigation;
    - Water reuse systems;
    - Distribution system leak identification and repair;
    - Dissemination of public information regarding water use efficiency measures, including public education, customer water use audits, and water saving demonstrations;
    - Water rate structures and billing systems designed to encourage water use efficiency in a fiscally responsible manner;
    - Regulatory measures designed to encourage water conservation; and,
    - Incentives to implement water conservation techniques, including rebates to customers to encourage the installation of water conservation measures.
- Provide a statement defining the role of the Plan in the District's supply planning.
- Outline the steps the District used and will use to implement, monitor, review, and revise its Plan.
- Define the time period (not to exceed seven years) after which the District will review and update its Plan.

- Report, either as a percentage or in acre-foot increments, an estimate of the amount of water that has been saved through a previously implemented conservation plan and an estimate of the amount of water that will be saved through conservation when the Plan is implemented.
- The Plan shall be made available for public review for no less than 60 days. A summary of the public review and comment process shall be included in the Plan with a list of the public comments received, if any, and the District's responses.

This Water Conservation Plan for the District was developed with the assistance of the guidance document found on the CWCB's website. The guidance document sets forth nine steps for the applicant to follow as addressed in the following chapters.

C. Previous Conservation Plan

There is not an existing Water Efficiency Plan for the District.

Chapter 1: Profile of Existing Water System

OVERVIEW OF EXISTING SYSTEM

A. Purpose

The purpose of Chapter 1 is to summarize the service and operating characteristics of the District's water system to establish current conditions. These conditions will be used to evaluate and frame the importance and value of water conservation in managing future water resources.

B. Service Area

The District serves the rural areas of Morgan, Adams, and Washington counties, including the towns of Snyder, Hillrose, Goodrich, Weldona, Log Lane Village, Orchard, and Jackson Lake State Park. The system currently serves approximately 2700 taps and an area in excess of 650 square miles (see Figure 1-1.).

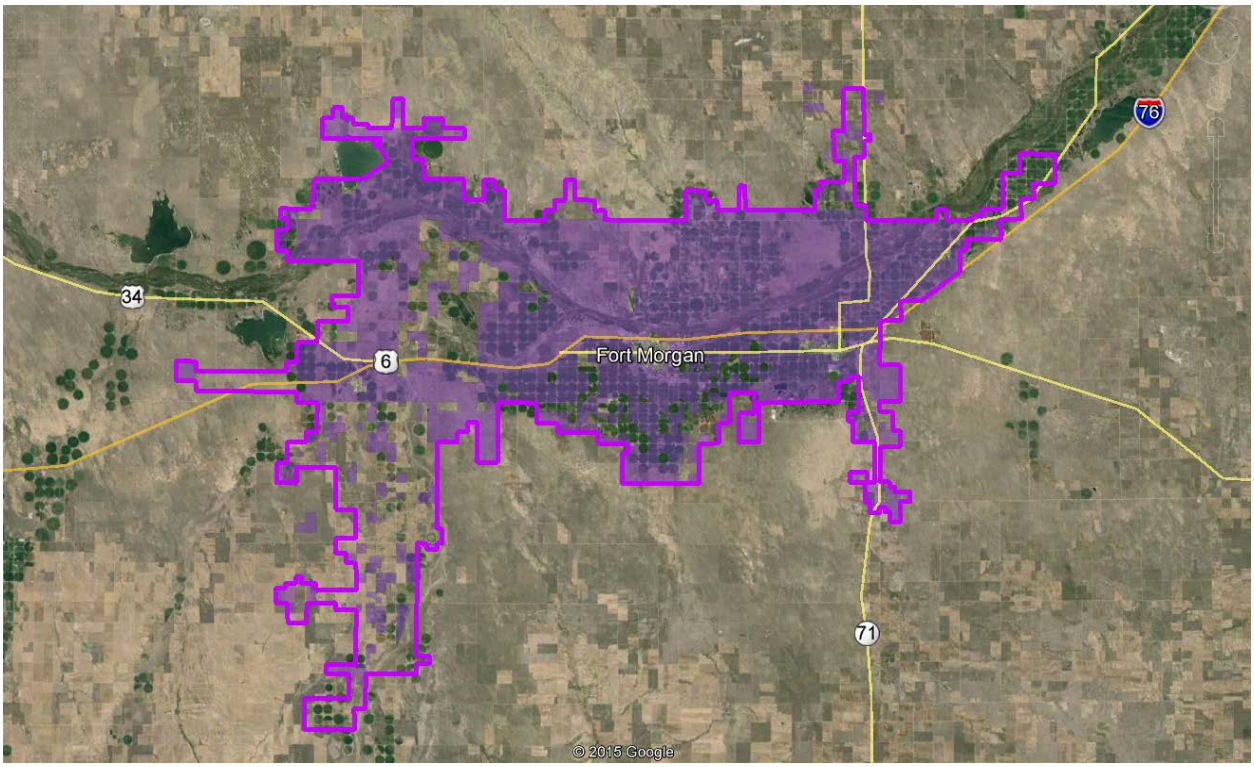

Figure 1-1: MCQWD Service Area

C. Water Sources

The District's current water supply includes both groundwater and Colorado Big Thompson (CBT) water. Groundwater is pumped from three different well fields: the Krause, Smart, and Weingardt. A thorough description of these sources follows.

Groundwater Sources

Table 1-1 provides an initial account of the primary groundwater wells operated by the District.

Table 1-1: District Groundwater Wells

	Krause Ranch	Weingardt	Smart	Total
Number of Wells	4 + State	2	2	9
Maximum Available Supply (AF/yr)	1,380 + 750 State Well	894	600	2,874 + 750

Krause Wells

There are four wells located in the Hay Gulch basin which is a part of the Lost Creek Designated Groundwater Basin. Three of the wells (Krause 2, 3, and 4) are located on District-owned land. Table 1-2 summarizes the Krause Wells.

Table 1-2: Krause Well Summary

Well ID	Permit No.	Priority Date	Drilled Date	Re-drilled Date	Permitted (acre-ft)	Pump Power (hp)	Pump Rate (gpm)
Krause #1	18338FP & 31655FP	5/15/74 & 3/20/75	6/30/75		345	50	440
Krause #2	17501FP	1/20/71	7/19/71		345	40	390
Krause #3	17502FP	1/20/71	7/19/71		345	40	500
Krause #4	16644-FP-R	9/12/72	11/20/71	3/26/2010	345	75	875
State Well	23851-F	6/4/75	10/19/78		750	25	100

The District has maintained records of the water levels in the Krause monitoring wells since 1979. The water level in the wells has shown a steady decline over the past 31 years with the total drop at about 17 feet. The water levels are shown in Figure 1-2. From the graph, it appears the downward trends are linear and are not leveling off as would be expected if the aquifer were being recharged at the original rates estimated for this basin. Based on the current trend and pumping rates, the water level is projected[1] to drop another 13 feet by 2030 and 25 feet by 2050.

The State Well is located on land leased from the State of Colorado adjacent to the Krause well field. The lease currently runs through 2037. With the continued drop in the water levels it is doubtful the aquifer could produce the additional 750 acre feet permitted for the State Well without significantly increasing the rate of decline. At 200 gpm the maximum production is estimated at 62 acre-feet over 70 days, and at 100 gpm the annual production is estimated at 160 acre-feet. The remaining wells are capable of producing their permitted amounts.

[1] Schreuder, Dr. William, Mefford, Scott G., "Study of Aquifer Conditions of the Hay Gulch Subbasin of the Lost Creek Designated Groundwater Basin", Feb. 1, 2010

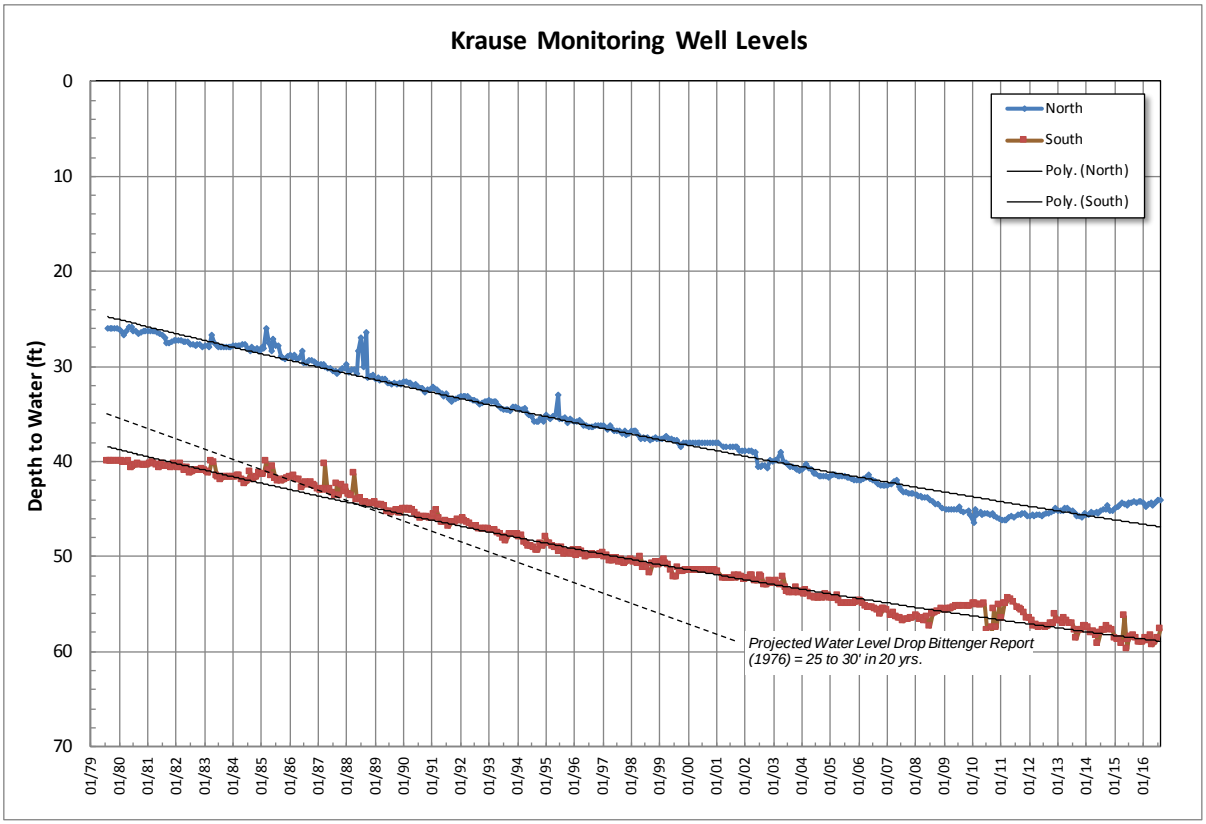

Figure 1-2: Depth to Water in Krause Wells

Weingardt Wells

The District purchased the Fugate and Weingardt property in the San Arroyo drainage covering an area of approximately 4,000 acres. The District completed Weingardt Well No. 1 in 1995 and Weingardt No. 2 in 2000. The wells are permitted for a total of 894 acre-feet/year, which can be pumped if sufficient augmentation water is available to cover depletions. The wells are covered by an augmentation plan that includes the Bijou augmentation pond. Table 1-3 provides a summary of the Weingardt Wells.

Table 1-3: Weingardt Well Summary

Well ID	Permit No.	Priority Date	Drilled Date	Permitted (acre-ft)	Pump Power (hp)	Pump Rate (gpm)
Weingardt #1	95168-VE	6/24/95	5/20/95	447	100	800
Weingardt #2	51226-F	12/13/98	6/27/2000	447	100	800

Figure 1-3, below, shows a slight decline in the pumping level from 2002 until 2006 which is probably due to the drought. Since 2006 the well levels have increased to the 2002 levels, which is partially due to the infiltration of the CBT water. Another factor in the rise in water levels is the large volume of water that has been delivered to the augmentation pond, as well as the general rise in the water table in the South Platte alluvium. The Figure also shows a higher increase in the water level of Weingardt No. 3 compared to No. 1 which is further evidence of the impact of the Bijou infiltration pond. For example, the difference in the water levels between Wells 1 and 3 in 2002 was about 12 feet compared to 9 feet in 2011.

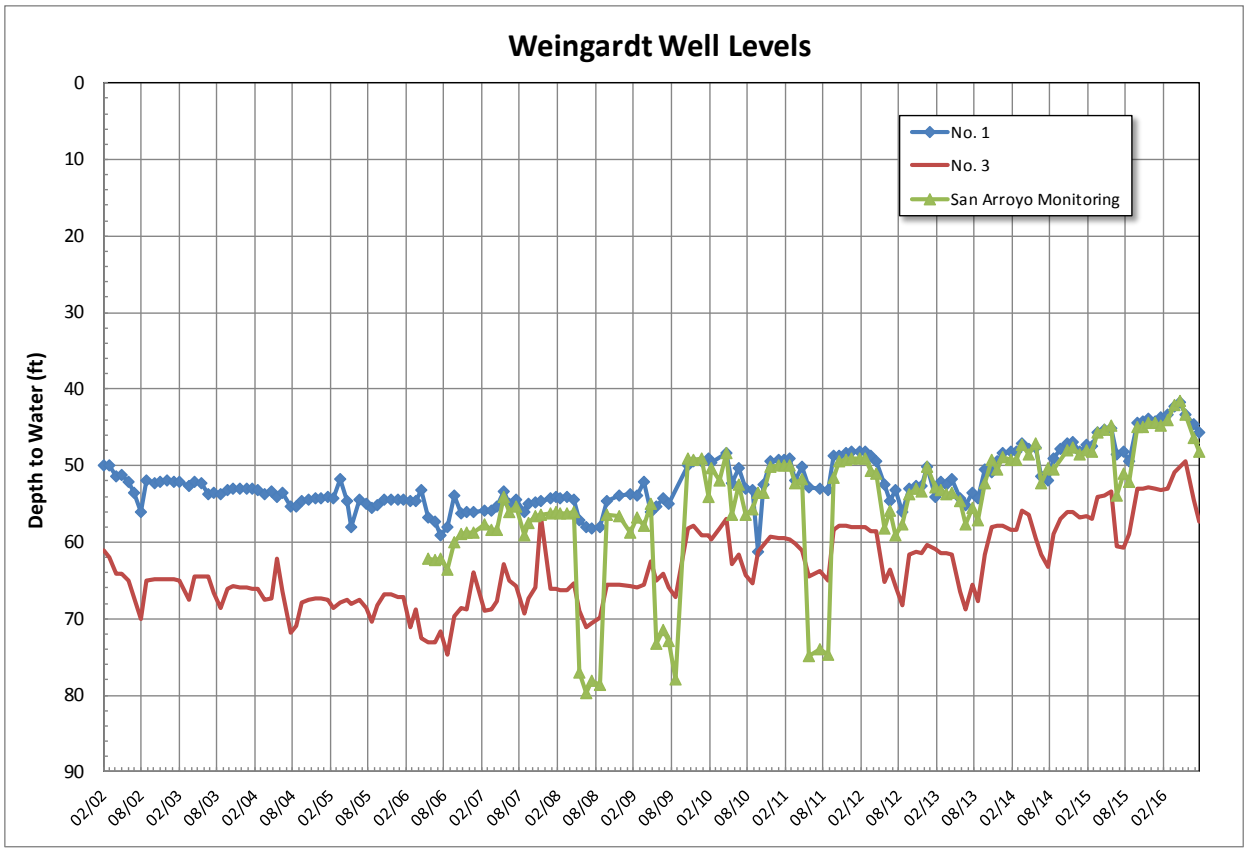

Figure 1-3: Depth to Water in Weingardt Wells

San Arroyo Wells

In addition to the Weingardt wells, the District has constructed two wells (San Arroyo #1 and#2) that are a part of the CBT infiltration/recovery project. These wells can pump an amount of water equivalent to what was infiltrated during the year. Table 1-4 summarizes the San Arroyo Wells.

Table 1-4: San Arroyo Well Summary

Well ID	Permit No.	Priority Date	Drilled Date	Permitted (acre-ft)	Pump Power (hp)	Pump Rate (gpm)
San Arroyo #1	64487-F		5/1/2007	N/A	100	850
San Arroyo #2	6875-F		3/24/2010	N/A	75	540

Smart Wells

The District purchased property southwest of Brush, CO in 1990 for the purpose of constructing two wells to supplement the supply to the southeast area of the system. Well No. 1 was constructed in 1991 and Well No. 2 was constructed in 1994. The wells are decreed for 600 acre feet per year and are augmented with Pioneer shares. The permitted amounts can be pumped if sufficient augmentation water is supplied to cover depletions. Table 1-5 provides a summary of the Smart Wells. The water levels in the Smart wells, as shown in Figure 1-4, have increased by about ten feet since 2002, which is probably the result of the curtailment of pumping in former GASP wells as well as increased augmentation at the Brush Prairie Ponds.

Table 1-5: Smart Well Summary

Well ID	Permit No.	Priority Date	Drilled Date	Decree (acre-ft)	Pump Power (hp)	Pump Rate (gpm)
Smart #1	38433-F	2/27/1991	5/14/1991	400	75	400
Smart #2	50599-F	9/17/1998	6/23/1994	200	75	350

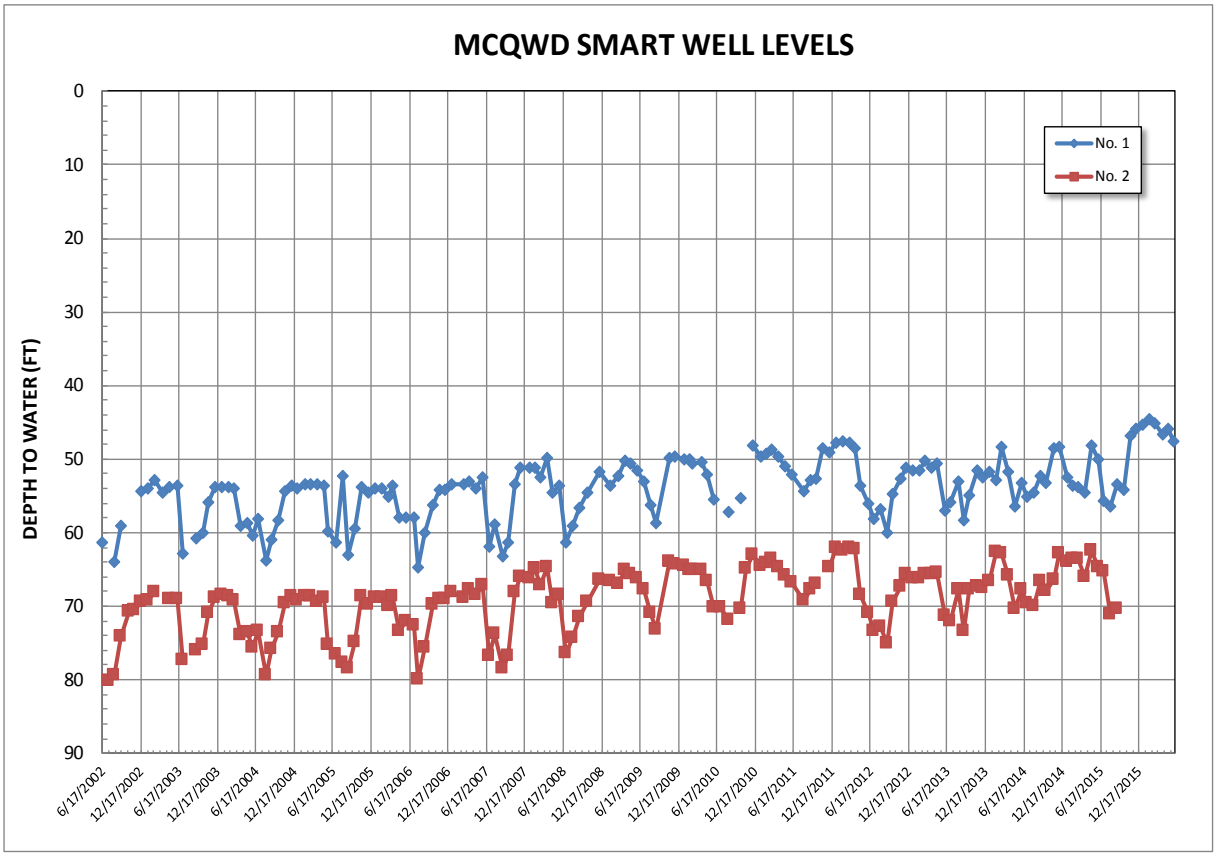

Figure 1-4: Depth to Water in Smart Wells

Operating Wells

Figure 1-5 provides a well profile summary for those wells regularly operated in the Krause, Weingardt, and Smart fields. Elevations are provided for the ground level, water level, and pump. With all pumps operating, the existing capacity is approximately 6,000 gpm. Table 1-6 provides a side-by-side summary of all groundwater wells the District currently operates.

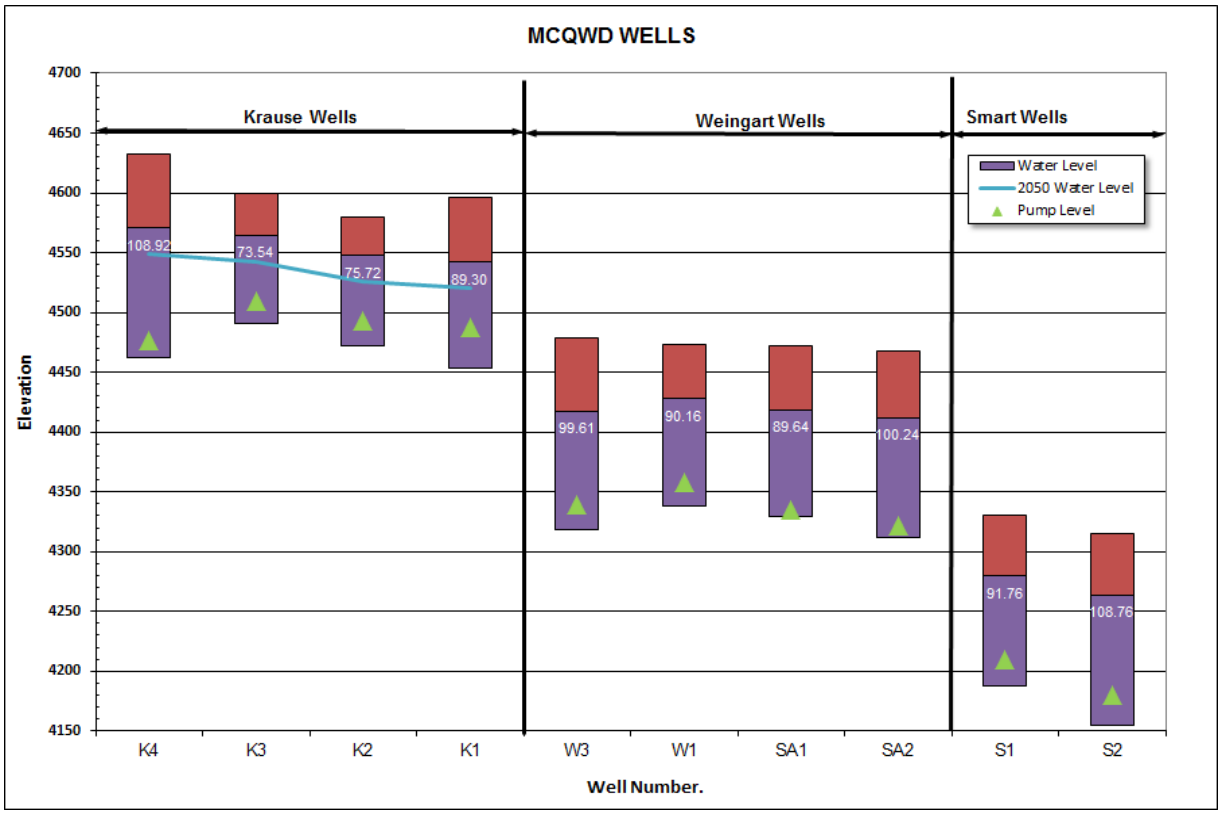

Figure 1-5: Krause, Weingardt, and Smart Well Profiles

Table 1-6: MCQWD Operating Groundwater Well Summary

Permit No.	Well ID	Well Field	Depth to Bottom (ft)	Depth to Water (ft)	Decree (Acre-ft)	Permitted Pumping Rate (gpm)
18338FP & 31655FP	Krause # 1	Krause	145	53.6	345	440
17501FP	Krause # 2	Krause	129	53.2	345	390
17502FP	Krause # 3	Krause	127	52.4	345	500
16644-FP R	Krause # 4	Krause	171	61.6	345	875
23851 - F	State Well	Krause	N/A	N/A	750	100
95168-VE	Weingardt #1	Weingardt	136	52.0	447	800
51226-F	Weingardt #3	Weingardt	156	60.2	447	800
64487-F	San Arroyo #1	Weingardt	143	53.3	N/A	850
6875-F	San Arroyo #2	Weingardt	146	55.0	N/A	540
38433-F	Smart #1	Smart	143	49.7	400	200
50599-F	Smart # 2	Smart	160	64.8	200	200

Colorado Big Thompson (CB-T) Water

In 2010 the District obtained 80% of the supply from its groundwater sources. The remaining supply was obtained from C-BT water. The District's groundwater decrees could supply an additional 880 acre feet of water; however, it is projected the District will require an additional 2,000 acre feet by 2050. Consequently, the District will have to use more CB-T water to supply the demands. The District participated in the Southern Water Supply Project (SWSP) which was coordinated by the Northern Colorado Water Conservancy District to build the Southern Pipeline system to deliver water to Morgan County. The District currently owns 1,097 C-BT units and has the option to purchase or lease an additional 1,395 units from the Riverside Irrigation District.

CBT Infiltration & Recovery Project

A pre-feasibility study of the artificial recharge of the aquifers in the Krause and the Weingardt well fields was conducted in 1998[2]. The District selected the Weingardt well field for the first infiltration site and completed a groundwater model that simulates the operation of the plan[3]. An operation plan for the proposed system was submitted to the State Engineer and to the NCWCD, and was approved by both entities.

The first phase of that plan was completed in 2008 with the construction of a 10-inch raw water pipeline from the Fort Morgan WTP to a new infiltration pond in the San Arroyo drainage basin and a recovery well. A second recovery well was completed in 2010 to increase the capacity of the system. The operational plan is to deliver the CB-T water to the infiltration pond from October through May, and then recover the water during June through September. With the two recovery wells operating at the rated capacity from June through September, the maximum annual volume that can be pumped from this site is 730 acre feet.

The 10-inch raw waterline has a capacity of 3.0 cfs which, on an 8 month schedule, could deliver up to 1,400 acre-feet/year to the San Arroyo site. As shown above, San Arroyo Well No. 1 has a pumping capacity of 850 gpm and Well No. 2 can deliver about 540 gpm. As previously stated, on a four-month pumping cycle the maximum recovery from this site is about 730 acre-feet. In order to infiltrate and recover the remaining 670 acre-feet delivered by the raw waterline, a new infiltration and recovery site would be required.

Southern Water Supply Project (SWSP) Pipeline

The SWSP consists of a series of pipelines from Carter Lake to the City of Fort Morgan's water treatment facility, located approximately 10 miles west of Fort Morgan. The District originally contracted for 1.5 cfs of capacity in the SWSP. A series of pump stations have since been constructed on the line from Hudson to increase the District's share to 1.76 cfs. The construction of a proposed Eastern Pump Station would increase their capacity to 2.5 cfs.

The District has the capability to take delivery of C-BT water near the Krause Wells or at the end of the pipeline located on the City of Fort Morgan's water treatment plant site. The maximum annual delivery capacity of the District's share in the line at 1.76 cfs is 1,274 acre feet and at 2.5 cfs is 1,810 acre feet. The District has entered into an agreement with the City of Fort Morgan that allows the City to use the District's capacity during June through September in exchange for allowing the District to deliver up to 4.1 cfs during the other eight months. The total delivery capacity at that rate is 1,950 acre-feet. As a comparison, the District currently owns 1,079 C-BT units, and has the option on an additional 1,395 units from the Riverside Irrigation District. At 70% delivery those units would supply 1,732 acre feet/year. At 100% delivery, the total volume would be 2,474 acre feet, which is more than can be delivered through the pipeline, even with the pump station. The following Figure shows the capacities of the line for the segment to Ft. Lupton and the segment to Ft. Morgan.

[2] John C. Halepaska & Associates, Inc., Pre-Feasibility Study for Artifical Recharge of Alluvial Aquifers Near Fort Morgan, Colorado, January 1998.

[3] Schreuder, Willem A., Weingardt Well Field Infiltration and Recovery Simulations, Principia Mathematica, July 2004

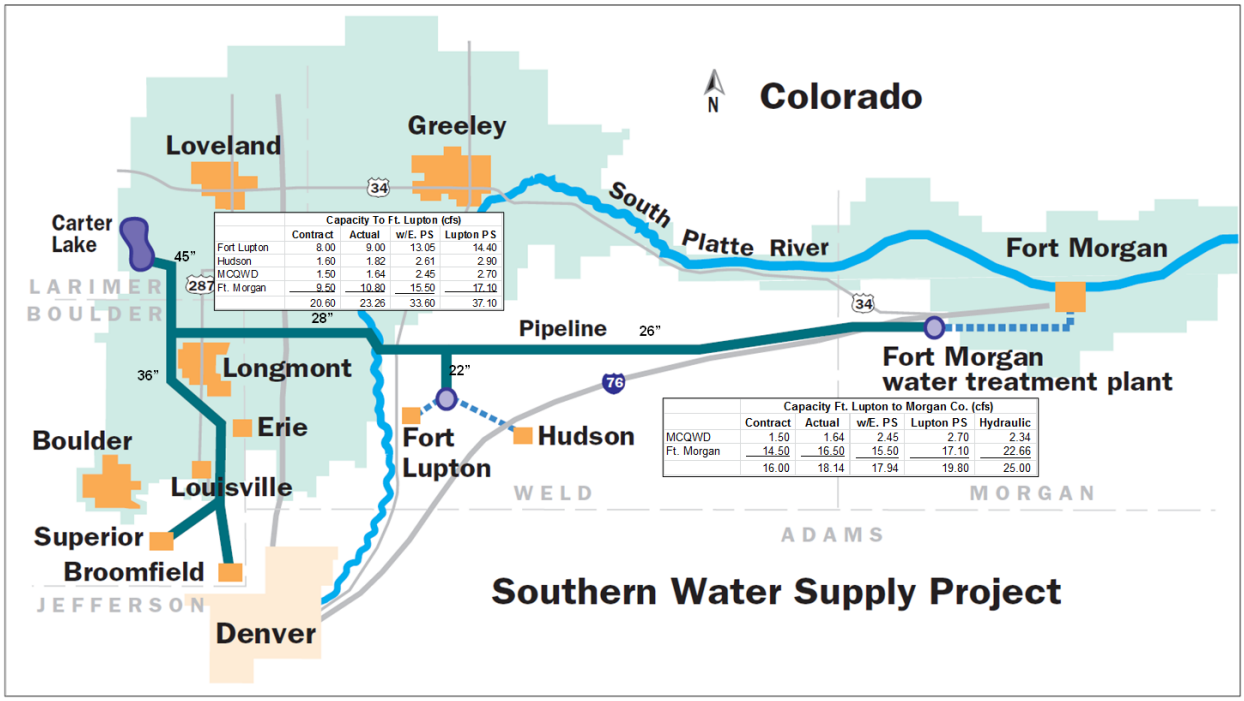

Figure 1-6: Southern Water Supply Project

With the implementation of the treatment agreement with the City of Fort Morgan there is some concern about the ability of the southern pipeline to supply the projected additional max day demand. The line of concern runs from Carter Lake to the Fort Lupton/Hudson turnout. The City's capacity in that segment is 9.5 cfs with the actual capacity at 10.8 cfs. MCQWD's contract capacity in that section is 1.5 cfs with the actual capacity at 1.64 cfs. The line from Ft. Lupton to Ft. Morgan has a total contract capacity of 16.0 cfs and an actual capacity of about 18.14 cfs. The projected demand on the section to Ft. Lupton along with the contract capacity is shown on the following graph.

Figure 1-7 shows an estimate of the projected demands for Fort Morgan and Fort Lupton on the pipeline based on the updated population projections. The projection for Fort Lupton is based on the updated projection for the Northern Integrated Supply Project (NISP) project. The projection for Fort Morgan is based on the historic annual growth rate of 0.8% as experienced since 1960. From this graph, it is projected the Eastern Pump Station may not be needed until sometime between 2035 and 2040.

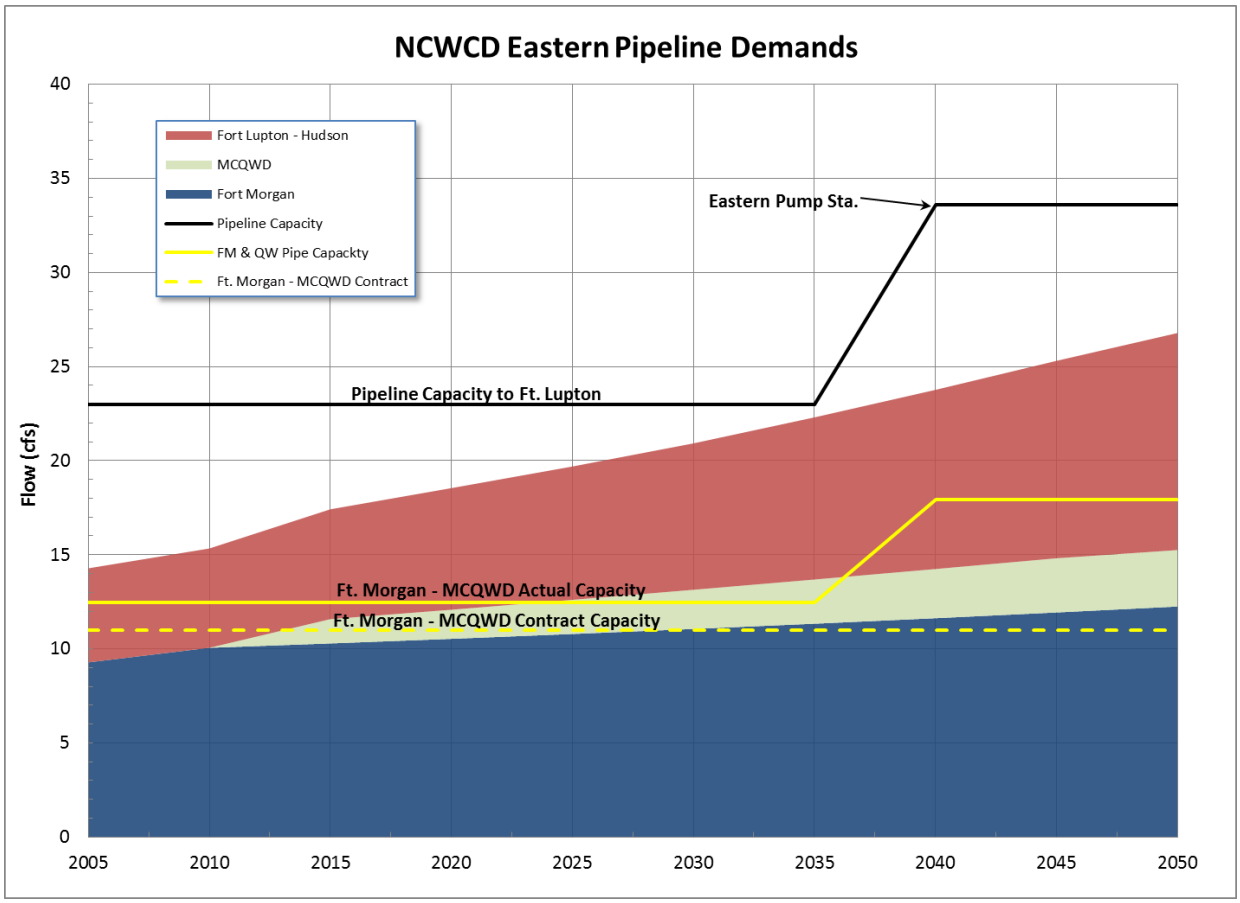

Figure 1-7: Projected Water Demands for Fort Morgan, Fort Lupton, and MCQWD

The above Figure predicts the combined demands of the City and the District will reach the contract capacity of the line to the Fort Lupton turnout by 2013 and the actual capacity by 2023.

Northern Integrated Supply Project (NISP)

In addition to its groundwater and C-BT resources, the District has been a participant in NISP, which is a joint project of 15 utilities that is administered by the Northern Colorado Water Conservancy District. If approved, the project will involve the construction of two reservoirs, pipelines, and pump stations to develop 40,000 acre feet of new water for the participants. MCQWD's share of that project is 1,300 acre feet. A summary of the District's water system profile is provided in Table 1-7.

Table 1-7: Water System Profile

SERVICE CHARACTERISTICS	Number		
Estimated service area (square miles)	650		
Miles of mains	494.5		
Number of treatment plants	0		
Number of separate water systems	0		
Interconnection with other systems	1 City of Fort Morgan		
AVAILABLE ANNUAL WATER SUPPLY	Annual Volume*	Number of Intakes or Source Points	Percent Metered
Groundwater	2,874 AFY	9	100%
Surface water	1,097 AFY		
Purchases: raw	1,395 AFY**	1	100%
Purchases: treated			
Total annual water supply	5,366 AFY		100%
SERVICE CONNECTIONS	Connections		Percent Metered
Residential	2,411		100%
Agriculture	73		100%
Public or governmental	24		100%
Business	56		100%
Total connections	2,786		100%
WATER DEMAND	2015 Volume	Percent of Total	Per Connection
Residential sales	1115 AF		151,627 gal
Nonresidential sales	1148 AF		997,471 gal
Other sales			
Non-account water: authorized and unauthorized uses	60 AF	8.8%	unknown
Total system demand (total use)	2401 AF	100%	287, 117 gal
PLANNING	Prepared a Plan ☑	Date	Filed with State ☑
System Master Plan	√	12/2014	
Drought or emergency plan			
Water conservation plan			

*Maximum available, not firm yield

** Can be purchased from the Riverside Irrigation District if necessary

D. Distribution System

Waterlines

The MCQWD distribution system contains nearly 500 miles of pipelines that range from 2 to 16 inches in diameter. Table 1-8 provides a summary of the waterlines currently in service.

Table 1-8: MCQWD Existing Waterline Summary

Size of Waterline	Length in Service (miles)
2-inch	85
2.5-inch	93
3-inch	73
4-inch	72
6-inch	55
8-inch	37
10-inch	29
12-inch	33
14-inch	12
16-inch	5.5
Total	494.5

Storage

The District currently has two storage tank sites in the system. The first site is in the Krause field and contains two 750,000 gallon tanks. The second site is the North Tank (with a capacity of 1,250,000 gallons), located near the intersection of Roads 16 and W, north of Fort Morgan. Figure 1-8 shows the recommended storage volumes for equalization and for emergencies compared to the existing storage available. The volume for equalization is equal to 25% of the maximum day demand, and the emergency storage volume is equal to one average day demand.

The available volume is short of the recommended volume for both equalization and for emergencies. However, the available storage for equalization of the peak hour demands is projected to be adequate through 2030. The actual volume required for emergencies is a function of the type of interruptions in the supply that can be planned for. In some locations, this may not be a big concern if the area is near wells with emergency power supply. At the present time, the District has emergency backup power for Krause Well No. 3 and Weingardt Well No. 3 with a combined capacity of 1,300 gpm or 1.87 MGD. Adding that capacity to the available storage indicates the District has adequate emergency supplies through 2030. However, other locations may need additional storage to compensate for pipeline losses during peak hour demands such as the Hoyt area or the area northeast of Brush.

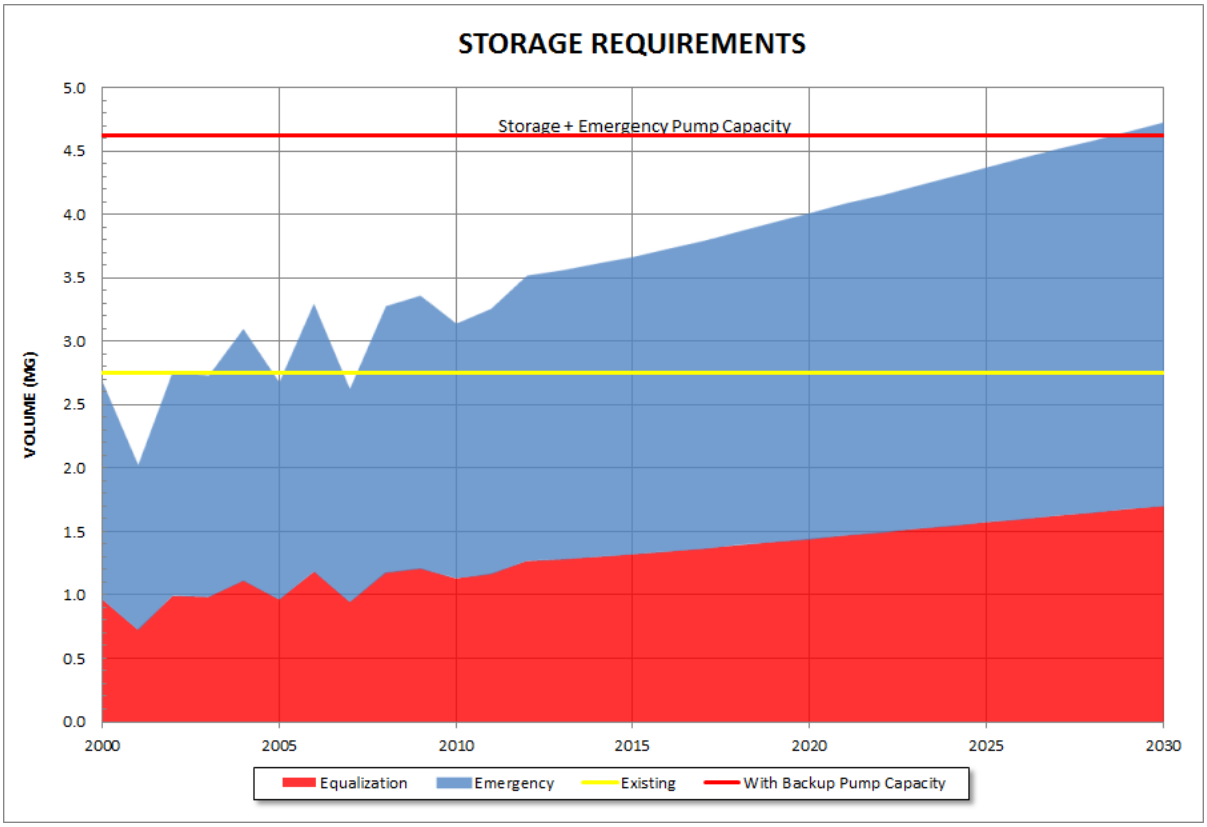

Figure 1-8: Storage Capacity and Requirements

Pressure Zones

The District provides water service to customers varying in service elevation from a high of approximately 4,800 feet to a low of around 4,100 feet. This 700 feet difference translates to a pressure range of over 300 psi, which requires the District to utilize pump stations and pressure reducing valves (PRV's) to maintain a desirable working pressure throughout the system.

In typical municipal systems, pressure zones are configured to supply pressures in the range of 35 to 100 psi. This allows the systems to supply direct service to customers without creating excessive pressures in home water systems. However, in rural water systems it is the general practice to operate a high-pressure system to overcome the pipeline losses through long distribution lines. To protect the customers' plumbing systems each tap is typically fitted with pressure reducing valves. With this type of system, the purpose of pressure reducing valves is to protect the pipelines from excessive pressures. The MCQWD system includes pipelines with pressure ratings of 150 and 200 psi. Therefore, the pressure zone configuration must consider the pressure rating of the pipelines.

E. System Conditions

The water system for the MCQWD has sufficient capacity for its expected growth, and is not in a critical water supply area; Table 1-9 summarizes the conditions of the District's water system.

Table 1-9: Needs and Limitations (Worksheet A)

Limitation and/or Future Need	Yes	No	Comments on Limitation or Future Need	How is Limitation or Future Need Being Addressed
System is in a designated critical water supply shortage area		X	The system is not currently in a critical water supply area.	
System experiences frequent water supply shortages and/or emergencies		X	The system does not experience supply shortages. Existing groundwater sources are capable of supplying the service area into the foreseeable future.	
System has substantial non-revenue water		X	With a newly installed metering system, unaccounted for water is limited to between 0-10%	
Experiencing high rates of population and demand growth		X	Population in the service area is projected to have a growth rate of between 1.7-2.4% until 2040.	
Planning substantial improvements or additions	X			System improvements are primarily intended to increase the capacity of existing pipelines and supply of both ground and surface water sources.
Increases to wastewater system capacity anticipated		X	MCQWD does not provide wastewater services.	
Need additional drought reserves		X	Only 70% of the permitted groundwater is currently being utilized. During a drought, groundwater sources could be further utilized to account for surface water shortfalls.	
Drinking water quality issues		X	The water delivered by the District meets all State and Federal Safe Drinking Water act parameters.	Some alternatives have been considered to improve the water quality or better utilize the Weingardt, Brungardt, and San Arroyo wells. Options include treatment for hardness and nitrates, as well as a separate commercial service for lower quality water.
Aging infrastructure in need of repair	X		Portions of the District's system are over 80 years old.	The District is engaged in replacing old mains to improve system reliability and decrease water leaks.
Issues with water pressure in portions of distribution system		X	The District has adopted the goal of maintaining a minimum pressure of 35 psi throughout the system during the peak hour demand with a maximum pressure of 150 psi.	

F. Water Supply Reliability

Statewide Water Supply Initiative

The Statewide Water Supply Initiative (SWSI) is a comprehensive evaluation of water supply and use within the state of Colorado. More specifically, the SWSI achieves the following:

1) Determines the estimated 2030 water demand for each major river basin.
2) Describes what measures are being taken to address water needs within the State.
3) Identifies areas where water supply will be inadequate, and by how much.
4) Evaluates how water supply gaps are currently addressed, and if further measures could be implemented to mitigate shortages.

The District is located within the Lower South Platte River Basin. According to the SWSI, this region will have a shortfall of 8,000 acre-feet by 2030. According to the District's 2014 master plan, groundwater and CBT supply will be adequate until 2030, or 2025 if several dairies receive service. This projection is based on utilizing 85% of the decreed groundwater, to be conservative. With 100% utilization of groundwater, the supply would suffice until 2038, or 2032 with the dairies. If the District remains a NISP participant and the project is completed, the District will have adequate water supplies past 2060 based on current growth projections and water demands. Several factors such as climate change, lower than expected firm yield, water quality, or large, new, industrial and commercial users could result in a water shortage sooner.

System Reliability

As part of the 2014 master plan, modeling of the supply and distribution system was completed. Three failure scenarios were simulated and include the following:

1) Loss of the transmission line to Snyder
2) Loss of one of the Smart wells
3) Loss of the Krause Transmission line

In the first two scenarios, water pressures, while lowered, remain acceptable to meet the average demand. Loss of the Krause Transmission line would result in low water pressure in the western portion of the system. If the line is not operating within 24 hours, the entire system would experience low pressure as the North Tank would be emptied. In this situation, the District would have to issue a request to curtail water usage.

Currently, a firm yield analysis has not been completed, nor has climate change been included as a criteria of water supply planning. During the 2002-2006 drought, groundwater levels in the Weingardt field experienced temporary lowering as a result of increased pumping to offset the decreased supply of CBT water. The water level in the field returned to historical conditions a few years after the drought.

G. Supply-Side Limitations and Future Needs

System Limitations and Future needs

While the District has adequate supply water beyond 2060, the transmission system will eventually lack the capacity to meet demand. As described previously, to deliver all of the District's C-BT water, the Eastern Pump Station will need to be constructed on the Southern Pipeline. However, this pump station may not be necessary until 2035 or later.

As previously stated, the existing infiltration/recovery pond within the Weingardt field is capable of delivering 736 acre-feet. The 10-inch raw waterline that supplies this pond is capable of delivery 1,400 acre-feet annually. Therefore, an additional infiltration pond with two recovery wells will be needed in the San Arroyo basin to supply the remaining 640 acre-feet available. Another transmission line will also need to be constructed for distribution. It is estimated this project will need to be completed by 2020 or 2025. The second recovery well can be delayed until 2027.

Another supply alternative would be to treat C-BT water at the City of Fort Morgan's plant and deliver it to the system. However, this would increase demand on the Southern Pipeline during peak months, rather than on the recovery ponds that receive water all through the winter. When the pipeline capacity is reached, a 1,000 acre feet surface reservoir would have to be constructed to supply the maximum day demands.

The District has minimized the use of the Weingardt wells in order to provide higher quality water to consumers. Unfortunately, this approach means a significant portion of the water resources are not being utilized. One alternative for making better use of Weingardt No. 3 would be to create a non-potable service for dairies located in the western portion of the service area. This would allow the District to utilize as much as 421 acre-feet per year, while simultaneously providing higher quality potable water. Another benefit of this system is the cost savings associated with replacing CBT water with an equal volume of Weingardt No. 3 water.

The District has a number of options available to address its water supply requirements. As identified, these range from increased supply and storage, to better management of available resources. The District should continue its acquisition of new water sources, and should also evaluate alternatives and system improvements for better management of its existing resources.

Chapter 2: Profile of Water Demands and Historical Demand Management

A. Purpose

This chapter describes the historical and projected water demands of the various demographics served by the MCQWD. An evaluation of water management efforts currently implemented is also included.

B. Demographics and Population

The District's water customers include residential, municipal, agricultural, industrial, and commercial users. Residential and agriculture, including dairy and feedlot operations, are by far the largest demand. Figure 2-1 provides an approximate distribution of water use by sector based on tap meter readings from 2015. The

The District completed a classification system for its taps in 2016. However, some taps remain "Unclassified" and account for approximately 5% of water consumption.

The State of Colorado experienced tremendous population growth during the period of 1990 through 2005. While Morgan County has not experienced the population growth of some Front Range counties, the growth within the county has been steady during recent years. The growth in the District's service area has been the most rapid in comparison to other water providers, and has exceeded the growth rate of Fort Morgan, Brush, and Wiggins. Figure 2-2 shows the combined population of the towns and rural areas of Morgan County. The annual growth rate of the rural area of the county averaged 2.0% between 1990 and 2000, but has since slowed to 0.5%.

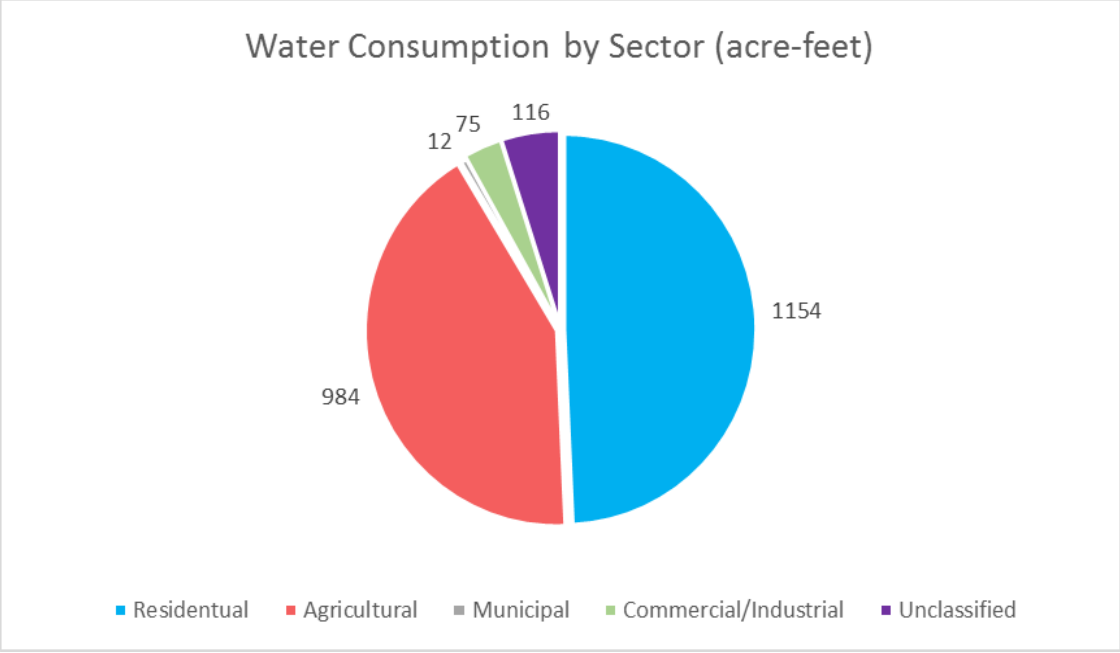

Figure 2-1: Water Consumption by Sector

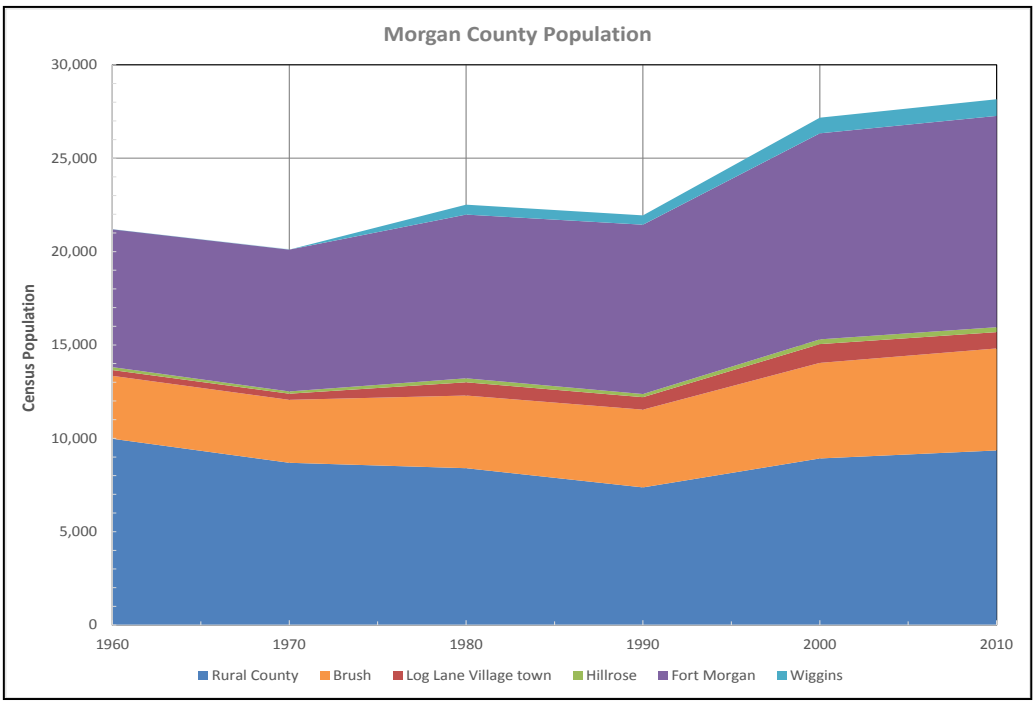

Figure 2-2: Morgan County Population

The annual tap sales and the total taps served by the District are shown in Figure 2-3. The graph shows a significant drop in the annual tap sales since 2005, with sales more in line with the 1980's. The period of 1990 to 2005 experienced much higher growth with annual sales of between 85 and 120 taps. This is an annual growth rate of about 4.25%. Table 2-1 summarizes the tap sizes and tap equivalents (TE) for the MCQWD.
Figure 2-3: Tap Sales

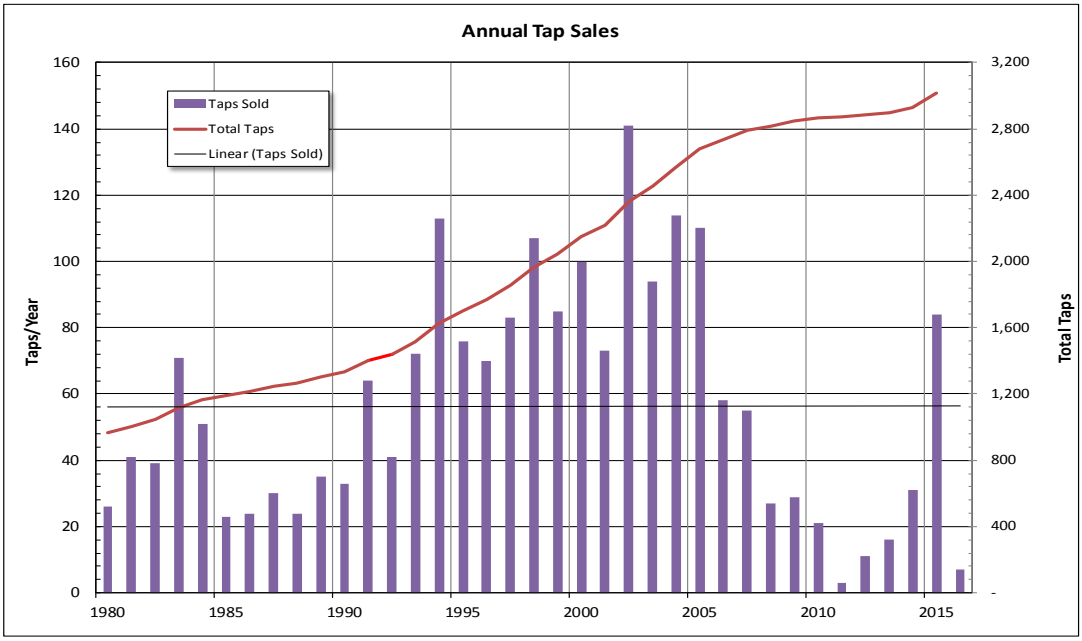

Figure 2-3: Tap Sales

Table 2-1: MCQWD Tap Sizes and Tap Equivalents (TE)

Tap Size	Tap Equivalent
5/8"	1
3/4"	2
1"	4
1-1/2"	9
2"	25

The 2010 Census indicated the population of Morgan County was 28,159, with an average persons per household of 2.55. Based on this census data and the number of residential taps, the population served by MCQWD can be estimated as 6,150 people. The Colorado Department of Local Affairs (DOLA) projects the population will increase at a rate of 2.4% from 2015 through 2020, and at 2.2% from 2020 to 2025, 2.0% from 2025 through 2030, 1.9% from 2030 through 2035, and 1.7% from 2035 through 2040. Table 2-2 projects the population served by MCQWD based on these figures.

Table 2-2: Projected Population Served by MCQWD

Year	DOLA Predicted Growth Rate	Population
2020	2.4%	6924
2025	2.2%	7720
2030	2.0%	8524
2035	1.9%	9365
2040	1.7%	10188

Figure 2-4 shows four projections for the number of taps that will be served by the District. The light blue line shows the actual taps served by the District while the dark blue line shows the number of equivalent taps served. The projected taps assume the annual tap sales will slowly increase to 65 taps per year by 2018. The green line shows the total number of equivalent taps including Log Lane and Hillrose. The dashed line is a more recent projection for the Northern Integrated Supply Project (NISP). That projection assumes the annual sales will be 80 taps per year and does not include the addition of Log Lane Village or Hillrose. The red line shows the projected number of taps using the annual growth rates as projected by the State Demography office. The current projection estimates the District will serve 3,549 taps plus an additional 373 taps in Log Lane Village and Hillrose, making the total 3,922 taps by 2020.

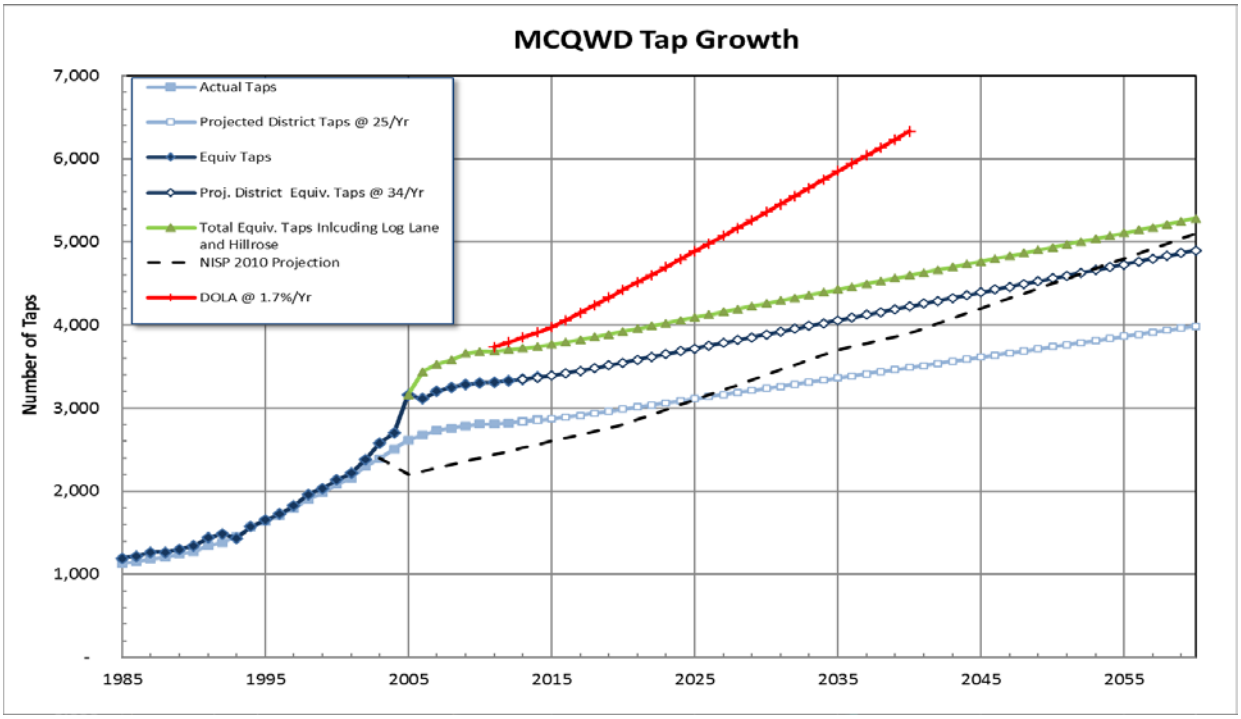

Figure 2-4: Projected Taps

C. Historic Water Use

The characteristics of water use that are of importance in the design of water system components include the average day demand, the maximum day demand, and the peak-hour demand. The average daily consumption is used to estimate the total annual usage and determine the adequacy of the raw water supply. The maximum day demand is used to size treatment plants, wells, transmission lines, main pump stations, storage reservoirs, and main distribution lines that deliver water from one reservoir to another. The peak-hour demands are used to size the distribution lines and booster pump stations that do not pump to a storage tank.

Annual Production

Figure 2-5 shows the annual water production since 2000. Little growth in water production has occurred over the past four years, even with more taps being serviced. Figure 2-6 shows the annual average of unaccounted for water since 2000. The new metering system has resulted in unaccounted for water stabilizing between 0 and 10%.

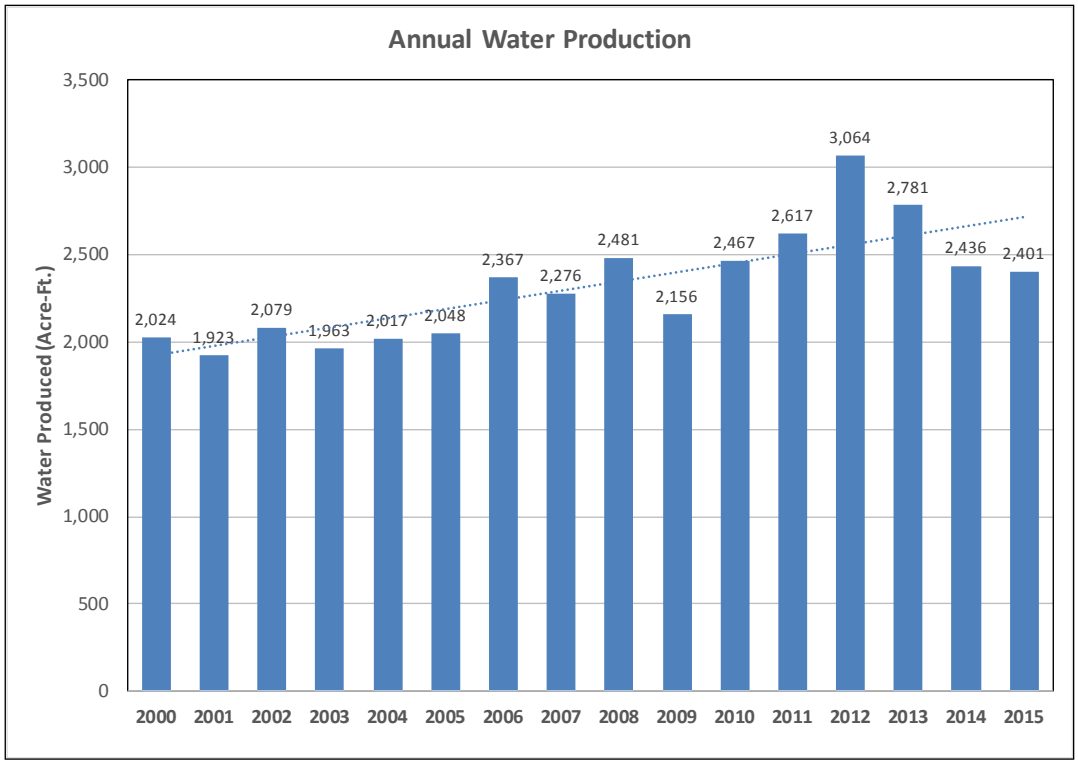

Figure 2-5: Annual Water Production

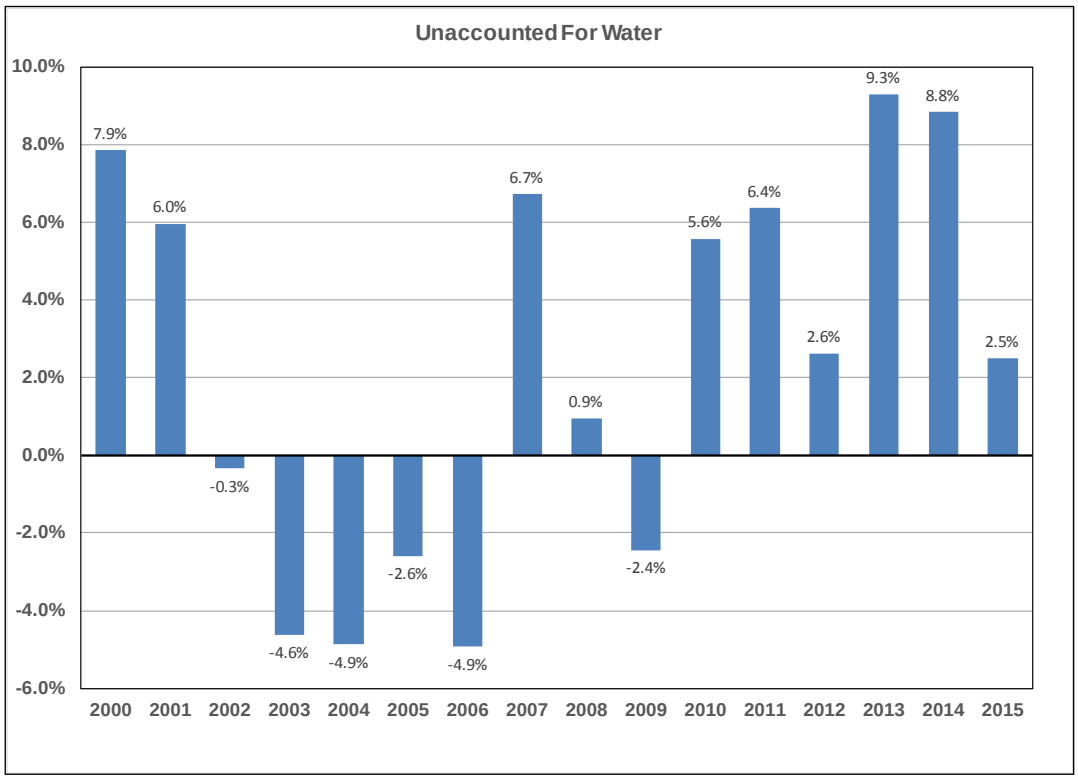

Figure 2-6: Unaccounted for Water

The total water demand for the District for the 2015 water year (November 2014 through October 31, 2015) was 2,341 acre feet.

Large dairies represent 243 equivalent taps that used 3.62 acre-feet per tap, or 880 acre-feet total. Subtracting the large dairies from the total results in an average annual usage of 0.48 acre feet per equivalent tap.

The District, like other utilities in arid climates, sees an increase in water usage in the summer months for irrigation. The maximum day demands typically occur in the hottest of the summer months, and residential users tend to be the largest users of water for irrigation.

As opposed to the commercial and industrial users whose water use requirements are more or less dictated and fixed in nature, the residential users have the potential to conserve an ample amount of water. For instance, they can curtail their water use by choosing not to irrigate their lawns or landscaping. The drought around 2000-2002 has brought the typical residential user to have a greater understanding of water use and water conservation shown by the changes in peak season water use.

D. Water Use Projections

Figure 2-7 shows two projections for the annual use within the District based on a projected annual growth. The red line is the projection used for the subsequent analysis of the District facilities. The green line is the projection made for the Northern Colorado Water Conservancy District (NCWCD) for the Northern Integrated Supply Project (NISP) project. The total annual water demand in the year 2060 is projected to be around 4,000 acre-feet (4,700 acre feet with recent dairy requests).

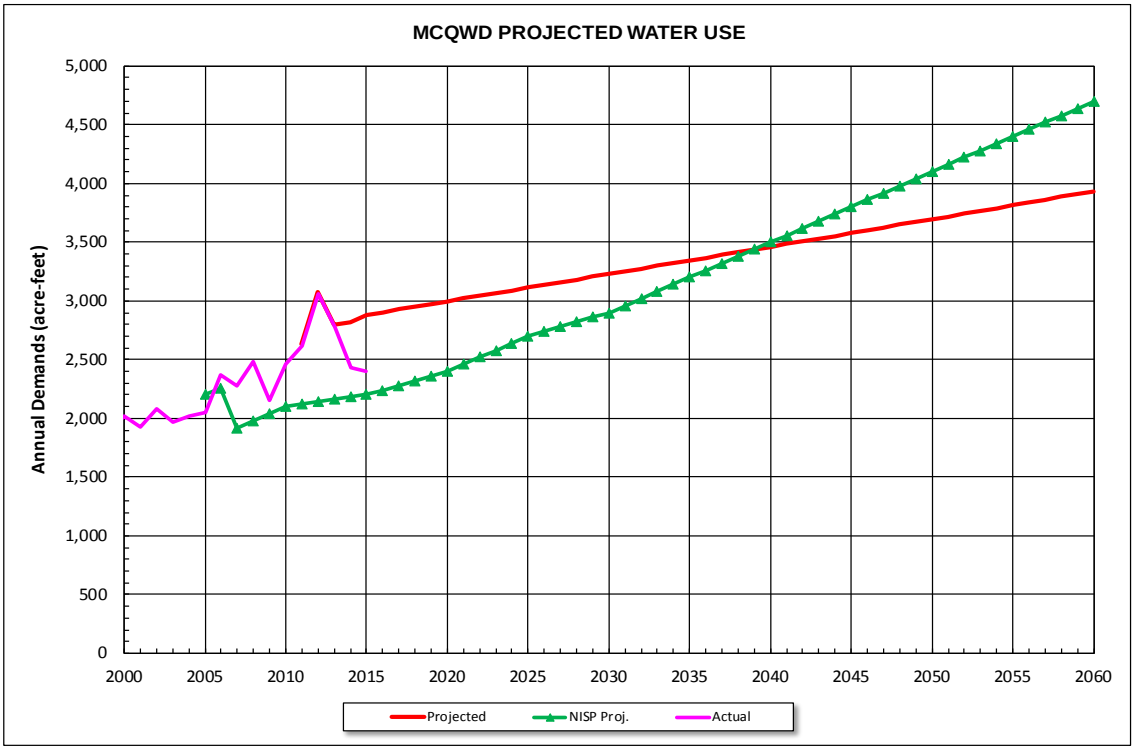

Figure 2-7: Projected Annual Use

Chapter 3: Profile of Proposed Facilities

A. Purpose

This step of the process is intended to identify the water supply needs for the District and estimate the costs for developing, operating, and maintaining the water supply and infrastructure.

B. Future Water Supply and Facility Needs

The District has been a participant in the Northern Integrated Supply Project (NISP); a joint project of 15 utilities administered by the Northern Colorado Water Conservancy District. The project will involve the construction of two reservoirs, pipelines, and pump stations to develop 40,000 acre feet of new water for the participants. MCQWD's share of that project is 1,300 acre-feet. Review of the projected demands and the available water supply indicates the District should have adequate supplies from the existing groundwater, C-BT, and NISP to meet projected demands through 2060.

Krause CBT Infiltration/Recovery Project

The District will need additional capacity to meet the maximum day demand by 2020. Consequently, the District should plan for the development of a new infiltration/recovery project by 2020 or 2025. That project will include a new 10-inch line from the NCWCD Southern Pipeline to an infiltration pond plus the first of two extraction wells and a transmission line to the Krause tanks. A second extraction will be required by 2027. Estimated cost of a raw waterline and meter vault from Northern's line to the site plus an infiltration pond is $414,000. The cost of the first of two extraction wells is estimated at $358,000. In addition, a new 13,800 foot 14-inch transmission line will be required from the extraction well to the Krause tank at an estimated cost of $567,000. If the District implements the City alternative, the need for the new infiltration/recovery project at the Krause field could be potentially delayed until 2040.

City Supply

As discussed previously, one alternative for additional supply would be to treat the C-BT water through the City plant and deliver it to the system. In addition to increasing the supply, this alternative would allow blending of high quality water with water from Weingardt No. 1 and the San Arroyo wells. Such approaches would increase the demand on the Southern pipeline since the peak demands would have to be supplied directly, rather than delivering the water to the infiltration systems during the winter and pumping it out during the summer. When the capacity in the line is reached the District and the City would have to construct a surface water reservoir in order to supply the maximum day demands. A rough cost for a surface water reservoir of 1,000 AF was provided to the City of Fort Morgan in 2005 at about $5M.

Commercial Water System

The District has minimized the use of the Weingardt wells in order to maintain the water quality as high as possible for customers. Unfortunately, this approach means a significant portion of the water resources are not being utilized. One alternative for making better use of Weingardt No. 3 would be to use it as a supply for a commercial water system to serve the large dairies in the western portion of the service area. This would allow the District to supply as much as 420 acre-feet per year which would reduce demand on the better-quality water. The estimated cost of this system is $1,145,000.

C. Pump Stations

Pump Station on line from Krause Wells

The previous section indicated the capacity of the Krause transmission line could be increased by about 800 gpm with a 100 HP pump station. However, the vulnerability analysis indicated the western portion of the District is at risk for being out of water should the pipeline fail. Furthermore, if a new infiltration/recovery system is constructed in Krause field, the combined supply from the Krause wells plus the new system would exceed the capacity of the transmission line without over-pressurizing the line. Consequently, it is recommended a second 16-inch line be constructed from the Krause tanks to MCR 3 sometime between 2015 and 2020.

D. Tanks

Hoyt Tank

The alternative of constructing a tank near Hoyt in conjunction with the Wiggins pump station was discussed in previous paragraphs. The analysis indicated the tank should be constructed sometime around 2020. The actual time frame is also dependent on the location of the future taps. If the taps are located at the south end of the system, the losses in the line south of the pump station will dictate an earlier construction time rather than later. The recommended minimum size for the tank is 0.75 MG which would provide operating storage of 0.375 MG, which is adequate for equalization.

Based on our recent bid for a similar tank for the Town of Eaton, the cost of a 1.0 MG tank with a 60' height is $550,000. However, in order to fully utilize the tank, 4.5 miles of 8-inch to 12-inch pipe will be required from MCR 5 and F south and west to Hoyt, and continuing to the proposed tank site. The cost of that pipeline is approximately $506,000.

Future North Tank

During the design of the pump station at the North Tank, it was contemplated that the station would ultimately be used to pump to a new tank north of the existing tank at an elevation that could serve the higher ground in the vicinity of the existing tank and along MCR W. The current projections indicate a 0.5 MG tank should be constructed in the 2025 to 2035 time frame.

East Tank

Currently there is no storage for the east end of system. The vulnerability analysis indicated severe pressure problems in the east end of the system if the river crossing at Snyder is lost. It also indicated some pressure problems if one of the Smart wells is out of service on a maximum day. It is proposed a tank be constructed to serve pressure zones 4 and 5. Two alternatives are available for a tank. The first and preferred alternative is a ground level tank southeast of Brush. The second alternative is an elevated tank southeast of Hillrose. Projected size of the tank is 0.5 MG.

Chapter 4: Identification of Conservation Goals

A. Purpose

Within this chapter, the MCQWD develops reasonable and measurable goals based on anticipated benefits for the water system and customers.

B. Water Conservation Goals

Specific, attainable goals tied to a timeline for implementation with regular review and modifications are key components to a successful conservation plan. Furthermore, the District recognizes the importance of conserving water while minimizing the impact to the customer. Thus, the District has set forth the water conservation goals listed below. Their goals are based on the existing system's conditions, current and future water demand projections, and anticipated needs for infrastructure improvements:

- Goal 1: Maintain and evaluate the existing tiered rate structure
- Goal 2: Maintain educational initiatives regarding water conservation
- Goal 3: Perform leak detection and repair on 10 miles of the distribution system per year
- Goal 4: Develop a commercial water system to supply dairies
- Goal 5: Meter during flushing operations
- Goal 6: Reduce residential water usage until it is equivalent to that of front range communities.

C. Goal Development Process

A collaborative effort between the District staff, officials, and consulting engineers was used in the goal development process. Data on the District's water system and current conservation measures were studied to characterize water supply, water demand, and customer use. Discussions were held in which target water users were identified based on the information that has been provided in the preceding chapters. The goals were then established based on those that would have the highest probability of success and public acceptance.

Another factor considered in the goal development process was whether the goals could be implemented under an effective monitoring plan. The development of these goals considered whether billing and well production data could be processed to annually measure the success of goals. To measure success, current data will need to be compared to historic data to identify trends and changes.

Public acceptance was another factor considered in the goal development process. For instance, the District did not want to establish goals that would be too restrictive on residential users nor excessively hamper local businesses. The goals also needed to be carefully crafted to not hinder any potential population growth.

Chapter 5: Identification of Conservation Measures and Programs

A. Purpose

Within this chapter, MCQWD provides a synopsis of conservation measures and programs considered for potential implementation. A preliminary screening process is then applied to eliminate conservation measures and programs that do not meet the District's conservation goals. Those conservation measures and programs that remain are further evaluated in Chapter 6.

B. Land Use Planning

The District works closely with the Morgan County Planning and Zoning Department. The expected water demand and the District's ability to provide service in an area is considered when it is zoned or re-zoned. When a new development is proposed, the District requires engineering plans as well as proof of water source be submitted to them for review. Single family residential developments require the District's Manger approval; commercial developments must be accepted by the District's Board of Directors.

One recent instance of this collaborative planning effort was the construction of a new car wash. This required the developer to provide the District with engineering plans and calculations providing anticipated demand and onsite water reuse. After reviewing, the District will either issue a permit allowing a service connection or require changes to their water use plan.

C. Identification of Conservation Measures and Programs

Conservation *measures* are specific technologies or practices that directly reduce water use. The customer, rather than the water provider, must implement the demand-side measures. For example, it is the customer who replaces an old toilet with a water-efficient model. The water provider, on the other hand, implements the supply side measures such as leak repair to transmission lines.

Conservation *programs* are the activities that a water provider undertakes to encourage or require conservation measures. For instance, the water provider can offer rebates to customers who replace old toilets.

MCQWD developed a universal list of topics regarding conservation measures or programs that could potentially be implemented. Those considered during the development of this Plan include the measures and programs identified in the Colorado Water Conservation Board's (CWCB) Water Conservation Plan Development Guidance Document and as specified in CRS 37-60-126 (4) (a). Twelve topics of conservation measures or programs were considered as part of this step:

Conservation Measures, Demand-Side

1. Water-efficient fixtures and appliances, including toilets, urinals, showerheads, and faucets.
2. Landscape efficiency, including low water use landscapes, drought-resistant vegetation, and efficient irrigation equipment and scheduling.

Conservation Measures, Supply-Side

1. Water reuse systems.
2. Distribution system efficiency, including leak repair and removal of phreatophytes.

Conservation Programs, Demand-Side

1. Education and information dissemination, including public education, water-saving demonstrations, school programs, and water bill inserts.
2. Technical assistance, including water use audits targeted at large users and large landscapes.
3. Rate structure and billing systems designed to encourage efficiency, including volume billing and tiered rate structure.
4. Regulations and/or Ordinances, addressing fixtures and appliances, landscapes, and water waste prohibition.
5. Incentives, including rebates.

Conservation Programs, Supply Side

1. Distribution system efficiency, including leak identification.
2. Analysis of non-account water and metering during flushing.

D. Screening Criteria

Screening criteria were developed to eliminate certain conservation measures and programs from further consideration. These criteria were used to evaluate the effectiveness of each measure or program with respect to the District's system. The twelve topics of conservation measures and programs listed above were evaluated against the following criteria:

Criteria 1. Lack of public acceptance.
Criteria 2. Insufficient water savings.
Criteria 3. Low benefit to cost ratio of implementation.
Criteria 4. Already met by existing conservation measure or program.
Criteria 5. Not applicable or relevant to MCQWD's water system.

E. Screening of Conservation Measures and Programs

The conservation measures and programs considered for implementation to the District's water conservation plan were screened to determine which ones would be further evaluated in the planning process. Each of the twelve measures or program topics are repeated below, followed by a brief explanation as to why they were or were not selected for further consideration.

Demand Side Measures and Programs

1. Water-efficient fixtures and appliances, including toilets and faucet aerators:
   Water efficient fixtures are currently mandated within the District's supply area. However, older appliances and fixtures that are less efficient are still in use within the District's service area. *Further consideration is deemed appropriate.*

2. Landscape efficiency, including low water use landscapes and efficient irrigation equipment:
   While landscape irrigation is not a major source of water use, the District will consider disseminating information regarding water efficient landscaping. Additionally, the District will consider providing rebates for automatic irrigation controllers and performing residential irrigation audits. *Further consideration is deemed appropriate.*

3. Industrial and commercial efficiency, including water-efficient processes:

   Large industrial and commercial customers already have significant financial incentive to conserve. Water reuse systems are already extensively used by the large dairies in the area. *Measures or programs related to this topic are deemed unnecessary for further consideration, by Criteria 4.*

4. Water reuse systems and non-potable use:

   The District does not provide wastewater service; therefore, a reuse system is not relevant. The District continues to pursue the potential for the development of a commercial non-potable water system. Monies are allocated each year for the research and development of the system, with a goal of serving its first customer in 2020. *Expansion of non-potable water use is deemed appropriate for further consideration.*

5. Distribution system efficiency and leak repair:

   The District performs ongoing maintenance and upgrades to the system to improve efficiency and reduce water loss. For the 2016 fiscal year, $140,000 was allocated for distribution system repairs. Every even-numbered year, the entire system is driven and every meter pit is inspected. Every odd-numbered year, every valve in the system is inspected and exercised. Any detected issues are given a "work order" and subsequently repaired. As line leakage is estimated at less than 5%, the District will likely consider utilizing leak detection on a regional basis. *Measures or programs related to leak repair are deemed appropriate for further consideration.*

6. Education and information dissemination, including public education, water-saving demonstrations, school programs, and water bill inserts:

   The District provides water saving pamphlets and presentations to schools and community organizations upon request. Additional conservation literature is in the process of being provided on the Districts website. *Measures or programs related to this topic are eliminated by Criteria 4.*

7. Technical assistance, including water use audits targeted at large users and large landscapes:

   The District contacts large customers annually to provide reviews of their water use, as well as recommendations for reducing use. The potential cost savings of reducing use are provided to the customers as part of this process. Additionally, the District reviews large customer usage for outliers that could signal a leak or other accidental overuse. *Measures or programs related to this topic are deemed unnecessary for further consideration, by Criteria 4.*

8. Rate structure and billing systems designed to encourage efficiency, including volume billing and conservation (tiered) rate structure:

   A tiered rate structure was first implemented in 2007. The District currently uses a monthly rate system that has a minimum charge dependent upon the tap equivalent (TE), and a uniform block rate structure that increases with increased water usage (also dependent on TE). The existing water usage rates implemented by the District are provided in Table 5-1. For taps larger than 1TE, the base rate and gallon allotment are multiplied by the number of TE's (available TE's include 1TE, 2TE, 4TE, 9TE, and 25TE). The tiered rate system provides substantial financial incentive to conserve water.

Table 5-1: Existing Water Usage Rates

Monthly Usage (gal)	Monthly Minimum Charge per TE	Fee per 1,000 Gallons per TE
0-4,000	$23.50	$1.54
5,000-19,000	$23.50	$1.82
20,000-59,000	$23.50	$2.75
60,000-199,000	$23.50	$4.23
200,000 and over	$23.50	$12.70

The District periodically reviews its rate structure based on the cost of maintaining and operating its system. *Measures or programs related to this topic are deemed unnecessary for further consideration, by Criteria 4.*

9. Regulations and/or Ordinances, addressing fixtures and appliances, landscapes, and water waste prohibition:

   The District operates under all applicable American Water Works Association (AWWA) standards, federal, and state laws and regulations and 2006 International Building Code (IBC). However, the District will consider adopting a water waste ordinance. *Further consideration is deemed appropriate.*

10. Incentives, including rebates:

    The District will begin a pilot rebate program to explore its efficacy. If there is adequate public interest and a noticeable benefit resulting from the pilot program, the District may expand funding and/or breadth of rebates offered in future years. *Further consideration is deemed appropriate.*

11. Distribution system efficiency, including leak identification:

    As previously stated, the District strives to maintain a well-functioning system. The District practices regular maintenance and provides for main replacement. Additionally, large charges in meter readings between billing periods are investigated for potential leaks. *Measures or programs related to this topic are deemed unnecessary for further consideration, by Criteria 4.*

12. Analysis of non-account water, and metering during flushing:

    The District's system is 100% metered. Since installing a metering system, non-account water has decreased to roughly 10%. To further decrease the amount of non-account water, the District will begin metering during flushing operations whenever practical. *Measures or programs related to metering are deemed appropriate for further consideration.*

Chapter 6: Evaluation and Selection of Conservation Measures and Programs

A. Purpose

In this chapter, the estimated savings and costs of the conservation measures and programs that were selected in the previous chapter are presented. A final group of conservation measures and programs are selected for implementation.

B. Selected Conservation Measures and Programs

From the previous Chapter, implementation of a non-potable service, leak detection, metering during flushing, rebates, and efficient landscape irrigation are measures deemed appropriate for further evaluation.

C. Estimated Water Savings of Selected Conservation Options

The water savings from rebate and audit programs were estimated using data provided by the US EPA Water Sense program. The District will establish the number of rebates and audits to issue per year based on financial availability, public interest, and their cost/benefit. For this planning period, the District will perform residential irrigation audits, commercial and industrial audits, and begin a rebate program for irrigation controls, toilets, and faucet aerators. Based on the success of these initial programs, the District will either expand them or pursue other measures during the next planning period.

Table 6-1 provides a summary of the anticipated water and monetary savings for all chosen conservation measures. Spreadsheets evaluating the benefit of rebates, audits, and the water waste ordinance can be found in Appendix C. When determining the potential financial savings involved with conservation, it was assumed the District would be delaying the need to purchase additional C-BT shares. Therefore, monetary savings are based on a C-BT share price of $27,000/unit. It was also assumed that a C-BT share would provide 0.7 acre-feet of supply.

From the 2014 Master Plan update, it was indicated that construction of the non-potable system would provide 421 acre-feet annually of currently unutilized water from the Weingardt wells. While this measure would not save water, it would tap a previously unusable resource and lower the demand on C-BT shares or other groundwater. The system would cost approximately $1,145,000 to build, but would save $16,240,000 by not having to purchase an equivalent amount of CBT water.

Metering during flushing does not directly lead to water conservation. However, reducing the amount of non-account water will provide a better understanding of how much water is lost to leaks, and therefore the efficacy of leak repair programs.

The cost/benefit of leak detection and repair is more difficult to quantify. It is estimated, leaks account for approximately half, or 5% of the non-account water. The District operates a relatively large system consisting of mostly small diameter pipe. Therefore, leak detection will not only require extensive surveying, but may not discover large leaks that would substantially benefit the District to repair. For this analysis, it was assumed 0.56 acre-feet are lost per year per mile of the distribution system.

The potential conservation resulting from a water waste ordinance is difficult to quantify. Additionally, water waste ordinances are difficult to enforce Therefore, a conservative 0.25% annual savings was applied to residential and commercial users.

Table 6-1: Summary of Anticipated Water Savings

Conservation Measure	Estimated Water Savings/Utilization	Unit Cost	Quantity	Cost to District	Net Monetary Savings
Non-Potable System	421 AF Total	$1,145,000	1	$1,145,000	$15,095,000 once
Leak Detection	0.56 AF/year	$300/mile	10 mi/year	$3,000 + leak repair cost	N/A*
Residential Irrigation Audits	0.56 AF/year	$214	20/year	$4,283/year	$17,474/year
Irrigation Rebate	0.54 AF/year	$146	20/year	$2,911/year	$17,924/year
Toilet Rebate	1 AF/year	$143	50/year	$7,141/year	$31,333/year
Faucet Aerator Rebate	0.04 AF/year	$15	50/year	$758/year	$623/year
Water Waste Ordinance	3.07 AF/year	$7,942	N/A	$7,942 once	$123,510/year
Commercial-Industrial Audits	0.70 AF/year	$322	5/year	$2,813/year	$24,049/year

*Due to the varying size of leaks and cost to repair them, a reasonably accurate monetary savings is difficult to determine.

Chapter 7: Integration of Resources and Modified Forecasts

A. Purpose

The purpose of Chapter 7 is to modify the water demand and supply capacity forecasts from Chapter 2 to reflect the anticipated effects of conservation. This step of the Plan will indicate whether and how water savings from conservation will allow the system to eliminate, downsize, or postpone new facilities or water purchases.

B. Revised Demand Forecast

A comparison of projected water demand with and without the chosen water conservation measures is provided in Figure 7-1. For this comparison, the reutilization of water resulting from the commercial system has been omitted to highlight actual savings. At the end of a ten-year period, it is estimated the new conservation measures could reduce demand 64.7 acre-feet. In conjunction with the commercial system, 485.7 acre-feet would be available to offset the acquisition of new CBT shares after a ten-year period.

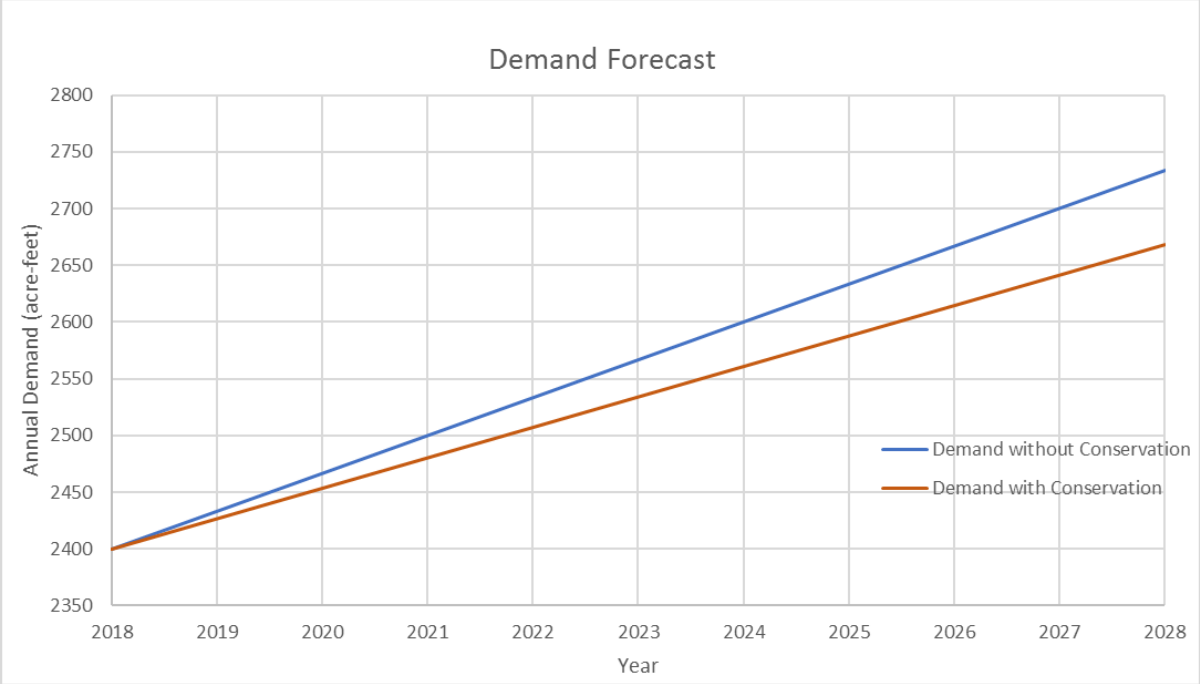

Figure 7-1: Projected Demand Forecast with and without Conservation Measures

C. Identification of Project-Specific Savings and Benefits of Conservation

Water conservation practices can reduce water demands and consequently have the potential to eliminate, downsize, or delay the need for water supply capital projects. Conservation can also reduce the amount of water rights that need to be purchased and thereby provide significant cost savings. The District does not anticipate downsizing or eliminating capital projects due to water conservation within this planning period.

However, the purchase of C-BT shares could be prevented or delayed as a result of these conservation measures.

D. Revenue Effects

In some cases, water conservation can result in a reduction to the revenue a water provider receives. However, the estimated lost revenue from conservation has been factored into the cost-benefit analysis. Compared to the cost of acquiring additional C-BT shares, the lost revenue from conservation is insignificant.

Therefore, the District feels that it is unlikely that water use reductions resulting from conservation would be cause for a rate increase. The District will monitor expenditures for conservations programs. If a program is not cost effective, it may be considered for elimination.

Chapter 8: Development of Implementation Plan

A. Purpose

Within this chapter, the District presents a strategy and timetable for implementing the conservation measures and programs selected in the previous chapter. Other elements of the conservation plan are also discussed, including monitoring and evaluation of water conservation activities and revision and updating of the Plan.

B. Implementation Schedule

MCQWD will begin to implement new conservation measures at the beginning of 2018. Their existing water conservation measures described in Section 5.D will remain in place.

C. Plan for Public Participation in Implementation

Beyond these existing actions and as part of this Plan, the District plans to sponsor workshops provided by the State of Colorado Forest Service and the Colorado Tree Coalition. The workshops will cover topics related to xeriscaping techniques as well as tree pruning and the effect that drought has on insects and diseases that could potentially attack trees.

As always, the public will play a key role in the overall effectiveness of the District's conservation plan. The success of the selected measure or programs depends on how the public responds to each. The more engaged the community is in altering their water-use behavior, the more effective the conservation plan will be.

D. Plan for Monitoring and Evaluation Processes

At the end of each year, beginning in 2019, the District will review the conservation measures and programs to determine the progress of each. A brief description of progress will be included in the District's annual report, and the success of each measure or program will be evaluated. The report will be made available for public review.

Quantification of actual water savings per individual measure is more difficult to determine. However, the District will assess those savings where possible. This information will be included in its annual report as well. Total water consumption records are easier to quantify and will continue to be part of the District's management activities.

E. Plan for Updating and Revising the Conservation Plan

Colorado's Water Conservation Statute requires that a covered entity revise their conservation plan at a minimum of every seven years. MCQWD plans on updating and revising this Plan within seven years from initial implementation, or by 2025. However, data will continually be collected and analyzed on an annual basis. If monitoring results or changes to the water supply system warrant changes to the conservation plan sooner than seven years, the District will revise the Plan accordingly.

Any modifications to the Plan will incorporate findings of the annual data collection and analyses. Historic water use, water savings, and implementation costs of water conservation efforts will be assessed. The performance of each conservation measure or program will be evaluated and any changes that are necessary will be identified. Additional conservation measures or programs will also be evaluated and considered for inclusion into the revised Plan.

F. Plan Adoption

The District's Conservation Plan was adopted on January 17, 2017, see signed meeting minutes in Appendix B. The District advertised the Plan for public review on their website and had copies of the Plan available at their office beginning on October 4, 2016. The Plan is still available to the public both online and in hard copy. To date, no comments have been received from the public regarding the Plan. The following advertisement was posted on their website: "Our Water Conservation plan is available for your review and comments. Click on the link below for access or stop by our office for a copy"

References:

Farnsworth Group, December 2014, Water System Master Plan for the Morgan County Quality Water District.

U.S. Environmental Protection Agency, 2007. Cases in Water Conservation: How Efficiency Programs Help Water Utilities Save Water and Avoid Costs.

Colorado Water Conservation Board, Municipal Water Efficiency Plan Guidance Document.

U.S. Environmental Protection Agency Water Sense program.

Colorado Revised Statute Title 37 Water and Irrigation §37-60-126. 37-60-126. Water conservation and drought mitigation planning - programs - relationship to state assistance for water facilities - guidelines - water efficiency grant program.

American Water Works Association, Manual of Water Supply Practices-M36, Second Ed., Water Audits and Leak Detection.