

Little Thompson Water District

WATER EFFICIENCY MANAGEMENT PLAN

November 2019

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Executive Summary

Profile

The Little Thompson Water District (District) was formed as a Colorado Special District in 1960 and began serving domestic water to a 300 square-mile area in Larimer, Weld and Boulder counties, Colorado in 1962. The District, a registered Colorado Public Water System, PWSID # CO0135477 provides potable and fire protection water to a service area that now encompasses nearly 300 square miles. The service area is generally bounded by the City of Loveland on the north, the City of Longmont on the south, the City of Greeley, the South Platte River and the St. Vrain River on the east and the foothills of the Front Range on the west. The District serves approximately 21,000 customers in and around ten municipalities, nine fire districts and three counties.

Currently the District relies solely on Colorado-Big Thompson (C-BT) water but it also owns Windy Gap water and native water rights. These other water rights will provide additional water supplies as they are brought online. The District also owns approximately 5,000 acre-feet of storage in Dry Creek Reservoir located west of Berthoud, Colorado. Dry Creek Reservoir is currently used for drought and Windy Gap water storage.

Population

There are approximately 21,000 customers in the District and 8,268 total taps. Total taps are all active and inactive taps in the District. Since the completion of the 2012 Water Efficiency Management Plan, the number of active total taps increased from 6,249 in 2012 to 7,929 taps in 2018, as shown in Table 1. Active taps are those that have water use every month of the year. The tap requests, infrastructure improvements and development activity have also accelerated in recent years, due to the economic activity in the communities served by the District. According to the Department of Local Affairs (DOLA), the population in towns near Interstate 25 have experienced growth in excess of five percent in recent years. This report summarizes these changing conditions and outlines efficiency measures and programs the District will incorporate to help meet the future water demands. Technical and legal issues connected with water rights and water storage are not addressed in this report.

Table 1: Annual Active Taps Count

Tap Category	2012	2013	2014	2015	2016	2017	2018
Residential	6,027	7,409	7,474	7,413	7,516	7,452	7,621
Non-Residential	220	301	304	316	322	299	296
Wholesale	2	16	4	16	17	13	12
Total:	6,249	7,726	7,782	7,746	7,855	7,764	7,929

Future Demand

In 2018, the District completed a Raw Water Master Plan (Master Plan), (see Appendix A). In the Master Plan the projected treated water demand was estimated based on historical deliveries and anticipated known and approved subdivisions. The District's 2012 to 2018 water demand was relatively stable, affected primarily by seasonal weather conditions, as shown in Table 2 below.

Table 2: Historic District Water Year Usage

Year	Usage (acre-feet)
2012	6,287
2013	5,541
2014	5,304
2015	5,502
2016	6,134
2017	5,995
2018	5,943

As the District encompasses a wide range of cities, towns and counties, it used the DOLA standard of 2.6 persons per household, or residential taps in anticipated subdivisions within the District to estimate future demand. The District's Master Plan estimated that the water demand from 2019 to 2025 will increase by 1,100 acre-feet to approximately 7,600 acre-feet. The estimated demand by 2040 is anticipated to be approximately 10,400 acre-feet. Conserved water was not included in these projections.

Efficiency Goals

The goals established for the 2012 Water Efficiency Management Plan were based on discussions with District Staff and Board. The goals were to reduce system losses by 25%, residential demand by 5%, and non-residential demand by 1%. The quantifiable goal for the 2012 water efficiency programs was to reduce the total water supply by over 480 acre-feet of water annually. Although it is unknown if the quantifiable goal for 2012 was met, steps were taken towards reducing water demand. The goals for the 2019 Water Efficiency Plan are:

- Keep water losses under 600 acre-feet annually
- Reduce real losses by 200 acre-feet, or 10%
- Reduce residential use by 150 acre-feet, or 5%
- Reduce non-residential use by 25 acre-feet, or 2%.

Efficiency Programs

In 2015, the District received a grant from the Colorado Water Conservation Board to complete and implement the American Water Works Association (AWWA) M36 Water Audit and Loss Control Program. The District hired a consultant to assist the District in

understanding the audit process and software, and to identify the highest priority programs which identify and reduce apparent water losses. The District continues to perform a water loss audit annually and adjusts its water loss program as needed. As part of its water loss program, the District is incrementally replacing existing customer meters with Automatic Meter Reading (AMR) meters to reduce water loss in customer service lines and facilitate water efficiency education.

The District hired a Water Conservation Coordinator in 2018 as part of the Water Resources team to manage and promote its existing water efficiency programs, and to establish an education and outreach program.

The District offers two different types of residential taps, a standard tap and an urban tap. The Cash-In Lieu fee, or raw water obligation, is less for an urban tap, but the rates are structured to send a significant price signal for high water use.

Efficiency Planning Process

The District Staff hosted a Water Conservation Work Session in April of 2019. Water conservation professionals discussed the need and pressure to conserve water and suggested programs and policies that could be implemented to conserve water in the District. Representatives from the Colorado Water Conservation Board, Western Resource Advocates, Water Demand Management and Northern Water, as well as District staff all contributed to the discussion. After the Conservation Work Session, the District Board discussed water efficiency programs, focusing on efficiency measures such as price signaling for high water users, education and outreach, fixture change out programs, and expanding the water-saving plants and soil amendment rebate programs to customers with existing landscaping. The Board also expressed interest in a photovoltaic system for Dry Creek Reservoir evaporation mitigation.

In the May 2019 Board meeting, the Board discussed water conservation. District Staff provided Board Members with a list of the Colorado WaterWise Guidebook Best Practices with staff recommendations for fiscal year 2020 along with highlights from the work session (Appendix B). The Board agreed to finance existing water efficiency programs including some expansion but tabled the larger water conservation discussion with plans to revisit it in the future.

Introduction

1.0 Profile of Existing Water Supply System

1.1 Overview of Existing Water Supply System

In the past the District served rural acreages, low-density subdivisions, dairies and feedlots, farmsteads, mobile home parks and a few small industrial parks. But its proximity to growth areas for ten municipalities including Berthoud, Evans, Firestone, Greeley, Johnstown, Longmont, Loveland, Mead, Milliken and Windsor and the Interstate 25 corridor has changed the nature of the District. It is becoming more of an urban water provider serving low, medium and high-density subdivisions as well as more retail and service oriented commercial customers.

The District currently provides service to approximately 8,268 total water taps in and around the ten municipalities, nine fire districts and three counties. To provide potable water service, the District jointly owns and operates the Carter Lake Filter Plant (CLFP) and Dry Creek Reservoir with the Central Weld County Water District (CWCWD). The water treatment plant and reservoir are both located west of Berthoud, Colorado. CWCWD and the District also jointly own transmission pipelines that originate at the CLFP.

This joint ownership allows the District to participate in cooperative water system projects, which lowers the incremental cost for both participants through economies of scale. The CLFP has a combined capacity of approximately 50 million gallons of water per day. The District also owns and maintains multiple treated water storage tanks and pumping stations, as well as over 600 miles of transmission and distribution pipelines throughout its large service area (Table 1.1). There are approximately 50 pressure zones in the District ranging from 35 pounds per square inch (PSI) to 165 psi.

Table 1.1: District Pipelines

Pipe Size	Length of Pipe (Feet)	Length of Pipe (Miles)
0.75	12	0.0
1	59,396	11.2
1.25	47,941	9.1
1.5	77,031	14.6
2	287,951	54.5
2.5	92,198	17.5
3	80,436	15.2
4	198,785	37.6
6	1,129,135	213.9
8	565,273	107.1
10	94,434	17.9
12	242,563	45.9
16	36,016	6.8
18	27,467	5.2
20	14,654	2.8
24	126,490	24.0
30	1,103	0.2
36	1,725	0.3
42	88,324	16.7
Total:	3,170,935	601

Through the partnership between the District and CWCWD, Dry Creek Reservoir was constructed in 2007. Dry Creek Reservoir has a storage capacity of approximately 10,000 acre-feet. Each District owns one half (or approximately 5,000 acre-feet of storage in the reservoir). Dry Creek Reservoir has an average annual evaporation of 500 acre-feet. Dry Creek Reservoir is primarily used for drought storage.

Currently the District relies on Colorado-Big Thompson (C-BT) water as its main water supply source. The C-BT system is managed by the Northern Colorado Water Conservancy District (Northern Water). Colorado River Basin water is diverted and stored in Granby Reservoir and delivered to the east side of the continental divide through the Adam's Tunnel to the Front Range and stored in several reservoirs including Carter Lake west of Berthoud. The District's C-BT water can then be delivered to CLFP or Dry Creek Reservoir from Carter Lake.

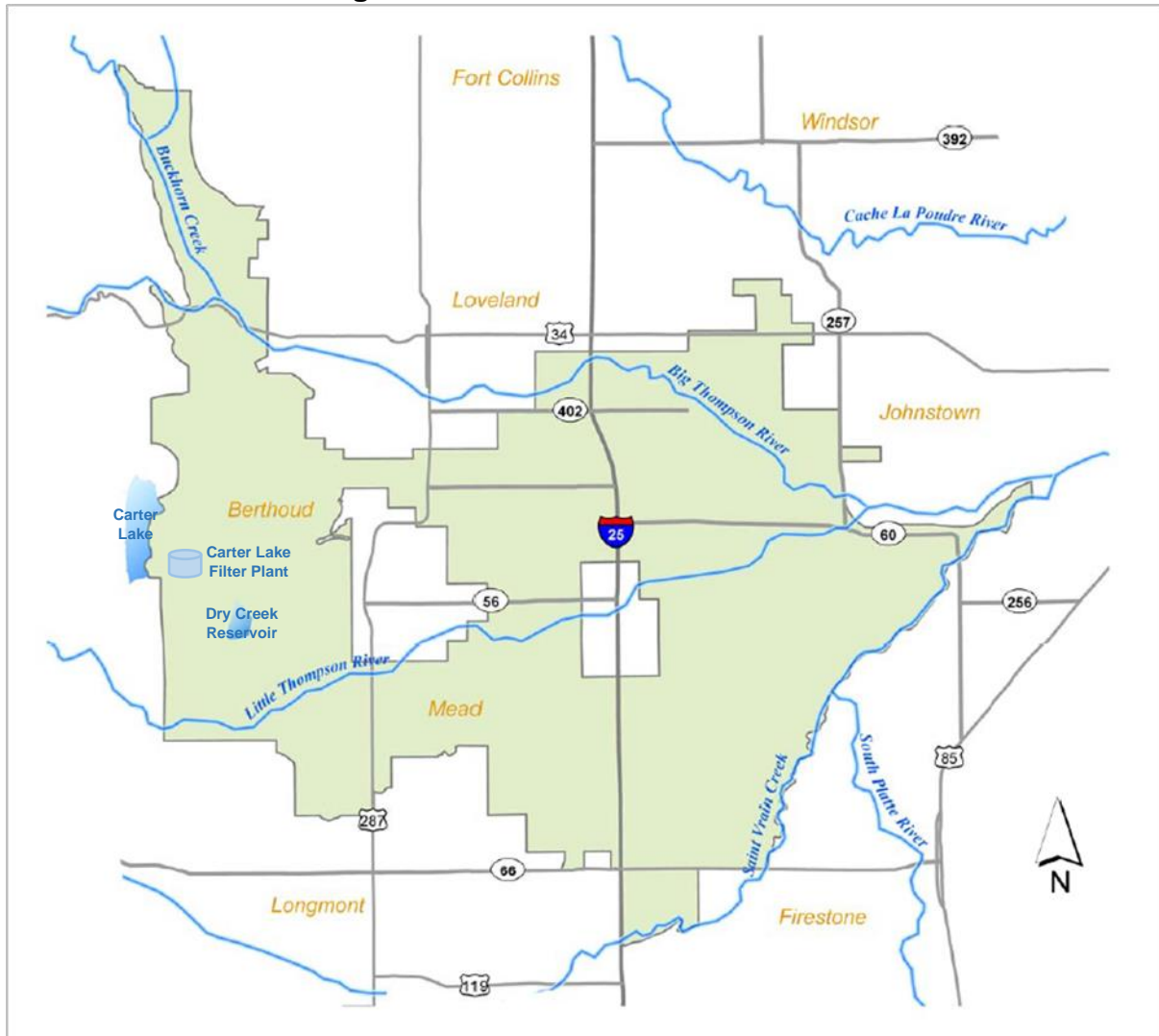
The District also owns 19 units of Windy Gap water, which are based upon a moderately junior water right on the Fraser and Upper Colorado Rivers. Currently, Windy Gap water can be stored at Granby Reservoir (subject to spill) and/or be delivered to CLFP or Dry

Creek Reservoir through the C-BT system. Water attributable to 12 of the 19 Windy Gap units will be stored in the Windy Gap Firming Project at Chimney Hollow Reservoir upon completion. Brookfield LLC met its raw water obligation by funding the purchase of the 12 Windy Gap units¹. The District owns the units, but the Windy Gap water will be served to Brookfield's development. In 2017 and 2018 the District acquired the additional seven Windy Gap units. The District is not directly participating in the Windy Gap Firming Project, so it plans use Dry Creek Reservoir storage to provide a firm yield for these Windy Gap units. A small volume of Windy Gap water was delivered into Dry Creek Reservoir during 2018.

The District also owns shares in local ditch companies but currently cannot use this supply as they are decreed for agricultural use. The District is planning to file a change of use application to the Water Court within the next year so it can use some of the ditch shares to meet future potable demands. Until then, the ditch shares are rented for agricultural use.

¹ The District entered into a contract with the City of Greeley to purchase the 12 Windy Gap units in 2005. The 12 units were formally transferred to the District in 2017 once the debt for the project was retired.

Figure 1.1: LTWD District Service Area



1.2 Water Supply Reliability

The District's water supply was tested during the 2002 drought. The District had to put restrictions on outdoor watering with staff enforcement. Record water demand caused by the hot, dry summer, coupled with projections of limited supplies for 2003 caused the District to ban all outdoor use in the late summer of 2002. In response to the 2002 drought the District began to diversify its water rights portfolio in 2005 to make it more resilient during these conditions. The District started accepting local ditch shares for water dedication and acquiring Windy Gap units, which are a wholly consumable water supply. In more recent years, scarcity of water supplies and the cost of water has been a driving factor in diversifying the District' portfolio. Tables 1.2 and 1.3 show water owned by the District and firm yield, or yield during a drought year, of each water supply.

Also in response to the 2002 drought, the District developed a Water Shortage Contingency Plan (see Appendix C). This plan is to ensure if a drought were to occur, water shortage criteria and responses were well defined. There are five drought stages and each stage have criteria for severity and the resulting responses the District will require from itself and tap holders.

With diversification of the District’s water rights portfolio, the District also planned for making these water rights usable. Native water shares cannot be used for municipal use until changed through Water Court, which can take as long as three years after applying. Windy Gap water also has its challenges being a junior water right and having limited storage to ensure a yield at all. With the firm yields in Tables 1.2 and 1.3, the District estimated in its Master Plan that there would be sufficient yield to meet estimated demands until approximately 2021.

Table 1.2: Water Deliverable to Carter Lake Filter Plant

Source	Quantity	Firm Yield Per Unit (ac-ft)	Total Firm Yield (ac-ft)	2018 Yield (ac-ft)
C-BT Class C Fixed Quota Units	5,274	0.5	2,637	3,692
C-BT Class C Variable Quota Units	4,971	0.7	3,480	3,977
C-BT Class D Griep Farm Units	100	0.5	50	80
Windy Gap Units	19	0	0	50
			Total (ac-ft):	7,798.6

Table 1.3: Native Water Shares owned by the District

Source	Quantity	Firm Yield Per Unit (ac-ft)	Total Firm Yield (ac-ft)
Big Thompson Ditch and Manufacturing Company	0.33	70.6	23.5
Consolidated Home Supply Ditch Company	58.75	3.5	205.6
Handy Ditch Company	39.9	2.5	99.8
Boulder and Larimer Ditch (Old Ish)	30	1.0	30.0
		Total (ac-ft):	358.9

1.3 Supply-Side Limitations and Future Needs

As the District continues to experience the high growth, and no slowdown is expected, its water demands will continue to increase. To meet the expected water demand, the District requires that developers of multi-lot subdivision and commercial properties dedicate water rights in exchange for water taps.

Supply limitations for native shares include getting the water somewhere it can be treated. Other limitations for native shares and Windy Gap units include long-term storage. The CLFP will also need to be enlarged when total capacity is close to being met. Additional

demand will also require additional distribution capacity throughout the District. There are no pressure issues the District is aware of at this time.

2.0 Profile of Water Demands and Historical Demand Management

2.1 Demographics and Key Characteristics of the Service Area

Within the nearly 300 square mile service area, the District provides water to a population of approximately 21,000 people in and around portions of Berthoud, Evans, Firestone, Greeley, Johnstown, Longmont, Loveland, Milliken, Windsor and all of the Town of Mead. In addition, the District delivers water to rural Boulder, Larimer and Weld County residences, businesses, agricultural, and livestock operations.

The District population is difficult to determine precisely because it provides service to many different governing entities. Census data can be obtained for counties, municipalities, and even regions, but not specifically for special districts. In an effort to estimate the household and total population for the District, 2013 to 2017 the District used estimate of persons per household data from the U.S. Census Bureau. The average persons per household in Colorado is 2.6. This was multiplied by the number of total urban and standard residential taps (7,917) in the District to get the approximate population of the District.

The District's utility billing system is used to account for five tap groups; standard residential, urban residential, urban non-residential, non-residential, and wholesale. Standard residential use includes single family homes with outdoor irrigation. The urban tap is for customers who have smaller lots, recommended for lots with less than 8,000 square feet, with little to no outdoor irrigation. This tap has an annual allotment of 114,000 gallons per year. If or when a customer's water usage gets above that annual allotment, a surcharge is applied is currently at \$8 per 1,000 gallons. Urban non-residential taps are also available for commercial properties that will have little to no outdoor irrigation and minimum indoor use such as retail space. Non-residential taps represent a wide range of use such as irrigation of large greenways in developments, dairies, commercial taps for light industrial. Wholesale customers include other water providers in and around the District. These wholesale customers, including the Town of Berthoud, Longs Peak Water District (LPWD) and North Carter Lake Water District (NCLWD), transfer raw water to the District monthly for treatment and delivery. The District does not retain authority over the customers living within the wholesale service areas.

2.2 Historical Water Demands

The District was originally formed to help meet water supply needs for rural customers struggling with local groundwater quality and quantity issues. The majority of early customers included agricultural users that needed water for operations including feedlots

and dairies. The District added residential and non-residential accounts starting in the 1960's and continuing into the 1980's. In the early 1990's the District began providing water to a growing residential community of large country estates. During this period the average, annual and peak water demands grew and changed significantly. In the 2000's the District is now experiencing another shift in demand toward smaller, more urban-sized residential lots with shared parks and open space. Although the majority of the District's service area is still zoned for agriculture, the trend of increasing residential and commercial zoning is expected to continue.

Table 2.1 shows the majority of the District's water demands are from residential customers. The non-residential category has the top five highest water users. All five water users are dairies. These dairies have had to upgrade waterlines and fix water leaks in the system in order to deliver the amount of water needed. Currently, there are no other water efficiency measures taken by these customers.

Table 2.1: 2012 to 2018 Average Water Demand by Tap Group

Category	Demand (acre-feet)	Percent (%) of Total Annual Deliveries
Residential	3,782	56.4%
Non-Residential	1,148	17.1%
Bulk Water	166	2.5%
Wholesale	847	12.6%
Real Losses	757	11.3%
Total:	6,700	100%

*Only average of real water loss data from 2014 to 2018

Figure 2.1 illustrates the District's monthly water use demand from 2012 to 2018. The District's demand for this time period varies from a low of 200 acre-feet per month, to highs of nearly 1,100 acre-feet per month. This difference in the range of seasonal use is the result of the increasing sector of urban residential customers and the demand for landscape irrigation in the summer.

Figure 2.1: District Monthly Water 2012 to 2018

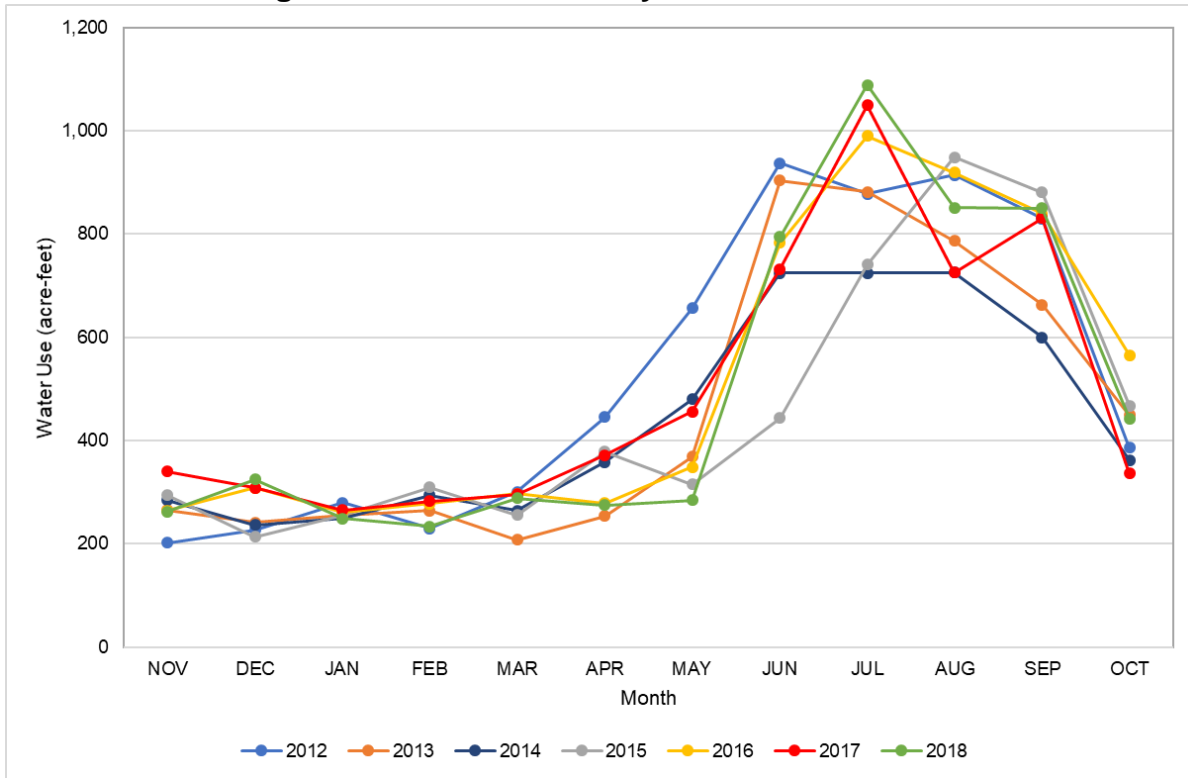


Figure 2.2 and Table 2.2 show the District’s annual water demand broken out into the different tap groups. In 2013, wholesale water spiked due to the September 2013 floods where the District assisted other water utilities so customers would not be without water. The real losses are only illustrated from 2014 to 2018 because the District completed its first AWWA M36 water audit. A spike in real losses in 2018 is likely due to master meter and residential change outs and upgrades and getting them dialed in to read correctly.

Figure 2.2: LTWD Annual Water Demand Distribution



Table 2.2: LTWD Annual Water Demand Distribution (ac-ft)

Tap Category	2012	2013	2014	2015	2016	2017	2018
Residential	4,011	3,565	3,438	3,579	4,020	3,865	3,996
Non-Residential	1,026	894	1,030	1,150	1,244	1,324	1,370
Bulk Water	0	0	487	225	67	92	289
Wholesale	109	1,792	678	571	782	922	1,073
Real Losses	N/A	N/A	754	751	307	824	1,152

2.3 Past and Current Demand Management Activities and Impact to Demands

The District supplied 5,943 acre-feet (1,936.5 million gallons) of potable water during the 2018 water year to 7,929 active customer taps within its residential and non-residential categories.

Residential Water Use

The majority of the District's water use is for residential customers within the growth management areas of the surrounding communities. Residential customers make up approximately 96% (7,273) of the total customers served from 2012 to 2018. This results in higher summertime demand for landscape irrigation on individual lots as well as in neighborhood open spaces. The residential water use average from 2012 to 2018 was 56.4% (3,782 acre-feet) of the total water delivered to customers by the District. The residential customer water use per tap was 0.52 acre-feet, or 170,857 gallons per tap, in 2018. In Table 2.3 below are past and current demand management activities for the residential tap category.

Landscape Efficiency Rebates

The District currently offers rebates and water efficiency programs to encourage a more water efficient landscape. The rebate programs allow customers of a new home to receive a Water-Saving Plant Rebate of \$250 and a Soil Amendment Rebate of \$500. Customers must provide receipts to receive the rebates. The District also partners with Resource Central to provide sprinkler audits. This program is free to all customers. A summary of the customers using these services is summarized below.

Table 2.3: Annual Water Conservation Participants Count

Year	Slow the Flow	Soil Amendment Rebate*	Water-Saving Plants Rebate*
2014	2	0	0
2015	13	0	0
2016	60	2	1
2017	56	3	2
2018	62	4	2

*Rebates were not implemented until 2016.

Water Loss Audit

In 2015, the District received a grant from the Colorado Water Conservation Board to promote the use of the American Water Works Association (AWWA) M36 Water Audit and Loss Control Program software. The District hired Peter Mayer of Water Demand Management to demonstrate to staff how the M36 software is to be used, the underlying assumptions, the importance of its data validity score and how to identify the highest priority projects to reduce its apparent water loss. The District has independently completed the audit every year since the grant. On average, water loss has been 11% from 2014 to 2018. Water loss was as low as 5% in

2016 and about 15% in 2018. Increase in water loss in 2018 is likely due to master meter and residential change outs and getting them setup correctly.

Customer Meter Replacement

The District is incrementally replacing all the customer meters with AMR meters. By allowing customers to have access to daily water usage through an app on their phone, leaks in the service lines can be identified and repaired in a timely manner reducing water loss. Additionally, the AMR platform allows the District to educate customers about water efficiency.

Water Conservation Coordinator

In 2018, the District hired a Water Conservation Coordinator. The most visible portion of the job is to work within the water conservation community to learn about water saving programs and ideas to educate the District's customers and Board. The coordinator is also responsible for data management and complex technical analyses such as the AWWA M36 Water Audit.

Urban Tap

The District has two residential taps: a standard tap and an urban tap. The standard tap is appropriate for larger and estate lots and rates are based on an inclining tiered structure. In 2016, the District created an urban tap. The Cash-in-lieu or raw water requirement for the urban tap is one half of that of a standard tap but the billing structure is designed to send a strong price signal to urban tap customers using with high water use. Customers with an urban tap are given an annual allotment of 114,000 gallons. If this allotment is exceeded, the customer is assessed a surcharge of \$8.00 per 1,000 gallons for the rest of the year. This is different than the Conservation Tap in the 2012 Water Efficiency Management Plan where the allotment was based on a monthly allotment. The urban tap is recommended for lot sizes of 8,000 square feet or less.

The urban tap is being requested more frequently by developers due to the high cost and limited raw water for dedication. Many developers constructing multi-lot subdivisions are reducing lot sizes.

Non-Residential Water Use

Non-Residential water users in the District include office buildings, schools, tree farms or nurseries, manufacturing and light industrial facilities, agricultural operations including dairies and feedlots, and some large irrigation taps. Non-Residential customers make up approximately 4% (294) of the total customers served from 2012 to 2018. Non-Residential water use is the second largest water use category in the District at 17.1% (1,148 acre-feet) of average water delivered to customers from 2012 to 2018. The non-

residential customer water use per tap was 4.63 acre-feet, or 1,509,437 gallons per tap, in 2018.

Wholesale Water Use

The District has multiple master meter accounts with adjoining water providers. It is a wholesale water provider for Longs Peak Water District, North Carter Lake Water District, and Town of Berthoud. In addition, the District has master meter connections with CWCWD, Fort Collins-Loveland Water District, Johnstown, Loveland, and Milliken. Wholesale customers account for 0.2% (12) of the total customers served from 2012 to 2018. Wholesale water use was 12.6% (847 acre-feet) of water delivered on average from 2012 to 2018. Total wholesale water use in 2018 was 1,073 acre-feet, or 349,566,632 gallons.

Bulk Water Use

The District supplies water for firefighting and other temporary uses from hydrants such as construction or for oil and gas production. The District also operates hydrants as part of its active distribution system flushing program. The volume of bulk water is variable year to year, depending primarily on demand for temporary use of water.

The District meters distribution system hydrant flushing, and water delivered from fire hydrants to more accurately track previously unaccounted for use. Bulk water use was 2.5% (166 acre-feet), or 54,091,266 gallons, on average from 2012 to 2018. Total bulk water use in 2018 was 289 acre-feet, or 94,170,939. The increase use in bulk water from 2010 (6.7 acre-feet) to present is likely due to the influx of oil and gas and construction activity in the area.

Real Losses

Water production is typically slightly higher than the amount of water billed due to system losses. System losses can be attributed to all unmetered uses including fire flows, flushing lines, illegal taps, pipe leaks, and theft. On average over the last seven years, 11% of all water delivered into the distribution system were real losses. In 2018, the estimated real losses in the District’s system was 1,152 acre-feet (15%). Real losses are summarized in Table 2.4.

Table 2.4: District Real Water Loss

Year	Real Loss (ac-ft)	% of Total Water Demand
2014	754	12%
2015	751	12%
2016	307	5%
2017	824	12%
2018	1,152	15%
Average:	757	11%

The District has been working for many years to reduce the real system losses. Regular valve maintenance, pipeline upgrades and prompt leak repair are standard operating procedures. The entire system is metered, and the water users are monitored monthly for high water use and contacted when identified. High water users have been evaluated and updated for correct meter sizing to avoid meter slippage, or the volume of water that is not registered by the meter at the correct flow rate. Several master meters have been installed in the system in strategic locations to create smaller areas to monitor for possible leaks. A SCADA system has been installed throughout the system and is used for real time monitoring.

Even with all of these measures the District has continued to experience high variability in annual losses. Therefore, the District has recently taken steps to better account for the system efficiency. One step has been upgrading meters in the District to the Badger Automatic Meter Readings (AMR). Another step included incorporating distribution system efficiency accounting tools provided by the American Water Works Association (AWWA) in their Water Audit and Loss Control Program M-36 manual and software. The water loss has been completed on an annual basis since 2014. District Staff is currently participating in the Colorado Water Loss Initiative, which will lead to two years of certified AWWA M36 Water Audits.

Non-Potable Water Use

The District has been meeting with developers who are interested in non-potable systems but no specific plans for a non-potable system have been presented.

Water Use Trends

Figure 2.4 shows the average annual water use by average active taps from 2006 to 2018 in the two retail categories served by the District: 1) Residential, and 2) Non-residential. Figure 2.5 shows per-capita water use for residential taps from 2006 to 2018. Annual variations in both figures are due to weather, having dry or wet years. The year 2012 was a particularly dry year, which can be seen as high peaks in both the average water use per tap and GPCD. 2013 was a wet year where a dip in the both Figure 2.4 and 2.5 can be seen. This is due to the September 2013 floods. As illustrated in the figures below, there has been little to no water savings through previous demand management efforts. Most of the saving is through weather variations. It should be noted that the District has significantly increased in growth from 6,249 taps in 2012 to 7,929 taps in 2018.

Figure 2.4: District Average Water Use per Tap

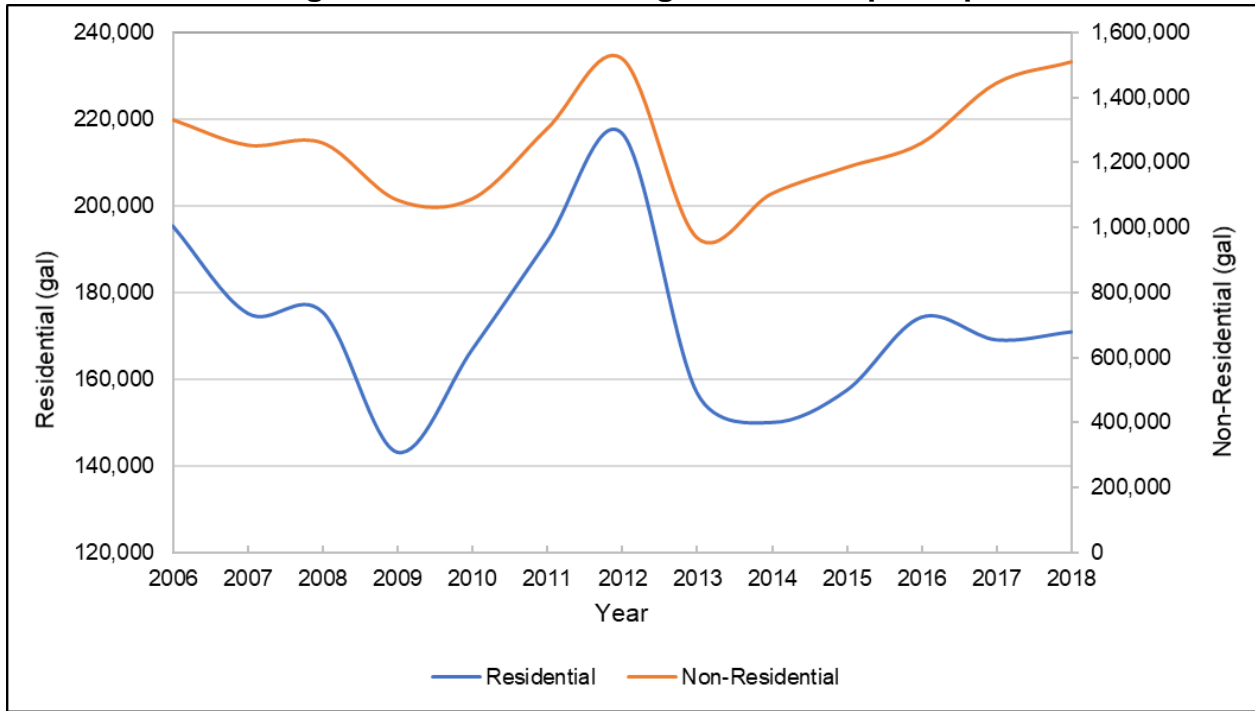
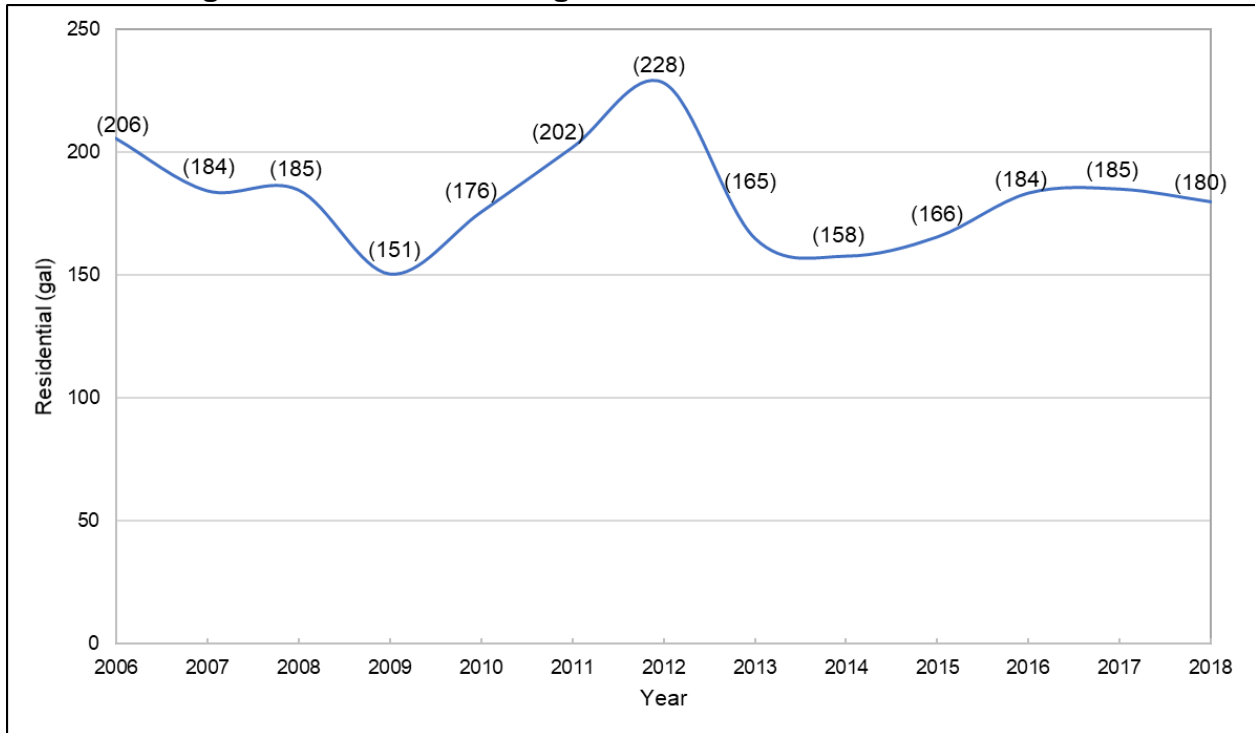


Figure 2.5: District Average Residential Water Use for GPCD



2.4 Demand Forecasts

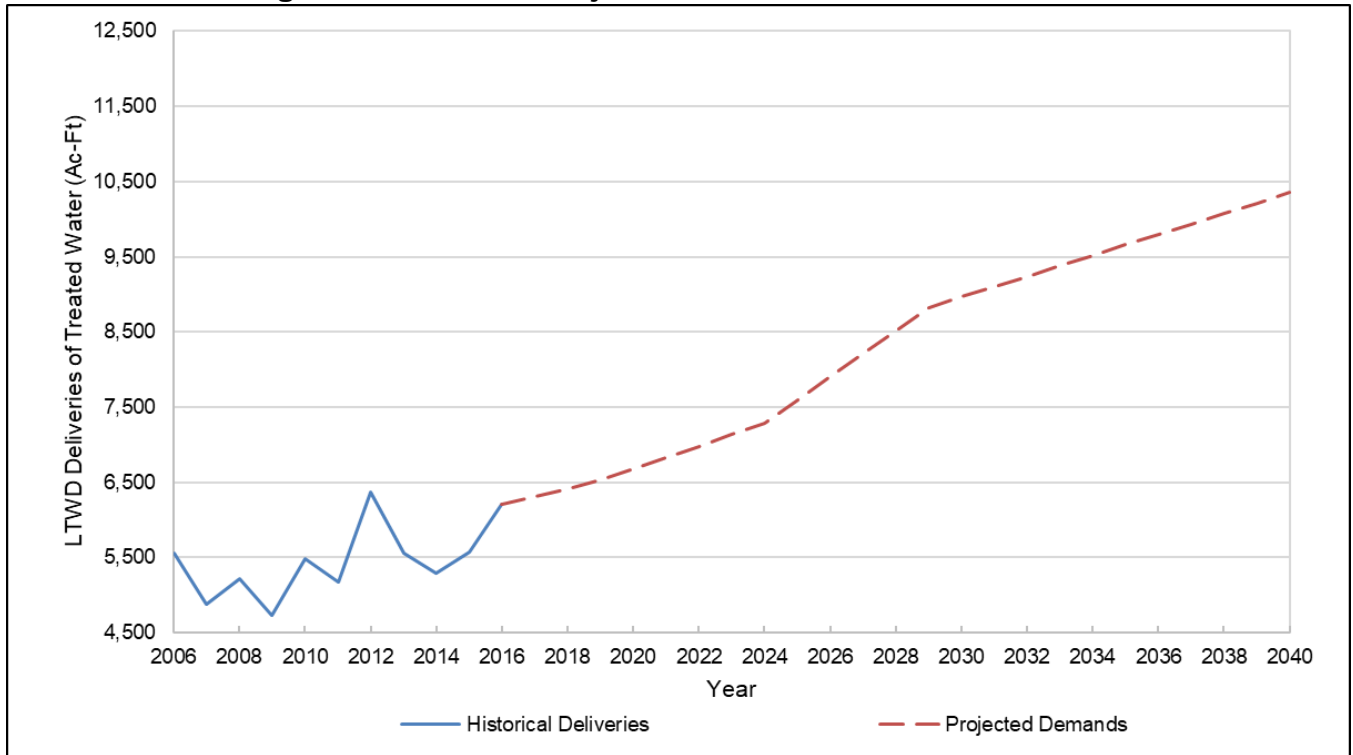
In the Master Plan, developments within the District service area were identified and ranked based on their approval status within local jurisdictions to estimate future growth rate and location within the District. The list included 33 primary developments and 27 smaller developments with 3,171 standard residential, 3,147 urban, 2,576 multi-family, 1,037 commercial and 136 irrigation/other taps by 2040. Assumptions were based on approved plans, phases of plans, commitment to serve letters, and timing of developments coming online.

A ranking system was assigned to the developments in order to set forth a schedule for construction and tap sales that the District may anticipate. The developments were further adjusted in their growth rates based upon four other weighting factors; location, the planning and zoning entity, the developer, and the availability of existing infrastructure. The sum of the weighting factors set forth the adjustment for development speed. Projections are intended to be approximate forecasts that demonstrate general trends and not to be interpreted as exact targets or absolute predictions of what will occur. Table 2.5 and Figure 2.6 show the District's projected demands through 2040, which were taken from the 2018 Raw Water Master Plan (Appendix A).

Table 2.5: District Projected Growth and Water Demand

Year	2020	2025	2030	2040
Average Annual % Growth	2.00%	2.60%	3.40%	1.40%
Total Taps at Period End	8,449	9,687	11,543	13,415
Total Demand at Period End	6,675 acre-feet	7,591 acre-feet	8,964 acre-feet	10,350 acre-feet

Figure 2.6: District Projected Retail Water Demand



3.0 Integrated Planning and Water Efficiency Benefits and Goals

The District currently does not include Water Efficiency in future water supply planning. The District’s Board is evaluating the best use of conserved water. Until that decision is made, the Board will not start an Integrated Resource Plan. The District requires any development over two taps to dedicate raw water to; therefore, the Board does not see conservation as key to maintaining an adequate future water supply.

3.1 Water Efficiency and Water Supply Planning

Water supplies along the Front Range are scarce and expensive. Developers are looking for alternative ways to meet or reduce the raw water dedication obligation.

Water conservation could reduce daily water usage peaks, reducing stress on CLFP and transmission lines. This would extend the life of the infrastructure and reduce or delay significant capital expenditures.

One of the conclusions of the 2018 Raw Water Master Plan was the need for more raw water storage. Additional storage would allow the District to retain water not needed in one year for use in a drought year. Conservation would increase the volume of water available for drought. Additional storage would increase the yield of the District’s other water supplies, which would allow the District to be more prepared for drought years.

3.2 Water Efficiency Goals

The District's objective is to implement a Water Efficiency Management Plan that will increase water use efficiency and thereby reduce water demands. The District will attempt to accomplish this without infringing upon people's right to use water and develop their land. The District's goals include reducing the loss and waste of water, improving efficiency in the use of water, extending the life of current water supplies, and identifying means to support water reuse.

Establishing water conservation goals is an iterative process that begins with quantifying the future demand for water based on current water-use habits and identifying areas water use can feasibly and effectively be reduced. Reduction of future water demand through water conservation will potentially delay planned water supply acquisition and the need for infrastructure improvements.

Residential Goals

The District goal's is to reduce residential water use by 200 acre-feet, or approximately 5%, of the average residential water use for the past seven-years (Table 2.1). A 200 acre-foot reduction in residential water is an 11 GPCD reduction. This would be a reduction from the current 180 GPCD (see Figure 2.5) to 169 GPCD. This reduction will come from the District's largest water-use category. Much of the water reduction is anticipated to come from increased communication and promotion of the existing measures and smaller lot sizes in new developments attributable to urban taps (and associated penalty rates for high usage).

Non-Residential Goals

The non-residential category includes office buildings, hotels, schools, retail stores, restaurants, car washes, tree farms or nurseries, manufacturing and light industrial facilities, agricultural operations including dairies and feedlots, and some large irrigation taps. The Non-Residential water demand is projected to increase due to growing commercial development and number of services within the I-25 corridor. The growth in this area may also bring higher water-use industries than there have been in the past.

The District's goal is to reduce non-residential water usage reduction by 2% or 25 acre-feet over the next seven-years. The goal is based on the average non-residential water usage (Table 2.1). The District will use this planning period to continue to audit high usage. The District needs to establish additional water use categories to better track the water use of these non-residential categories in its billing system. The District will increase the water usage categories to increase the effectiveness of future water efficiency planning and programs.

Master Meter Goals

The contracts that the District has with its wholesale and master meter customers limits the District's ability to impose conservation measures on those entities and relieves the

District of the responsibility for obtaining water rights for those customers. The District's wholesale customers transfer their own water rights to the District to meet their water demands. Without authority to enforce conservation measures within the service areas of its wholesale customers, and no obligation to secure water rights for them, the water use of the District's master meters is excluded from analysis in this report.

Real Loss Goals

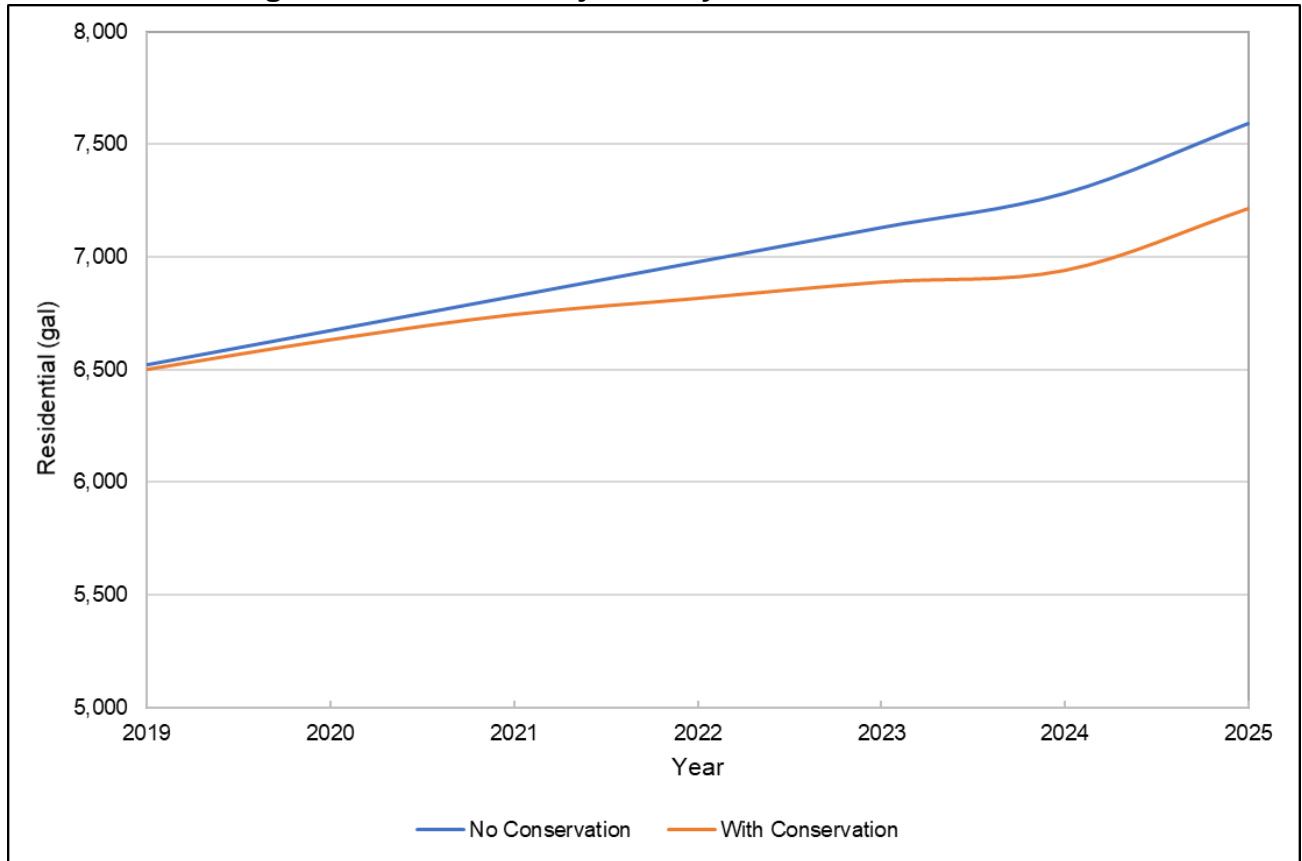
Since 2014, Real Loss is calculated using the AWWA M36 Water Audit method. Real losses have been a focus for the District in the last ten years. Meters have been installed and updated on all taps and pressure reducing valves along with a SCADA system are in place to monitor pressures that could lead to leakage. Leaks are monitored and repaired in a timely manner.

To improve system water loss, the District started changing out master meters and customer meters in 2018 to Automatic Meter Readings (AMR), where customers can access their water usage on a daily basis through an app on their smart phones. The District's real water loss was 15% in 2018. Without more metering in the joint sections of the District and CWCWD distribution system, it is unknown if this real loss is a higher or lower percent for the District. The District will strive to keep annual water loss under 600 acre-feet per year, or approximately under 10%. This was based on the average water use demand over the past seven years (5,815 acre-feet) in Table 1. The District's goal is to reduce system loss by 150 acre-feet based on the average system real losses from 2014 to 2018, Table 2.2, and the difference between the average seven year water demand, Table 1.

Total Water Efficiency Goals

Figure 3.1 shows the District's projected total system water demand from 2019 to 2025, both with and without the stated efficiency goals. By the time the Water Efficiency Management Plan is fully implemented in 2025, it is estimated that the projected annual system water demand will be reduced by a total of 375 acre-feet due to District and customer efficiency improvements.

Figure 3.1: District Projected System Water Demand



4.0 Selection of Water Efficiency Activities

4.1 Summary of Selection Process

District Staff reviewed numerous resources to develop a list of water efficiency measures and programs that could be considered for implementation in order to reach the efficiency goals established in the Water Efficiency Management Plan. After attending several water conservation workshops, including the District’s Water Conservation Work Session, reviewing several templates, CWCB guidance documents, and approved plans, Staff determined that the Colorado WaterWise document, “Guidebook of Best Practices for Municipal Water Conservation in Colorado”, provided the best and most current review of water efficiency measures and programs to consider.

Screening Criteria

The District relied on the Guidebook for an initial screening of the measures, programs, and practices that exist and have been tested. Even the 226-page Guidebook only presented 14 Best Practices for initial consideration.

The Guidebook incorporated the Best Practices into several categories for consideration including:

1. Water System and Utility Best Practices (BP 1 – 6)
2. Outdoor Landscape and Irrigation Best Practices (BP 7 – 10) and
3. Indoor Residential and Non-Residential Best Practices (BP 11 – 14)

The measures were also evaluated to determine if the CWCB minimum required water conservation plan elements were addressed. The CRS§37-60-126(4) required CWCB elements include:

1. Water-efficient fixtures and appliances, including toilets, showerheads, and faucets.
2. Low water use landscapes, drought resistant vegetation, removal of phreatophytes, and efficient irrigation.
3. Water-efficient industrial and commercial water use processes.
4. Water reuse systems.
5. Distribution system leak identification and repair.
6. Dissemination of information regarding water use efficiency measures, including by public education, customer water use audits, and water-saving demonstrations.
7. Water rate structures and billing systems designed to encourage water use efficiency in a fiscally responsible manner.
8. Regulatory measures designed to encourage water conservation.
9. Incentives to implement water conservation techniques, including rebates to customers.

The Guidebook was an invaluable tool to help evaluate and rank the initial list of Best Practices. The District thoroughly reviewed and considered each of the foundational, informational, and operational measures. The District also applied additional screening criteria based on Board and Staff input. Each Best Practice was further evaluated using the following criteria:

1. Statutory requirement - Several water conservation measures noted as Best Practices in the Guidebook are programs that are already mandated by Colorado State statute or are now required to be implemented for this plan to be approved. While Colorado's Water Conservation Planning requirement (CRS§37-60-126) does mention several plan elements that are to be considered, not all of them are required to be implemented. The District identified in the screening which of the Best Practices are required to be implemented.
2. System Applicability – The District is a very unique water system. The nature of the service area, the historical layout of the infrastructure, the water resources currently used, and the makeup of the customers all

provide obstacles to the direct implementation of some of the recommended Best Practices, including land use best practices. The District has no land use authority.

3. Board Direction - The District Board of Directors provided input and guidance for the implementation of this Water Efficiency Management Plan. In general, direction was given to meet statutory conservation requirements while continuing to meet the needs of our customers by increasing District operational efficiencies, continuing public outreach, and implementing some new targeted conservation programs.
4. Financial Impacts – Providing quality water to customers at a fair and reasonable price is the District’s reason for existence. All of the measures, or Best Practices considered are evaluated not only by the cost of implementation but also for the potential for lost revenue. Any decrease in water usage correlates directly to a reduction in revenue and will likely lead to increased rates.

List of Measures and Programs Considered

Each of the 14 Best Practices was screened with the above criteria in mind and the results are presented below in Table 4.1.

Table 4.1: Colorado Waterwise Best Practices

	Best Practices Considered	Existing	Reasons for Inclusion or Exclusion				Further Evaluation	Comments
			Statutory requirement	System applicability	Board direction	Financial impacts		
1	Metering	Yes	Yes				Yes	100 % metered connections, CRS§37-97-103.
	Conservation-oriented rates	Yes	Yes				Yes	Increasing block rate, CRS§37-60-126 (4) (a)(VII). Increased; effective Jan. 1, 2019.
	Tap fees	Yes	No				Yes	Based on water demand and meter size.
	Customer categorization within billing system	Yes	No				Yes	Updated billing system in 2013 has better capability to track customer classes. Not NAICS compliant, some potential billing system limitations.
2	Integrated resources planning	No	Yes			Exclude	No	Required for this plan, CRS§37-60-126.
	Goal setting	Yes	Yes			Exclude	Yes	Required for this plan, establish both supply and demand side efficiency goals.
	Demand monitoring	Yes	Yes				Yes	Currently monitor demand, will use to track efficiency gains from implementing this plan.
3	System water loss control	Yes	Yes			Include	Yes	Currently monitor water balance, and repair leaks, CRS§37-60-126 (4) (a)(V).
4	Conservation coordinator	Yes	No					Currently a shared staff responsibility with a designated contact point, small system high cost.
5	Water waste ordinance	No	No			Exclude	No	Water Shortage Contingency Plan covers forced restrictions. Best handled by local building Codes, City and/or County implementation.
6	Public information and education	Yes	Yes			Include	Yes	CWCB AWWA M36 Water Audit grant, bill stuffers, newsletters, website, seminars, conservation fair.

Best Practices Considered	Existing	Reasons for Inclusion or Exclusion				Further Evaluation	Comments	
		Statutory requirement	System applicability	Board direction	Financial impacts			
9	Water efficient design, installation, and maintenance practices for new and existing Landscapes	No	Yes	Exclude	Exclude		No	Use the increasing block rate to limit use, large lots and agricultural uses provide obstacles for budgeting. Best handled by local building Codes, City and/or County implementation. No land use regulation authority.
10	Irrigation efficiency evaluations	Yes	No			Include	Yes	Free sprinkler audit program through Resource Central for all customers.
11	Rules for new construction, residential and non-residential	No	No	Exclude			No	Best handled by local building Codes, City and/or County implementation. No land use regulation authority.
12	High-efficiency fixture and appliance replacement for residential and non-residential sector	No	No		Exclude		Yes	Discussion of potential rebates to replace fixtures in the future.
13	Residential water surveys and evaluations, targeted at high demand customers	No	No			Include	Yes	May include links to audit tools in public information. No staff or funds to implement this program or regulate the professionals and /or designs.
14	Specialized nonresidential surveys, audits, and equipment efficiency Improvements	No	No			Include	Yes	May include links to audit tools in public information. No staff or funds to implement this program or regulate the professionals and /or designs.

Initial Screening of Efficiency Measures and Programs

Based upon the initial screening criteria the following Best Practices Guide were evaluated further for consideration and implementation the District:

Table 4.2: Best Practices Evaluated

Guidebook Best Practice	Best Practice Description
1	Metering
1	Tap fees
1	Customer categorization within billing system
2	Goal setting
2	Demand monitoring
3	System water loss control
6	Public information and education
12	High-efficiency fixture and appliance replacement for residential and non-residential sectors
13	Targeted high demand water efficiency surveys and evaluations for residential and non-residential sectors

4.2 Demand Management Activities

4.2.1 Foundational Activities

Additional SCADA / Telemetry Sites

The District currently has 56 radio telemetry sites spread out over the nearly 300 square mile service area. The telemetry sites have been installed in each new or upgraded master meter vault, pressure regulating valve vault or pump station over the past 25 years. The District has other sites that do not have telemetry. Installation of telemetry at these additional sites will provide more timely information and notification of distribution system problems or failures. This information will lead to better service for customers and more responsive leak identification and repair.

Demand Monitoring

The Colorado WaterWise "Guidebook of Best Practices" said it best, "Demand monitoring provides regular feedback on consumption patterns in a utility. Tracking demands over time is essential for determining if a conservation program is achieving the desired results. Without demand monitoring there is no way to determine if a conservation goal has been achieved." The District will review changes to the demand patterns annually in order to monitor the effectiveness of the water efficiency programs and determine if goals need to be revised.

Tap Connection Fees

The District charges a tap connection fee that is based on a volume of deliverable water and the size of the connection and metering equipment, see Table 4.3. Water rates are based on the tap size and corresponding volume of water delivered. The fees charged for a tap are directly related to the use of system infrastructure and the raw water resources needed to meet the water demand. The District offers several different size taps from the standard 5/8-inch residential size tap up to a 4-inch non-residential tap. The District works with new customers to help guide them to the correct size tap in order to suit their water needs.

In 2016, the District developed and began offering an Urban Tap to provide a water service alternative for customers who are committed to efficient outdoor water use. In the 2012 Water Efficiency Management Plan, this tap was referred to as the Conservation Water Tap. Water dedication and water rates for the Urban Tap reflect normal inside water use but encourage significantly lower outside use as compared to the standard residential customer. Customers who choose this option are rewarded with a significant upfront cost savings on the tap connection fee but will have water rates that discourages high use. Currently, there is an \$8 per one-thousand-gallon surcharge added to the cost if the customer exceeds an annual allotment of 114,000 gallons. The District will continue tracking water use by Urban Tap customers to evaluate the cost and resource savings this tap option provides.

Table 4.3: District Water Tap Fees

Meter Size	Plant Invest Fee	Install Fee	Water Rights Acre-Feet	Current Water Rights Value	Total Cost
5/8" Urban	\$7,000	\$3,000	0.35	\$23,880	\$33,880
5/8"	\$11,000	\$3,000	0.7	\$47,600	\$61,600
3/4"	\$16,500	\$3,500	1.10	Must bring raw water	\$20,000 + Raw Water
1"	\$27,500	\$4,000	1.80	Must bring raw water	\$31,500 + Raw Water
1 1/2"	\$55,000	*\$1,825	3.50	Must bring raw water	\$56,825 + Raw Water
2"	\$88,000	*\$2,920	5.60	Must bring raw water	\$90,920 + Raw Water

*Developer must install. Fee is for materials.

Billing System Customer Categorization

The District finalized a new customer billing program in 2013. The new billing system will provide additional customer classifications that will be used for water usage tracking.

Better tracking information will also provide the District with a way to monitor progress toward meeting the water efficiency goals outlined in this plan.

High Efficiency Fixture and Appliance Replacement

District staff and Board discussed a rebate program to replace fixtures and appliances, specifically toilets and clothes washers with water efficient models.

Water Rates

The District's increasing block water rate structure encourages efficient water use. The inclining rate structure is utilized for all customers. Residential customers have a variable demand. However, some non-residential customers have high and fairly constant demands. The District has worked to set commodity rates at levels to encourage the residential customers to be more efficient summer irrigators without penalizing the non-residential customers. The District had a rate hearing in 2018 and approved a 3% increase for the all tiers effective beginning January 1, 2019 (Table 4.4). The District's water rates have proved to be the most effective conservation tool and have helped reduce the need to impose and enforce strict outdoor watering schedules or monthly water use budgets.

The District will continue to evaluate the base fee, usage tiers and commodity rates as a part of the annual budgeting process. The District will continue to ensure that water rates are designed for cost stabilization, building reserve funds, promoting conservation, and providing equity between customer classes for funding new construction and replacement programs.

Table 4.4: District Monthly Water Usage Rates

Tap Size	Monthly Base Charge	Gallons Used	Rate per Thousand Gallons
*5/8" Urban	\$26.86	0 - 6,000	\$2.44
		6,001 - 15,000	\$3.07
		>15,000	\$4.15
5/8" Standard	\$26.86	0 - 6,000	\$2.44
		6,001 - 25,000	\$3.07
		25,001 - 50,000	\$3.61
		>50,000	\$4.15
3/4" Standard	\$29.10	0 - 9,000	\$2.44
		9,000 - 45,000	\$3.07
		45,000 - 90,000	\$3.61
		>90,000	\$4.15
5/8" Non-Residential	\$26.86	0 - 6,000	\$2.44
		6,000 - 30,000	\$3.07
		30,000 - 60,000	\$3.38
		>60,000	\$3.70
3/4" Non-Residential	\$29.10	0 - 9,000	\$2.44
		9,000 - 45,000	\$3.07
		45,000 - 90,000	\$3.38
		>90,000	\$3.70
1" Non-Residential	\$37.15	0 - 15,000	\$2.44
		15,000 - 75,000	\$3.07
		75,000 - 150,000	\$3.38
		>150,000	\$3.70
1 1/2" Non-Residential	\$69.89	0 - 30,000	\$2.44
		30,000 - 150,000	\$3.07
		150,000 - 300,000	\$3.38
		>300,000	\$3.70
2" Non-Residential	\$84.63	0 - 48,000	\$2.44
		48,000 - 240,000	\$3.07
		240,000 - 480,000	\$3.38
		>480,000	\$3.70
3" Non-Residential	\$157.00	0 - 105,000	\$2.44
		105,000 - 525,000	\$3.07
		525,000 - 1,050,000	\$3.38
		>1,050,000	\$3.70
4" Non-Residential	\$229.44	0 - 189,000	\$2.44
		189,000 - 945,000	\$3.07
		945,000 - 1,890,000	\$3.38
		>1,890,000	\$3.70

*The 5/8" Urban Tap rate allows for 114,000 gallons of usage per year. Usage overage results in a surcharge of \$8.00 per thousand gallons. Vacant Lot Base Fee = \$8.35

System Water Loss Control

The District's current leak detection program uses customer meters, pressure reducing valves, Supervisory Control and Data Acquisition (SCADA) communications and the billing database to track water use and leaks in the system. All known leaks in distribution lines are repaired in a timely manner and any leaks found on customer service lines are promptly reported to the customer. All leaks are recorded into the District's Geographic Information System (GIS) through Global Positioning Systems (GPS) and evaluated annually to assist in identifying what distribution areas of the District need to be addressed and upgraded.

In 2015, the District received a grant through CWCB that allowed the District to hire Peter Mayer from Water Demand Management to teach staff how to use the AWWA M36 water audit methodology and software to evaluate real and apparent losses from its distribution system and identify projects and policies that could reduce system water loss. District personnel from operations, engineering, management and customer service have worked on water accounting issues that may contribute to undocumented losses every year since Peter's engagement. Using the M36 Audit, the District identified several cost-effective projects to reduce system water loss. For example, it upgraded its master meters. In 2018, the District also started to replace residential and non-residential with AMR meters that can alert customers of high-water use through the smart phone

The District is relying on guidelines presented in the AWWA Water Audit and Loss Control Program M36 manual and software to effectively manage the water delivery system. The District is currently participating in the Colorado Water Loss Initiative M36 water audit. Using information from leak repairs, meter testing and reading, distribution system flushing, and hydraulic modeling, the District is now more successful evaluating both apparent and real losses including accounting for metered and un-metered, billed and unbilled uses and losses.

Billing and Customer Meter Reading Practices

The District reads meters and sends bills monthly. The District uses automatic meter reading (AMR) to gather monthly usage data from customers. Customer connections have been retrofitted with radio read meters that can be monitored more easily. The District is currently working on a three-year customer change out program that will allow customers to view daily water usage data. Customers also receive a monthly consumption comparison on their bill automatically by the District's billing software and will be flagged for investigation if it falls outside the expected range. The District will alert customers immediately to determine if leaks may exist beyond the customer meter.

Each water bill shows the monthly water use and corresponding charge by tier. The bill also includes a chart depicting the customer's water usage in each of the previous 12 months. This chart helps the customer track their water consumption and compare it to historic practices.

Recycled Filter Backwash

The CLFP uses filters to remove organic solids from water in the treatment process. These filters become less efficient over time because of the solids that collect in them. Therefore, water is flowed backward through the filters periodically to remove the solids and restore the efficiency of the filters. The CLFP collects all of this backwash water in settling ponds adjacent to the plant. After settling, this water is returned to the filter plant for treatment. Approximately 1% of the total water production is recycled backwash water that has been treated.

Goal Setting

After a thorough screening of the Best Practices, District staff recommended that it would be in the best interest of the District to also address the following elements: 1). water waste ordinance; 2). allow availability of rebate programs to existing customers; 3). additional education and community outreach; 4). water budgets, information and feedback for high water users by adding price signals to over users after an evaluation of an acceptable amount of water for what the high-water user is trying to accomplish is completed; 5). replacement for high-efficiency fixtures and appliances. After staff presented recommendations, the Board decided to table these elements for discussion until the year 2020.

The District has established goals for the Water Efficiency Management Plan that are supportable, realistic, achievable, and financially sustainable. The goal to keep system losses under 600 acre-feet, or 10% (or less), and reduce system losses by 200 acre-feet over the next seven years will help reduce supply side losses. Residential customers will also be encouraged to reduce their water demand by 150 acre-feet and a 169 GPCD over the next seven years, measured by a reduction of the 2019 to 2025 average water usage. Non-Residential customers will be encouraged to reduce their water demand by 25 acre-feet over the same period. The District will evaluate its progress and adjust goals and/or programs to better fit the system as needed.

The District provides water service to properties within the planning areas of three counties and multiple municipalities who already make decisions regarding water conservation standards and who can enforce them through the local political agencies where land use decisions are made, and ordinances are enacted. In addition, these agencies have the staff and code enforcement personnel to monitor and enforce these types of standards.

The District promotes the Conservation Gardens and Landscape Seminars made available through the nearby NCWCD. The District also encourages efficient irrigation practices through progressive tiered water rates, Slow the Flow sprinkler audit program (free for all District customers) and tap fees and products including the Urban Tap.

The District will continue to refine the new billing system to better classify and separate different residential and non-residential accounts in order to establish a baseline for future water efficiency goals.

The selected programs and measures for implementation are based on guidance from the Colorado WaterWise “Guidebook of Best Practices”. The District relied upon the Guidebook for the initial high-level elimination of programs that might not be appropriate to consider. The District further evaluated the 14 best practices in “Guidebook of Best Practices” to determine which of the programs made sense for this water system and could be supported politically and financially in the region.

4.2.2 Targeted Technical Assistance and Incentives

Level 1 Utility/Municipal Facility Water Efficiency

Rebates for soil amendment and low water use plants are currently available for customers with new homes as of January 1, 2016. The District did not track addresses of the rebates until 2018. There is not enough data to determine a significant difference in water usage for customers who have participated in these rebates.

Few customers have taken advantage of this program. This District is evaluating if the participation level can be increased by additional marketing or expanding of the program to customers with existing landscaping.

Level 2 Management of Largest Customer Demands

The District uses billing data to identify the largest water users in the District. By contract, some of the larger non-residential users such as dairies must provide additional raw water if there is a continual exceedance of the initial raw water dedication. The cost of additional raw water should encourage large these entities to become more efficient. HOAs and other high-water users are contacted by the District or Resource Central in an attempt to get them to participate in the free sprinkler audit. The District does not have a non-residential audit program at this time to help agricultural users become more water efficient.

Level 3 Management of Remaining Customer Demands

A majority of master meters in the District have been changed out for more accurate readings and to reduce real loss within the system. These master meters serve other water entities. As previously mentioned, these entities have to transfer water to the District for the master metered water usage. The District has no water conservation authority over these entities. Bulk water is metered through fire hydrants. These users have to transfer water to the District as well.

4.2.3 Ordinances and Regulations

The District currently has no water efficiency ordinances or regulations as it has no land use authority. The responsibility to regulate and enforce water efficiency programs would fall primarily onto the towns and counties within the District. The District's most effective contribution to water efficiency is to encourage developers to limit outdoor use by offering taps that require less raw water to be dedicated such as an urban or indoor tap.

4.2.4 Education Activities

New residential customers, before January 1, 2016 can participate in the soil amendment rebate and water saving rebates. New customers receive details about this program in their new customer packet when they purchase a tap. Additionally, the applications and additional information about the rebate programs are posted on the water conservation webpage as well. The soil amendment rebate covers costs up to \$500 and the water saving plant rebate cover up to \$250.

Residential and commercial customers receive bill stuffers at least once a year, if not twice, with information on Slow the Flow sprinkler audits through Resource Central. This service is free to all Little Thompson Water District customers. Additional information on this program can also be found on the District's water conservation webpage.

The District also provides tips to conserve both indoor and outdoor water use. There are instructions on how to look at a customer's water use history on the water conservation web page. District Staff also update the water conservation webpage to display current seminars or classes offered locally on water conservation and are also available to answer any questions customers may have on water conservation.

5.0 Implementation and Monitoring Plan

Each of the Best Practices selected for implementation at the District are expected to either increase District water conveyance efficiency or decrease customer water demand. A description of each of these Best Practices is presented below with some insight in to how each of the measures and programs will work as a part of the overall District Water Efficiency Management Plan. A summary of the selected water efficiency measures is also included in Table 5.1.

5.1 Implementation Plan

All of the proposed water conservation measures and programs will require staff resources for planning and coordination before implementation. Water savings resulting from implementation of this plan will occur gradually as the District has the resources to implement each selected measure and program and the water users respond to that implementation. Details for implementation are included in Chapter 6.

5.2 Monitoring Plan

Monitoring the success of this Water Efficiency Management Plan includes measuring water use as well as money spent on the selected conservation measures and programs.

As shown in Chapter 3, one way to monitor water use is per customer category. District population can be tracked according to tap equivalents and published people per household values. The GPCD can then be tracked from year to year to monitor progress. Per tap or tap equivalent usage can be calculated for each of the categories. Participants in the rebate and audit programs can be recorded and individual accounts tracked for specific water reductions.

Expenditures for conservation will be documented by District staff and reported to the Board on a regular basis. This will be valuable information in evaluating the benefit-cost ratio and to validate the success of implementing the selected conservation measures and programs. Since the programs will be implemented in phases, there will be time to evaluate and establish the appropriate method to monitor success of each program and measure. Table 5.2 identifies the tracking methods for each efficiency measure.

Table 5.1: District Efficiency Measures and Practices

Best Practice for Implementation	Existing/New Program	Best Practices Guidebook Expected Savings	Efficiency Goal	Comments
Metering and Demand Monitoring				
Customer and Master meter replacement program	New 2019	10% to 40% range with 15% being a recent estimate of the expected reduction in demand.	Reduce system demand by 375 acre-feet over a seven-year period. Keep real loss below 600 acre-feet.	Required by Statute, must be maintained for accurate billing and efficiency evaluation.
Master meter/distribution system meter maintenance / replacements program	New 2019	Not directly addressed	Reduce system demand by 375 acre-feet over a seven-year period. Keep real loss below 600 acre-feet.	Maintaining system meters allows the District to effectively monitor usage patterns and identify leaks.
SCADA/telemetry installation program	Existing/Ongoing	Not directly addressed	Reduce system demand by 375 acre-feet over a seven-year period. Keep real loss below 600 acre-feet.	Additional monitoring points will provide opportunities to monitor pressure, flow and usage throughout the system.
System Water Loss Control				
Evaluation of system losses with intermediate metering	Existing/Ongoing	Not directly addressed	Reduce system losses by 200 acre-feet over a seven-year period.	New program to geographically compare master and system meters with customer meters to identify areas with the highest losses.
Operational SOP's for problematic service line failure	Existing/Ongoing	Not directly addressed	Reduce system losses by 200 acre-feet over a seven-year period.	Procedures to address failure problems identified with certain types of service lines.
Conservation Oriented Equitable Rates				
Increasing block rate evaluation program	New 2019	10% to 30% estimate of the expected reduction in demand.	Reduce system demand by 375 acre-feet over a seven-year period.	Evaluate and adjust the increasing block rate structure as necessary to encourage efficient usage by customers.
Tap Connection Fees				
Matching customer demand with the correct tap size	Existing/Ongoing	Correct meter sizing can result in a 30% to 70% reduction in usage.	Reduce system demand by 375 acre-feet over a seven-year period.	Offer a range of tap sizes with corresponding tap fees to encourage customers to purchase the correct tap for anticipated water usage.
Monitoring use and impact of the urban tap	Existing/Ongoing	Not directly addressed	Reduce residential customer demand by 150 acre-feet over a seven-year period.	Offer a conservation product to encourage customers to purchase the correct tap for anticipated water usage.
Billing System Customer Categorization				
New billing system customer categorization and tracking	Existing/Ongoing	"does not save water by itself, but enables targeting of water conservation initiatives at the customers that have the greatest potential to save"	Reduce non-residential customer demand by 25 acre-feet over a seven-year period.	Acquire a new billing system that provides tools to evaluate customers usage patterns based upon multiple classifications.
Water Efficiency Goals				
Establishing water efficiency goals	New 2019	Part of the integrated resource planning process and provides the incentive to develop and implement programs.	Reduce system demand by 375 acre-feet over a seven-year period. Keep real loss below 600 acre-feet.	This Water Efficiency Management Plan establishes specific and measurable goals to gauge the effectiveness of conservation efforts on an annual basis.
Demand monitoring	Existing/Ongoing	"Without demand monitoring there is no way to determine if a conservation goal has been achieved".	Reduce system demand by 375 acre-feet over a seven-year period. Keep real loss below 600 acre-feet.	Improvements in system metering and billing system over the next few years will enable better monitoring of customer usage.

Best Practice for Implementation	Existing/New Program	Best Practices Guidebook Expected Savings	Efficiency Goal	Comments
Public Information and Education				
General public information disbursement	Existing/Ongoing	"Don't determine the success of a water public outreach campaign based exclusively on measured changes in water use"	Reduce residential customer demand by 150 acre-feet over a seven-year period.	Continue to provide access to water efficiency information through the website, seminars and literature.
Targeted informational campaigns	Existing/Ongoing, New 2019	"Don't determine the success of a water public outreach campaign based exclusively on measured changes in water use"	Reduce system demand by 375 acre-feet over a seven-year period. Keep real loss below 600 acre-feet.	Use monthly bills and inserts to communicate with customers. Add social media to get information to customers.
Remote meter reading equipment	New 2019	"Don't determine the success of a water public outreach campaign based exclusively on measured changes in water use"	Reduce system demand by 375 acre-feet over a seven-year period. Keep real loss below 600 acre-feet.	Make remote meter reading equipment available to customers for personal water use evaluation.
Soil Amendment and Water-Saving Plant Rebates	Existing/Ongoing	Eliminating inefficient water uses should be able to reduce annual consumption by 10% - 20% after implementing the recommendations of a carefully conducted site audit.	Reduce residential customer demand by 150 acre-feet over a seven-year period.	Provides customers an incentive to have a more efficient landscape.
High Efficiency Fixture and Appliance Replacement				
Targeted rebates for high efficiency fixtures	New 2019	"Replacing a 3.5 gpf toilet with a Water Sense labeled toilet can save 40,000 gal /household annually" "full retrofit of toilets... been shown to reduce indoor demand by approximately 30% to between 35 and 40 gpcd.	Reduce residential customer demand by 150 acre-feet over a seven-year period.	Board discussed as a potential program due to a result of April 2019 Water Conservation Work Session
Targeted Water Efficiency Surveys and Evaluations				
Targeted audits for high use customers	Existing/Ongoing	Eliminating inefficient water uses should be able to reduce annual consumption by 10% - 20% after implementing the recommendations of a carefully conducted site audit.	Reduce customer demand by 375 acre-feet over a seven-year period. Keep real loss below 600 acre-feet.	Offer free sprinkler audits through Resource Central to all customers.

Table 5.2: District Efficiency Measures Tracking Matrix

Best Practice for Implementation	Number of Rebates	Individual Customer Water use	Customer Class Water Use	Per Capita Water Use	Unaccounted for Water	Peak & Annual Treated & Total Water Demand
	(A)	(B)	(C)	(D)	(E)	(F)
Metering and Demand Monitoring						
Customer meter maintenance / replacement program		X		X	X	X
Master meter/distribution system meter maintenance / replacements program					X	X
SCADA/telemetry installation program					X	X
System Water Loss Control						
Evaluation of system losses with intermediate metering					X	X
Operational SOP's for problematic service line failure					X	X
Conservation Oriented Equitable Rates						
Increasing block rate evaluation program		X	X	X		X
Tap Connection Fees						
Matching customer demand with the correct tap size		X	X	X		X
Monitoring use and impact of the conservation water tap		X	X	X		X
Billing System Customer Categorization						
New billing system customer categorization and tracking		X	X	X	X	X
Public Information and Education						
General public information disbursement						X
Targeted informational campaigns		X	X			X
Remote meter reading equipment		X	X			X
High Efficiency Fixture and Appliance Replacement						
Targeted rebates for high efficiency toilet retrofits	X	X	X	X		X
Targeted Water Efficiency Surveys and Evaluations						
Targeted audits for high use customers	X	X	X	X		X

Notes:

1. The number of rebates and/or giveaways will be tracked for those installations that have been verified.
2. Water use prior and post installation will be tracked to determine if savings have occurred.
3. These measures affect specific customer classes that can be tracked to determine savings.
4. A reduction in the Gallons per Capita Water Use will show an overall savings.
5. These measures track uses that are not billed but are supply side related.
6. Reductions in peak and annual water use will show an overall savings.

6.0 Adoption of New Policy, Public Review and Formal Approval

6.1 Adoption of New Policy

On August 15, 2019 the Board was presented the 2018 Water Efficiency Plan for Public Review. Public comments ended October 31, 2019.

6.2 Public Review Process

One of the CWCB requirements for a Water Efficiency Management Plan is to publish a draft plan, give public notice of the plan, make the plan publicly available, and solicit comments from the public for no less than a 60-day period.

Because the District has had a conservation program in place since 1996, the public has become familiar with the conservation concept and activities. The District's public education program has contributed to this level of awareness. For this water planning process, the public was notified of the 71-day comment period from August 20, 2019 to October 31, 2019 and how to submit comments. Notifications were made in public places and in customer water bills. The plan was made available on the District's website and in its office for review. Written comments and responses to those comments are included in Appendix D.

6.3 Local Adoption and State Approval Processes

After the public comment period, the comments will be incorporated into the planning document as well as any additional revisions. The District Board will adopt the Plan and Staff will submit it to the CWCB. The CWCB will provide written notification of approval, conditional approval or disapproval within 90 days of submittal. Conditions for conditional approval or disapproval will be addressed if necessary.

6.4 Periodic Review and Update

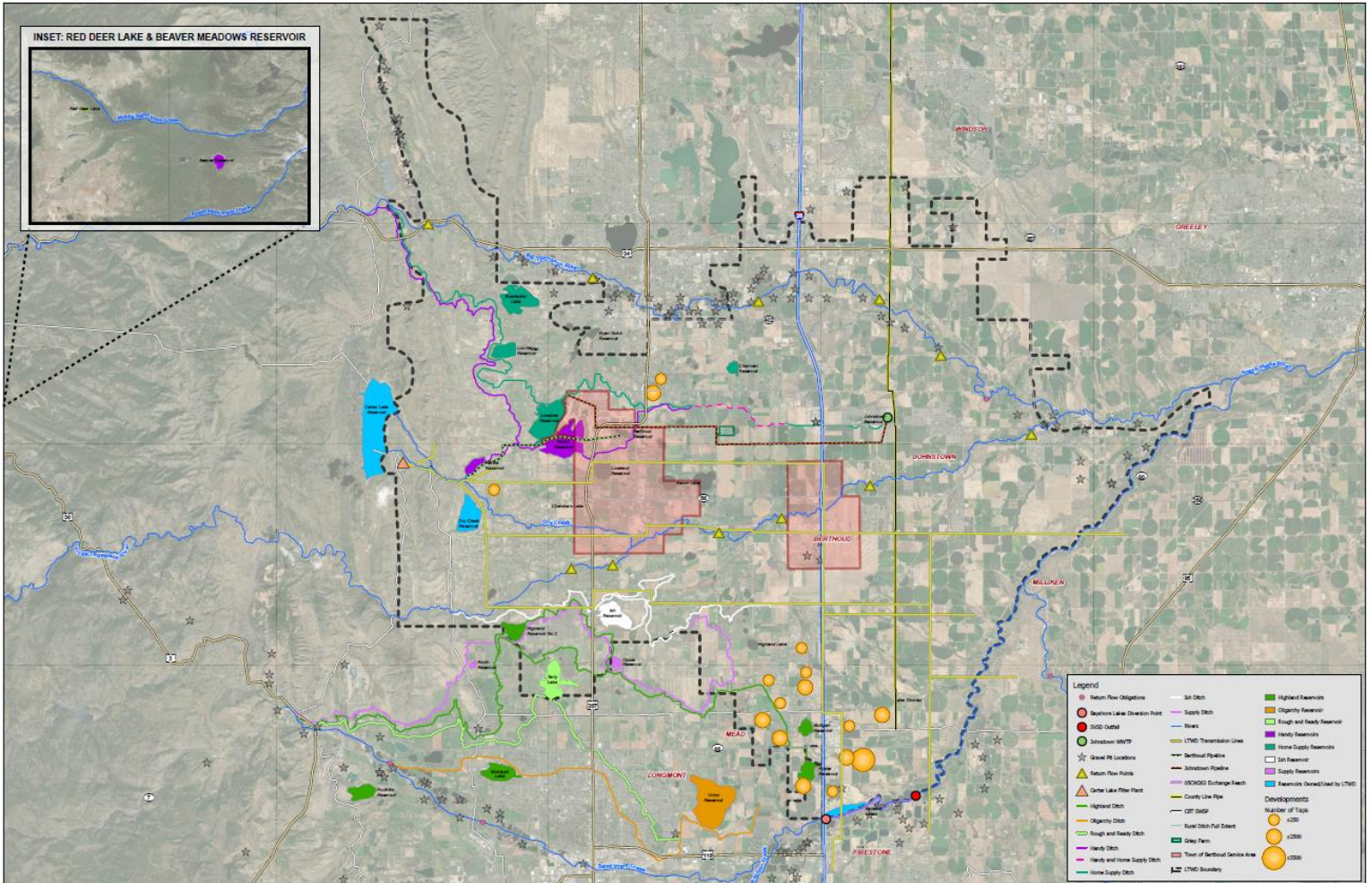
The required schedule for updating the Water Efficiency Management Plan is seven years. The progress towards achieving the water savings goals will be monitored on an annual basis. The District will update this plan prior to seven years if implementation and actual water savings deviate too much. This deviation may be caused by several factors including higher than expected growth, less than anticipated participation or the inability to implement the plan due to lack of funding.

Appendix A: 2018 Raw Water Master Plan

Little Thompson Water District

Raw Water Master Plan

November 2018



Prepared By:



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Introduction

The Little Thompson Water District (District) was formed as a Colorado Special District in 1960. By 1962 the District began serving domestic water to portions of Larimer, Weld and Boulder Counties. The District now provides potable and fire protection water services to an area that encompasses nearly 300 square miles. The service area is generally bounded by the City of Loveland on the north, the Cities of Longmont and Firestone on the south, the City of Greeley, the South Platte River and the St. Vrain Creek on the east and the foothills on the Front Range on the west.

Figure 1 below shows the District boundaries and surrounding entities. In the past, the District served rural acreages, dairies, low density subdivisions and a few small industrial parks. But its proximity to growth areas including Berthoud, Firestone, Longmont, Loveland, Mead and the Interstate 25 corridor has changed the nature of the District. It is becoming more of an urban service provider, serving low, medium and high-density subdivisions as well as more retail and service-oriented commercial customers. The District provides water service to nearly 8,800 water taps in and around these municipalities, fire districts and counties. Additionally, the District is the primary water provider for the Town of Mead.

Figure 1: Little Thompson Water District Service Area



The District's service boundaries are not static; they can be changed through Intergovernmental Agreements (IGA) and contractual obligations. The most relevant example of a service area change is the Town of Mead. By contract, the District must serve any land annexed by the Town, even if the newly annexed land could otherwise be served by another water provider.

The District's policy is that growth must pay its own way. Developers must dedicate water to the District that can be used in its potable water system. Developers have historically dedicated Colorado-Big Thompson (C-BT) water. The District can use the C-BT water immediately with no legal or infrastructure

obligations. However, there is very little C-BT water available, so the District is evaluating water supply options so that growth can continue to be self-supporting.

Purpose

To meet water demands due to future development within the District’s service area, the District must acquire additional raw water supplies. It would be advantageous for the District to diversify its water rights portfolio to match its growth pattern which is the highest in the Lower St. Vrain basin. These new water rights could be purchased or dedicated but they cannot be easily conveyed to the Carter Lake Filter Plant (CLFP) or to Dry Creek Reservoir or used for municipal purposes.

The purpose of the Raw Water Master Plan is for the District to identify water rights, conveyance structures, water treatment locations, and storage facilities that could be used separately or together to increase and diversify the District’s water supplies and the flexibility of its raw water system. The Master Plan does not address policy issues such as funding mechanisms or changes to the raw water dedication regulations.

Demand Projections

Demand projections are a key driver in any raw water master plan. Estimating demand projections within the District’s boundaries is a difficult undertaking because, among other reasons, the District’s service area is approximately 300 square miles and includes portions of three counties, six municipalities and three river basins.

In 2011, the District estimated future demands for its Water Treatment and Distribution System Master Plan. To update the data from the previous study the District obtained historic growth rates for unincorporated Weld and Larimer Counties, the City of Loveland, and the Towns of Mead, Johnstown, Berthoud, and Milliken through 2015 from the Colorado Department of Local Affairs (DOLA). Overall, populations in and around the District’s service area have grown steadily and continue to trend upward. Additional review of tap sales for the District were evaluated to provide context to the DOLA data. Both agree that the low population growth is approximately 0.5 percent and ties well to growth seen in the District during the 2008 recession. In more recent years, populations in towns near the Interstate 25 corridor, such as Johnstown and Mead have experienced back-to-back years of population growth in excess of 5 percent, but the overall average growth rate within the District over the past 20-years has been approximately 2 percent. The low and high population growth rate curves are summarized in Table 1 and illustrated in Figure 2.

Table 1: Population Growth Assumptions

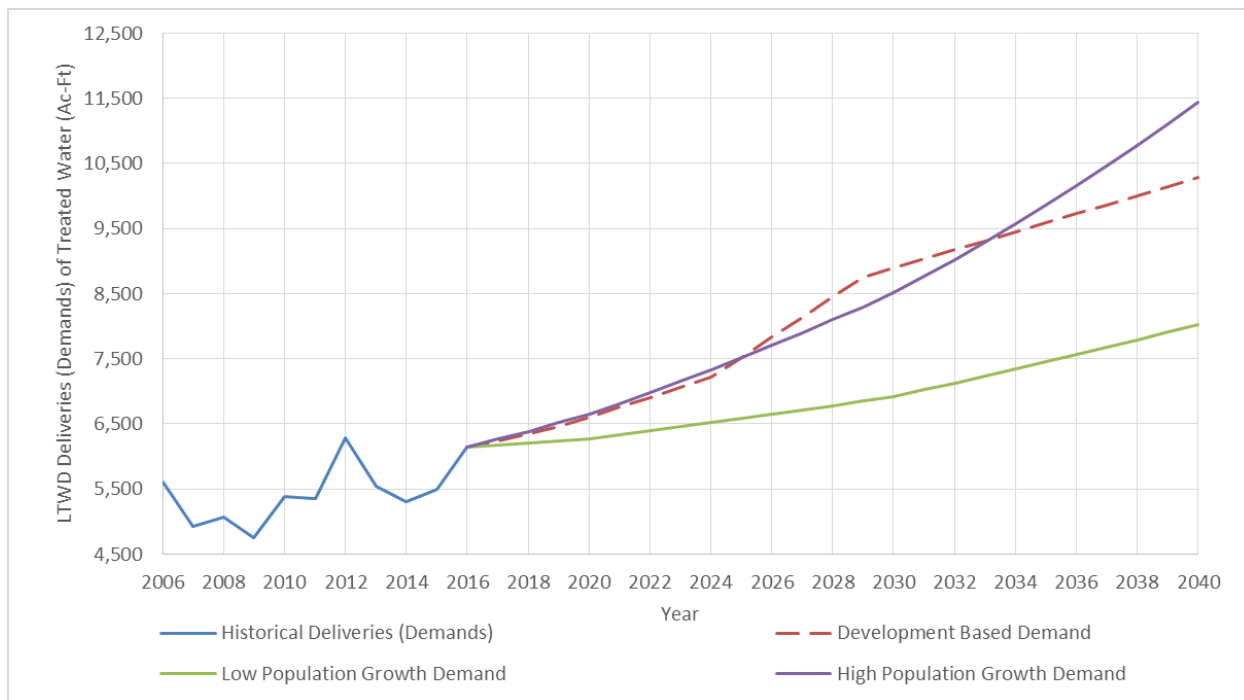
Years	Low Population Growth Curve	High Population Growth Curve
2016-2020	0.50%	2.0%
2021-2030	1.00%	2.5%
2031-2040	1.50%	3.0%

The projected deliveries (demands) curve in Figure 2 was based upon historical tap growth, anticipated number of new taps based on known and approved developments, and access to raw water.

Using the District’s 2016 treated water delivery volume of 6,140 acre-feet as the starting point and applying the low growth rate and high growth rate to this volume each year, the annual projected treated

deliveries (demands) were calculated and are shown in Figure 2. Demands will likely be greater in drought years.

Figure 2: Projected Deliveries for Future Growth



Existing Supplies

Currently, the District uses C-BT water to meet existing demands, as C-BT water may be used by the District immediately at the CLFP. The firm yield of the District’s water is the amount the District can rely on during a drought year or year(s). The average yield takes into account deliveries over a significant period of time, which includes wet, dry and average years. The District plans for and accepts water for dedication based upon the firm yield of the water rights. Table 2 summarizes the C-BT units that are currently owned by the District, along with the estimated average and firm yields of those units.

Table 2: Little Thompson Water District’s Existing C-BT Inventory

Source	Quantity	Average Yield per Unit (AF)	Total Average Yield (AF)	Firm Yield per Unit (AF)	Total Firm Yield (AF)
C-BT Class C Variable Quota Units	4,971	0.72	3,579	0.50	2,486
C-BT Class C Fixed Quota Units	5,274	0.70	3,692	0.70	3,692
C-BT Class D Griep Farm Units	100	0.72	72	0.50	50
Total Existing C-BT and Windy Gap Supplies			7,343		6,228

The District also owns Windy Gap water, which is based upon a moderately junior water right on the Fraser and Upper Colorado Rivers. The water can be stored at Granby Reservoir and delivered to CLFP or Dry Creek Reservoir through the C-BT system. However, in dry years the Windy Gap water right might not provide any water and in wet years, Granby Reservoir might be full of C-BT water, so the Windy Gap water may not be able to be stored (could be spilled). Under these operational constraints, and to be conservative, the estimated firm yield of Windy Gap units, as shown in Table 3, is zero. It is likely the Windy Gap project can produce a firm yield greater than zero acre-feet per year, but given the relative newness of this project, the project is not mature enough to define a firm yield. The average yield of the Windy Gap project is also difficult to define, partly due to the limited diversion data and partly due to the District's planned operations of Windy Gap water. Without storage, the average yield of the Windy Gap units could be 40 acre-feet, but the water may be delivered in one or two months when Granby Reservoir is spilling. This delivery schedule does not allow the District to maximize the second of Windy Gap water. Storage, either in Dry Creek or Chimney Hollow Reservoirs will allow the District to retime the annual yield to meet operational needs.

The Windy Gap units are referred to as "firmed" or "unfirmed". The District owns 12 "firmed" and 5 "unfirmed" units. The annual yield of all Windy Gap units is proportionately the same between all units. The distinction between "firmed" or "unfirmed" units is access to storage. The District is one of the Windy Gap unit holders that are participating in building Chimney Hollow Reservoir, Northern Colorado Water Conservancy District's (NCWCD) "firming" project. Approximately 400 acre-feet of storage is needed to firm one Windy Gap unit to 100 acre-feet per unit. This ratio is based on NCWCDs modeling and is consistent with most other Windy Gap project participants.

Brookfield LLC (Brookfield), the developer of the Barefoot Lakes project, is funding a portion of the Chimney Hollow project in order to obtain approximately 5,000 acre-feet of storage. This reservoir storage will be used to provide a firm yield of 1,200 acre-feet from the 12 "firmed" Windy Gap units. However, it will take a minimum of five years to construct and fill Chimney Hollow Reservoir. Until this time, the 12 "firmed" Windy Gap units dedicated by Brookfield are functionally the same as the District's other five "unfirmed" Windy Gap units that have a firm yield of zero based upon District conservative assumptions.

Table 3 summarizes the Windy Gap units that are currently owned by the District along with the estimated average and firm yield of those units. Tables 3 and 5 through 8 also show the amount of water credit the District provided to developers for each Windy Gap unit and native water share developers dedicated in exchange for water taps. The District is obligated to meet the demand associated with these taps when they are sold, regardless of whether the water from Windy Gap units or native supplies are available. ***This is "obligated demand" and is summarized throughout the report.*** Currently, the obligated demand must be met with existing C-BT supplies until the Windy Gap or native water dedicated for the taps is available. Timing is key. Not all the obligated demand taps will be sold and generate demand immediately. C-BT water has been dedicated for other developments, but the development may not build out for years. The District can use this dedicated C-BT water immediately to meet existing demands, but the obligated demand remains.

Table 3: Little Thompson Water District’s Existing Windy Gap Inventory

Source	Quantity (Units)	Average Yield per Unit (AF)	Total Average Yield (AF)	Firm Yield per Unit (AF)	Total Firm Yield (AF)	Per-Unit Credit Provided by District (AF)	Obligated Demand (AF)
Windy Gap “Firmed” Units No Chimney Hollow or Dry Creek Reservoir	12	40	480	0	0	40	480
Windy Gap “Unfirmed” Units No Dry Creek Reservoir	5	40	200	0	0	40	200
Total Existing C-BT and Windy Gap Supplies			680		0		680

As previously stated, the difference between “firmed” and “unfirmed” Windy Gap units is storage, but not just Chimney Hollow Reservoir. The District can also use Dry Creek Reservoir to “firm” all or a portion of its 17 Windy Gap units. The storage required to firm all 17 Windy Gap units to 100 acre-feet per unit exceeds the District’s 5,000 acre-feet capacity in Dry Creek Reservoir.¹ However, the District is conservative when providing water credit for Windy Gap units, restricting the water credit to 40 acre-feet per unit for any unit, including the 12” firmed” Windy Gap units dedicated by Brookfield. The District has to temporarily firm the 12 units provided by Brookfield to 40 acre-feet per unit until Chimney Hollow Reservoir comes online.

One of the key assumptions in this report is that the District would allocate enough storage in Dry Creek Reservoir to firm all its Windy Gap units to 40 acre-feet per unit. District staff requests approval from the Board to make this designation. Dry Creek Reservoir was constructed to provide drought protection for the District. The District “banks” C-BT water not needed in a particular year to help meet demands in a multi-year drought. If a portion of Dry Creek Reservoir is used to firm the District’s Windy Gap water, then the volume allocated for drought protection will be reduced. Using the ratio of approximately 400 acre-feet of storage needed to obtain 100 acre-feet of yield per unit, approximately 160 acre-feet of storage is needed to firm one Windy Gap unit to 40 acre-feet.

Table 4 shows the Dry Creek Reservoir storage volume that must be allocated to firm all of the District’s 17 Windy Gap units, including the 12 units provided by Brookfield, to 40 acre-feet per unit. Of this 2,700-acre-foot storage requirement, 1,900 acre-feet will **not** be needed once Chimney Hollow Reservoir comes online since the 12 units provided by Brookfield will be “firmed” to 100 acre-feet per unit through that storage project.

¹ Approximately 400 acre-feet per unit of storage multiplied by 17 Windy Gap Units = 6,800 acre-feet

Table 4: Dry Creek Reservoir Storage Required to Firm Windy Gap Units to 40 Acre-Feet per Unit

Type of Windy Gap Units	No. of Windy Gap Units	Dry Creek Reservoir Approx. Storage Needed
“Firmed” Units provided by Brookfield	12	1,900 Acre-Feet*
“Unfirmed” Units owned by District	5	800 Acre- Feet
Total	17	2,700 Acre-Feet

* Storage in Dry Creek Reservoir only needed until Chimney Hollow Reservoir is online for the 12 units provided by Brookfield.

Table 5 summarizes the yield obtained using Dry Creek Reservoir to firm the 17 Windy Gap units.

Table 5: Little Thompson Water District’s Yield of Windy Gap Inventory Assuming Limited Use of Dry Creek Reservoir and/or Space in the C-BT System

Source	Quantity (Units)	Average Yield per Unit (AF)	Total Average Yield (AF)	Firm Yield per Unit (AF)	Total Firm Yield (AF)	Per-Unit Credit Provided by District (AF)	Obligated Demand (AF)
Windy Gap “Firmed Units” With Dry Creek Reservoir	12	40 ¹	480	40	480	40	0
Windy Gap Unfirmed Units With Dry Creek Reservoir	5	40 ²	200	40	200	40	0
Total Windy Gap Supplies			680		680		0

1. Assumes that no more than 1,900 acre-feet of Dry Creek Reservoir storage is allocated.
2. Assumes that no more than 800 acre-feet of Dry Creek Reservoir storage is allocated.

Once sufficient storage is provided in Dry Creek Reservoir and filled, the firm yield will approximately equal the average yield of 40 acre-feet. The remaining 60 acre-feet of water credit per unit for the 12 Windy Gap units would be provided to Brookfield when Chimney Hollow Reservoir is constructed and filled, producing an average and firm yield of 100 acre-feet. The obligated demand for the 60 acre-foot per units of 12 Windy Gap units is zero because the demand from Brookfield cannot come online until the supply does. Similarly, if the District develops new storage, the yield from the District’s 5 “unfirmed” Windy Gap units would increase and be available for water credit or drought protection. As the District has not provided credit for the 60 acre-feet per unit for the 5 “unfirmed” Windy Gap units, there is no obligated demand associated with the increased yield. Table 6 summarizes the additional yield that can be obtained with new storage.

Table 6: Little Thompson Water District’s Yield of Windy Gap Inventory from Chimney Hollow Reservoir and Additional District Storage

Source	Quantity	Additional Average Yield per Unit (AF)	Additional Average Yield, all Units (AF)	Additional Firm Yield per Unit due to Additional Storage (AF)	Additional Firm Yield due to Additional Storage, all Units (AF)	Per-Unit Credit Provided by District (AF)
Windy Gap Firmed Units – Yield <u>With</u> Chimney Hollow Reservoir	12	60	720	60	720	60
Windy Gap Unfirmied Units- Yield <u>With</u> Additional Storage	5	60	300	60	300	TBD
Total Additional Supplies with WG Storage			1,020		1,020	

The District’s Windy Gap units may also be used a second time once the District has the legal authority to do so. This second use occurs after the water is first used in the District’s service area, treated at a wastewater treatment plant and discharged back to the river. Only the second use of the 12 Windy Gap units dedicated by Brookfield are currently legally available for use by the District. The District must apply to the Water Court to reuse additional units of Windy Gap water purchased outside of the Barefoot Lakes development and will likely face larger opposition than it did in the past due to increased pressure on water supplies.

The firm and average yield from the second use of the 12 Windy Gap units is estimated as 50% of the first use of Windy Gap water. Although the amount of water available from the second use of the 12 “firmed” Windy Gap units will increase incrementally as the Brookfield development comes online, the full yield of the second use will not be available until (a) the Chimney Hollow Reservoir project is operational, and (b) the Brookfield development has been completed and is making a first use of all 12 units. Similarly, the yield of the second use of water attributable to the District’s 5 “unfirmied” Windy Gap units will be available incrementally but the full yield will not be available until (a) a decree is obtained through Water Court to use the second use water, (b) the District acquires additional storage or dedicates storage in Dry Creek Reservoir and (c) the developments using the Windy Gap water have been completed.

The estimated yield of the second use of the 17 Windy Gap units (once new storage for firming is online and the associated developments are at build-out) is summarized in Table 7.

Table 7: Little Thompson Water District’s Yield from Second Use of Windy Gap Inventory, Assuming a 100 AF/unit Yield on First Use

Source	Quantity	Average Yield per Unit (AF)	Total Average Yield (AF)	Firm Yield per Unit (AF)	Total Firm Yield (AF)	Credit Provided by District (AF)
Windy Gap Second Use Firmed With Chimney Hollow Reservoir	12	50	600	50	600	0
Windy Gap Second Use Unfirmed With Additional Storage	5	50	250	50	250	0
Total Supply from 2nd Use of WG			850		850	

In 2003 the District made the decision to accept native water shares to diversify its water portfolio and to provide a buffer in the event of a call on the Colorado River which could impact the District’s C-BT supply. It is a sound strategy to meet growing demands and to provide some drought protection by using waters from various basins. Although the native water rights cannot immediately be used by the District (whereas C-BT and Windy Gap units can be), these native water rights can be used to meet future demands once the water rights have been changed or approved for changed uses. Table 8 summarizes the District’s current native water supplies along with the estimated average and firm yields.

Table 8: Little Thompson Water District’s Native Water Supply Inventory

Source	Quantity (shares)	Average Yield per Unit (AF)	Total Average Yield (AF)	Firm Yield per Unit (AF)	Total Firm Yield (AF)	Per-Unit Credit Provided by District (AF)	Obligated Demand ¹ (AF)
Big Thompson Ditch and Manufacturing Co.	0.33	92	30.4	70.6	23.3	0.0	0.0
Consolidated Home Supply Ditch Co.	70	11	770.0	3.5	245.0	3.5	210.0
Handy Ditch Co.	20	10.7	214.0	2.5	50.0	2.5	37.5
Sub-Total of Potential Potable Supplies			1,014.4		318.3		247.5
Boulder & Larimer Ditch (Old Ish) ²	30	3.7	111	1.0	30	1.0	30.0
Sub-Total of Potential Non-Potable Supplies			111		30		30
Total			1,125		348		278

1. Some or all of the Big Thompson Ditch and Manufacturing, Consolidated Home Supply and Handy Ditch shares were acquired by the District without the need to provide dedication credit water, which is why the obligated demands are less than the firm yields of these two water types.
2. The District’s shares in Old Ish will be difficult to change in Water Court due to location of the supply. Although these shares are part of the obligated demand, it is recommended these shares be kept as options for a non-potable supply for irrigation of open space below the ditch.

The total obligated demand is comprised of water credit given for native water and water credit given for Windy Gap units without storage. Currently, the obligated demand is 958 acre-feet (278 acre- feet from native water supplies and 680 acre-feet from Windy Gap water. Additionally, the District committed to replace the evaporation of the Barefoot Lakes up to 343 acre-feet per year. This obligation may be met with second use water or other water the District has or may acquire in the Lower St. Vrain basin. The District is **not** obligated to use any of its potable water supplies to meet this demand.

The District must determine how much additional obligated demand it is willing to carry. It can take three to five years to bring each native water system online and in the interim, the obligated demand can increase significantly due to the dedication of additional water shares. Water conservation can decrease demands and delay the impact of the obligated demands. Additionally, capping dedication of water rights that create additional obligated demand until Windy Gap units are firm, or other water supplies come online reduces the risk of more frequent or more severe water curtailment during a drought. Obligated demand associated with the District’s Windy Gap units can be eliminated if storage in Dry Creek Reservoir is allocated to firm the Windy Gap units, and the allocated storage space is filled with Windy Gap water.

Setting aside the issue of timing and assuming all existing supplies are available when needed, Tables 3 and 5 through 8 show the firm and average yield of each water supply. Although it is highly unlikely the District’s supplies would only deliver the firm yield year-after-year as shown in the graph, it can occur in a single year or during a prolonged drought. The graph is an inventory of water rights and associated

yields and does not reflect the actual water supplies that may be available in a particular year of a drought. The District may have drought supplies in the Dry Creek Reservoir storage that is not used to firm Windy Gap units and carryover storage in the C-BT system that could be used to meet a portion of these demands.

If enough storage is available, the firm yield of the District’s supplies will move closer to the average yield. So long as sufficient storage in Dry Creek Reservoir is allocated to firm the yield of Windy Gap units, the District’s firm yield will be sufficient to meet estimated demands until approximately 2021, as shown on Figure 3. Figure 4 shows how the District could meet its estimated demands using an average yield from its supplies. For simplicity, the estimated demands shown in Figures 3 and 4 use the demand based on development projections (from Figure 2). Actual demands could be higher or lower as demonstrated using the high and low projections based on DOLA’s population growth projections.

Additional supplies (such as yield from the District’s native supplies, yield from the District’s Windy Gap units due to additional storage, and the full use of the Windy Gap second use water) will need to start coming online in 2021 to meet increasing demands with a firm yield. This Master Plan provides options for the District to obtain additional water supplies, and firm up its existing water supplies to meet the demands.

Figure 3: Little Thompson Water District’s Firm Yield vs. Demand

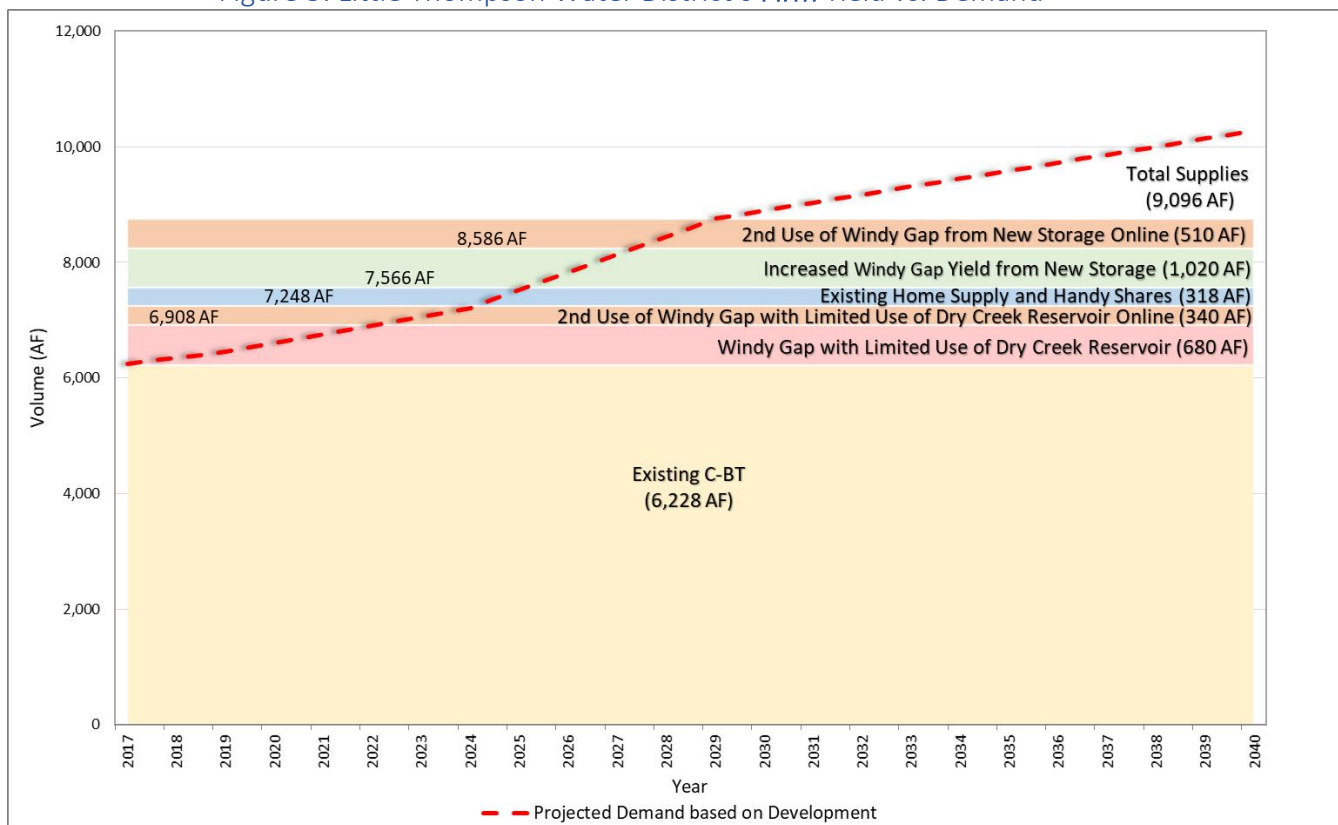
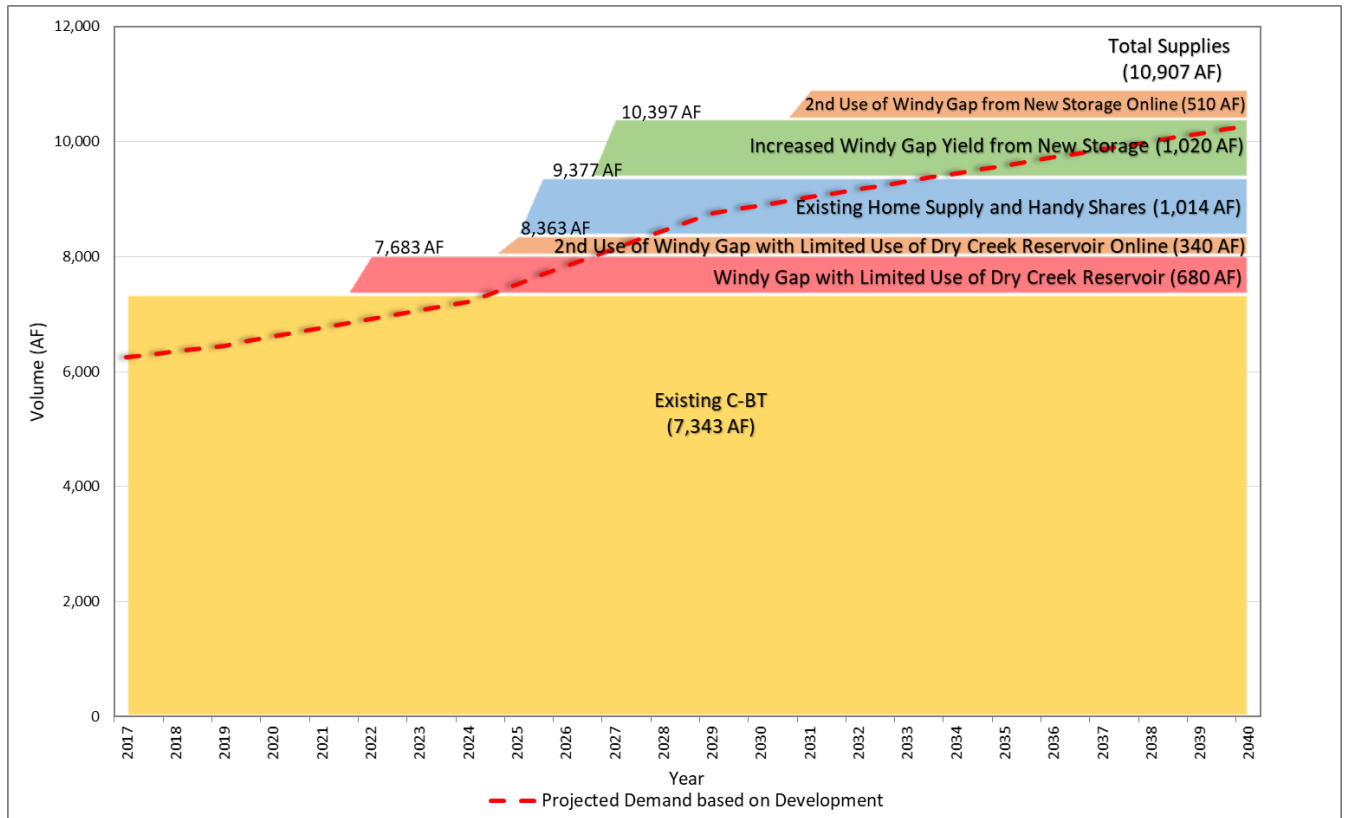


Figure 4: Little Thompson Water District's **Average** Yield in Quantity and Time vs. Demand



Developing New Supplies

The time required to bring these existing supplies online will likely take years and has not been fully addressed in this report, but it is assumed in Figures 3 and 4 that the supplies will be online when needed.

Even with all of the District's currently owned supplies online and available for use, the District will not have sufficient firm yield to meet estimated demands beginning around 2028. This indicates that in addition to bringing its current supplies online, the District needs to acquire and develop additional supplies. This report identifies the water rights, infrastructure and operational flexibility the District should pursue.

Components

The District compiled and reviewed numerous options to meet future water demands. To create the various options, the District first identified all the "components" that would be needed to provide a new usable supply. There are four (4) categories of components and all of them are needed to make a supply usable. These categories are as follows: water source, storage, conveyance and treatment.

The water sources identified included, but were not limited to:

- shares in a ditch system,
- units in the C-BT/Windy Gap system,
- direct flow rights,
- storage rights,
- groundwater rights, and
- contracts with other water providers.

The storage components identified included existing storage facilities, expansion of existing facilities, and new storage facilities.

The conveyance components were not individually identified, but consideration was given to whether the District's existing pipeline conveyance system would suffice or if new pipelines and pump stations would be needed. Additionally, as part of the conveyance components, the District considered whether existing ditches or streams could be used to convey certain raw water sources.

Treatment components included:

- the existing CLFP,
- a new centralized water treatment plants (large regional plants),
- a new distributed water treatment plants (small localized plants), and
- a collaboration with the Town of Firestone for a large treatment plant on the St. Vrain Creek.

The various water sources, storage, conveyance and treatment components are all summarized in Appendix A and are organized according to which basin they are located in (i.e. St. Vrain, Big Thompson, Little Thompson, etc.). The summaries provide a detailed description of the component along with positive and negative attributes identified. Also listed in the summaries are any unknown factors that would need to be examined prior to moving forward with that component.

Concepts

Nine (9) "concepts", stitched together from the various components discussed above, were identified as potential options for developing, treating, and conveying a reliable water supply for the District. Many of the concepts have multiple variations to one or more of the components and are signified by "a" or "b" after the primary concept number.

After compiling the nine (9) feasible concepts summarized in Table 9, the District ranked each concept to determine which projects should be pursued first. The maximum score for each concept was 100 points, which would be the most favorable rating possible. The overall concept score is the sum of the scores for various criteria for each component. The components that were ranked for each concept, along with their maximum category point values, are as follows:

- Water Source – 32 points,
- Storage – 32 points,
- Stream or Ditch Conveyance – 12 points,
- Infrastructure – 12 points, and
- Treatment – 12 points.

Since having a water source and storage to manage the supply are critical to the success of a concept, these components were weighted higher than the conveyance, infrastructure and treatment components. It should be noted that the scores were based on the District's current storage volume in Dry Creek Reservoir. A feasibility study on expanding Dry Creek Reservoir is currently underway which may improve the scores for some of the concepts.

Historically, the District had planned to satisfy new demand with a network of small, unmanned or "distributed" water treatment plants designed to treat 1 to 3 MGD. The water quantity and timing of the raw water supplies available at these distributed plants is poor and the cost of treating water in intermittent or small flows is high. Therefore, the concepts that relied solely upon distributed water

treatment plants such as the Old Mead Water Treatment Plant site, the Griep Farm water treatment plant and the Ish Reservoir water treatment plant were eliminated. The concepts that could deliver water to the Lower St. Vrain basin were retained because storage exists or could be acquired, and the water could be delivered to a water treatment plant in cooperation with the Town of Firestone as well as a distributed water treatment plant at Barefoot Lakes. These plant locations are also positioned to serve larger demand centers. Similarly, concepts that could deliver water to Dry Creek Reservoir were retained as it was assumed that there would be significant storage and adequate treatment capacity at CLFP or a potential water treatment plant at Dry Creek Reservoir. Table 9 summarizes the nine (9) identified concepts with the various components that define it and the score for each concept. Existing components were identified using a checkmark (✓). Improvements (+) were also noted as increasing the score for the concepts where appropriate. Further detail and concept maps can be found in Appendix B.

Table 9: Raw Water Master Plan Concepts

Score	No.	Concept Description	Basin	Source							Storage													Conveyance					Treatment			
				Windy Gap First Use	Windy Gap Second Use	Handy Ditch	Home Supply Ditch	St. Vrain Water Rights	Boulder Creek Water Rights	Near Demand Center	Dry Creek Reservoir	Dry Creek Reservoir Enlargement	Chimney Hollow Reservoir	Termiant Storage at Griep Farm	Maitland Reservoir	Home Supply Reservoirs	Hertha Reservoir	Barefoot Lakes	Gravel Pits in St. Vrain basin	Highland Ditch Reservoirs	Ish Reservoir	St. Vrain Storage Facilities	Union Reservoir	Terry Lake (Pleasant Valley Reservoir)	Existing Distribution System	River Exchange	Additional Infrastructure	Agreements between Ditches	Existing Ditches	Carter Lake Filter Plant	Dry Creek Reservoir	Barefoot Lakes
65	1	First Use of District's Unfirm Windy Gap Water		✓						✓	+													✓					✓	+		
71	2	Second Use of Firmed Windy Gap Water used by Brookfield			✓				✓	+	+							✓	+		+				✓						+	+
44	2a	Second Use of District's Windy Gap Water			✓													✓	+		+				+	+				+	+	
56	3	Handy and Home Supply Shares - Griep Farm Reverse	Big Thompson River			✓	✓			✓		+														+		✓	+			
48	3a*	Handy and Home Supply Shares with Potential Water Treatment Plant at Griep Farm	Big Thompson River																													
67	4	Handy and Home Supply Shares - Boedecker Exchange/Lonetree Delivery	Big Thompson River			✓	✓			✓	+			✓												+	+	✓	+			
67	4a	Handy and Home Supply Shares - Lonetree Delivery to Dry Creek Reservoir	Big Thompson River			✓	✓			✓	+			✓												+	+	✓	+			
67	5	Handy and Home Supply - Using Handy Infrastructure	Big Thompson River			✓	✓			✓	+			+												+	+	✓	+			
67	5a	Handy and Home Supply Shares	Big Thompson River			✓	✓			✓	+			+												+	+	✓	+			
64	6	Purchase Handy Replacement Water and Divert to Dry Creek	Dry Creek			✓				✓																+	+	+	✓	+		
48	7	St. Vrain Water Delivered via Supply and Highland Ditch	St. Vrain Creek					✓	✓									✓	+	+	+	+					+	+			+	+
41	7a*	Ish Water to Potential Water Treatment Plants	St. Vrain Creek																													
27	7b*	Deliver St. Vrain Water to Potential Mead Water Treatment Plant	St. Vrain Creek																													
44	8	Deliver Rough & Ready and Oligarchy Ditch to St. Vrain Creek to Potential Barefoot or Firestone Water Treatment Plant	St. Vrain Creek					+	✓									✓	+			+	+			+	+			+	+	
24	9	Deliver South St. Vrain Water and Boulder Creek Water to Potential Barefoot or Firestone Water Treatment Plant	St. Vrain Creek					+	✓									✓	+						+	+				+	+	

NOTES:
 + would increase the score if completed (if a check mark, the component already exists)
 *Concept eliminated

Conclusions

The District is experiencing unprecedented growth which makes it challenging for developers to acquire acceptable water supplies to accommodate new demand while ensuring the District maintains its system reliability and drought protection. Although the District has sufficient water to meet the needs of its customers in the near term, it must begin acquiring new supplies and firming existing supplies now as it takes time and resources to make water supplies available to meet demands. ***The District is seeking approval from the Board to proceed with the highest priority projects identified below in the Recommendations section.***

The concepts summarized in the previous section highlight the importance of storage to increasing the yield and reliability of the retained concepts, specifically at Dry Creek Reservoir and/or in the Lower St. Vrain basin. Additional storage increases the firm yield of the District's existing supplies, specifically for the "unfirmed" Windy Gap units and, native water and allows the District to maintain its historic drought protection.

The District will continue to acquire Big Thompson native water such as Handy Ditch and Consolidated Home Supply Ditch shares. Developers can still purchase ditch shares that can be incorporated into the District's change of use application. However, there is competition for these ditch shares from neighboring water providers. For example, almost one half of the Consolidated Home Supply ditch shares are owned by Johnstown and the Town is actively seeking additional shares. Furthermore, and some ditch shares will remain in agricultural use. It is unlikely that there will be enough local native water to meet the projected demands of the District.

Most of the anticipated growth in the District will be in the St. Vrain River basin where the District has not been actively pursuing native water. The concepts using St. Vrain water scored low based on lack of ownership, historical limitation of use from the Highland Ditch Company, and the distance from the demand centers near Mead to water treatment plants. However, the District may find opportunities to use St. Vrain Basin water as it meets with the ditch companies and water providers in the basin. Storage in the lower St. Vrain basin will increase the yield of St. Vrain water.

For the reasons cited above the District has not identified a St. Vrain ditch system or facilities that can be incorporated in its water supply system. The District will have to be proactive and evaluate any new St. Vrain native water as a complete system with the ability to provide additional water and convey the water to a District treatment facility. This holistic approach concentrates the District's efforts to acquire a significant volume of St. Vrain water instead of reacting to shares from multiple ditch companies as they are offered by developers. The District must evaluate the opportunity to acquire water supplies from proposed regional projects in the same manner.

Recommendations

The District must obtain the legal authority through Water Court to use its existing water rights and obtain new water supplies. Due to the timing of the Water Court process and construction for new infrastructure and storage, it will take at least three years to utilize a native supply. Therefore, it is imperative the District begin working to change and use its native supplies years before it is needed to meet demands.

The highest priority projects are:

- Allocate sufficient Dry Creek Storage to firm the District's Windy Gap Units
- File an application with the Water Court for the change of use of the District's Home Supply shares

- File an application with the Water Court to allow the District to quantify and use second use of its Windy Gap units.
- Pursue options for additional storage in the Big Thompson and Lower St Vrain basin.
- File an application with the Water Court for the change of use of the District's Handy Ditch shares.

Many of the projects will require District staff to meet with ditch companies and other water providers to determine if there are impediments or opportunities for cooperation in order to solidify concepts.

Other projects that will support the change of use applications and potentially increase the yield of the District's water rights are:

- Determine the location of new water treatment plant(s)
- Investigate opportunities to target acquisition of specific St. Vrain basin water rights.
- Evaluate the cost and feasibility of conveyance options for the new supplies at a concept level.
- Investigate opportunities to obtain water supplies from regional projects.

Appendix A

Components

St. Vrain Basin

Component 1- Second Use of Windy Gap Water Used at Barefoot Lakes Development

DESCRIPTION: Supply

Windy Gap water originates on the West Slope and is delivered from the Windy Gap Reservoir near Granby Reservoir through the Colorado-Big Thompson (C-BT) project facilities to the Front Range for water providers that own units in the Windy Gap project. This water is operated on top of the C-BT project and, therefore has a lower priority for the facility use than C-BT water. An advantage of Windy Gap water over C-BT water is that it's wholly consumable and can be used "use to extinction".

Windy Gap water is based upon a moderately junior water right on the Fraser and Upper Colorado Rivers. The water can be stored at Granby Reservoir and delivered to Carter Lake Filter Plant or Dry Creek Reservoir through the C-BT system. However, in dry years the Windy Gap water right might not provide any water and in wet years, Granby Reservoir might be full of C-BT water, so there may not be room for Windy Gap water and it could be spilled. Under these operational constraints, and to be conservative, the estimated firm yield of Windy Gap units is zero. To increase the firm yield, storage is needed to capture the water when it spills out of Granby Reservoir in wet years.

Some water providers owning Windy Gap units, including the District, are financing a new storage facility to increase the reliability of Windy Gap water. A new 90,000-acre-foot reservoir located just west of Carter Lake, Chimney Hollow Reservoir, has received all environmental permits but the project is currently on hold due to a lawsuit.

Brookfield is the developer of 5,000 residential units at the Barefoot Lakes Development. The District is the potable water provider for the development. Brookfield financed the purchase of 12 Windy Gap units, which will provide 1,200 acre-feet of firm yield using 5,000 acre-feet of storage in the Chimney Hollow project (firmed units). The development includes Barefoot Lakes, two linked and lined gravel pits with 900 acre-feet of storage. The District has a decree (05CW263) that can be used to fill the lakes to be used as an amenity for the development, or a source of non-potable water, or storage of second use water.

All sewer inflow from the development accrue to the Saint Vrain Sewer District (SVSD). The decree defines how to quantify and claim Windy Gap second use water from the outfall of the SVSD, approximately one mile downstream of Barefoot Lakes. The District may exchange 2.5 cfs of Windy Gap second use water to Barefoot Lakes. The Windy Gap second use water can be used by the District to serve other customers or sell to downstream users. The District has independent use of 270 acre feet of storage in Barefoot Lakes.

POSITIVES:

Existing decree

Existing facilities

"Firmed" water through storage in Chimney Hollow Reservoir when constructed

Infrastructure to be installed and financed by Brookfield

NEGATIVES:

Water available downstream of all District customers

No existing treatment facility

Water not available for 10+ years

UNKNOWNNS:

When will Chimney Hollow be completed?

Will the District have to use Dry Creek Reservoir to firm the Windy Gap units until Chimney Hollow Reservoir is completed?

STRUCTURES NEEDED TO INCREASE FIRM YIELD:

Potentially more storage as storage in Barefoot Lakes is limited to 270 acre-feet

Treatment facility, either on-site or collaborative with Firestone.

St. Vrain*

Component 2- Additional Unfirmed Windy Gap Water

DESCRIPTION: Supply

The District has purchased an additional 5 Windy Gap units for its own use that do not have associated storage in Chimney Hollow (unfirmed units). To have reliable yield from these unfirmed units, the District will have to construct storage or use its existing storage to provide firm yield. Other unfirmed units may be available for purchase.

Through a provision in the Amended Windy Gap Decree (17CW3176), the Windy Gap first use water can only be stored overwinter in a storage facility that was constructed **and** controlled by the Windy Gap owners prior to 2016. Only Dry Creek and Barefoot Reservoirs meet this criterion.

POSITIVES

No Water Court Decree needed for First Use.

Can be delivered to Dry Creek for storage (Pre- 2016 facility)

Can be used by existing CLFP or new Dry Creek Water Treatment Plants

Wholly Consumable

NEGATIVES

Variable yield- requires storage to firm

Will reduce the drought storage in Dry Creek if it is stored there

UNKNOWNNS

There is storage for Windy Gap water in the CBT system. The project has diverted and delivered Windy Gap water to water providers owning Windy Gap units but the project has not matured enough to estimate the average year yield and to be conservative, the firm yield is zero

STRUCTURES NEEDED TO INCREASE FIRM YIELD

Storage for C-BT or other water to replace drought storage in Dry Creek Reservoir

Local storage (St. Vrain) to manage flows

St. Vrain Basin*

Component 3- Second Use of Additional Windy Gap Units

DESCRIPTION: Supply

The District owns five unfirmed Windy Gap units, meaning that there is no associated storage and the yield of the units is variable. Windy Gap water is wholly consumable; it may be used, reused to extinction. The District may purchase additional Windy Gap units.

There are several large developments planned near Interstate 25 and Colorado State Highway 66. The wastewater from these developments will accrue to SVSD. If the District “targeted” the water from the five (or more) Windy Gap units to these developments, then the District could possibly claim additional Windy Gap second use water at the SVSD outfall. The 05CW263 decree does not specifically address Windy Gap water use on parcels other than Barefoot Lakes but it defines how the Windy Gap second use water should be calculated. The District could potentially use the 2.5 cfs exchange to move the second use water to Barefoot Lakes or file a new exchange to other storage in the lower St. Vrain Creek. The second use water could also be used to meet downstream return flow obligations from changed native water supplies.

POSITIVES

Water potentially available at the SVSD outfall- District already managing second use water there.

Water available near highest new demand area.

Wholly consumable.

District may be able to sell or trade water for supplies that can be treated at CLFP.

NEGATIVES

Not available to CLFP.

270 acre- feet of storage in Barefoot Lakes may not be sufficient storage.

May need a new exchange right to store water upstream of Barefoot Lakes.

UNKNOWNNS

Availability/ Approval to use 05CW263 exchange.

STRUCTURES NEEDED TO INCREASE FIRM YIELD

Administrative permission or Water Court decree to “target” Windy Gap Water to St. Vrain.

Water Treatment Plant at Barefoot or Combined with Firestone.

St. Vrain Basin

Component 4- Red Deer Lake (aka Green Lake Reservoir)

DESCRIPTION: Storage and Supply

The Town of Mead operated a water treatment system using its water rights until the 1990's. The District served water to the Town through master meters and in 2002, the District became the primary water provider for the Town. At that time, the Town water treatment plant was abandoned, and the Town transferred C-BT and ditch shares to the District. The Town of Mead did not transfer all its water rights. Red Deer Lake was an asset retained by the Town.

Red Deer Lake is located on land within the boundary of the Indian Peaks Wilderness in Boulder County. The land was "reserved from the public domain" by the federal government in 1905. According to the water rights decree, the reservoir was constructed in 1908 and is filled from water in the Middle St. Vrain Creek.

There are two separate decrees for Red Deer Lake. The first decree was obtained in a 1926 adjudication making 72.2 acre-feet of storage absolute and granting a conditional water right of 251.8 acre feet. In 1951, there was a supplemental adjudication for reservoirs in District 5 (No.11715). This decree made 81.4 acre-feet of Red Deer Lake storage absolute and 353 acre feet conditional with a 1935 appropriation date.

In the 1951 decree, the owners of the Red Deer Lake stated that the reservoir had been filled every year since it was constructed and was used "for sale or exchange". The Water commissioner records for Red Deer Lake are available for the period of 1950-1988. The maximum water stored was 120 acre feet and the maximum water used was 96 acre feet. Although the Town of Mead did not acquire the Red Deer Lake water right until 1960, water from the lake was used by the Town of Mead consistently for the period 1950-1960. The Town used the Red Deer Lake water from 1960-1988 except in wet years. The water was likely diverted from the St. Vrain Creek through the Highland or Supply Ditches to the Mead Water Treatment Plant.

The construction of Red Deer Lake was authorized by the United States Department of Interior. Unlike many other high mountain reservoirs operated by Front Range water providers, Red Deer Lake is not subject to periodic special use permitting by the U.S. Forest Service.

In 1991 the Red Deer Lake was inspected by the state. The dam was found to be in satisfactory condition. The state determined that it was a non-jurisdictional dam and not subject to annual dam safety inspections. A private consulting firm was hired to inspect the dam in 1992 and found that the dam had an operating capacity of 100 acre-feet, although it appeared that the normal operating capacity was 82 acre feet. The engineers also determined that it was not feasible to increase the dam to store the 323 acre-feet conditional water right.

The engineers determined that although the structures of the reservoir were serviceable, they were not up to design standards and there was considerable seepage through the embankment. The engineers identified four options to reduce seepage and improve statures of the reservoir. Any substantive repair would be difficult due to the elevation and restrictions of working in a wilderness area.

POSITIVES

St. Vrain water right
High in St. Vrain Basin
Senior water right (82 acre-ft absolute)
Deliverable to high use area.

NEGATIVES

District assumes liability for restoration if the dam fails.
Potential federal oversight
High cost to rehabilitate dam in wilderness
Operational issues
Decreed for domestic and agricultural use

UNKNOWNNS

Discrepancy of the two decrees
Condition of dam- cost to repair it
Could water right be used for municipal used sand transferred to the District?
Will Supply Ditch agree to convey Red Deer Lake Water?
Willingness of Forest Service to work with the District and terms of DOI Easement
Treatment Plant location?

STRUCTURES NEEDED TO INCREASE FIRM YIELD

Repair dam
Transmission to a WTP.

St. Vrain Basin

Component 5- Divide Reservoir

DESCRIPTION: Storage and Supply

Divide Reservoir is in the northeast corner of Boulder County. The decreed capacity of the reservoir is 900 acre-feet. Surveys indicate that the actual capacity of the reservoir is 500 acre feet with enlargement possibilities.

The reservoir is filled at a rate of 10 cfs through the Supply Ditch. The reservoir has a No.5 fill priority water right of the St. Vrain Creek in addition to two other water rights (refills). The original decree is for 75 acre-feet, 1st refill of 40 acre-feet and 2nd refill of 317 acre-feet.

Water from Divide Reservoir has been used to irrigate farm ground north and east of the reservoir. The farm has been irrigated with Divide Reservoir water, Highland Ditch and Supply Ditch water. The seller has provided a historic use affidavit for the farm. The seller may be willing to sell the farm, providing de-facto dry-up for the reservoir and ditch water shares.

Divide Reservoir could provide return flows to St. Vrain Creek and possibly the Little Thompson if a connection can be established.

POSITIVES

- Storage high in the basin
- Could be used to store other St. Vrain water
- Proximity to Little Thompson River and Saint Vrain River for making return flows.

NEGATIVES

- Cannot be treated at CLFP
- Change of use through Water Court likely

UNKNOWNNS

- Outlet to Little Thompson River
- Commitment to sell farm and/or provide dry-up
- Feasibility of enlargement

STRUCTURES NEEDED TO INCREASE FIRM YIELD

- Agreement from Supply Ditch to convey water from the St. Vrain River
- Infrastructure for conveying stored water to either the St. Vrain or Little Thompson Rivers.

St. Vrain Basin

Component 6 – Gravel Pit Storage

DESCRIPTION: Storage and Supply

Gravel Pit operators along the St. Vrain River often enter into agreements with water providers to sell the finished capacity after mining gravel. This may be an option for the District. Capacity in a gravel pit along the St. Vrain River could be used to store the second use water from the Districts' Windy Gap units a newly appropriated storage right, changed irrigation rights, future lawn irrigation return flow credits, and other reusable sources of water the District may obtain. Gravel Pit storage on the St. Vrain could also be used to re-time the District's raw water supplies prior to delivering to a new water treatment plant at either Barefoot Lakes or Firestone. The gravel pit could also be used to make releases for return flow obligations of changed ditch shares to the St. Vrain River and/or the South Platte River. Some of the gravel pit sites may come with shares in irrigation companies that could be changed in the future.

Based on the St. Vrain Basin Water Source Study by ERC, dated March 1, 2016, approximately 2,000 acre-feet of gravel pit storage currently exists within the St. Vrain basin, and another 15,000 acre-feet of potential future gravel pit storage exists along the lower portion of the St. Vrain River. The report goes on to list various specific storage locations that either currently exist or may exist in the future.

Gravel pit operators with current mining permits in the St. Vrain area include, but are not limited to, Varra Companies, Aggregate Industries, Ready Mixed Concrete Company, L.G. Everist, Asphalt Specialties Co., Bestway Concrete Company, and Martin Marietta Materials. It is unknown at this time what reservoirs, or how much capacity, might be available. To minimize evaporation, deeper pits with smaller surface areas are more ideal than shallow pits.

POSITIVES

Storage in the St. Vrain basin

Provides storage for 2nd use water

Provides an opportunity to file for a junior storage right

Can be used to meet return flow obligations when the call is downstream on the St. Vrain or Platte.

Could be used to store other St. Vrain water

Could be treated at a WTP at Barefoot or Firestone

NEGATIVES

Difficult to be treated at CLFP

UNKNOWNNS

Availability and location

STRUCTURES NEEDED TO INCREASE FIRM YIELD

Connections to new treatment plant location.

Infrastructure for conveying stored water to St. Vrain Rivers.

St. Vrain Basin

Component 7 – Allotment Contract from Central Colorado Water Conservancy District

DESCRIPTION: Storage and Supply

LTWD may be able to enter into an allotment contract with Central Colorado Water Conservancy District (CCWCD), which could provide LTWD with water from gravel pit storage along the St. Vrain River. CCWCD and its sub-districts provide water to its constituents within the District boundaries through allotment contracts. These contracts specify a maximum amount of water to be provided each year, but actual deliveries may vary from year to year based on an annual declared quota. Some of LTWD's current service area is located within CCWCD's boundary, but some is not. Discussions would need to occur between LTWD and CCWCD to determine what portion, if any, of LTWD would need to be included in CCWCD's boundary in order to provide LTWD with an allotment contract to serve the Mead area using St. Vrain water supplies. It is anticipated this water could be provided to a new water treatment plant at Barefoot Lake or Firestone for service to the Mead area.

POSITIVES

Some structures may already be in place.
Could be treated at a WTP at Barefoot or Firestone.

NEGATIVES

Cannot be treated at CLFP.
Yield Dependent on Allocation.

UNKNOWNNS

Availability.
Cost.
Source of Supply (i.e. specific or combination of many, inclusive of direct flow rights, etc.).

STRUCTURES NEEDED TO INCREASE FIRM YIELD

Infrastructure for conveying water to a new WTP.

St. Vrain Basin

Component 8 – Alluvial Ground Water Wells

DESCRIPTION: Supply

Alluvial ground water wells located adjacent to or near the St. Vrain River could provide a water supply to a new treatment plant located at Barefoot or Firestone with a higher quality supply than surface water. The viability of a high production alluvial well or well field in the St. Vrain basin would need further exploration to determine location and estimated yield. Based on the St. Vrain Basin Water Source Study by ERC, dated March 1, 2016, the yield of wells in the St. Vrain basin is low due to the limited extent of the alluvial aquifer in this area.

POSITIVES

Higher water quality

NEGATIVES

Potentially low yielding wells

Junior - Depletions need to be augmented through an augmentation plan approved in water court

Need a surface water supply and storage to provide an augmentation supply

Augmentation supply would need to be changed in water court

UNKNOWNNS

Yield

Location

STRUCTURES NEEDED TO INCREASE FIRM YIELD

Infrastructure to WTP at Barefoot or Firestone.

St. Vrain Basin

Component 9 – Highland Ditch

DESCRIPTION: Supply, Storage and Conveyance

The Highland Ditch Company owns and operates the Highland Ditch and several storage reservoirs for the benefit of its shareholders. There are 700 shares of stock outstanding, with an additional 25.5 contract shares. The Highland Ditch diverts water out of the north side of the St. Vrain River in the NW ¼ of Section 20, Township 3 North, Range 70 West of the 6th P.M. The ditch has an estimated capacity of 320 cfs below the headgate. A conveyance efficiency of 10 percent is estimated for the ditch. The Highland Ditch Company has three direct flow water rights totaling 324.03 cfs:

- 205.46 cfs – Adjudication Date = 2/6/1882, Appropriation Date = 11/30/1871,
- 23.57 cfs - Adjudication Date = 2/6/1882, Appropriation Date = 06/01/1878,
- 95.00 cfs - Adjudication Date = 3/13/1907, Appropriation Date = 09/20/1902.

In addition to the direct flow rights, Highland Ditch also has numerous storage rights:

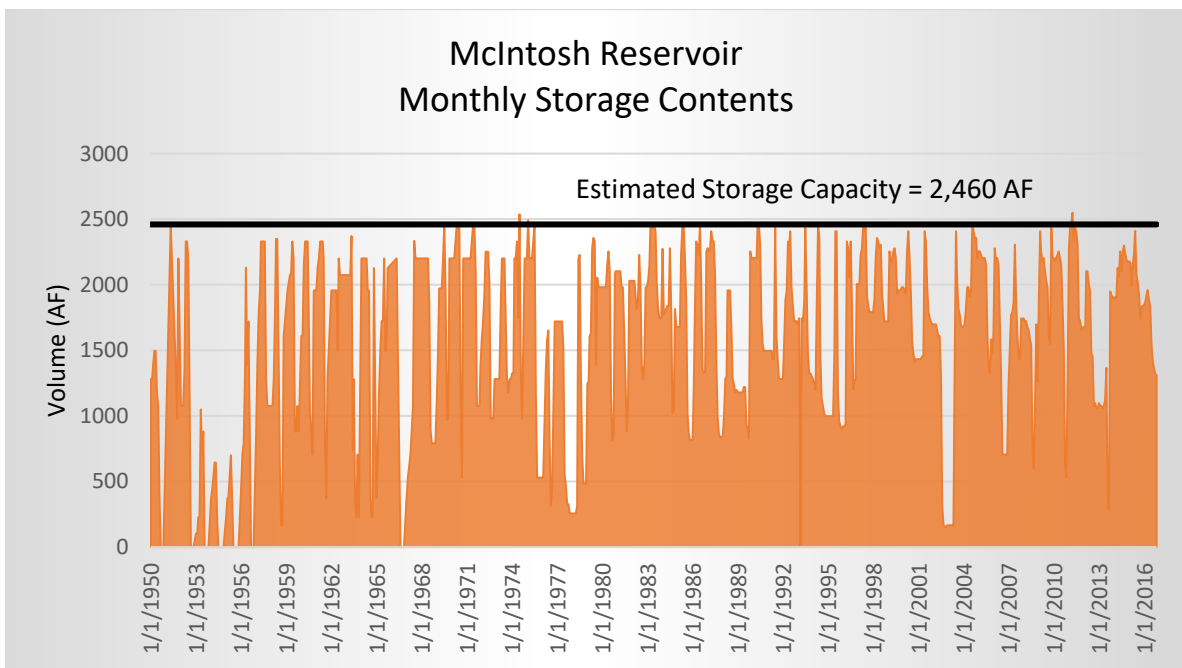
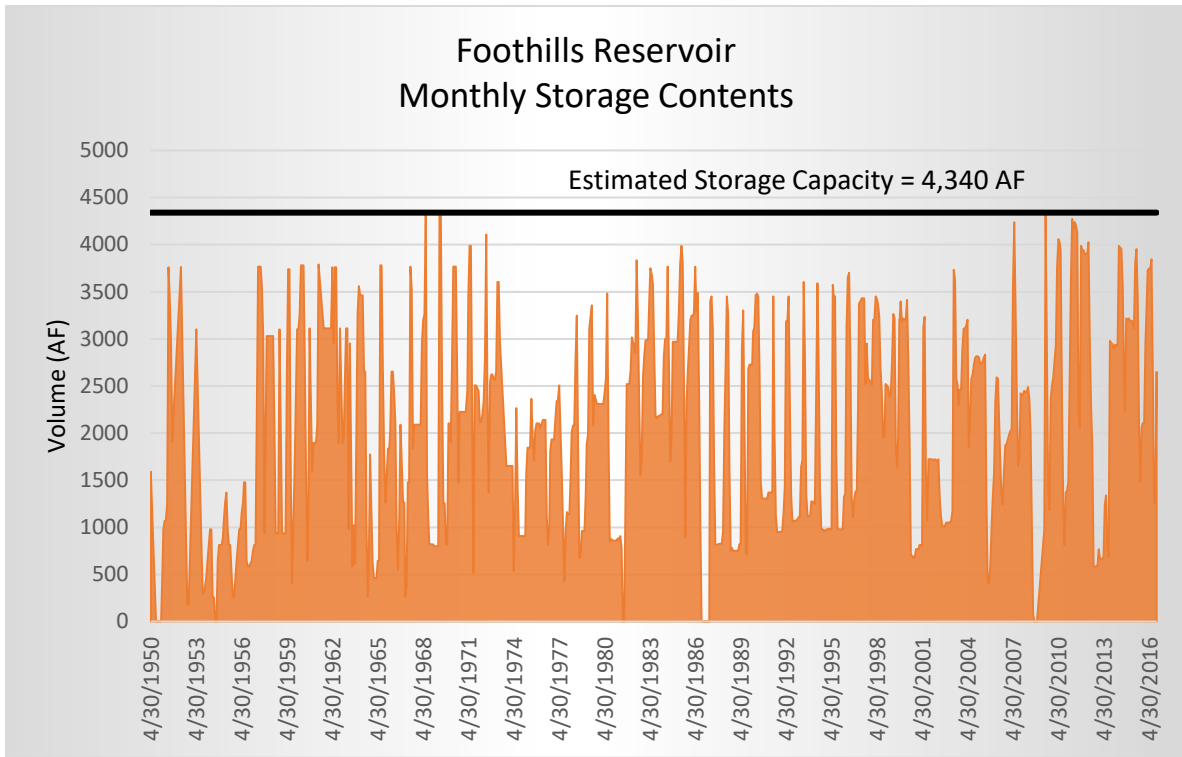
- Highland Reservoir No. 1 – 1,063.7 AF first fill and 1,063.7 AF refill
- Highland Reservoir No. 2 – 3,728.8 AF first fill and 2,740 AF refill
- Highland Reservoir No. 3 – 1,660 AF first fill and 1,660 AF refill
- McIntosh Reservoir – 2,460 AF first fill and 2,460 AF refill
- Foothills Reservoir – 4,239 AF first fill and 2,506 AF refill
- Beaver Park Reservoir – 2,182 AF first fill

Figures illustrating the monthly contents of each reservoir are shown below.

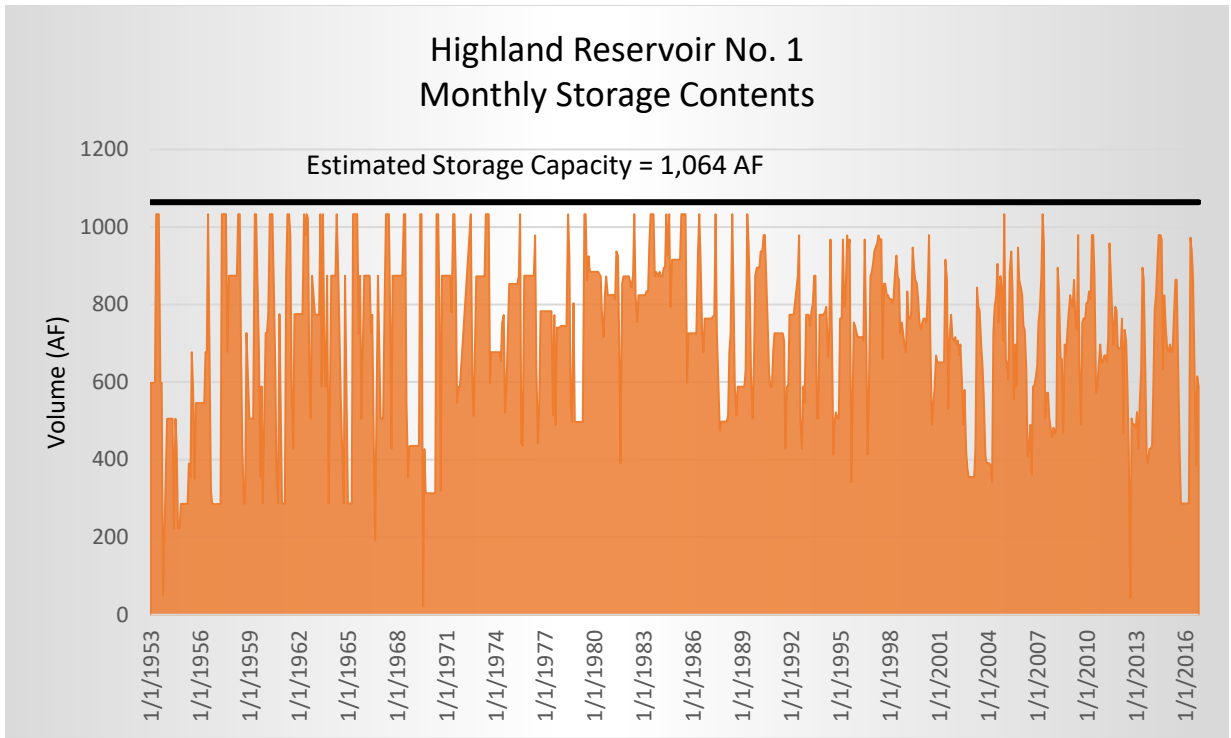
Beaver Park Reservoir is owned by the St. Vrain Fish & Reservoir Company (SVFRC), with approximately 51% of the shares in Beaver Park Reservoir owned by the Supply Ditch Company and 49% owned by the Highland Ditch Company. This reservoir is located upstream of the headgate of the Highland Ditch and is used as a supplemental supply to the Highlands Ditch shareholders during the late irrigation season. Beaver Park Reservoir is listed as a separate component to be considered.

Foothills and McIntosh (aka Dawson Lake) Reservoirs are both located on the south side of the St. Vrain River, downstream of the headgate of the Highland Ditch. The capacity in Foothills Reservoir is approximately 4,340 acre-feet and the decreed capacity in McIntosh Reservoir is 2,460 acre-feet. These reservoirs are used by the Highland Ditch Company for exchange purposes. The reservoirs provide replacement water to the St. Vrain River for diversions made at the Highland Ditch headgate. Foothills Reservoir releases can be made to the St. Vrain River upstream of the Oligarchy Ditch. McIntosh Reservoir releases can be made directly to the Oligarchy Ditch when the Highland Ditch diverts water intended for the Oligarchy Ditch. Anticipating increased municipal use of McIntosh Reservoir, the Highland Ditch Company changed the management of McIntosh Reservoir in 2001 by forming an independent company called Lake McIntosh Reservoir Company. This enabled shareholders to buy or sell shares in McIntosh Reservoir independently from Highland Ditch shares.

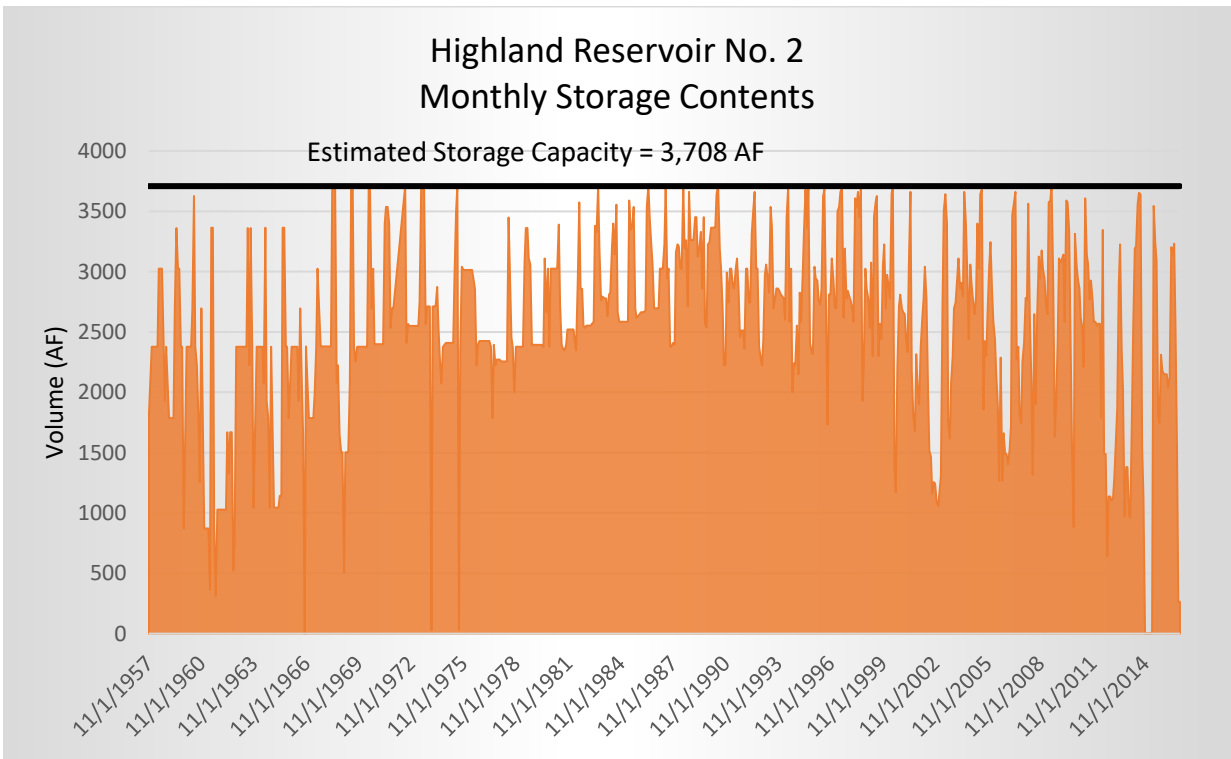
The City of Longmont uses McIntosh Reservoir shares for municipal uses, so if LTWD acquires McIntosh Reservoir shares it may be possible to lease and/or sell the shares to Longmont, or to allow Longmont to use the shares in exchange for use of other water, storage, or use of bypass structures.



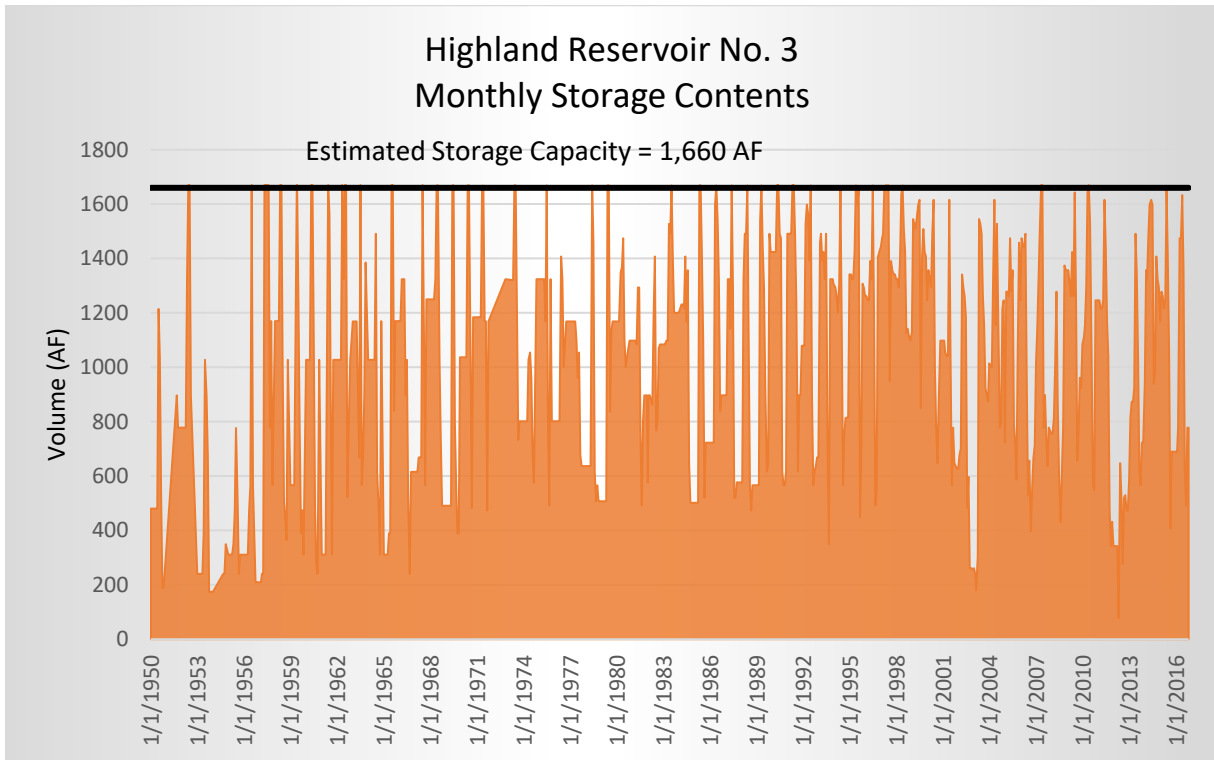
The reservoirs located within the Highland Ditch system include Highland Reservoir Nos. 1, 2, and 3. Highland Reservoir No. 1 (aka Cowles Lake, or Mulligan Reservoir) is located approximately 25 miles down-ditch from the river headgate on the Highland Ditch in Section 22, Township 3 North, Range 68 West of the 6th P.M. Releases from Highland Reservoir No. 1 are delivered to lands in the lower portion of the system off the Baugh Lateral.



Highland Reservoir No. 2 is located in Sections 5 and 6 of Township 3 North, Range 69 West of the 6th P.M. Most of the Highland Ditch diversions are run through the Highland Reservoir No. 2 and delivered to the North Branch Lateral or the main ditch.



Highland Reservoir No. 3 (aka Foster Reservoir) is located south of Highland Reservoir No. 1 in Section 27, Township 3 North, Range 68 West of the 6th P.M. Releases from Highland Reservoir No. 3 are delivered to the Ditch No. 3 Lateral.



In addition to delivering Highland Ditch water rights to shareholders, the ditch is also used to deliver CB-T water to shareholders. The upper portion of the ditch is also used by the City of Longmont to deliver non-Highland Ditch water to its Water Treatment Plant.

From 1908 through 2004, and using available records, the average annual farm headgate delivery per share is 38.87 acre-feet. Thus far, no change of use cases have been filed pertaining to the Highland Ditch Company shares. Estimated average historical depletions from 1974 through 2003 are 19.08 acre-feet per share.

In 2005, the Highland Secondary Water Company was formed for the purpose of facilitating the use of Highland Ditch shares for irrigation in dual water systems located within the Highland Ditch service area. Since the Mead area is located within the Highland Ditch service area, it may be possible to use Highland Ditch shares for this purpose.

Based on the St. Vrain Basin Water Source Study by ERC, dated March 1, 2016, the Highland Ditch system was given a “zero” ranking score on the “feasibility of transferring the water rights” indicating that a ditch company bylaw exists which constrains the use of the water to irrigation of lands within the ditch service area. A copy of the most recent bylaws should be obtained and reviewed, and a meeting with the ditch company may provide further insight into the ability to change the water rights.

POSITIVES

Many storage components within St. Vrain basin
Conveyance to the Mead / Barefoot Lakes area
Opportunities with the City of Longmont for trades or money

NEGATIVES

Any change of use of Highlands shares would be the first to go through Water Court (no precedent)

UNKNOWNNS

Availability of shares.

Updated information from the Ditch Company regarding reservoir capacities, operations, and CBT units in the system.

Dual systems in Mead area.

Ability to obtain carriage agreements from the Highland Ditch for delivery of other water to the Mead/Barefoot Lakes area for treatment.

Bylaw provision(s) restricting changes of use

STRUCTURES NEEDED TO INCREASE FIRM YIELD

Infrastructure to WTP at Barefoot or Firestone

St. Vrain Basin

Component 10 – Oligarchy Ditch

DESCRIPTION: Supply, Storage and Conveyance

The Oligarchy Ditch Company owns and operates the Oligarchy Ditch, which diverts water from the north bank of the St. Vrain River in the Southeast ¼ of the Northeast ¼ of Section 27, Township 3 South, Range 70 West of the 6th P.M. The St. Vrain Basin Water Source Study by ERC, dated March 1, 2016 selected the Oligarchy Ditch for the “short list” of potential water sources for the study participants with the goal of delivering the yield to a water treatment plant near Barefoot Lakes or Firestone. Since the Oligarchy Ditch is described in detail in the ERC report in Section 4.2.7, we have highlighted some of the key components of the system here.

- Direct flow rights of 237.51 cfs with appropriation dates ranging from 06/01/1866 to 04/01/1874.
- Storage rights in Oligarchy Reservoir No. 1 (aka Burch Lake) consisting of 2,129.4 acre-foot fill and 2,130 acre-foot refill.
- Previous changes of use by Longmont, which provide some guidance to future changes (note these were not ditch-wide changes).
- Average annual historical consumptive use = 16 acre-feet/share.
- Firm year historical consumptive use = 10.93 acre-feet/share.
- The location of the Oligarchy Ditch could facilitate deliveries to the new water treatment plant location.
- Reusable effluent might be used to meet return flow obligations.
- 129.6654 shares out of a total of 300 remain unchanged.

POSITIVES

Storage component within St. Vrain basin
Conveyance to the Mead / Barefoot Lakes area
Past change cases in Water Court to provide an example

NEGATIVES

Distance to lower St Vrain through urban corridor

UNKNOWNNS

Availability of shares.
Updated information from the Ditch Company regarding reservoir capacities, operations, and CBT units in the system.
Ability to obtain carriage agreements from the Oligarchy Ditch for delivery of other water to the Mead/Barefoot Lakes area for treatment.

STRUCTURES NEEDED TO INCREASE FIRM YIELD

Augmentation structure or additional infrastructure to convey the water to the WTP at Barefoot or Firestone.

Big Thompson River

Component 11 - Dry Creek Reservoir Enlargement

DESCRIPTION: Storage

The District, along with Central Weld County Water District (CWCWD) constructed Dry Creek Reservoir in 2007. It is a clay filled dam with a concrete core. The reservoir capacity is 10,000 acre-foot and the capacity is shared equally by the two water Districts. The U. S. Army Corps of Engineers determined that the Dry Creek Reservoir site is isolated from any stream channel and therefore the District did not need to obtain a Corps 404 permit or complete a NEPA analysis. The District can physically store CB-T and Windy Gap water in the reservoir through the St. Vrain Supply Canal. The water in Dry Creek can be pumped up to the CLFP and water can be delivered in the same pipeline from CLFP to Dry Creek Reservoir. Currently the District uses its 5,000-acre-foot pool for drought protection.

Through a provision in the Amended Windy Gap Decree, Windy Gap water cannot be stored overwinter in a reservoir that the District did not own **and** control prior to 2016. The only storage the District has that meets this criterion is Dry Creek Reservoir and Barefoot Lakes.

There is approximately one million cubic yards of clay stockpiled on the west edge of the reservoir. This clay could be used to raise the dam and increase the storage in the reservoir. The increased storage could be used for drought protection and operational flexibility. The original 5,000 acre-feet of storage could be used to “firm” the Windy Gap water the District has purchased from Poudre River Power Authority and other Windy Gap water that it may acquire.

The District is evaluating the feasibility of an enlargement.

POSITIVES

Water in the reservoir can be treated at CLFP or a new Dry Creek Water Treatment Plant if constructed.

Can be used to increase the firm yield of Windy Gap units.

Can increase the yield of native waters acquired by the District.

Existing transmission lines can be used to deliver water.

NEGATIVES

Must use existing transmission capacity to deliver water to high demand centers.

Feasibility study time and cost.

CWCWD has an ownership interest in Dry Creek Reservoir.

Water Quality/Geosmin.

UNKNOWNNS

Feasibility, land needed, new capacity, Corps jurisdiction.

NEEDS TO INCREASE FIRM YIELD

Can be used to increase firm yield of other water rights.

St. Vrain River

Component 12 - Knoth Reservoir

DESCRIPTION: Storage and Supply

Knoth Reservoir is located in Boulder County. The Reservoir and water rights are owned by the Mr. R.C Brand and the Vance Brand family. The Reservoir fills from water delivered from the Supply Ditch, which diverts from the St. Vrain Creek below the Town of Lyons. Water from the Reservoir has been historically used to irrigate lands lying below and to the east of the Reservoir.

The Reservoir was originally constructed in 1880 with a capacity of 37.5 acre feet. The reservoir was enlarged in the early 1940's to its present capacity of 220-230 acre-feet. There are three decreed water rights for the reservoir totaling 651.95 acre feet.

<u>Adjudication Date</u>	<u>Decreed Amount</u>	<u>Decreed Use</u>	<u>Status</u>
4/25/1883	37.5	Irrigation	Absolute
7/23/1942	73.2	Irrigation	Absolute
4/1/1962	541.25	Irr/Dom	Conditional

The conditional water right is decreed for irrigation and domestic water use. It is likely that this water right would require a Water Court change to allow it to be used for municipal use.

Historical records are not complete, but it appears that the Knoth Reservoir was typically filled to a level of 138 acre- feet, slightly above the sum of the two absolute decrees. Although filled through the Supply Ditch, diversion records for this Ditch do not differentiate water carried in the Ditch for Knoth Reservoir. The reservoir filled in 1970 but shortly after the fill, the reservoir showed leakage and the reservoir was emptied. The reservoir has not filled since.

Analysis shows that the long-term average storable inflow from the junior conditional decree into Knoth Reservoir is 170 acre-feet and the firm yield is 37 acre-feet. Even if the senior water rights could be obtained and changed through Water Court, the water available for municipal use is limited due to long periods of minimal or no use.

The reservoir could be used to store other water rights in the St. Vrain basin if the Reservoir was rehabilitated. A CWCB feasibility report investigated the cost to rehabilitate the reservoir to three storage capacities: 220 acre-feet, 360 acre-feet and 540 acre-feet. In 2004 dollars, the cost of storage ranged from \$3,400 to \$4,000 per acre foot. These costs do not consider the cost to acquire the land and potential conveyance cost that might be charged by Supply Ditch.

In 2017, District staff met with members of the Brand family and discussed potential rehabilitation of the reservoir by the District. The family is interested and would like to consider the rehabilitation of the reservoir in conjunction with development of the property.

POSITIVES

In high use basin

Storage

Conveyance from the river in place

NEGATIVES

Feasibility study time and cost

UNKNOWNNS

Feasibility, cost effective capacity, Corp jurisdiction

Participants, CWCB loan, Supply Ditch Interest

NEEDS TO INCREASE FIRM YIELD

Water rights on St. Vrain

Infrastructure to convey stored water back to either Little Thompson River or Saint Vrain River.

St. Vrain River Basin

Component 13 - Supply Ditch

DESCRIPTION: Supply and Conveyance

The Supply Ditch Company delivers water out of the St. Vrain River off the south bank and serves farmers north of Longmont, and around Mead. The Supply Ditch has a direct flow decree for a total of 92.2 cfs and 51% of the storage right in Beaver Park Reservoir high in the St. Vrain basin. The direct flow right is junior with an appropriation date of May 31, 1878. The Beaver Park Reservoir has three storage rights; the original for 888 acre-feet with an appropriation date of June 30, 1892, the first enlargement for 959 acre-feet with an appropriation date of June 21, 1902, and a second enlargement for 335 acre-feet with an appropriation date of September 30, 1905. The Supply Ditch irrigates lands in both the St. Vrain Creek basin and the Little Thompson River basin. Approximately 79% are used in the St. Vrain Creek basin and the remaining 21% are used in the Little Thompson River basin.

The current capacity of the ditch is unknown. Based on the original decree (CA1387), the ditch was constructed with a capacity of 6,480 inches, or approximately 169 cfs using the standard conversion of 38.4 miner's inches per cfs. The ditch loss is estimated between 10 and 15 percent. The ditch could be used as a conveyance structure for other water rights that the District owns or may purchase. The Ditch is used to fill Divide Reservoir and the Mead Ponds. Additionally, the Ditch could potentially be used to convey District water rights to Ish Reservoir, several Highland Ditch Company Reservoirs. The Ditch crosses several drainages that accrue to the St. Vrain upstream of Barefoot Lakes.

There are 400 shares outstanding in the Supply Ditch Company and so far none have been changed through water court. Based on ERC's *St. Vrain Basin Water Source Study* from March 1, 2016, it is estimated that the average annual yield per share is 4.95 acre-feet with a firm yield of 1.10 acre-feet per share.

(References: Case No. 02CW334; ERC's St. Vrain Basin Water Source Study dated March 1, 2016).

POSITIVES

Conveyance to other reservoirs
Possible conveyance to Little Thompson for return flows

NEGATIVES

Yield per share low
No previous changes in water court

UNKNOWNNS

Available capacity
Outlet to Little Thompson River
Highland or Ish available storage
Ability to use drainage to lower St. Vrain Creek

NEEDS TO INCREASE FIRM YIELD

Water rights on St. Vrain

St. Vrain River Basin

Component 14 - Mead Ponds

DESCRIPTION

The Town of Mead owns three ponds. It is assumed that the ponds were used as terminal storage for the Mead Water Treatment Plant while it was operating. Currently the ponds are used as an amenity for a local park and are full periodically. The decrees expressly state that the conveyance for the ponds are periodically filled, presumably from the Supply Ditch. The Town of Mead does not own any Supply Ditch shares, so they are likely filled with excess water in the ditch.

There are water rights for four Mead Ponds.

Pond	Adjudication Date	Case No	Volume
1	August 21, 1985	84CW100	14.0 Acre-Feet
2	August 21, 1985	84CW101	25.5 Acre-Feet
3	August 21, 1985	84CW103	40.0 Acre-Feet
4	September 28, 1983	84CW104	42.5 Acre-Feet

Pond number four was never constructed so the water right was abandoned. The ponds could be used as temporary or over winter storage of water rights on the St. Vrain.

POSITIVES

Existing structures and conveyance

NEGATIVES

Junior water right

80 acre-feet of storage

Resistance to lower pond level in a park

UNKNOWNNS

Seepage

Discharge

NEEDS TO INCREASE FIRM YIELD

Water rights on St. Vrain

St. Vrain River Basin

Component 15 - Beaver Park Reservoir

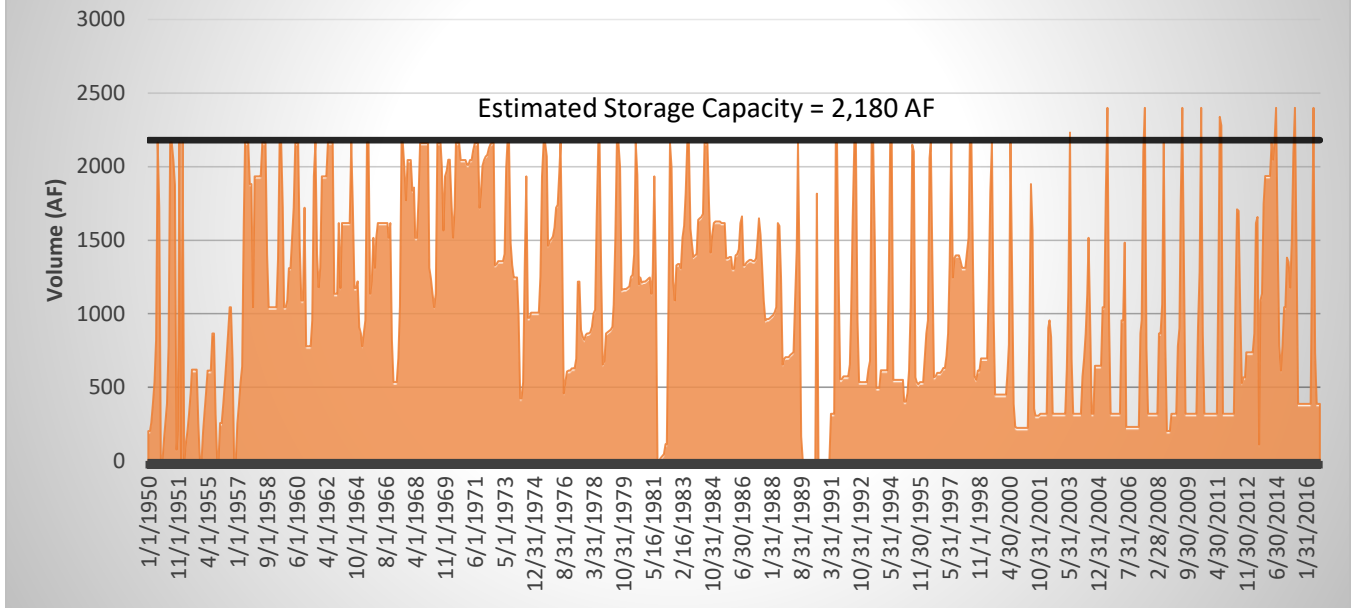
DESCRIPTION: Storage and Supply

Beaver Park Reservoir is located in portions of Sections 23, 24, 25, and 26 of Township 2 North, Range 73 West of the 6th P.M. on Beaver Creek, a tributary to the South St. Vrain Creek. The reservoir is owned by the St. Vrain Fish & Reservoir Company (SVFRC). A total of 600 shares are outstanding. The Supply Ditch Company owns 301 shares in the SVFRC (51%) and the Highland Ditch Company owns the remaining 299 shares (49%). The reservoir has a decreed capacity of over 2,180 acre feet. Beaver Park Reservoir has three storage rights; the original for 888 acre-feet with an appropriation date of June 30, 1892, the first enlargement for 959 acre-feet with an appropriation date of June 21, 1902, and a second enlargement for 335 acre-feet with an appropriation date of September 30, 1905. Monthly reservoir storage contents are shown in the figure below.

The St. Vrain & Left Hand Water Conservancy District changed 80 shares in SVFRC in Case No. 02CW334. It is our understanding the St. Vrain & Left Hand Water Conservancy District either leased or purchased (or a combination thereof) the 80 shares in SVFRC from the Supply Ditch Company. Depending on whether they purchased or leased the shares from the Supply Ditch Company, the Supply Ditch Company's percent ownership stated above may be reduced.

Based on the decree in Case No. 02CW334, the average annual amount delivered into the Supply Ditch from Beaver Park Reservoir was 2.523 acre-feet per share. The average consumptive use of this water was 1.3625 acre-feet per share with 0.9083 acre-feet per share going to return flows and 0.2522 acre-feet per share going to historical ditch losses.

Beaver Park Reservoir Monthly Storage Contents



POSITIVES

- St. Vrain Water Supply
- Can be conveyed through Supply Ditch
- Can be conveyed through Highlands Ditch.

NEGATIVES

UNKNOWNNS

- Condition of Dam
- Federal Authority? U-11 Permit
- Operations

NEEDS TO INCREASE FIRM YIELD

Big Thompson River Basin

Component 16 - Home Supply Ditch and Reservoir

DESCRIPTION: Supply, Storage and Conveyance

The Consolidated Home Supply Ditch and Reservoir Company (Home Supply Ditch) diverts direct flow and storage water out of the Big Thompson River and delivers water to approximately 16,500 irrigated acres along with the Town of Johnstown. Home Supply Ditch diverts up to 349.85 cfs under 5 direct flow rights ranging in seniority from November 1, 1861 to July 15, 1881. The ditch relies upon the storage of three reservoirs for deliveries in the late irrigation season; Lone Tree (Farwell), Mariano (Boedecker) and Lon Hagler. Water released from Lone Tree Reservoir is delivered to the River Ditch (the Home Supply Ditch below Lone Tree Reservoir) or to the Lake Ditch (which parallels the River Ditch between it and the Big Thompson River) for delivery to lands below Lone Tree Reservoir. Releases from Mariano and Lon Hagler are made to the Big Thompson River and used to exchange to the Home Supply Ditch headgate to increase deliveries later in the irrigation season. The ditch also receives delivery of C-BT water and requires a 50% shrink on all foreign water brought through the system. Typical shrink in the ditch for delivery of Home Supply Ditch water is between 8 and 10% from the river headgate to Lone Tree Reservoir.

The Home Supply Ditch consists of 2,001 outstanding shares of stock. The average annual farm headgate delivery of a Home Supply share is approximately 11.0 acre-feet with a dry-year delivery of approximately 7.4 acre-feet. Based on previous studies, the average annual consumptive use is approximately 7.0 acre-feet per share and the dry-year consumptive use is approximately 3.4 acre-feet per share.

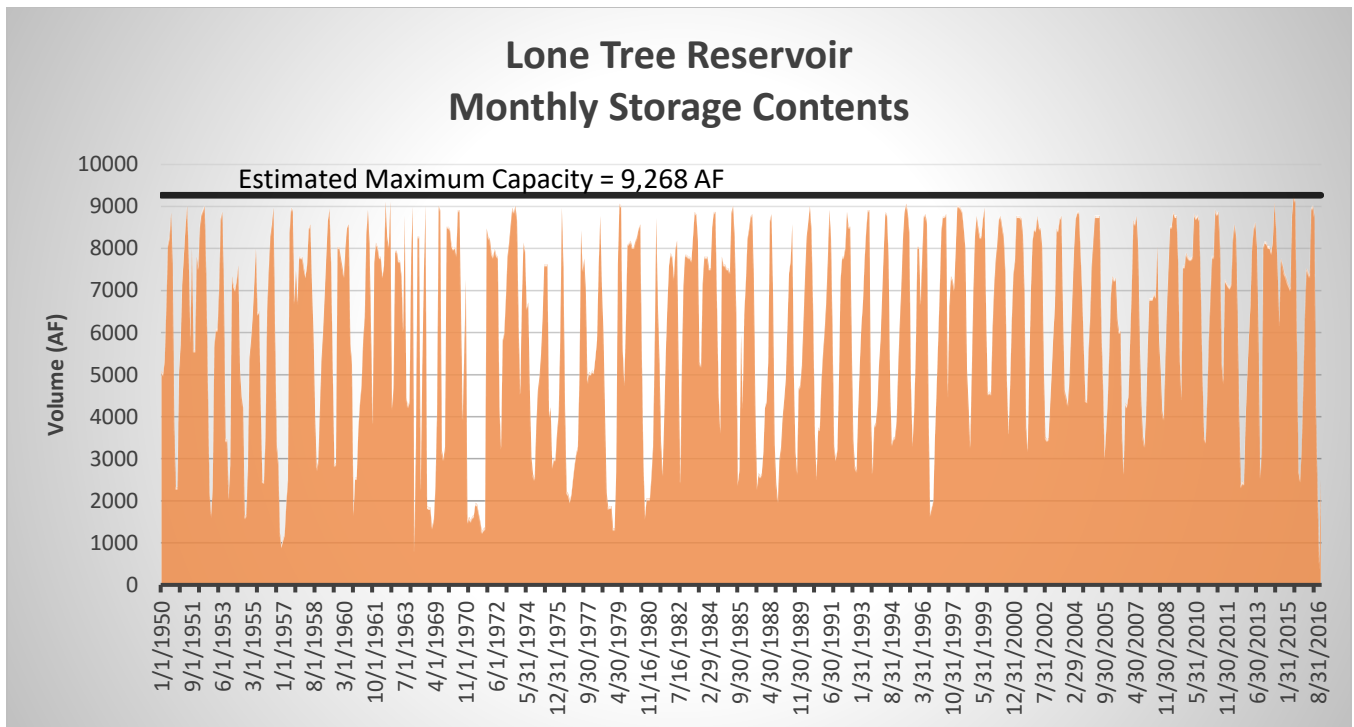
The Town of Johnstown has changed roughly 41% of the shares in the Home Supply Ditch and takes delivery of its water through the ditch or via pipeline from Lone Tree Reservoir. Johnstown's initial change case (98CW410) was based upon a ditch-wide analysis, and their second change case (06CW224) relied upon the same analysis and included similar terms and conditions. It is likely that additional change cases in the Home Supply Ditch can rely upon the same ditch-wide analysis from Johnstown's changes.

Water in the Home Supply Ditch could be changed in Water Court to include municipal uses. This water could be treated and used as part of the potable water supply for the District. The change case could include replacement credit for municipal return flows from this supply, including municipal effluent and lawn irrigation return flows.

Storage will likely be required to make releases to the Big Thompson River for return flow obligations from the historical use of this water, especially during the non-irrigation season. Mariano Reservoir would be ideal for this use since it is already used by the ditch company for making releases to the Big Thompson River. It may be possible to enter into an operational agreement with the Home Supply Ditch Company (so long as operations do not interfere with Home Supply's historical operations) allowing LTWD to retain storage capacity in the reservoir during the winter months so it can make winter return flow requirements to the Big Thompson River. Storage will also be needed

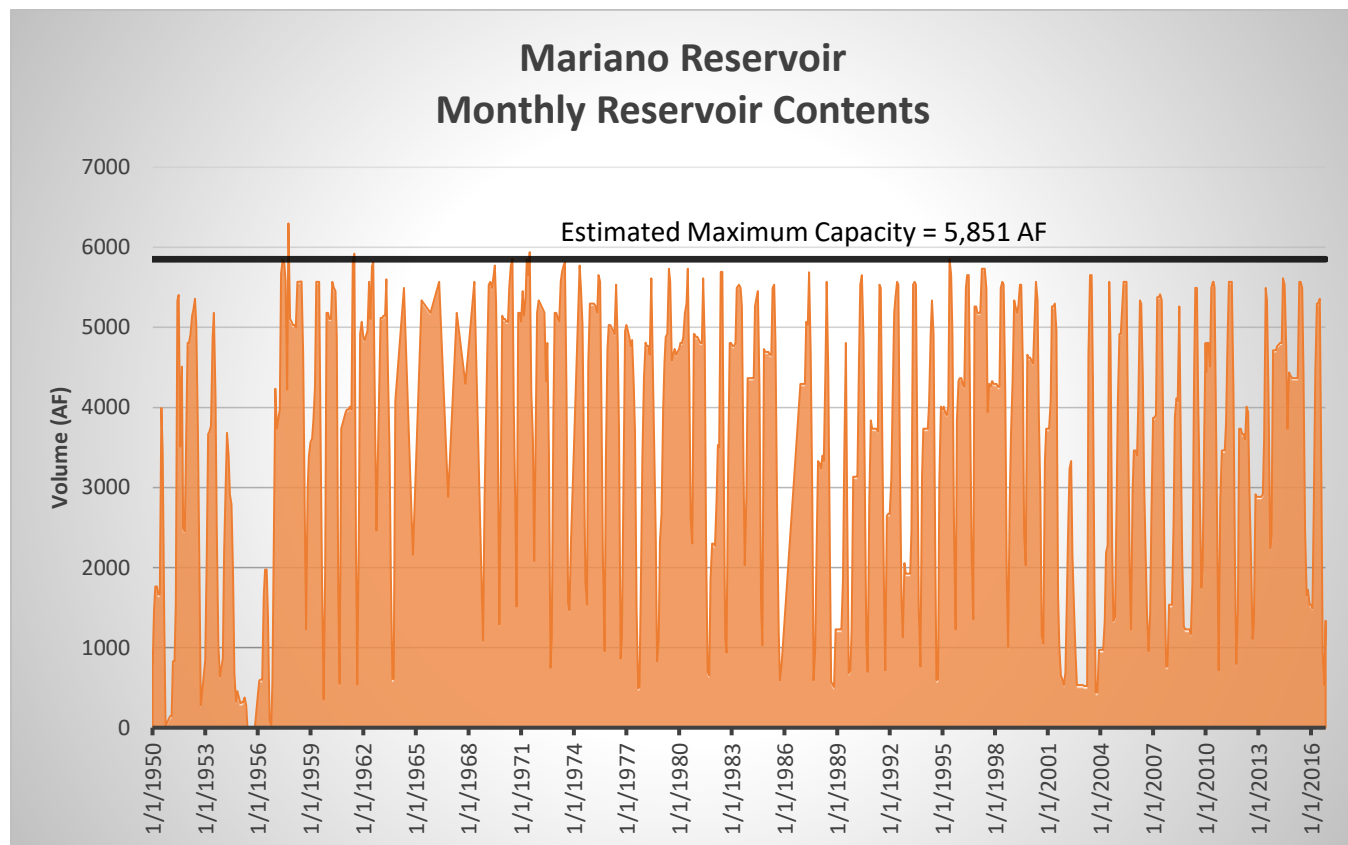
to help equalize the deliveries from the Home Supply Ditch (which generally delivers water April through October) and the demands from the District (which supplies water to customers year-round).

Lone Tree Reservoir has two storage rights associated with it: a first fill right of 9,183 acre-feet with an appropriation date of February 1, 1881, and a refill right for another 9,183 acre-feet with an appropriation date of June 15, 1907. Its capacity was constructed in 1881 to be approximately 9,268 acre-feet, but its active capacity is approximately 9,068 acre-feet. This is the No. 1 priority storage right on the Big Thompson River, so it generally fills every year. Water is delivered to the reservoir through the Home Supply Ditch, approximately 11 miles down-ditch of the river headgate. Lone Tree Reservoir is the Home Supply Ditch Company’s primary storage facility. Although water stored in Lone Tree Reservoir may be released to the Lake Ditch or to the River Ditch, water released to the River Ditch is limited to only the top two feet of active storage.



Mariano Reservoir is the No. 3 priority storage right on the Big Thompson River and generally fills every year, but did not in the severe drought year of 2002. The Mariano Reservoir storage rights include a first fill right with an appropriation date of August 1, 1888 for 5,571 acre-feet and a refill right with an appropriation date of June 7, 1907 for 5,571 acre-feet. Mariano’s total capacity is approximately 5,851 acre-feet, but its active capacity is estimated as 5,476 acre-feet. Mariano Reservoir is filled using the George Rist Ditch, which has its headgate just below the Home Supply Ditch in the SW ¼ of the NE ¼ of Section 12, Township 5 North, Range 70 West of the 6th P.M. The Home Supply Ditch Company uses Mariano Reservoir to make releases to the Big Thompson River, which it then exchanges back up to the headgate of the Home Supply Ditch. This operation is done when the direct flow supplies in the Home Supply Ditch are not enough to satisfy irrigators.

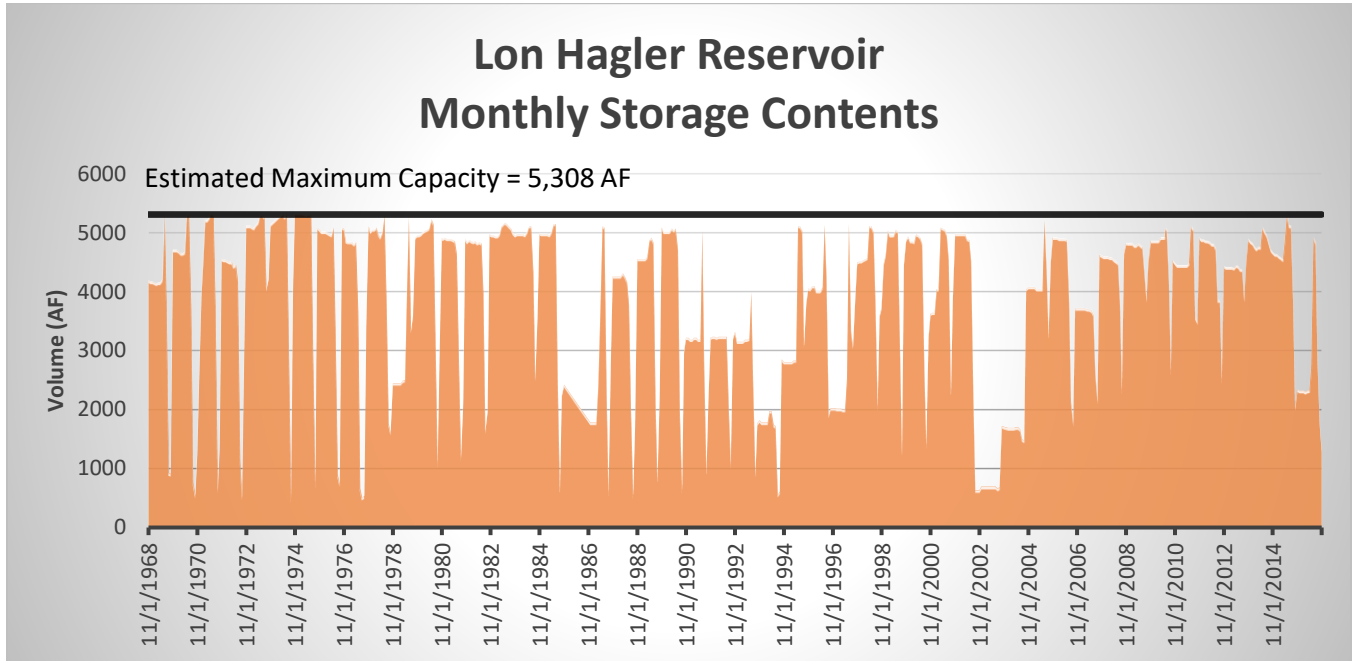
Based on the location of Mariano Reservoir, it may be possible for LTWD to store its interest in the Home Supply Ditch in Mariano and later make releases to the Big Thompson River to cover return flow requirements or to convey the water to the Handy Ditch where it could be delivered into Dry Creek and/or Dry Creek Reservoir. Any deliveries to the Handy Ditch would, at a minimum, require additional infrastructure (a pump and pipeline to convey the water out of Mariano Reservoir and into Handy Ditch) and a carriage agreement with the Handy Ditch.



The Lon Hagler Reservoir has a very junior storage right and is primarily used by shareholders in the Home Supply Ditch Company to store excess C-BT water or leased water sources. The Lon Hagler Reservoir storage rights include a first fill with an appropriation date of July 7, 1959 for 5,308 acre-feet, and a refill right with an appropriation date of August 21, 1979 for 5,308 acre-feet. Lon Hagler’s estimated total capacity is 5,308 acre-feet and its active capacity is 5,148 acre-feet. The reservoir is located approximately 7 miles down-ditch from the headgate of the Home Supply Ditch. Releases from the reservoir can only be made to Mariano Reservoir, where they can then be released to the Big Thompson River. The Colorado Division of Wildlife has maintained a minimum conservation pool of 500 acre-feet in the reservoir for hunting and fishing purposes.

Similar to Mariano Reservoir, Lon Hagler Reservoir’s proximity to the Handy Ditch make it possible for it to be used to store the District’s Home Supply shares and then pump the water into the Handy

Ditch for delivery to Dry Creek or Dry Creek Reservoir. This would require additional infrastructure to convey the water into the Handy Ditch and a carriage agreement with the Handy Ditch. Lon Hagler Reservoir could also be used to store LTWD’s Home Supply shares for later delivery to the Big Thompson River for the purpose of making return flow replacements.



(References: SPDSS Memorandum by Rick Parsons and Erin Wilson, Task 5, 2/16/05; CDSS Monthly Reservoir Content data; St. Vrain Basin Water Source Study by Ecological Resource Consultants and Williams and Weiss Consulting dated March 1, 2016; Preliminary Engineering Report Ditch-Wide Analysis Historical Water Use Under the Consolidated Home Supply Ditch and Reservoir Company by Leonard Rice Engineers, 7/25/2005)

POSITIVES

- Municipal development process through Water Court established (Johnstown’s 90CW202, 98CW410, 06CW224).
- Water storage and yield components.
- Delivered high in the District’s service area.

NEGATIVES

- Water Court transfer process required for domestic use of ditch water.
- Competing interest with other water providers.
- Potential quality concerns if storing native water in Dry Creek Reservoir.

UNKNOWNNS

Availability of shares.

Updated information from the Ditch Company regarding reservoir capacities, operations, and CBT units in the system.

Ability to obtain carriage agreements from the Handy Ditch for delivery of Home Supply water to Dry Creek/Dry Creek Reservoir.

STRUCTURES NEEDED TO INCREASE FIRM YIELD

Storage to make return flow deliveries to Big Thompson River at or above location of historical use.

Storage to equalize supplies to meet demands.

Treatment facility, either near ditch, or at Carter Lake Filter Plant (CLFP) with delivery to CLFP.

If delivered to CLFP, need pipeline for direct delivery or agreement with Handy Ditch to deliver to Dry Creek and exchange up to CLFP.

Big Thompson River Basin

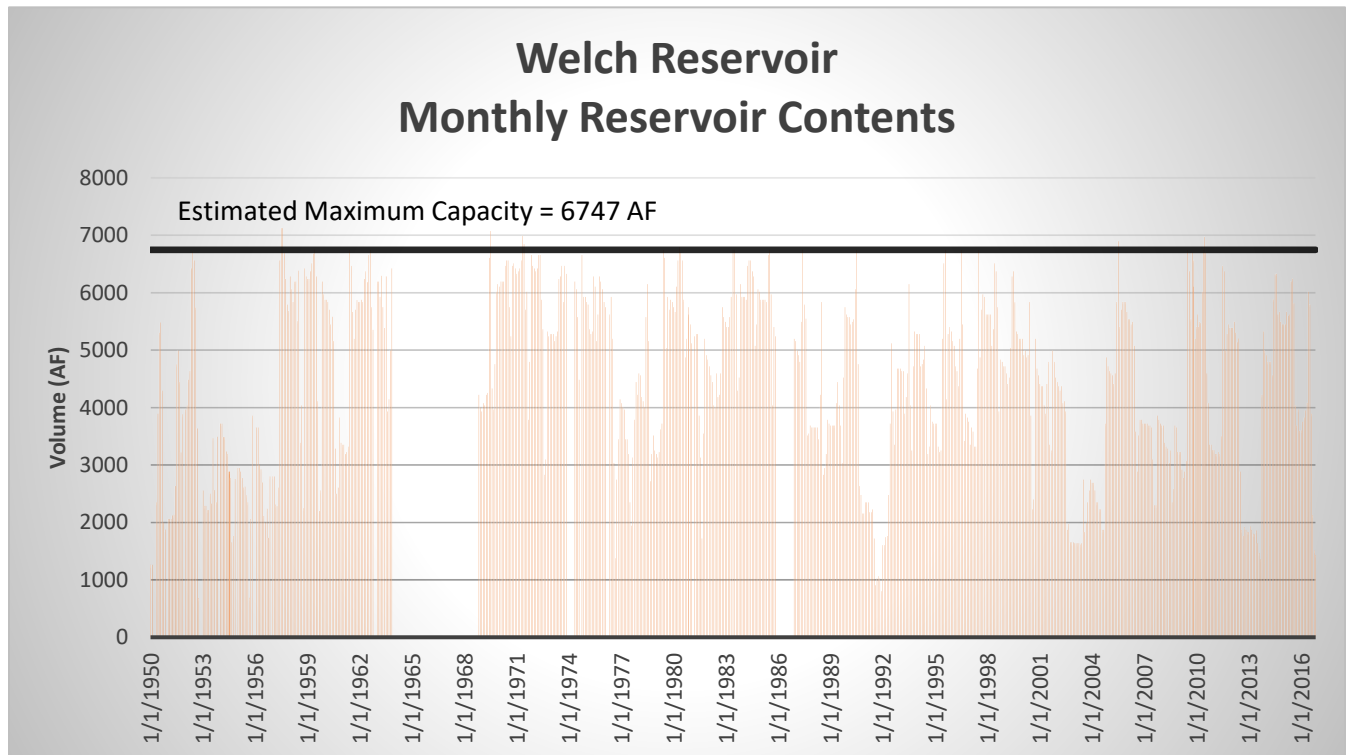
Component 17 - Handy Ditch

DESCRIPTION: Supply, Storage and Conveyance

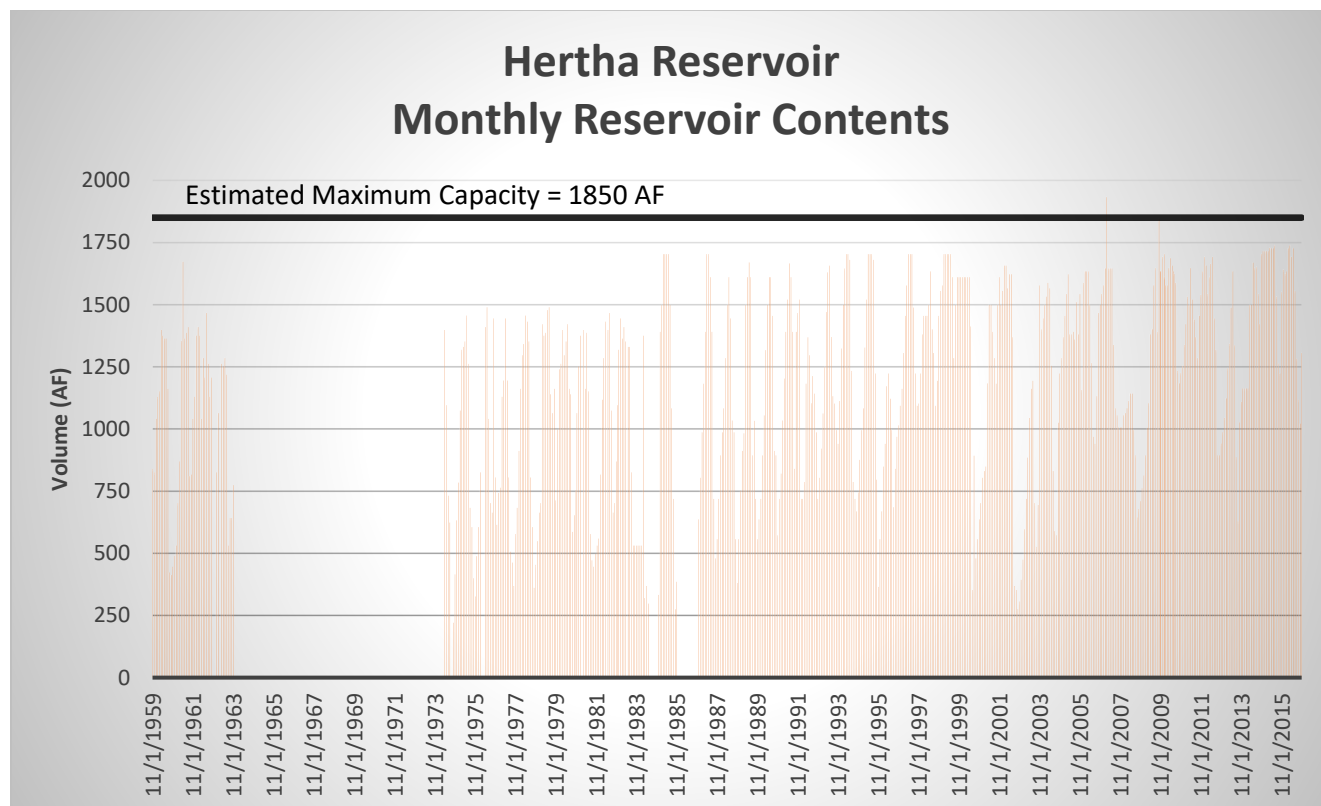
The Handy Ditch diverts out of the Big Thompson River and serves approximately 12,000 irrigated acres in the Berthoud area. Storage associated with Handy Ditch is in Hertha Reservoir and Welch Reservoir. The Handy Ditch diverts up to 198.4 cfs under 7 direct flow rights ranging in seniority from April 1, 1863 to December 15, 1880. Five major laterals exist within the Handy Ditch system: Dry Creek (Shweck) Lateral, Welch Lateral, Whipple Lateral, McIntyre Lateral, and Rock (Sunnyside) Lateral. There are 900 shares of capital stock outstanding in the Handy Ditch Company. The capacity of Handy Ditch is approximately 206 cfs. Ditch loss in the system is estimated between 10% - 15%. The average annual farm headgate delivery of a Handy Ditch share is approximately 10.7 acre-feet with a dry-year delivery of approximately 5.1 acre-feet. Based on previous studies, the average annual consumptive use is approximately 6.4 acre-feet per share and the dry-year consumptive use is approximately 0.9 acre-feet per share.

Many shareholders on Handy Ditch have C-BT units that are delivered through the ditch. A 25% shrink is applied to all C-BT shares.

The Welch Reservoir is the largest reservoir off of Handy Ditch and is the primary storage facility for the system. Its located 12.5 miles downstream of the Big Thompson River. The reservoir has a storage capacity of 6,747 acre-feet and can release water into Handy Ditch or into the Welch Lateral. Welch Reservoir was decreed in Case No. CW-9079 for 4,955 acre-feet.



Hertha Reservoir is located approximately 1.5 miles west of Welch Reservoir and has a capacity of approximately 1,850 acre-feet. Hertha Reservoir captures natural drainage from Dry Creek and also receives water from Carter Reservoir as replacement water from the C-BT Project. Hertha Reservoir was also decreed in CA-9079 for 2,136 acre-feet of storage.



Water in Handy Ditch could be changed in Water Court by the District to include municipal uses. There have already been three change cases on Handy Ditch. Although one was based on a ditch-wide study, the ditch-wide approach was not decreed. The previous cases provide a guide that District would be able to follow when going through Water Court and allow for a better understanding of what to expect in terms of yield. If the District were able to secure additional capacity in Welch Reservoir and Hertha Reservoir through an operating agreement with the Handy Ditch to manage their capacity differently, this interest could help the District equalize water deliveries year-round. If the District were able to deliver the shares through Dry Creek (Sweck) Lateral it might be possible to deliver the water to Dry Creek Reservoir.

(References: Little Thompson Water District, Water Resource Planning – Supply Project Alternatives, July 1, 2004. Interview Notes with Steve Anderson, Board Member of the Handy Ditch Company, May 6, 2005. Armbruster, Edward, Preliminary Engineering Report Handy Ditch Company, Leonard Rice Engineers, Inc., August 10, 2005; CDSS Monthly Reservoir Content data.)

POSITIVES

Municipal development process through Water Court established (Berthoud's 00CW0110, Koolstra's 01CW0182, and Escape Properties' W7439).

Water storage and yield components from Hertha Reservoir and Welch Reservoir.

Proximity to existing transmission lines

The Handy Ditch Company has completed a ditch-wide analysis that could possibly be used as the basis of a District Water Court Application.

NEGATIVES

Water Court required for domestic use of water

Delivered high in LTWD's service area

Potential water quality concerns if storing native water in Dry Creek Reservoir

UNKNOWNNS

Delivery through Dry Creek Lateral and exchange upstream to Carter Lake Filter Plant

Conveyance to Dry Creek Reservoir

Availability of shares

STRUCTURES NEEDED TO INCREASE FIRM YIELD

Storage to make return flow deliveries to Big Thompson River at or above location of historical use.

Storage to equalize supplies to meet demands.

Treatment facility, either at Dry Creek Reservoir or CLFP

Use of ditch and Dry Creek Lateral to deliver to Dry Creek.

Big Thompson River Basin

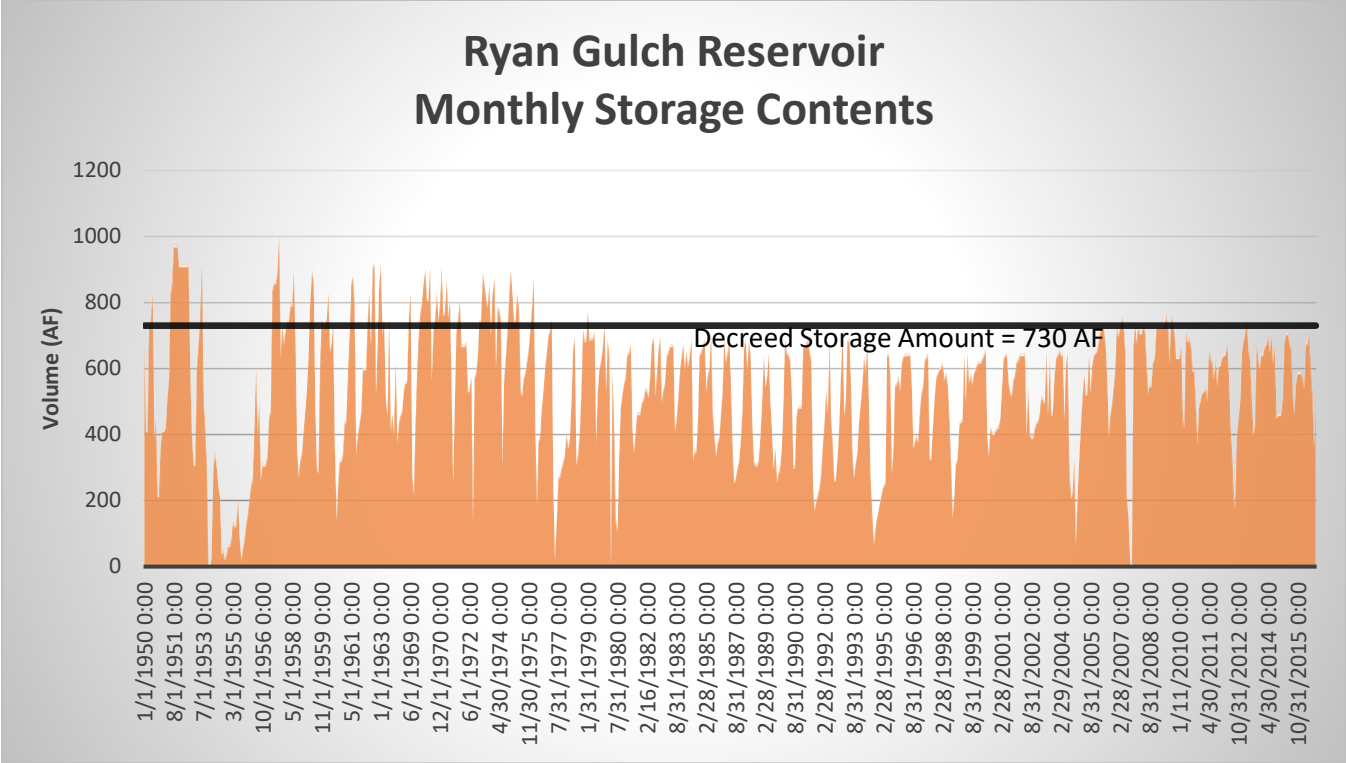
Component 18 – Ryan Gulch Reservoir

DESCRIPTION: Storage and Supply

Ryan Gulch Reservoir is owned by the Ryan Gulch Reservoir Company. It is located in Section 27, Township 5 North, Ranch 69 West of the 6th P.M, and receives water from Ryan Gulch. The reservoir was constructed by building a dam across Ryan Gulch to capture native flows. Ryan Gulch Reservoir is decreed a storage right on Ryan Gulch for 729.96 acre-feet with an appropriation date of April 12, 1904, and a refill right for 730 acre-feet with an appropriation date of June 18, 1907. Ryan Gulch Reservoir also receives water from the Southside Reservoir which is located just south (upstream) of Ryan Gulch Reservoir. Through a contractual arrangement between the Ryan Gulch Reservoir Company and the Southside Canal Company, some Southside Reservoir water is stored in Ryan Gulch Reservoir. The Buckingham Ditch diverts from the Big Thompson River and runs into Ryan Gulch Reservoir, but is not used to carry storage water. Releases from Ryan Gulch Reservoir are delivered down Ryan Gulch to the Big Thompson River.

There are a total of 100 shares of stock outstanding in the Ryan Gulch Reservoir Company. Each share provides 7.3 acre-feet of water when the reservoir is full. It is our understanding the Handy Ditch Company previously owned 39 shares in the Ryan Gulch Reservoir Company, but sold those shares and no longer has an interest in Ryan Gulch Reservoir. The City of Loveland changed 13.75 shares in the Ryan Gulch Reservoir Company through Case No. 06CW089 to use for augmentation. The engineering in this case notes that the reservoir generally fills the 730 acre-foot storage right every year, but that from 1994 to present, the yield was lower due to “out of the ordinary administrative purposes” and a restriction “due to inadequacy of the spillway” which has since been repaired. Based upon the monthly reservoir contents shown in the figure below, it appears there are often times when storage space is available in the reservoir.

Ryan Gulch Reservoir shares have been used by irrigators as a supplemental supply for late-season irrigation. The water is released from the reservoir, delivered to the Big Thompson, and then re-diverted into a variety of ditches and/or reservoirs in the Loveland area for delivery to shareholders.



(References: 06CW089 Decree and supporting documents; CDSS Monthly Reservoir Content data)

POSITIVES

- Storage and yield components in Ryan Gulch Reservoir.
- Proximity to existing transmission lines.
- Means of making return flows to Big Thompson River.
- Potential for exchange to Home Supply Ditch or Handy Ditch.

NEGATIVES

- Will require a Water Court change case to use for municipal purposes.

UNKNOWNNS

- Possible conveyance through Home Supply Ditch.
- Possible to exchange on Big Thompson to Home Supply headgate or Handy Ditch headgate
- Confirm how Ryan Gulch Reservoir Company operates storage
- Availability of shares

STRUCTURES NEEDED TO INCREASE FIRM YIELD

- Treatment facility either near ditch, or pump and pipe to either Dry Creek Reservoir or CLFP.

Little Thompson River Basin

Component 19 - Ish Ditch

DESCRIPTION: Supply, Storage and Conveyance

The Ish Ditch (aka Boulder and Larimer County Irrigating and Manufacturing Ditch) diverts water off the south side of the Little Thompson River in the NW ¼ of the NE ¼ of Section 1, Township 3N, Range 70W of the 6th P.M. The ditch runs for approximately 6 miles to irrigate lands on the south side of the Little Thompson River. In addition to the water rights described below, some shareholders have C-BT units which are conveyed through the Old and New Ish Ditch systems. An additional carriage “charge” or “shrink” is applied to the C-BT deliveries or any other foreign water carried in the Ish Ditch system.

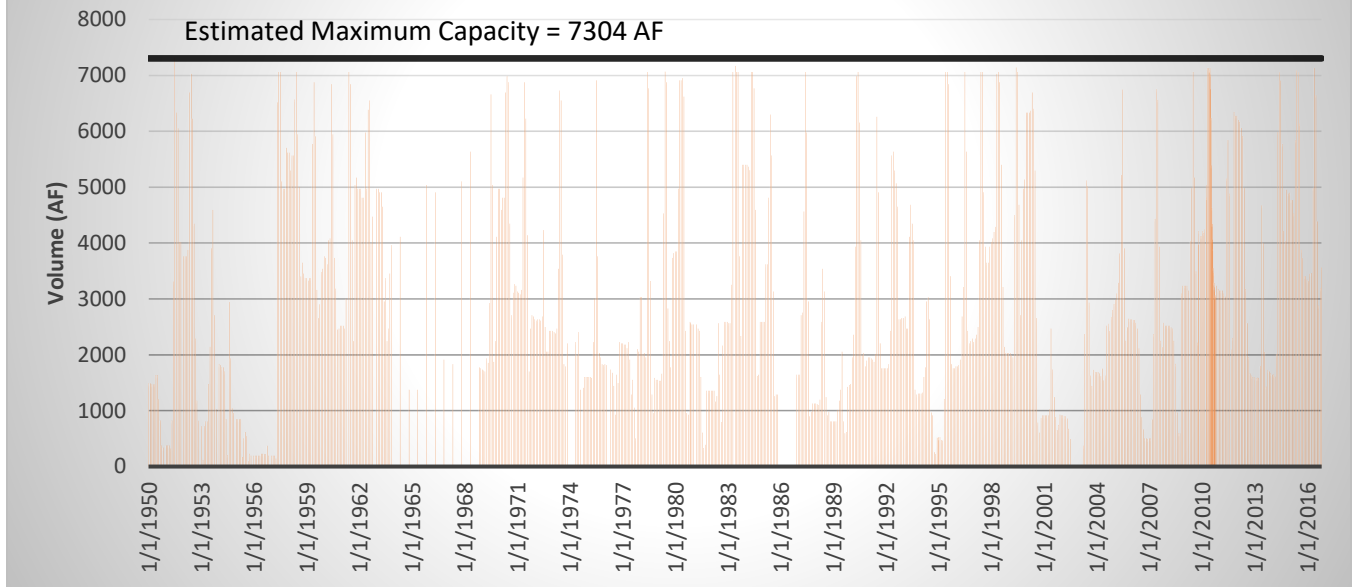
Old Ish: The Old Ish Ditch Company was incorporated in 1875 with 1,000 shares and has both direct flow irrigation rights and storage rights in Ish Reservoir (aka Boulder Larimer Reservoir). Old Ish has two direct flow rights totaling 66.72 cfs with appropriation dates of June 30, 1875 (27.20 cfs) and May 20, 1877 (39.52 cfs). The company is entitled to the bottom 20 feet of Ish Reservoir storage and 20% of the top storage, equaling a total of 3,504 acre-feet.

New Ish: The New Ish Company was incorporated in 1905 with 600 shares and contains the remaining 80% of storage in the top portion of Ish Reservoir which equals 3,800 acre-feet. The New Ish Company receives water only after the bottom 20 feet of the reservoir is filled and the decrees of the Old Ish Ditch Company are satisfied. It also has the obligation of maintaining Ish Reservoir. New Ish does not have any direct flow rights.

Reservoir(s): Water is delivered to Ish Reservoir through the Boulder Larimer Ditch approximately 4 miles below the river headgate. Old Ish Company runs its direct flow and C-BT deliveries through the reservoir, whereas the New Ish Company takes its C-BT water through its bypass structure. The total decreed amount for Ish Reservoir is 7,343.78 acre-feet with a refill right decreed for 307 acre-feet absolute and 1,693 acre-feet conditional. The storage rights in Ish reservoir range in priority from June 30, 1875 to January 4, 1904, and the refill right has a priority date of June 9, 1987. There are two outlets on the reservoir, the New Ish outlet releases water to the New Ish Ditch and the Old Ish outlet releases water to the Old Ish Ditch.

Deliveries to Old and New Ish shareholders is based on a quota provided by the Companies in the spring based on the amount of water in storage. Old Ish shareholders receive an additional quota for their direct flow rights. It's estimated based on available records from 1969 through 1987 that the average annual quota for New Ish shareholders was 3.6 acre-feet delivered, and for Old Ish shareholders it was 3.7 acre-feet delivered. Previous engineering by Leonard Rice Engineers (LRE) estimates the historical depletions associated with New Ish shares at 2.2 acre-feet per share and with Old Ish shares at 2.3 acre-feet per share.

Ish Reservoir Monthly Reservoir Contents



Shares in both the Old Ish Company and New Ish Company could be changed in Water Court to include municipal uses. If shares are acquired, LTWD would be entitled to its pro-rata portion of Ish water stored in the reservoir. If LTWD is able to obtain an operational agreement with the Ish Company, the reservoir could be used by LTWD to make releases to Little Thompson River for return flow requirements or could help LTWD equalize water deliveries year-round. If a carriage agreement with the Highland Ditch could be obtained, it might be possible for Ish shares to be released from Ish Reservoir and conveyed down Highland Ditch to be utilized in areas that LTWD is seeing high population growth. Further investigation would be needed to determine if this is possible and where the water would be treated.

Big Elk Meadows changed 12 shares in the Old Ish Company in Case No. 95CW238 to be used for augmentation, so some precedent has been set for changing this water. The average annual depletion was determined to be 2.62 acre-feet per share, similar to the estimate by LRE.

(References: Little Thompson Water District, Water Resource Planning – Supply Project Alternatives, July 1, 2004, Armbruster, Edward, Preliminary Engineering Ditch-Wide Analysis Historical Water Use Under the Boulder Larimer Ditch System (Old Ish and New Ish), Leonard Rice Engineers, Inc., December 14, 2005; CDSS Monthly Reservoir Content data.)

POSITIVES

- Storage and yield components in Ish Reservoir.
- Proximity to new population growth areas.
- Proximity to existing transmission lines.

NEGATIVES

New Ish shares are junior storage rights.

Will require a Water Court change case to use for municipal purposes.

UNKNOWNNS

Possible conveyance through Highland Ditch.

Confirm how New Ish and Old Ish manage storage in Ish Reservoir.

STRUCTURES NEEDED TO INCREASE FIRM YIELD

Treatment facility either near ditch, or pump and pipe to Dry Creek Reservoir

Storage to make return flow deliveries to the Little Thompson River at or above location of historical use.

Storage to equalize supplies to meet demands.

Little Thompson River Basin

Component 20 – Bacon Lake

DESCRIPTION: Supply, Storage and Conveyance

Bacon Lake has a water storage right of 360 acre-feet with a right to refill to 1,400 acre-feet. The right was decreed in Case No. 79CW345 and is administered with a 1979 priority. However, within the priorities filed in 1979, Bacon Lake is administered according to its appropriation dates, which are January 1, 1919 for irrigation and direct flow irrigation exchange uses, and August 1, 1972 for municipal, domestic and augmentation uses. The sources of the water right are: *“seepage, runoff, agricultural return flow and drainage, storm sewer drainage from the Town of Berthoud, and waters of the Newell Lake Drainage District, said waters arising from unnamed water courses located in the vicinity of Bacon Lake, all of which are tributary to the Little Thompson River which is tributary to the South Platte River...”*. Bacon Lake is filled through the McIntyre Lateral (part of the Handy Ditch system) and various private wastewater channels and field drains. The decree also appropriated a conditional storage right of 200 acre-feet, which was later abandoned in 1988.

In a 2017 letter from the Division Engineers Office, it was confirmed that Newell Lake water can be released to Bacon Lake. This water can be stored in Bacon Lake only if the Bacon Lake storage right is in-priority. If the water right is out-of-priority, the water must be released to the Little Thompson River. It should be noted that Newell Lake does not have any water right associated with it, so it is our understanding any water stored in Newell Lake during periods when the call is anything other than free-river will need to be released to Bacon Lake. Newell Lake was a part of the Newell Lake Drainage District (Drainage District) which was organized to provide a drainage system to specific property owners surrounding Newell Lake. In a 1965 agreement between the Drainage District and the Bacon Reservoir Company (Company), the Company agreed that it would take delivery of all water the Drainage District delivers to Bacon Lake. If these operations are still ongoing, capacity for beneficial uses in Bacon Lake could be reduced to manage drainage flows. If acquired, LTWD may be obligated to continue the drainage obligations to the surrounding properties. Additionally, the 79CW345 decree states that the right to store waters in Bacon Lake is subordinate to the right of the Town of Berthoud to “alter the course of storm waters and run-off from lawn and garden irrigation draining from or through the present and future boundaries of that town.”

The surface area associated with Bacon Lake is specified as 93.606 acres in the decree, which is close to the surface area as measured in Google Earth of 98 acres. Although the water right associated with Bacon Lake is limited to 360 acre-feet, the volume in storage as reported by the Division of Water Resources was as high as 872 acre-feet. Given a capacity of 872 acre-feet and a surface area of approximately 94 acres, the average depth of the lake is approximately 9.3 feet, making it a relatively shallow water storage facility that will suffer large evaporative losses proportionate to its volume. Using National Weather Service (NWS) 33, the average net evaporative losses in this area is 3.25 ft/year per acre, or approximately 304.2 acre-feet per year from Bacon Lake.

Since Bacon Lake can be filled through the McIntyre Lateral off the Handy Ditch system, it may be possible for the District to take delivery of its Handy Ditch shares at the McIntyre Lateral and store this water in Bacon Lake for later delivery to a water treatment plant or for release to the Little Thompson River to offset downstream return flow obligations.

Bacon Lake is located approximately 1.7 miles southwest of the Griep Farm, which is owned by the District. If the District decides to construct a water treatment plant or reservoir at the Griep Farm location, then Bacon Lake would be in close proximity and could be connected to the facility on the Griep Farm. Without knowing what type of facility will be located on the Griep Farm, the benefit of any interconnect with Bacon Lake is unknown at this time.

POSITIVES

- Close proximity to Griep Farm.
- Storage located within the District’s boundaries.
- Proximity to Little Thompson River.
- Possible delivery of LTWD Handy Ditch shares into Bacon Lake.

NEGATIVES

- Potential drainage obligations may be a liability.
- Large amount of evaporation as compared to storage capacity.

UNKNOWNNS

- Current drainage operations.

STRUCTURES NEEDED TO INCREASE FIRM YIELD

- If used as storage for raw water supplies, infrastructure would be needed connecting Bacon Lake to the water treatment plant.

Boulder Creek Basin

Component 21 – Rural Ditch

DESCRIPTION: Supply and Conveyance

The Rural Ditch Company owns and operates the Rural Ditch, which diverts water from the southeast bank of Boulder Creek approximately 4.5 miles upstream from the confluence with the St. Vrain River. The St. Vrain Basin Water Source Study by ERC, dated March 1, 2016 selected the Rural Ditch for the “short list” of potential water sources for the study participants with the goal of delivering the yield to a water treatment plant near Barefoot Lakes or Firestone. Since the Rural Ditch is described in detail in the ERC report in Section 4.2.3, we have highlighted some of the key components of the system here.

- Direct flow rights totaling 83.00 cfs with appropriation dates of 05/10/1862 and 03/10/1863.
- Previous changes of use by Central Colorado Water Conservancy District and Varra Companies, which provide some guidance to future changes (note these were not ditch-wide changes).
- Average annual historical consumptive use ranges from 39.4 to 62.0 acre-feet/share.
- Firm year historical consumptive use ranges from 36.0 to 52.8 acre-feet/share.
- The location of the Rural Ditch could facilitate deliveries to the new water treatment plant location.
- Reusable effluent might be used to meet return flow obligations.
- 40 shares out of a total of 50 remain unchanged.

POSITIVES

Seniority of the water rights
Conveyance to the Mead / Barefoot Lakes area
Past change cases in Water Court to provide an example

NEGATIVES

No storage associated with the Rural Ditch shares.

UNKNOWNNS

Availability of shares.

STRUCTURES NEEDED TO INCREASE FIRM YIELD

Augmentation structure or additional infrastructure to convey the water to the WTP at Barefoot or Firestone.

Big Thompson River Basin

Component 22 – Maitland Reservoir

DESCRIPTION: Supply and Conveyance

Maitland Reservoir currently does not exist but has an anticipated capacity of 9,000 acre-feet. The reservoir has the potential of being non-jurisdictional. The City of Loveland previously did an assessment of Maitland Reservoir.

POSITIVES

Possibility of a joint project with City of Loveland

NEGATIVES

Not constructed

UNKNOWNNS

STRUCTURES NEEDED TO INCREASE FIRM YIELD

Dry Creek Basin

Component 23 – Carter Lake Filter Plant

DESCRIPTION: Supply and Conveyance

The Carter Lake Filter Plant (CLFP) was constructed in 1962 and has been expanded over the years to its present capacity of 50 MGD. Although the plant is rated at 50 MGD, CLFP has operational restrictions that limit the production to less than 50 MGD. There are operational and structural tweaks that can be implemented to improve the efficiency of the plant but the Districts either must construct significant infrastructure to obtain more capacity at the CLFP or develop treatment capacity elsewhere in the District. Dry Creek water can be pumped to CLFP. In 2018 the District began pumping a small amount of Dry Creek water to CLFP and blend it with Carter Lake water. There has been no taste and odor complaints.

Dry Creek Basin

Component 24 – Dry Creek Water Treatment Plant

DESCRIPTION: Supply and Conveyance

The District is considering constructing a new water treatment plant at the base of Dry Creek. The District owns sufficient land around Dry Creek Reservoir to build a new WTP.

POSITIVES

District owns land

NEGATIVES

Not constructed
Water quality

UNKNOWNNS

Participation by CWCWD

STRUCTURES NEEDED TO INCREASE FIRM YIELD

Water treatment plant
Pipeline to convey raw water

Saint Vrain Basin

Component 25 – Barefoot Lakes Water Treatment Plant

DESCRIPTION: Supply and Conveyance

The District is considering constructing a new water treatment plant at Barefoot Lakes. The new water treatment plant will be a relatively small (1 to 3 MGD), pre-built and housed in a wood or metal structure. This plant would not have onsite operators. Brookfield has granted the District an out-lot to build the water treatment plant.

The Barefoot Lakes are only 11 feet deep and has a significant algae problem. The water quality in the lower St. Vrain Creek is poor. The District should assess whether water of this quality can be treated with a small distributed WTP.

POSITIVES

District has access to land

NEGATIVES

Not constructed
Water quality

UNKNOWNNS

STRUCTURES NEEDED TO INCREASE FIRM YIELD

Water treatment plant
Pipeline to convey water

Saint Vrain Basin

Component 26 – Firestone Water Treatment Plant

DESCRIPTION: Supply and Conveyance

The Town of Firestone plans to construct a new WTP just downstream of Barefoot Lakes on the south side of the St. Vrain Creek. The Firestone WTP plant is being designed to treat the low-quality water from the St. Vrain Creek at that location or directly from the SVSD outfall.

The Town has an aggressive schedule: anticipating that the plant will be operational within five years. Firestone has purchased the land for the water treatment plant as well as gravel pit storage nearby. Firestone has asked the District to be part of a treatment authority that would oversee the treatment plant and possibly raw water supplies.

POSITIVES

Regional collaboration.

NEGATIVES

Not constructed.

UNKNOWNNS

Structure and cost of being part of authority.

Effect of authority on water rights.

STRUCTURES NEEDED TO INCREASE FIRM YIELD

Pipeline to convey raw and treated water.

Big Thompson River Basin

Component 27 – Griep Farm Water Treatment Plant

DESCRIPTION: Supply and Conveyance

A new WTP at the Griep Farm has been considered in the District's long-term planning studies. Like the potential Barefoot Lakes WTP, the Griep Farm WTP will be a small (1-3 MGD), pre-built plant, housed in a wood or metal structure. This plant would not have onsite operators.

POSITIVES

District owns land.

NEGATIVES

Not constructed.

UNKNOWNNS

Water quality.

STRUCTURES NEEDED TO INCREASE FIRM YIELD

Water treatment plant.

Pipeline to convey water.

Little Thompson River Basin

Component 28 – Ish Reservoir Water Treatment Plant

DESCRIPTION: Supply and Conveyance

A new WTP at Ish Reservoir has been an option considered in the District's long term planning studies. Like the potential Barefoot Lakes WTP, the Griep Farm WTP will be a small (1-3 MGD) pre-built plant, housed in a wood or metal structure. This plant would not have onsite operators.

POSITIVES

Property has been zoned to accommodate a WTP.

NEGATIVES

Not constructed.

Water quality in ditches is likely poor.

UNKNOWNNS

Water quality.

STRUCTURES NEEDED TO INCREASE FIRM YIELD

Water treatment plant.

Pipeline to convey water.

Saint Vrain Basin

Component 29 – Town of Mead Water Treatment Plant

DESCRIPTION: Supply and Conveyance

The Town of Mead demolished its WTP in the 2000's. A new WTP at the Mead site has been an option considered in the District long term planning studies. Similar to the potential Barefoot Lakes WTP, the Mead WTP will be (1-3 MGD) pre-built plant, housed in a wood or metal structure. This plant would not have onsite operators.

POSITIVES

Would be built on old Mead WTP site; would have to purchase or enter agreement with Mead.

NEGATIVES

Not constructed.

Water quality in ditches is likely poor.

Not near demand centers.

UNKNOWNNS

Water quality.

STRUCTURES NEEDED TO INCREASE FIRM YIELD

Water treatment plant.

Pipeline to convey water.

Appendix B
Concept Summaries and Maps

Concept No.	Concept Name	Basin	Source	Storage	Conveyance	Treatment
1	First Use of District's "Firmed" Windy Gap Water	Little Thompson River	District's Five "Unfirmed" Windy Gap Units – First Use	Dry Creek Reservoir	Existing Distribution System	CLFP and/or New WTP at Dry Creek Reservoir
2	Second Use of "Firmed" Windy Gap Water	St. Vrain Creek	Twelve Windy Gap "Firmed" Units Dedicated by Brookfield's – Second Use	Barefoot Lakes and/or Gravel Pit on St. Vrain Creek. 1 st use firmed in Chimney Hollow or Dry Creek Reservoirs	River Exchange from St. Vrain Sanitation District Plant to Barefoot Lakes	Distributed WTP at Barefoot or Centralized Firestone WTP
2a	Second Use of District's "Unfirmed" Windy Gap Water	St. Vrain Creek	Five "Unfirmed" Windy Gap Units – Second Use	Barefoot Lakes and/or Gravel Pit on St. Vrain Creek. 1 st use firmed in Dry Creek Reservoir	Possible River Exchange from St. Vrain Sanitation District Plant to storage or Pipeline	Distributed WTP at Barefoot or Centralized Firestone WTP
3	Handy and Home Supply Shares - Griep Farm Reverse	Big Thompson River	20 Handy & 70 Home Supply Ditch Shares	Terminal Storage at Griep Farm <u>then</u> Dry Creek Reservoir	Pipe from Griep Farm to Dry Creek Reservoir	New WTP at Dry Creek Reservoir or CLFP
3a	Handy and Home Supply Shares with Potential WTP at Griep Farm	Big Thompson River	20 Handy & 70 Home Supply Ditch Shares	Terminal Storage at Griep Farm <u>then</u> treated and delivered to Twin Mounds Tanks	Pipe from WTP to Twin Mounds Tanks	Distributed WTP at Griep Farm
4	Handy and Home Supply Shares - Boedecker Exchange/Lonetree Delivery	Big Thompson River	20 Handy & 70 Home Supply Ditch Shares	Space Available in Home Supply Storage <u>then</u> Dry Creek Reservoir	Pipe from Lonetree Reservoir to Dry Creek Reservoir	New WTP at Dry Creek Reservoir or CLFP
4a	Handy and Home Supply Shares - Lonetree Delivery to Dry Creek Reservoir	Big Thompson River	20 Handy & 70 Home Supply Ditch Shares	Space Available in Home Supply Storage <u>then</u> Dry Creek Reservoir	Deliver Handy Shares into Home Supply system. Pipe from Lonetree Reservoir to Dry Creek Reservoir	New WTP at Dry Creek Reservoir or CLFP

Concept No.	Concept Name	Basin	Source	Storage	Conveyance	Treatment
5	Handy and Home Supply Shares - Using Handy Infrastructure	Big Thompson River	20 Handy & 70 Home Supply Ditch Shares	Dry Creek Reservoir <u>or</u> Maitland Reservoir	Deliver Home Supply Shares into Handy Ditch. Use Sweck Lateral and pipeline to convey to Dry Creek Reservoir	New WTP at Dry Creek Reservoir <u>or</u> CLFP
5a	Handy and Home Supply Shares Using Handy Infrastructure	Big Thompson River	20 Handy & 70 Home Supply Ditch Shares	Hertha Reservoir <u>then</u> Dry Creek Reservoir <u>or</u> Maitland Reservoir	Deliver Home Supply Shares into Handy Ditch. Store in Hertha. Pipe to Dry Creek Reservoir	New WTP at Dry Creek Reservoir <u>or</u> CLFP
6	Purchase Handy Replacement Water and Divert to Dry Creek	Dry Creek	Handy Replacement Water from Bureau of Reclamation / NCWCD	Dry Creek Reservoir <u>or</u> Hertha Reservoir <u>then</u> Dry Creek Reservoir	Replacement Water Ditch and/or Pipeline from Hertha to Dry Creek Reservoir	New WTP at Dry Creek Reservoir <u>or</u> CLFP
7	St. Vrain Water Delivered via Supply and Highland Ditch	St. Vrain Creek	St. Vrain Water Rights (new right, free river, shares in St. Vrain ditches)	Barefoot Lakes <u>or</u> Gravel Pits on St. Vrain Creek <u>or</u> Available Capacity in Highland Ditch Reservoirs <u>or</u> Ish Reservoir	Excess capacity in Supply and/or Highland Ditches	Distributed WTP at Ish Reservoir, Mead, <u>or</u> Barefoot <u>or</u> Centralized WTP at Firestone
7a	Ish Water to Potential WTPs	St. Vrain Creek	St. Vrain Water Rights (new right, free river, shares in St. Vrain ditches)	Mulligan Reservoir <u>or</u> Foster Reservoir	Excess capacity in Highland Ditch to St. Vrain River	Distributed WTP at Barefoot <u>or</u> Centralized WTP at Firestone
7b	Deliver St. Vrain Water to Potential Mead WTP	St. Vrain Creek	St. Vrain Water Rights (new right, free river, St. Vrain storage rights)	St. Vrain Storage Facilities (Red Deer, Knoth, Divide, Beaver Park)	Excess capacity in Supply and/or Highland Ditches	Distributed WTP at Mead

Concept No.	Concept Name	Basin	Source	Storage	Conveyance	Treatment
8	Deliver Rough & Ready and Oligarchy Ditch Water to St. Vrain Creek to Potential Barefoot or Firestone WTP	St. Vrain Creek	Rough & Ready and Oligarchy ditches	Union Reservoir <u>or</u> Barefoot Lakes <u>or</u> Available Capacity in Pleasant Valley Reservoir <u>or</u> Gravel Pits on the St. Vrain	Excess capacity in existing ditches to St.	Distributed WTP at Barefoot <u>or</u> Centralized WTP at Firestone
9	Deliver South St. Vrain Water and Boulder Creek Water to Potential Barefoot or Firestone WTP	St. Vrain Creek	Lower St. Vrain or Boulder Creek ditch water	Barefoot Lakes <u>or</u> Gravel Pits on the St. Vrain	Exchange on St. Vrain Creek <u>or</u> Pipeline	Distributed WTP at Barefoot <u>or</u> Centralized WTP at Firestone

Potable Concept 1 - First Use of District's "Unfirmed" Windy Gap Water

Summary:

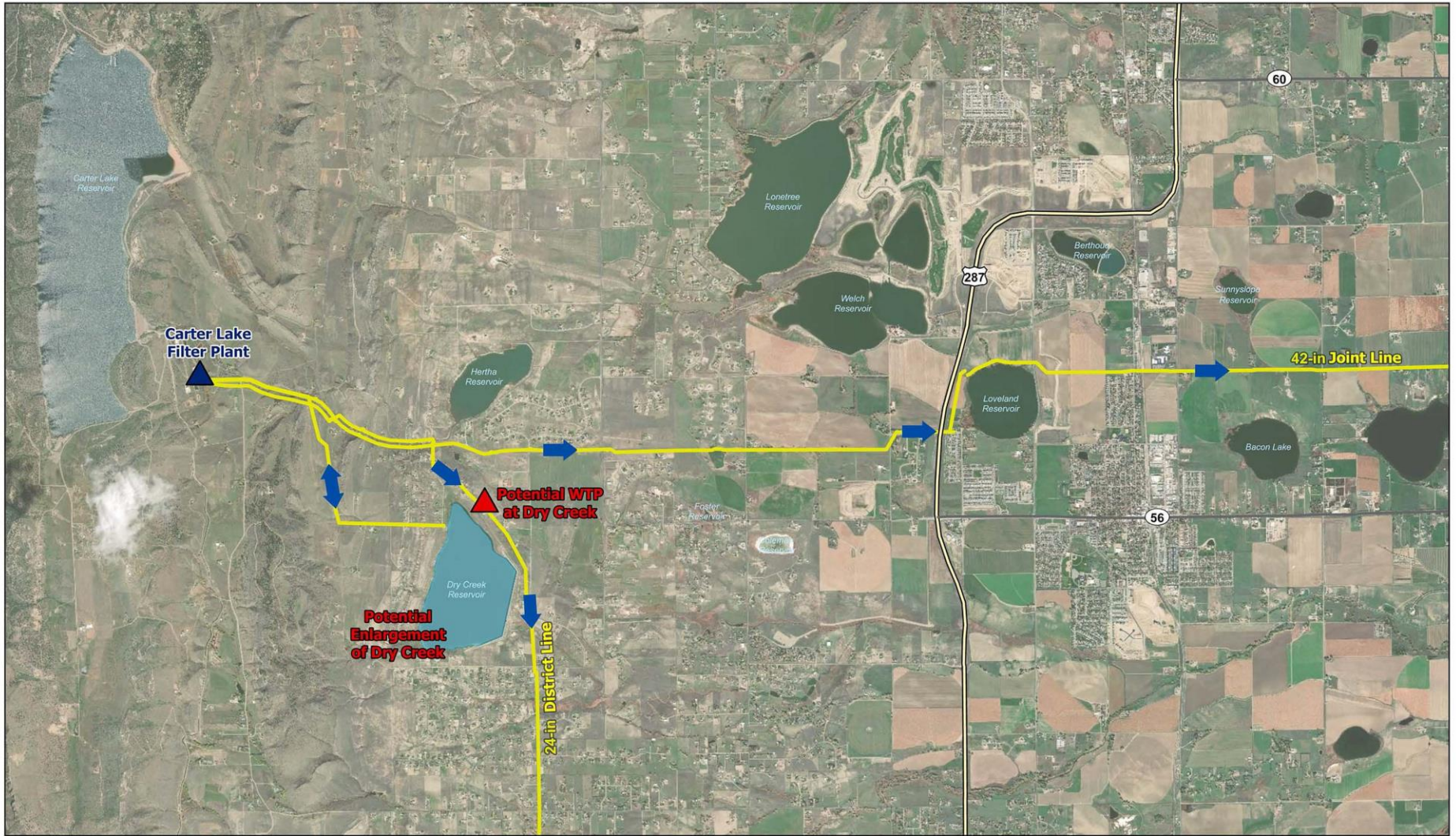
The District has purchased five Windy Gap units and may purchase more. These units are "unfirmed" as there is no associated storage in Chimney Hollow Reservoir. Concept 1 allows the District to take delivery of its Windy Gap water from Carter Lake Filter Plant (CLFP) and treat it for immediate use. The Windy Gap water can be delivered from Carter Lake directly to the CLFP and distributed into the District's potable water system.

Alternatively, the Windy Gap water can be delivered to Dry Creek Reservoir where the District can use the reservoir to regulate the variable annual yields (firming). The Windy Gap water can be stored in Dry Creek Reservoir can be pumped to CLFP or a potential water treatment plant at Dry Creek Reservoir and then delivered into the District's potable water system. Dry Creek Reservoir could possibly be expanded to retain some drought storage capacity in addition to providing storage for the new unfirmed Windy Gap units.

Score: 65

Issues:

- Dry Creek Reservoir storage needed to firm the units
- No independent water storage right
- Carter Lake Filter Plant is nearing capacity



Potable Concept 1: First Use of District's Windy Gap Water
 November 2018

Potable Concept 2 - Second Use of “Firmed” Windy Gap Units Dedicated by Brookfield

Summary

Brookfield funded the purchase of 12 Windy Gap units and is expected to firm this water through participation in Chimney Hollow Reservoir. This reservoir will provide storage so that a variable water right such as Windy Gap will have a firm yield. The District provided 480 acre-feet of water credit (40 acre-feet per unit x 12) units when Brookfield dedicated the 12 “Firmed” Windy Gap units. The remaining 720 acre-feet of water credit (60 acre-feet x 12) will be provided to Brookfield when Chimney Hollow Reservoir is constructed and filled

Brookfield began constructing houses in its development, Barefoot Lakes, in 2016. Brookfield plans to construct approximately 300 houses a year for the next 10 or 15 years for a total of 4,800 houses at buildout. Windy Gap potable water will be served to the homes at Barefoot Lakes. As the homes are constructed and occupied, the wastewater will accrue to the St. Vrain Sanitation District (SVSD).

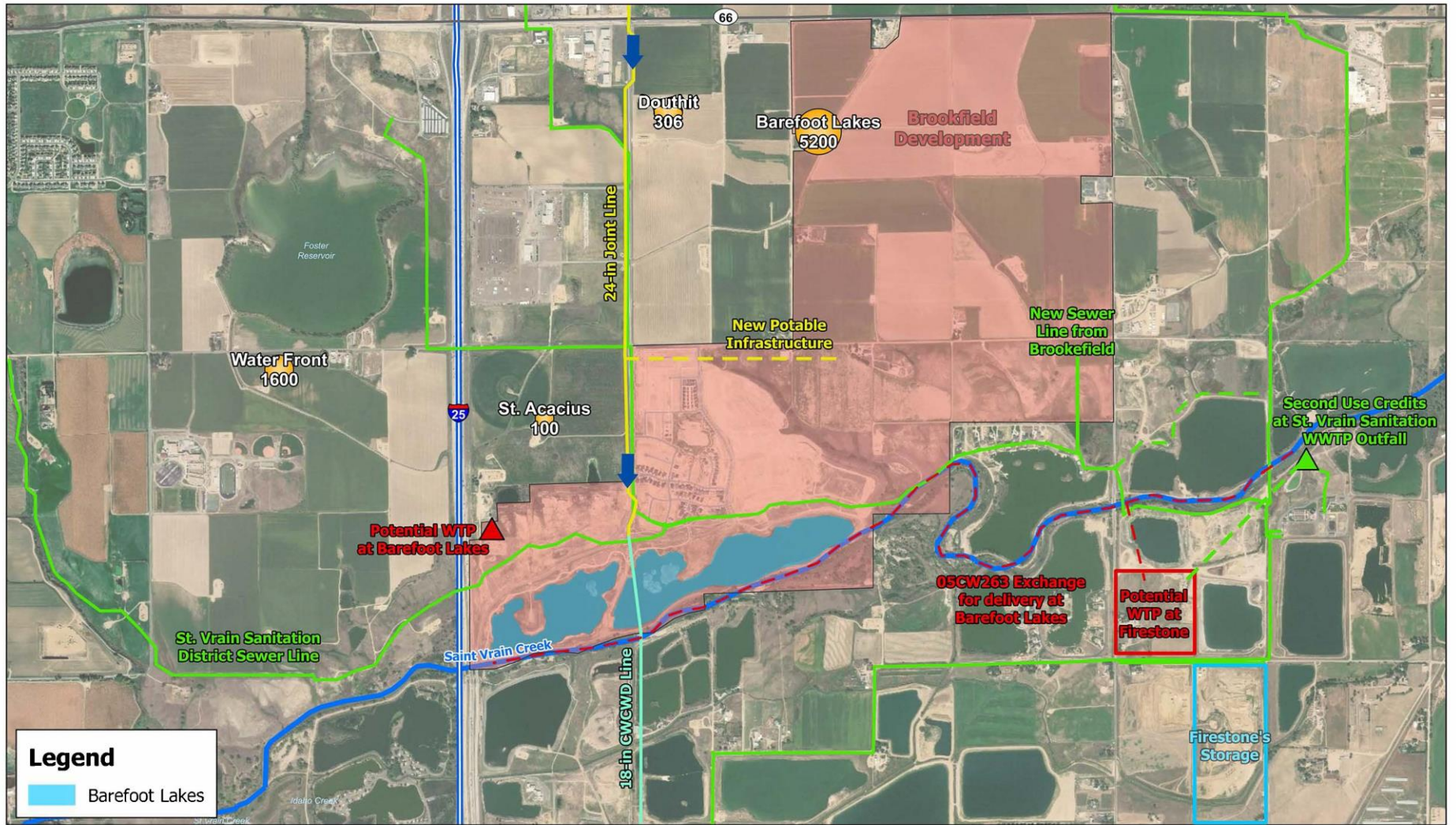
The District’s 05CW263 decree defines the criteria to calculate the second use of the Windy Gap water that is treated at the SVSD and discharged into the St. Vrain Creek a mile downstream from the Barefoot Lakes Development. The second use water can be exchanged up to Barefoot Lakes and be treated at a potential distributed treatment plant at that site or it can be left in the river to be treated at a potential water treatment plant in cooperation with the Town of Firestone.

Brookfield traded a portion of its Windy Gap second use water and 270 acre-feet of storage in Barefoot Lakes to the District for development credit. As the Barefoot Lakes Development builds out, second use water will be available to the District.

Score: 71

Issues:

- The District will have to firm 40 acre-feet per units of Brookfield 12 units in Dry Creek Reservoir until Chimney Hollow Reservoir comes online
- Delays in Chimney Hollow Reservoir construction delays will require District to use Dry Creek Reservoir storage
- Limited storage for second use water
- Water quality issues



Potable Concept 2: Second Use of Brookfield's Windy Gap Water
 November 2018

Potable Concept 2a - Second Use of the District's "Unfirmed" Windy Gap Water

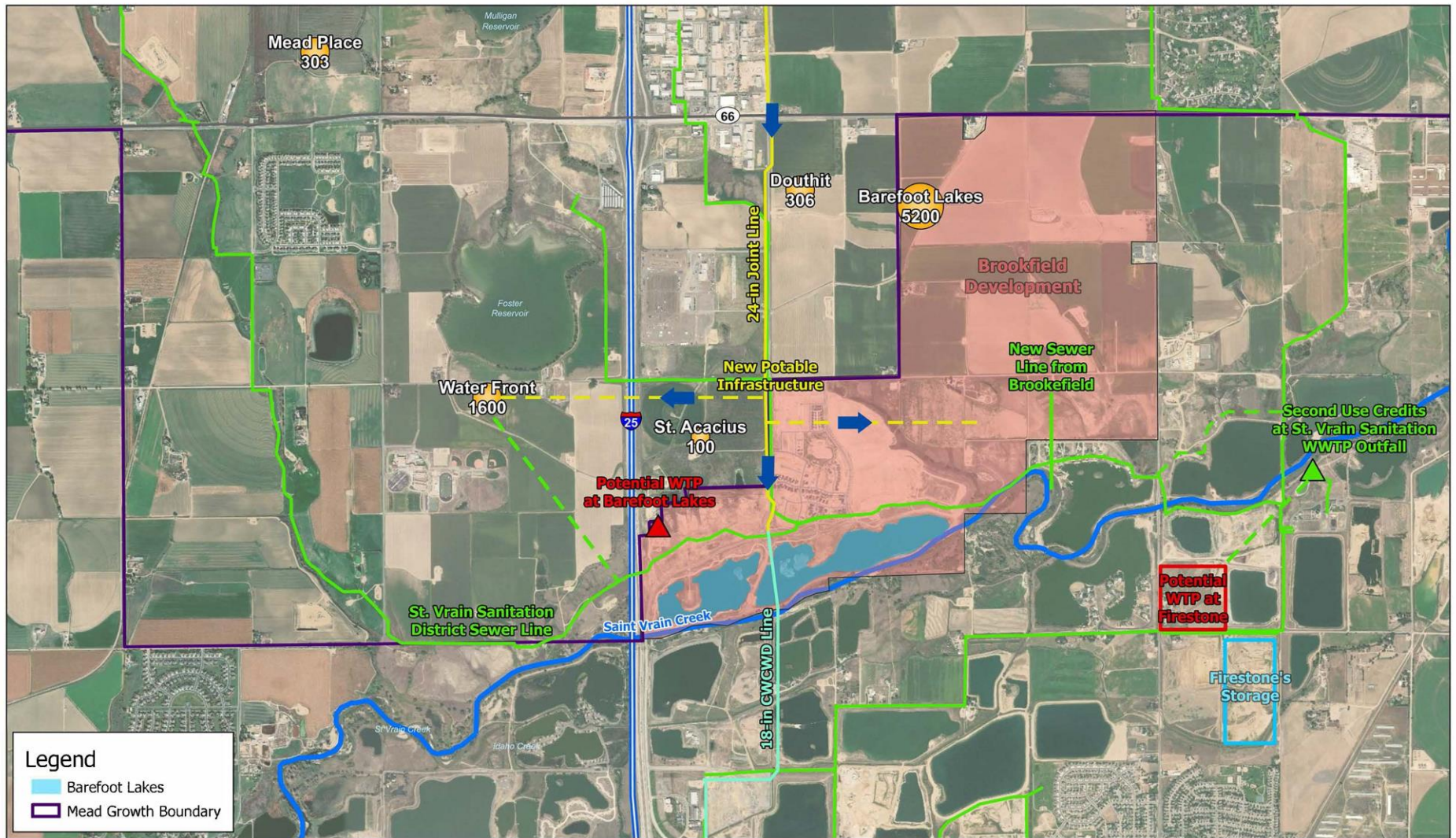
Summary:

The District purchased five "unfirmed" Windy Gap units and may purchase more. The Windy Gap water will be used in the I-25 and HWY 66 corridor. SVSD provides sewer service and second use water will be discharged to the St. Vrain Creek just downstream of Barefoot Lakes. The second use water could be exchanged up to Barefoot Lakes, stored in gravel pits, treated at potential distributed water treatment plant, or it can be left in the river be treated at a potential water treatment plant in cooperation with the Town of Firestone.

Score: 44

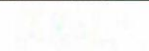
Issues:

- The District must use Dry Creek Reservoir to firm its Windy Gap units in Dry Creek Reservoir
- Need to obtain a Water Court decree or administrative permission to use the criteria in the 05CW263 decree and obtain another exchange decree
- Additional storage on the St. Vrain Creek may be needed to store the District's second use water
- Water quality issues



Potable Concept 2a: Second Use of District's Windy Gap Water

November 2018



Potable Concept 3 - Handy and Home Supply Shares - Griep Farm Reverse

Summary:

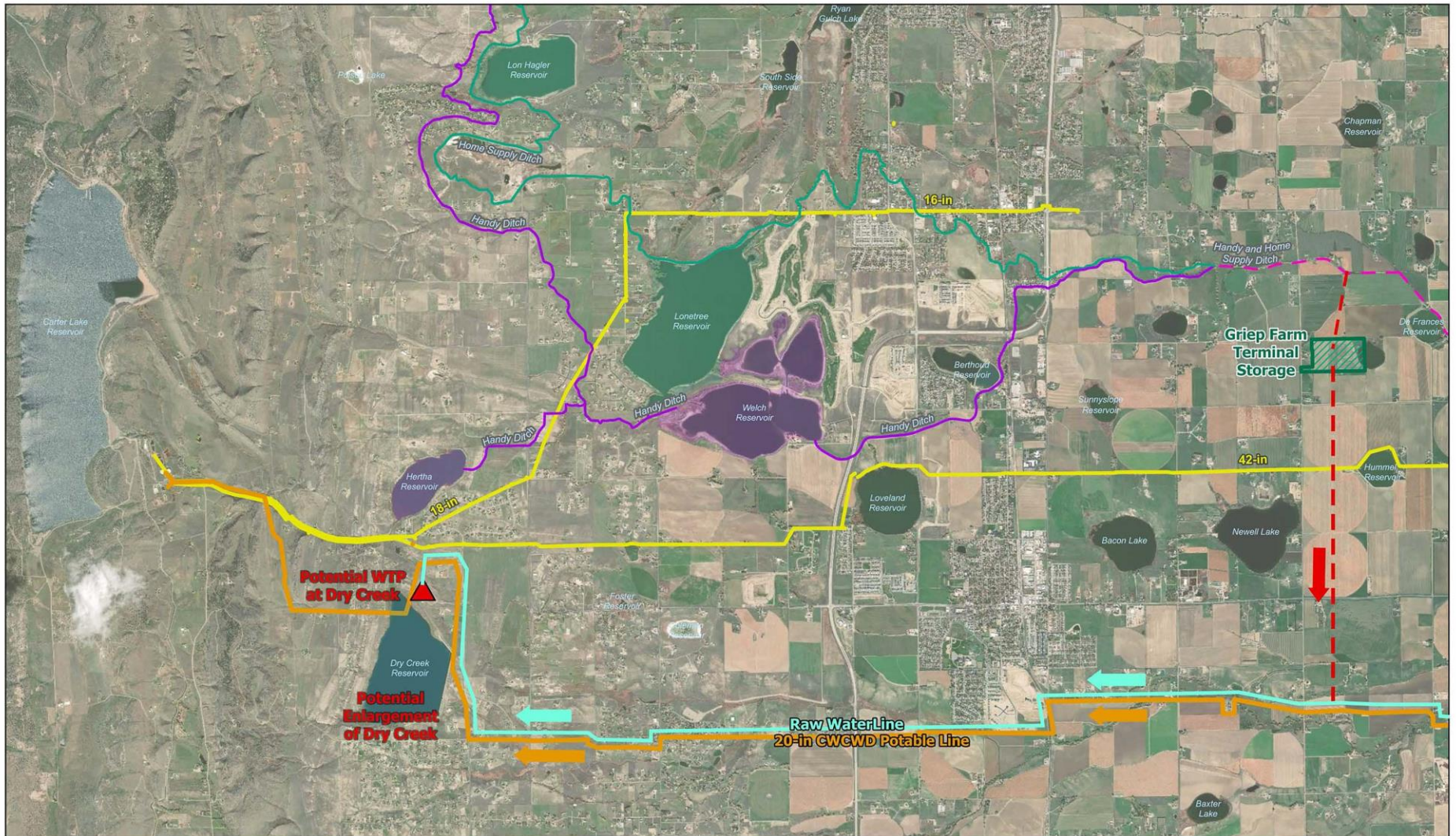
The District owns shares in the Consolidated Home Supply Ditch and Reservoir Co. (Home Supply) and the Handy Ditch Companies, which will be changed in Water Court for municipal uses. The District also owns a 67-acre farm (Griep Farm) located northeast of the District Office, near the intersection of WCR 3 and WCR 46. The farm borders the joint section of the Handy and Home Supply ditches, so the District's Handy and Home Supply water can be delivered to the property.

Concept 3 allows the ditch water to be delivered to the Griep Farm, stored in terminal storage onsite and then use a pressurized pipe to reverse the direction of the water to Dry Creek Reservoir to be treated either at a potential conventional water treatment plant at Dry Creek Reservoir or CLFP.

Score: 56

Issues:

- District would have to build infrastructure to convey water to Dry Creek Reservoir
- Not near any of the District's developing areas
- Shares must be changed in Water Court for municipal use, which takes time
- Using Handy and Home Supply water interchangeably would require carriage agreements between ditch companies



Potable Concept 3: Handy and Home Supply Shares - Griep Farm Reverse
 November 2018

Potable Concept 4 & 4a - Handy and Home Supply Shares – Boedecker Exchange / Lonetree Delivery

Summary:

Concept 4 allows for the District's Home Supply water to be temporarily stored in an underutilized storage facility of the Home Supply system and then delivered to Dry Creek Reservoir. Home Supply's Boedecker (Mariano) reservoir is an exchange facility and is not directly connected to Home Supply's ditch and reservoir system. Boedecker Reservoir typically has unused capacity. The District would store its Home Supply water temporarily in Boedecker Reservoir then convey it from Boedecker to Lon Hagler Reservoir through a pipeline. When there is unused capacity in the Home Supply system, the District would convey its water from Lon Hagler through the ditch to Lonetree Reservoir and then to Dry Creek Reservoir via a pipeline. The Home Supply water would be stored in Dry Creek Reservoir.

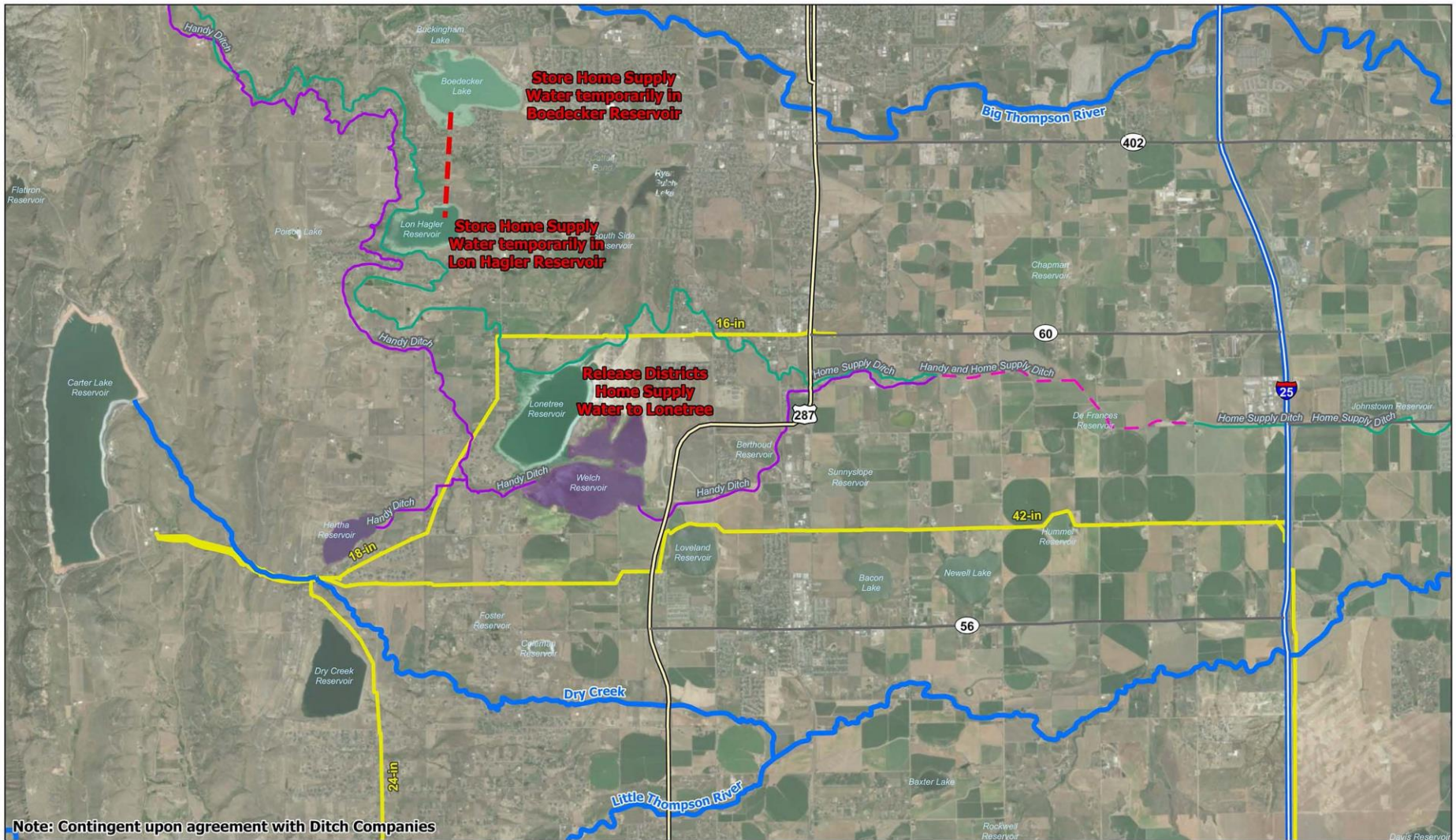
Concept 4a could also be used to stage and deliver Handy water if the companies are willing to transfer water from one ditch to another. This concept would require carriage agreements between the ditch companies.

There are numerous variations on the concept using different components of both ditch systems

Score: 67

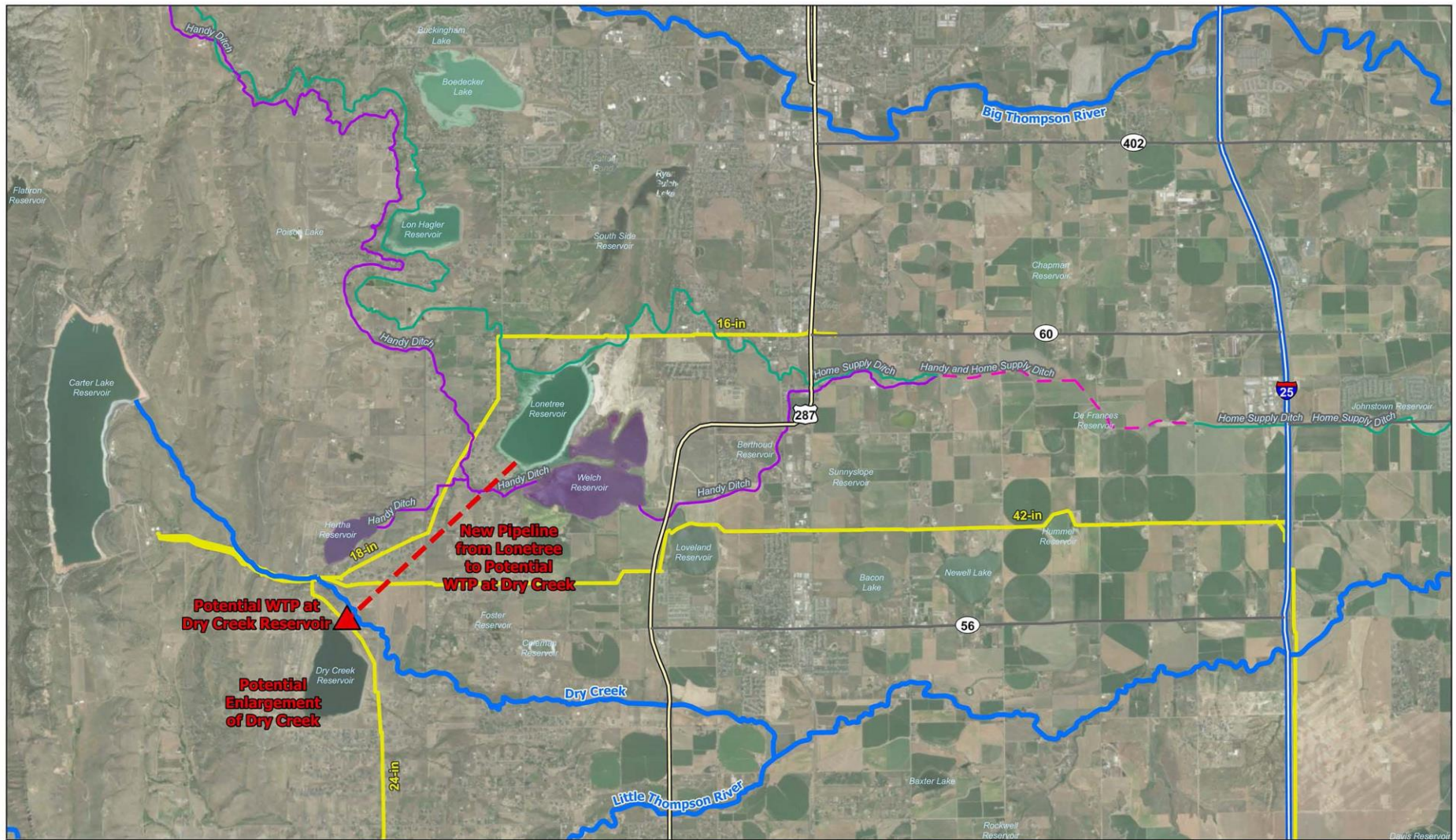
Issues:

- Shares must be changed in Water Court for municipal use, which takes time
- No independent storage
- Store in Dry Creek Reservoir, which would not reduce drought storage
- Carriage agreement needed between ditch companies



Potable Concept 4: Handy and Home Supply Shares - Boedecker Exchange/Lonetree Delivery

November 2018



Potable Concept 4a: Handy and Home Supply Shares - Lonetree Delivery to Dry Creek Reservoir
 November 2018

Potable Concept 5 and 5a - Handy and Home Supply Shares – Using Handy Infrastructure

Summary:

Concept 5 allows the District's Handy and Home Supply water to be delivered to Dry Creek Reservoir through the Handy Ditch system. A lateral of the Handy Ditch (the Sweck Lateral) flows within a mile of the reservoir. The Handy and Home Supply ditches parallel each other high in the system and it may be possible to physically transfer water from Home Supply Ditch to Handy Ditch upstream of the Sweck Lateral. The District could convey its Home Supply and Handy water from the Sweck Lateral to Dry Creek Reservoir via a new pipeline.

Concept 5a would deliver Handy and Home Supply water to Hertha Reservoir instead of the Sweck Lateral. From Hertha Reservoir, the water could be conveyed via a new pipeline to Dry Creek Reservoir.

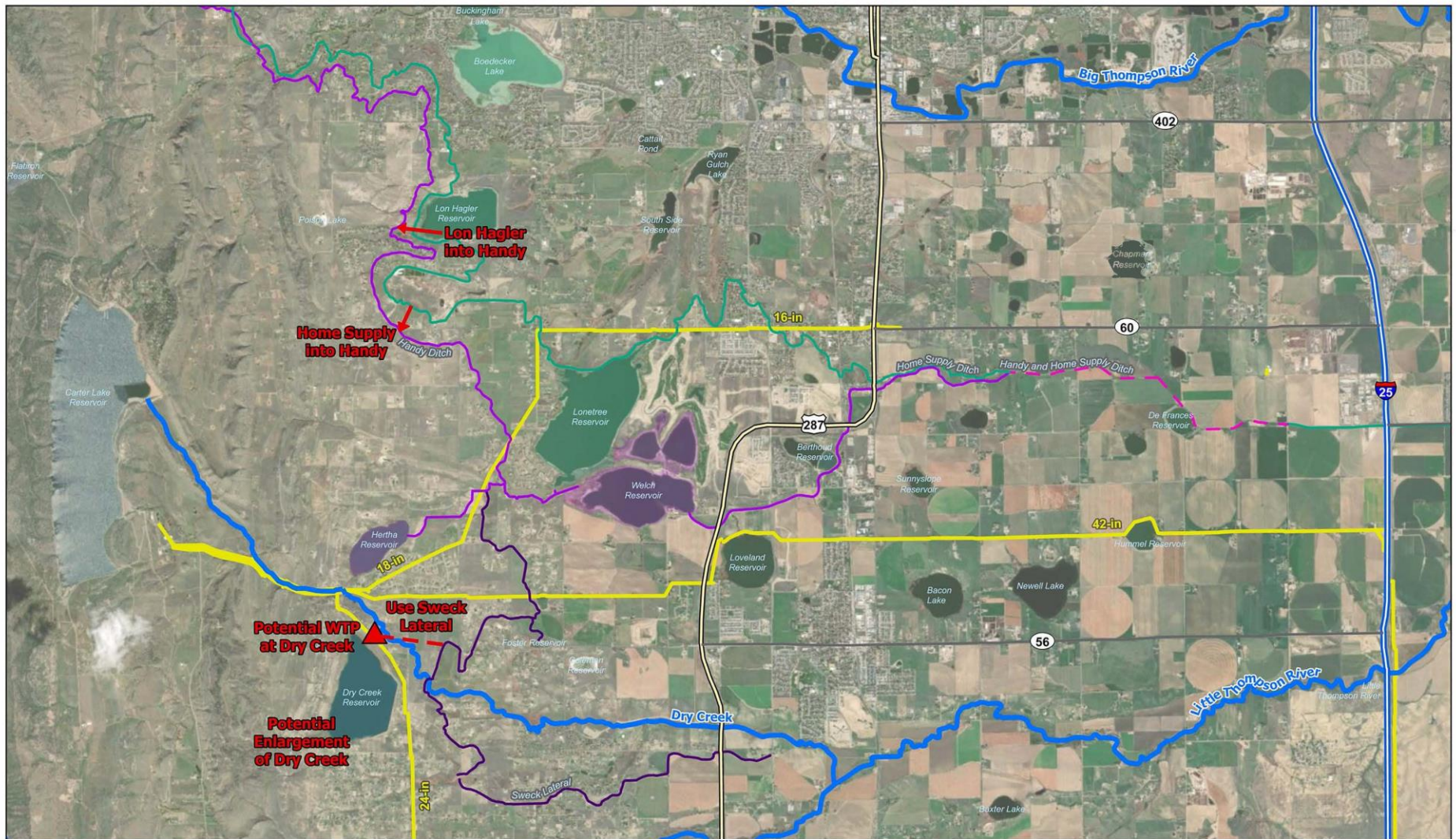
These concepts would require carriage agreements between the ditch companies.

There are numerous variations on the concept using different components of each ditch system.

Score: 67

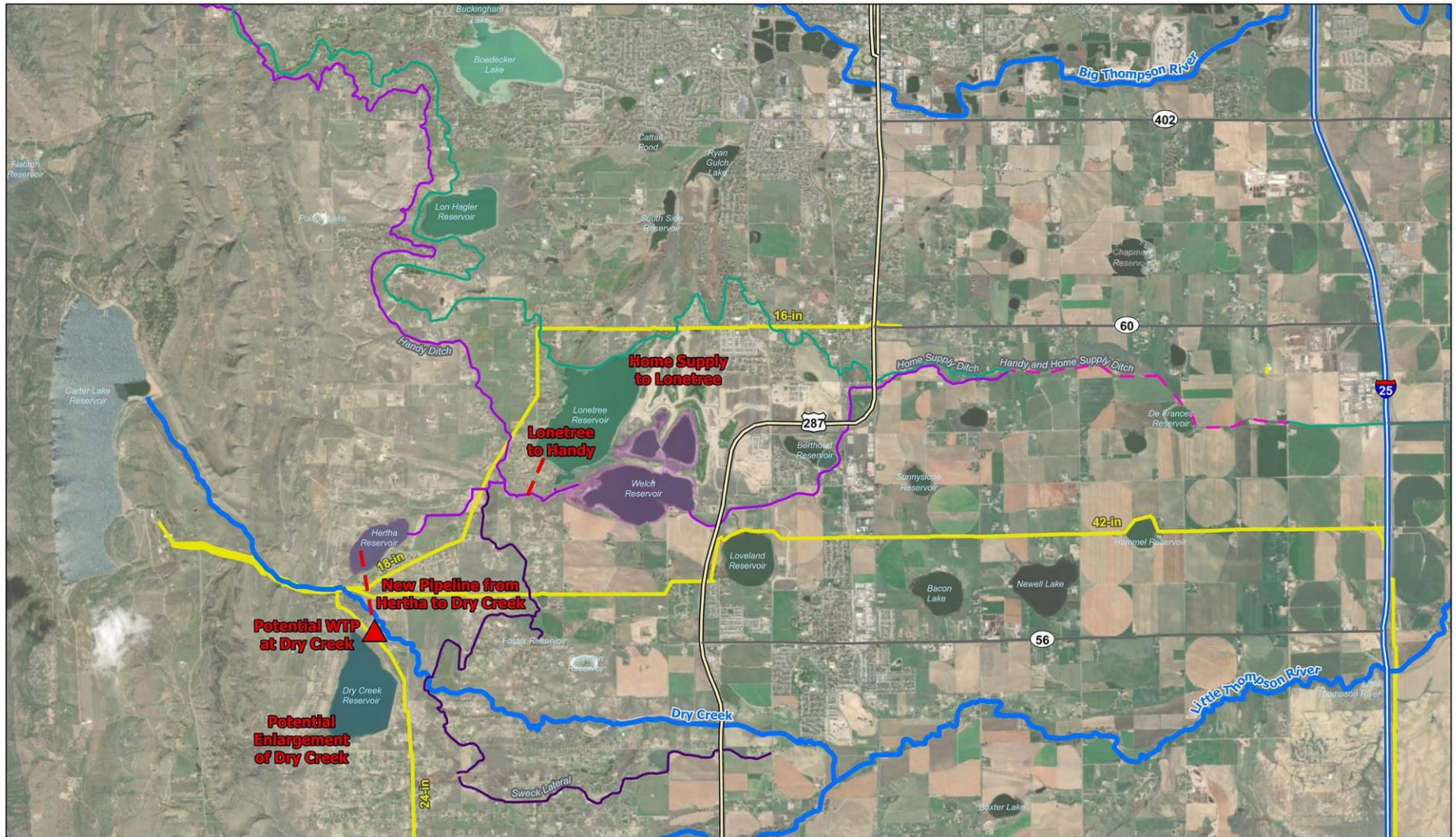
Issues:

- District would have to build infrastructure to convey water to Dry Creek Reservoir
- Not near any of the District's developing areas
- Shares must be changed in Water Court for municipal use, which takes time
- Using Handy and Home interchangeably would require agreements between ditch companies
- Storing ditch water in Dry Creek Reservoir, which would reduce drought storage



Potable Concept 5: Handy and Home Supply Shares - Using Handy Infrastructure

November 2018



Potable Concept 5a: Handy and Home Supply Shares
 November 2018

Potable Concept 6 – Purchase Handy Replacement Water and Divert to Dry Creek

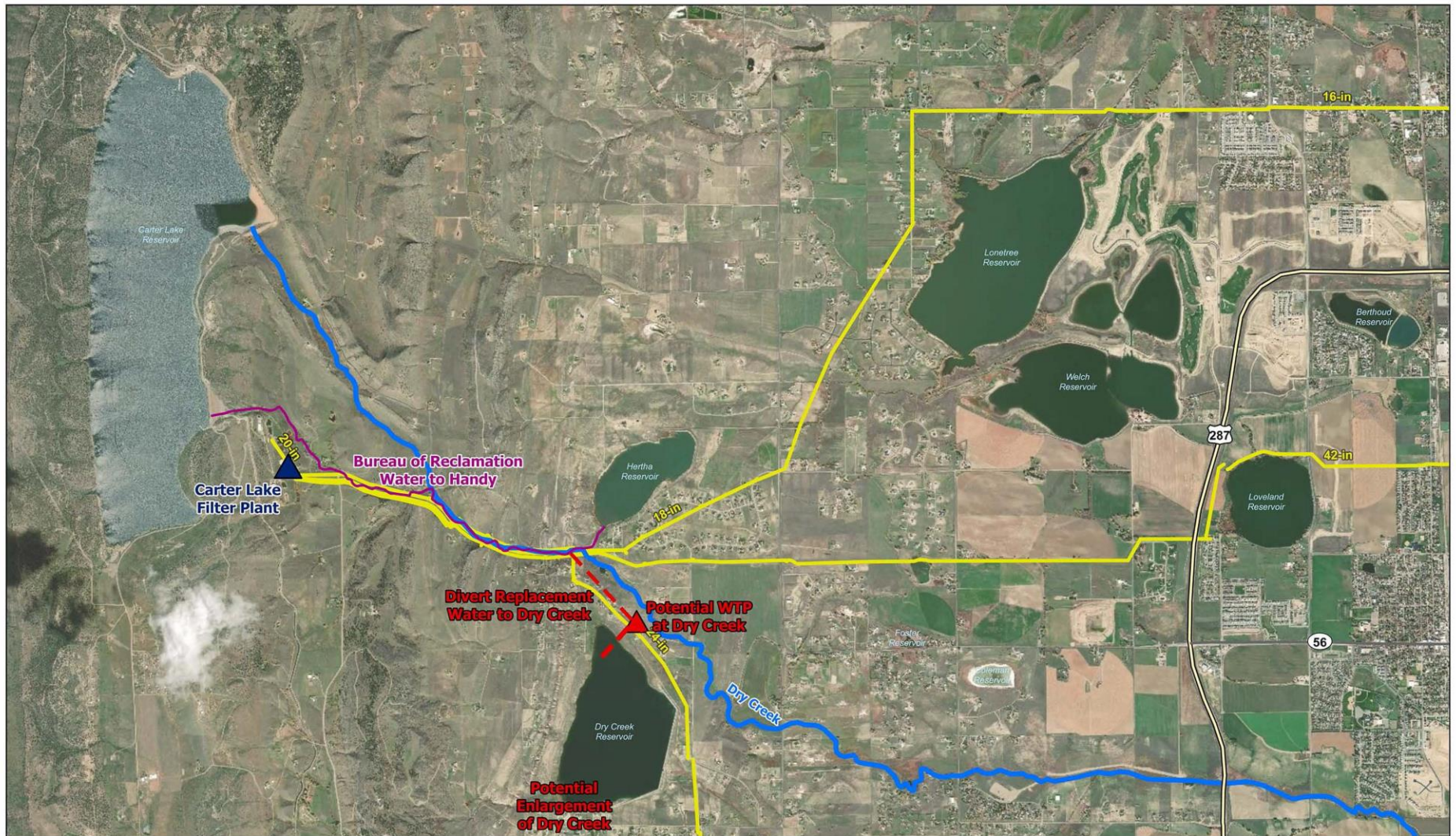
Summary:

The Handy Ditch Company receives water from NCWCD through Carter Lake to replace the inflow that historically accrued to the Handy Ditch's watershed and are now intercepted by Carter Lake. The replacement water is released from Carter Lake into a small ditch that parallels the Districts' potable water lines down Larimer County Road 8E and is stored in Hertha Reservoir. The replacement contract requires NCWCD to provide 165 acre-feet of water per year Hendy's Hertha Reservoir. Concept 6 allows the District to acquire the replacement water and deliver it to Dry Creek Reservoir via a new pipeline.

Score: 64

Issues:

- NCWCD is unclear what the source of the replacement water is (Native or Transbasin water). The Division Engineers Office states the water is Transbasin (C-BT) water
- Unsure of the possibility of purchasing and changing this water to municipal uses
- Condition and capacity of ditch is unknown



Potable Concept 6: Purchase Handy Replacement Water and Divert to Dry Creek
 November 2018

Potable Concept 7 & 7a - St. Vrain Water Rights Delivered via the Supply and Highland Ditches

Summary:

Concept 7 allows the District to use the Supply and Highland Ditches to convey St. Vrain Creek water high in the watershed to the St. Vrain Creek near Barefoot Lakes where it could be diverted and treated at a potential distributed water treatment plant at Barefoot Lakes or a water treatment plant in collaboration with Firestone water. This water would come from either a new water right, free river, or changed irrigation shares in the St. Vrain Creek. Most of the C-BT water from these ditches has been sold so there is limited “push water” in the St. Vrain ditches, which may make conveying the District’s water attractive to these ditch companies.

Concept 7 also allows the District to deliver St. Vrain water to Ish Reservoir which could be used as a drought storage to make up for the drought storage lost in Dry Creek Reservoir. The Supply and Highland Ditches deliver water to land adjacent to Ish Reservoir and could deliver water to the reservoir with minimal infrastructure.

Concept 7a allows the District to convey the water through the Highland Ditch to Mulligan or Foster Reservoirs, and then to the St. Vrain Creek just upstream of Barfoot Lakes for treatment at a potential water treatment plant at Barefoot Lakes or a water treatment plant in cooperation with the Town of Firestone.

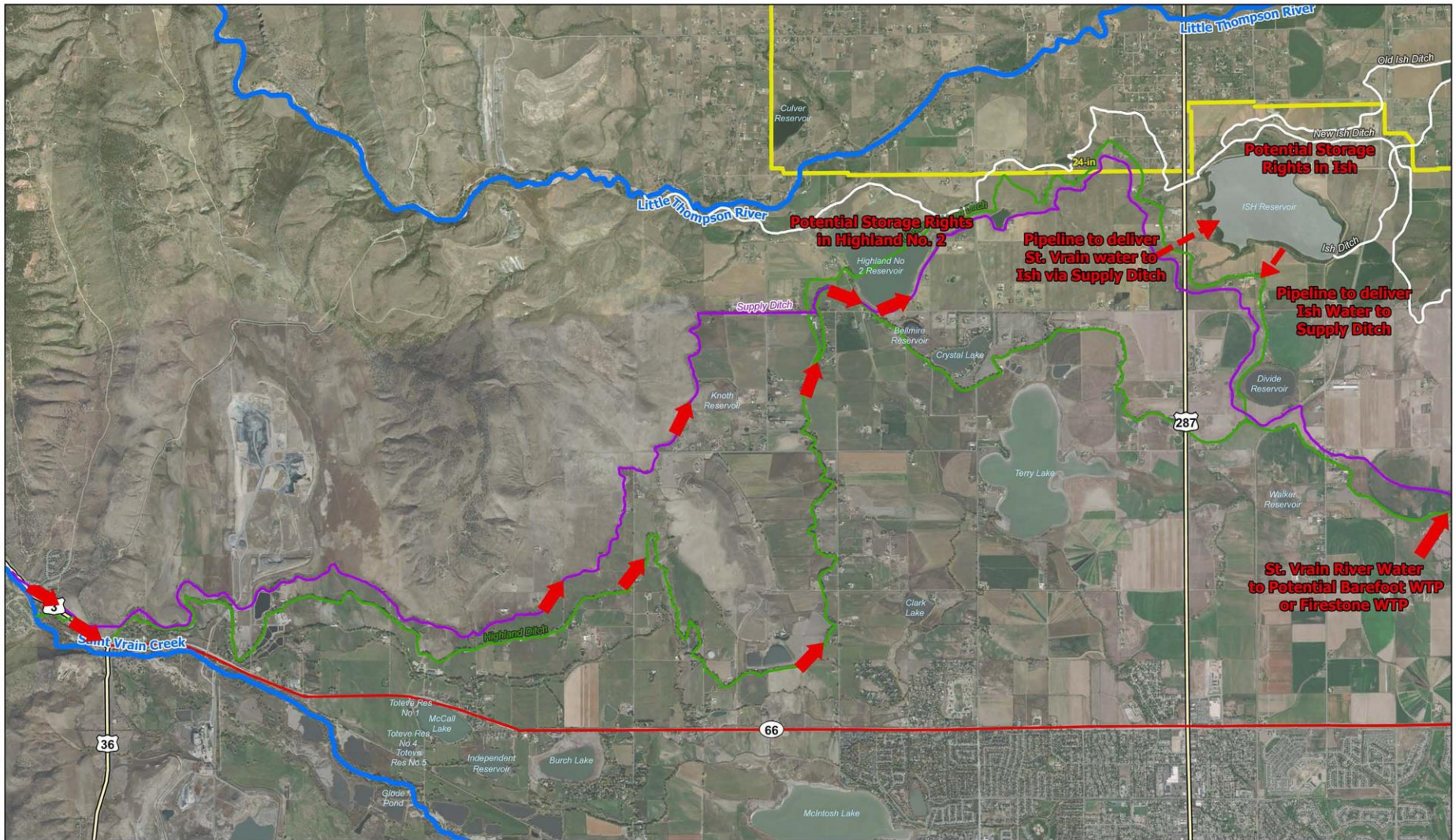
The concept highlights two ditches, but there are other potential water sources in the area.

Score 7: 48

Score 7a: 41

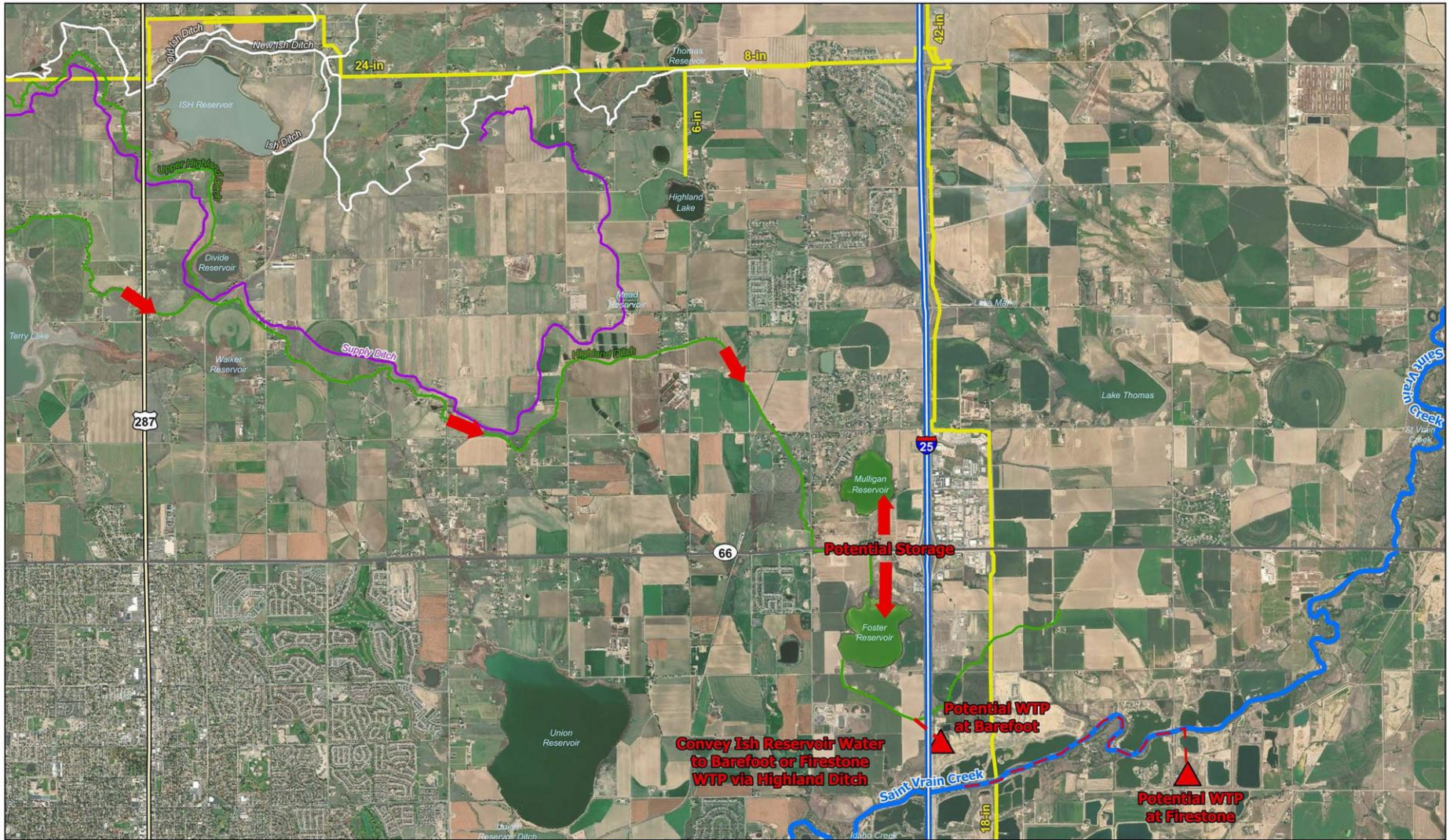
Issues:

- Shares in Supply, Highland and Ish would have to be changed in Water Court
- Highland Ditch bylaws limit water to irrigation only
- Water quality in ditches and St. Vrain Creek is poor
- Ish and Supply Ditch cannot deliver water to the District’s existing or proposed water treatment plants



Potable Concept 7: St. Vrain Water Delivered via Supply and Highland Ditch

November 2018



Potable Concept 7a: Highland, Supply, and Ish Water to Potential WTPs
 November 2018

Potable Concept 8 – Deliver Rough & Ready and Oligarchy Ditch to St. Vrain Creek Near Barefoot Lakes

Summary:

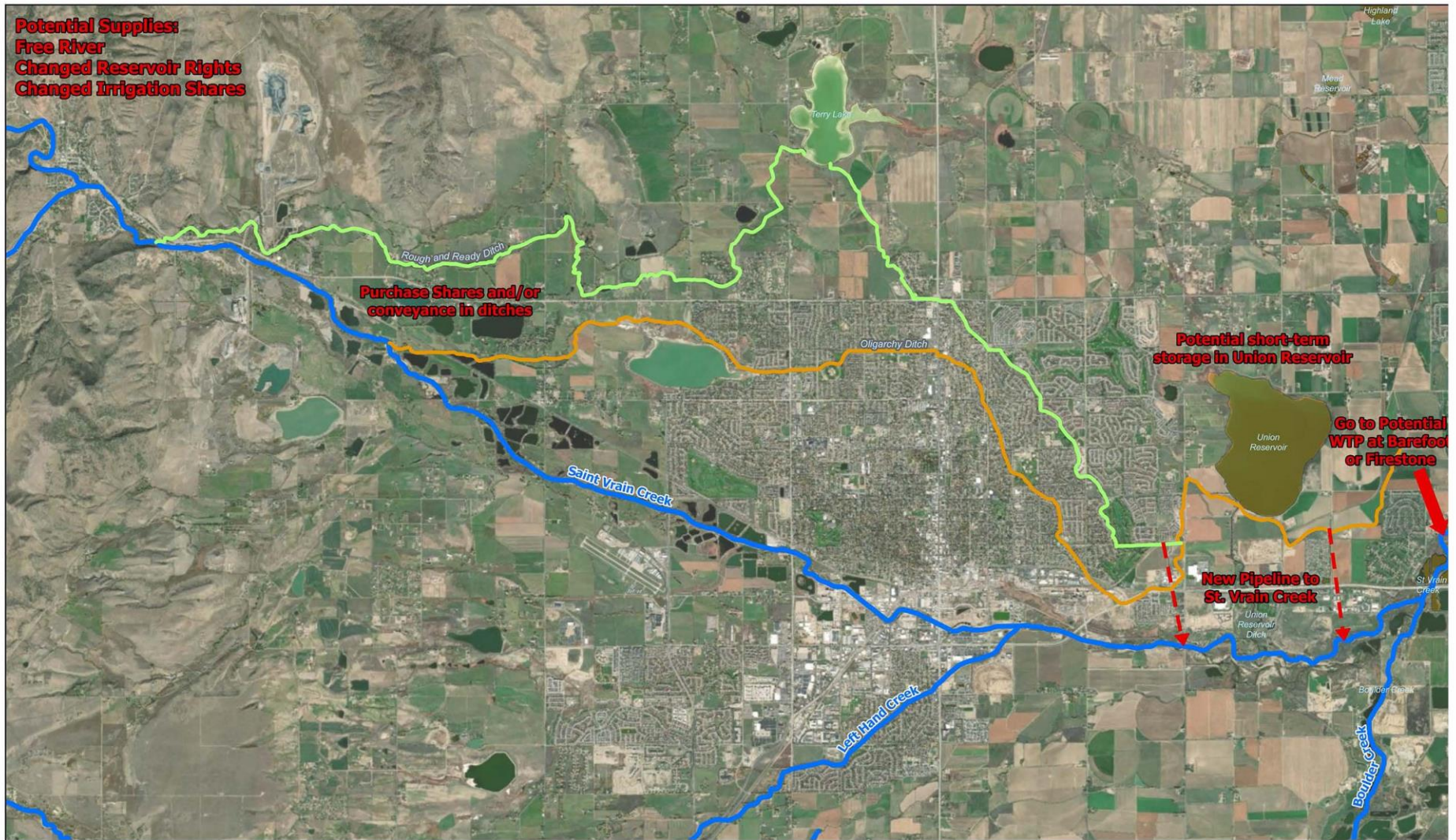
There are agricultural ditches that divert from the St. Vrain Creek high in the watershed, travel through or just north of the City of Longmont and return to the St. Vrain Creek upstream of Barefoot Lakes. Concept 8 allows the District to obtain additional water supplies in the lower St. Vrain Basin that could be delivered to either a potential distributed water treatment plant at Barefoot Lakes or to a potential water treatment plant in cooperation with the Town of Firestone. Concept 8 highlights two ditches, but there are other potential water sources in the area.

The concept highlights three ditches, but there are other potential water sources in the area.

Score: 44

Issues:

- Need to purchase agricultural shares in ditches in the upper St. Vrain Creek such as the Oligarchy or Rough & Ready Ditch
- Unknown availability and competition for shares
- Water treatment plants far from the area where ditches could potentially deliver water



Potable Concept 8: Deliver Rough & Ready and Oligarchy Ditch to St. Vrain Creek to Potential Barefoot or Firestone WTP
 November 2018

***Potable Concept 9 – Deliver Lower St. Vrain and Boulder Creek Water to
Potential Barefoot or Firestone Water Treatment Plant***

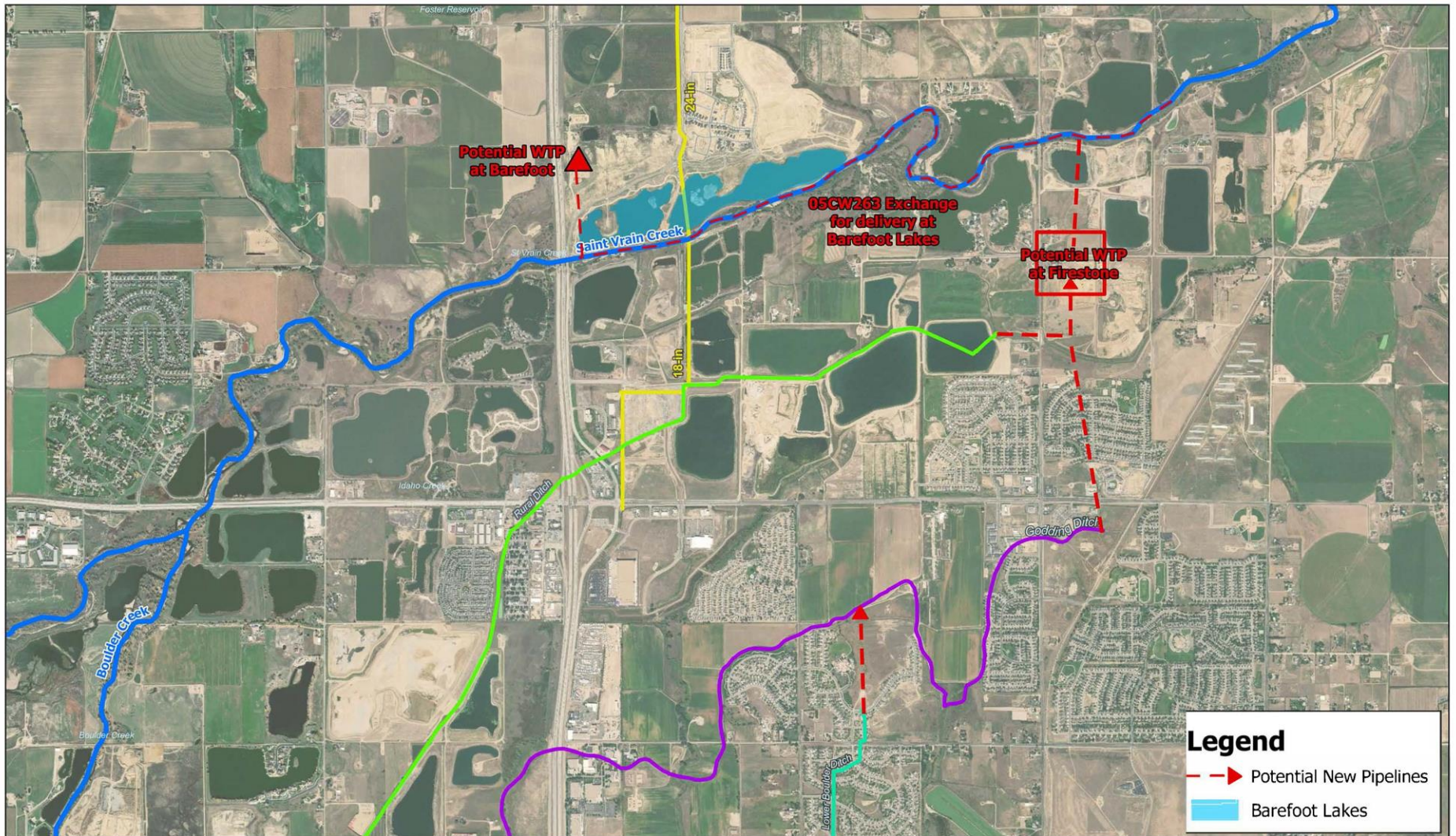
Summary:

There are agricultural ditches that divert and travel southeast from St. Vrain Creek or Lower Boulder Creek and terminate close to St. Vrain Creek upstream of Barefoot Lakes. This concept allows the District to acquire additional water supplies in the St. Vrain basin that could be delivered to either a potential distributed water treatment plant at Barefoot Lakes or to a water treatment plant in cooperation with the Town of Firestone. The concept highlights three ditches, but there are other potential water sources in the area.

Score: 24

Issues:

- Need to purchase agricultural shares in ditches in the upper St. Vrain Creek such as the Oligarchy or Rough & Ready Ditch
- Unknown availability and competition for shares
- Water treatment plants far from the area where ditches could potentially deliver water



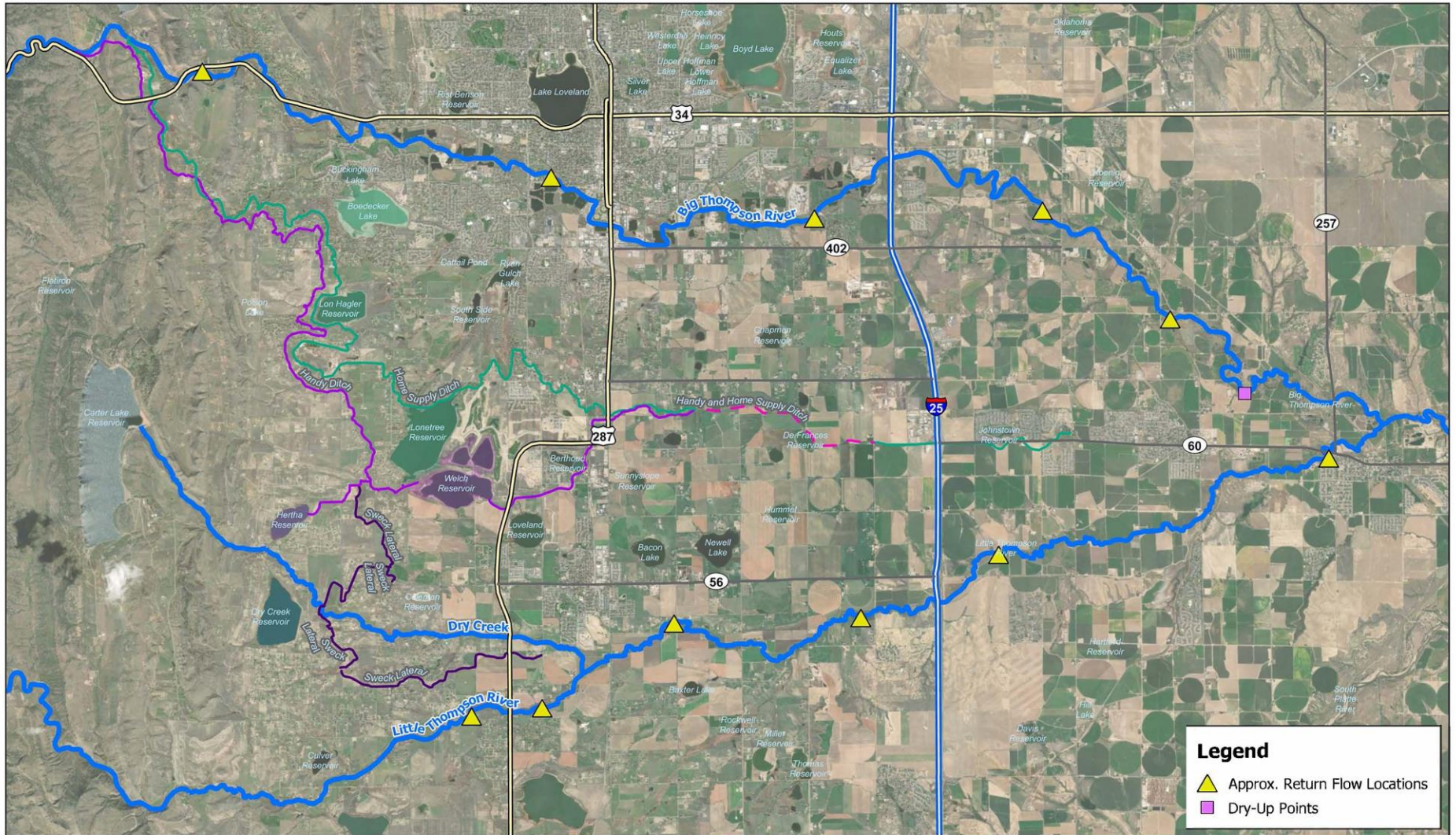
Potable Concept 9: Deliver South St. Vrain Water and Boulder Creek Water to Potential Barefoot or Firestone WTP

November 2018

Return Flow Obligations – Big and Little Thompson Rivers

Summary:

Water storage will be needed to make return flow requirements from changed Handy and Home Supply shares. The return flows will be owed to the Big Thompson River or Little Thompson River during both the irrigation and non-irrigation seasons. During the irrigation season, a portion of the diversions can be returned to the river for return flows through augmentation structures. During the non-irrigation season, return flows will need to be made from water in storage. It is possible the return flow obligations for the Handy and Home Supply shares could be made from Boedecker (Mariano) and Lon Hagler Reservoirs in the Home Supply system and from Hertha Reservoir in the Handy system.



Return Flows Concept Map: Little and Big Thompson Rivers

November 2018

Appendix B: Work Session Highlight and Best Practices List

Agenda Item Summary

Little Thompson Water District

Date: May 6, 2019

Item: 6.6

Staff: Amanda Hoff, Water Resources Engineering Technician

Subject: Summary of Conservation Work Session and Path Forward

Topics Discussed at Work Session that Generated Conversation:

Infrastructure cost

Water gaps in Colorado – if we don't serve, someone else will and growth will continue

Water conservation generally regarded as cheapest “new” supply

Protecting Colorado River and C-BT system

Dry Creek Reservoir floating photovoltaic system

Collaborate with appropriate partners

Board Discussion Recap

- Don't waste water
 - Charge high water user customers
 - Rate structure that says use the water, but do not waste it
 - Evaluate residential high-water users and what is a sufficient amount of water for what they are trying to accomplish (farming, dairy, etc.)
- Education:
 - New customer education and outreach packet with stickers, items that inform on water conservation
 - Have the Board members go into the community and talk to customers about where their water comes from and water conservation
 - LTWD Board of Directors hold an event
 - customer appreciation, seminars
- Change out rebates/programs
 - Toilets and showers mentioned
- Motion and approval to review soil and landscape incentive rebates for current residents as part of the 2020 budget process

Colorado WaterWise Guidebook of Best Practices for Municipal Water Conservation in Colorado

Best Practice Summary Listed in Priority by Colorado WaterWise

- ✓ 1. Metering, conservation-oriented rates and tap fees, customer categorization within billing system
- ✗ 2. Integrated resources planning, goal setting, and demand monitoring
- ✓ 3. System water loss control
- ✓ 4. Conservation Coordinator
- 5. Water waste ordinance
- ✓ 6. Public information and education
- 7. Landscape water budgets, information, and customer feedback
- ✗ 8. Rules and regulations for landscape design and installation and certification of landscape professionals
- ✓ 9. Water efficient design, installation, and maintenance practices for new and existing landscapes
- ✓ 10. Irrigation efficiency evaluations
- ✗ 11. Rules for new construction - Residential and non-residential
- 12. High-efficiency fixture and appliance replacement for residential and non residential sectors
- ✗ 13. Residential water surveys and evaluations, targeted at high demand customers
- ✗ 14. Specialized non-residential surveys, audits, and equipment efficiency improvements

Legend:

- ✓ Currently doing; more opportunities available for a higher degree of implementation
- Evaluate options for fiscal year 2020
- ✗ Not evaluating for implementation

Appendix C: Water Shortage Contingency Plan

WATER SHORTAGE CONTINGENCY PLAN

Little Thompson Water District

September 5, 2002

Section I: Declaration of Policy, Purpose, and Intent

In order to conserve the available water supply and protect the integrity of water supply facilities, with particular regard for domestic water use, sanitation, and fire protection, and to protect and preserve public health, welfare, and safety and minimize the adverse impacts of water supply shortage or other water supply emergency conditions, the Little Thompson Water District (the District) Board of Directors adopted the following regulations and restrictions on the delivery and consumption of water on June 6, 2002.

Water uses regulated or prohibited under this Water Shortage Contingency Plan (the Plan) are considered to be nonessential; and continuation of such uses during times of water shortage or other emergency water supply condition are deemed to constitute a waste of water which subjects the offender(s) to penalties as defined in this Plan.

The goal of this Plan is to ensure an adequate supply of water for the tapholders of the District. The Plan includes measures that will both reduce water demand by the tapholders and increase the raw water supply available to the Carter Lake Filter Plant.

Water rate adjustments at Stage 3 and beyond shall be based on a percentage of winter use. This measure will allow the District to relieve some of the budget impacts of reduced water consumption and encourage tapholders to conserve. Commercial tapholders who rely on a year-round steady supply of water and are consistent users shall not be severely impacted by the water rate adjustments. Residential tapholders shall not be adversely impacted by the rate adjustments for essential household uses. Residential tapholders who use excessive amounts of water to maintain large landscapes will be affected by the rate adjustments.

Section II: Tapholder & Regional Entity Involvement

Opportunity for the tapholders and regional entities to provide input into the preparation of the Plan was provided by the District by the following means:

- Posting the draft Plan on the District website
- Providing a copy of the draft Plan to regional entities with a request for comment
- Meeting with various regional entities and individuals to discuss the draft Plan

Section III: Tapholder Education

The District will periodically provide the tapholders with information about the Plan, including information about the conditions under which each stage of the Plan is to be initiated or terminated and the water shortage response measures to be implemented in each stage. This information will be provided by means of quarterly and/or monthly newsletters, billing inserts, door hangs, web site, posted public notice when appropriate, and press releases.

Section IV: Notification and Coordination with Regional Water Providers

A copy of this Water Shortage Contingency Plan will be provided to other regional water providers. Written notice will be provided to other regional water providers whenever the District initiates and/or terminates various stages of this Plan.

Section V: Authorization

The District Manager or the Manager's designee is hereby authorized and directed to implement the applicable provisions of this Plan upon determination that such implementation is necessary to conserve water during times of shortage while still protecting the public health, safety, and welfare. The District Manager or the Manager's designee shall have the authority to initiate or terminate water shortage or other water supply emergency response measures as described in this Plan. The District Manager or the Manager's designee shall immediately inform the Board of Directors of any changes in Stages of the Plan.

Section VI: Application

The provisions of this Plan shall apply to all persons, tapholders, and property utilizing water provided by the District. The terms "person" and "tapholder" as used in the Plan include individuals, corporations, partnerships, associations, municipalities, special districts, and all other legal entities.

Water service provided via master meter for contractual purposes may be subject to this Plan following coordination with the contract holder.

Section VII: Definitions

For the purposes of this Plan, the following definitions shall apply:

Aesthetic water use: water use for ornamental or decorative purposes such as fountains, reflecting pools, and water gardens.

Beneficial use: water uses that are essential or required for the protection of public, health, safety, and welfare, including domestic water use.

CLFP: Carter Lake Filter Plant – the water treatment plant, jointly owned by Little Thompson Water District and Central Weld County Water District, that provides potable water to the Districts.

Conservation: those practices, techniques, and technologies that reduce the consumption of water, reduce the loss or waste of water, improve the efficiency in the use of water or increase the recycling and reuse of water so that a supply is conserved and made available for future or alternative uses.

Domestic water use: water use for personal needs or for household or sanitary purposes such as drinking, bathing, heating, cooking, sanitation, or for cleaning a residence, business, industry, or institution.

Even number address: street addresses, box numbers, or rural postal route numbers ending in 0, 2, 4, 6, or 8 and locations without addresses.

Landscape irrigation use: water used for the irrigation and maintenance of landscaped areas, whether publicly or privately owned, including residential and commercial lawns, gardens, golf courses, parks, and rights-of-way and medians.

Master meters: tapholders who purchase water wholesale from the District and re-sell the water to others.

MGD: million gallons per day.

NCWCD: Northern Colorado Water Conservancy District – delivers the majority of the District's raw water supply.

Non-essential water use: water uses that are not essential nor required for the protection of public, health, safety, and welfare, including:

- (a) irrigation of landscape areas, including parks, athletic fields, and golf courses, except otherwise provided under this Plan;
- (b) use of water to wash any motor vehicle, motorbike, boat, trailer, airplane or other equipment or vehicle;
- (c) use of water to wash down any sidewalks, walkways, driveways, parking lots, tennis courts, or other hard-surfaced areas;
- (d) use of water to wash down buildings or structures for purposes other than immediate fire protection or hazardous substance remediation;
- (e) flushing gutters or permitting water to run or accumulate in any gutter or street;
- (f) use of water to fill, refill, or add to any indoor or outdoor swimming pools or Jacuzzi-type pools;
- (g) use of water in a fountain or pond for aesthetic or scenic purposes except where necessary to support aquatic life;
- (h) failure to repair a controllable leak(s) within a reasonable period after having been given notice directing the repair of such leak(s); and
- (i) use of water from hydrants for construction purposes or any other purposes other than fire fighting.

Odd number address: street addresses, box numbers, or rural postal route numbers ending in 1, 3, 5, 7, or 9.

Tapholder: individuals, corporations, partnerships, associations, municipalities, special districts, and all other legal entities using water supplied by the District.

Water shortage rates: water rates that are fair to the largest number of tapholders possible, and that are based on a percentage of average monthly winter usage are the most equitable way to encourage tapholders to conserve water and to recover lost revenue. Tapholders who use approximately the same amount of water year-round will be minimally affected by the water shortage rates.

Water year: November 1 through October 31.

Winter usage: quarterly consumption for the previous months of January, February and March. The winter consumption is divided by three to determine the average monthly winter usage. If a tap does not have a record of winter use, then the average monthly winter usage for all taps in that tap size category shall be used as the basis.

Section VIII: Criteria for Initiation and Termination of Water Shortage Response Stages

The District Manager or the Manager's designee shall monitor water supply and demand conditions on a monthly basis or as operational conditions require. The District Manager shall determine when conditions warrant initiation or termination of each stage of the Plan, that is, when the specified "triggers" are reached.

The triggering criteria described below are based on a statistical analysis of the vulnerability of the water source under water shortage conditions, historical water demand patterns, and the District's ability to meet the projected water demands.

Northern Colorado is an arid climate. During wet cycles, water demand is reduced and there is plenty of water available for unrestricted use. However, during dry cycles and facility emergencies, water demand increases and the supply diminishes. Some of the trigger criteria are based on future projections. The District is committed to conservatively planning ahead for future years as well as meeting the needs of the current year.

Section IX: Water Shortage Condition Triggers and Responses

There are five (5) stages of water shortage conditions detailed in this Plan. The criteria to be used to determine the severity of the water shortage are presented as well as the responses that the District will require from itself and the tapholders at each stage.

If at any time, the District's supply of water is greater than 120% of the projected worst case demand, then no more than a Stage 2 Water Shortage can be triggered, unless adverse operational conditions exist. It is possible that only a portion of the District would be affected by a water shortage if that shortage were due to a catastrophic operational condition in a localized area.

Stage 1: MILD Water Shortage Conditions

Trigger Criteria

Requirements for initiation: Tapholders shall be requested to voluntarily conserve water and adhere to the prescribed restrictions on certain water uses when one or more of the following events occur:

- (a) NCWCD declares a fixed quota less than 70%.
- (b) NCWCD declares a variable quota of 70% or less ***and*** the most conservative projected quota for the next year is 80% or less.
- (c) When total daily water demand at CLFP equals or exceeds 27 MGD (80% of capacity) for 14 consecutive days.
- (c) At any time when projected demand is greater than or equal to 110% of the expected supply.

Requirements for termination: Stage 1 of the Plan may be rescinded when all of the conditions listed as triggering events have ceased to exist.

Response Requirements

Goal: Achieve a voluntary 10 percent reduction in total water use or daily water demand as required.

Supply Management Measures The District shall:

- (a) Limit operational flushing of fire hydrants and dead end water lines except to maintain system water quality.
- (b) Evaluate NCWCD carryover options.
- (c) Repair all leaks promptly and investigate all reports of leaks promptly.

Demand Management Measures: The District shall send notification (by post card, letter or newsletter) to all tapholders of the water shortage stage by May 15 or as needed.

Voluntary Water Use Restrictions:

- (a) Tapholders are requested to voluntarily limit the irrigation of landscaped areas to Sundays and Thursdays for tapholders with an even number street address, and Saturdays and Wednesdays for tapholders with an odd number street address, and to irrigate landscapes only between the hours of 12:00 midnight and 10:00 a.m. and 8:00 p.m. to 12:00 midnight on designated watering days.
- (b) Tapholders are requested to practice water conservation and to minimize or discontinue water use for non-essential purposes.

Stage 2: MODERATE Water Shortage Conditions

Trigger Criteria

Requirements for initiation: Tapholders shall be required to comply with the requirements and restrictions on certain non-essential water uses for Stage 2 of this Plan when one or more of the following events occur:

- (a) NCWCD declares a fixed quota less than 70%.
- (d) NCWCD declares a variable quota of 70% or less **and** the most conservative projected quota for the next year is 70% or less.
- (c) When total daily water demand at CLFP equals or exceeds 27 MGD (80% of capacity) for 21 consecutive days.
- (d) At any time when projected demand is greater than or equal to 120% of the expected supply.

Requirements for termination: Stage 2 of the Plan may be rescinded when all of the conditions listed as triggering events have ceased to exist. Upon termination of Stage 2, Stage 1 becomes operative.

Response Requirements

Goal: Achieve a minimum of 20 percent reduction in total water use or daily water demand as required and increase raw water supply with supply management measures.

Supply Management Measures The District shall:

- (a) Carryover the maximum number of available CBT shares.
- (b) Transfer the 100 CBT shares from the District's farm property to Carter Lake Filter Plant for the year.
- (c) No operational flushing of fire hydrants and dead end water lines except to maintain public health.
- (d) Repair all leaks immediately and investigate all reports of leaks immediately.
- (e) Evaluate budget impacts of water shortage and implement any necessary water rate increase to offset budget impacts of the water shortage conditions.
- (f) Evaluate and implement as determined by the Manager
 - i. Renting additional CBT throughout the year.
 - ii. Exchanges of native water for CBT throughout the year.
 - iii. Operational benefits and costs of utilizing tie-ins to surrounding water systems.
- (g) Utilize existing employees to monitor tapholder non-compliance with water restrictions.

Demand Management Measures:

- (a) The District shall provide monthly updates to all tapholders of water shortage stage.
- (b) The District shall provide additional public notice by press releases to local newspapers.
- (c) Tapholder penalty for non-compliance:
 - i. First offense is a written warning.
 - ii. Second offense is a \$25 fine.
 - iii. Third offense is a \$50 fine.

- iv. Fourth offense results in a flow restrictor in the meter pit or termination of water service at the discretion of the District Manager or the Manager's designee.
- v. Water service shutoffs shall be subject to current District shutoff/turn-on fees.

Mandatory Water Use Restrictions: Under threat of penalty for violation, the following water use restrictions shall apply to all persons:

- (a) Irrigation of landscaped areas with hose-end sprinklers or automatic irrigation systems shall be limited to Sundays and Thursdays for tapholders with an even number street address, and Saturdays and Wednesdays for tapholders with an odd number street address. Irrigation of landscaped areas is further limited to the hours of 12:00 midnight until 10:00 a.m. and between 8:00 p.m. and 12:00 midnight on designated watering days. However, irrigation of landscaped areas is permitted at anytime if it is by means of a hand-held hose, a faucet-filled bucket or watering can of five gallons or less, or drip irrigation system.
- (b) Use of water to wash any motor vehicle, motorbike, boat, trailer, airplane or other vehicle is prohibited except on designated watering days between the hours of 12:00 midnight and 10:00 a.m. and between 8:00 p.m. and 12:00 midnight. Such washing, when allowed, shall be done with a hand-held bucket or a hand-held hose equipped with a positive shutoff nozzle for quick rinses. Vehicle washing may be done at any time on the immediate premises of a commercial car wash or commercial service station. Further, such washing may be exempted from these regulations if the health, safety, and welfare of the public is contingent upon frequent vehicle cleansing, such as garbage trucks and vehicles used to transport food and perishables.
- (c) Use of water to fill, refill, or add to any indoor or outdoor swimming pools, wading pools, ornamental fountains and ponds, or Jacuzzi-type pools is prohibited except on designated watering days between the hours of 12:00 midnight and 10:00 a.m. and between 8 p.m. and 12:00 midnight.
- (d) Use of water from hydrants shall be limited to fire fighting, related activities, or other activities necessary to maintain public health, safety, and welfare.
- (e) Use of water from designated fire hydrants for construction purposes may be allowed under special permit from the District and large amounts of construction water may require a raw water transfer.
- (f) Use of water for the irrigation of golf course greens, tees, and fairways is prohibited except on designated watering days between the hours 12:00 midnight and 10:00 a.m. and between 8 p.m. and 12:00 midnight. However, if the golf course utilizes a water source other than that provided by the District, the facility shall not be subject to these regulations.
- (g) The following uses of water are defined as non-essential and are prohibited:
 - i. Wash down of any sidewalks, walkways, driveways, parking lots, tennis courts, or other hard-surfaced areas;
 - ii. Use of water to wash down buildings or structures for purposes other than immediate fire protection;
 - iii. Flushing gutters or permitting water to run or accumulate in any gutter or street; and
 - iv. Failure to repair a controllable leak(s) within a reasonable period after having been given notice directing the repair of such leak(s).

Stage 3: SEVERE Water Shortage Conditions

Trigger Criteria

Requirements for initiation: Tapholders shall be required to comply with the requirements and restrictions on certain non-essential water uses for Stage 3 of this Plan when one or more of the following events occur:

- (a) NCWCD declares a fixed quota less than **60%**.
- (b) NCWCD declares a variable quota of **60%** or less ***or*** the most conservative projected quota for the next year is **70%** or less.
- (c) When total daily water demand at CLFP equals or exceeds **27** MGD (**80%** of plant capacity) for **30** consecutive days.
- (d) At any time when projected demand is greater than or equal to **130%** of the expected supply.

Requirements for termination: Stage 3 of the Plan may be rescinded when all of the conditions listed as triggering events have ceased to exist. Upon termination of Stage 3, Stage 2 becomes operative.

Response Requirements

Goal: Achieve a minimum of **20** percent reduction in total water use or daily water demand as required and increase raw water supply a minimum of **10%** with supply management measures.

Supply Management Measures: All requirements of Stage 2 shall remain in effect during Stage 3 except the District shall:

- (a) Dry up the Griep farm and exchange all native water for CBT.
- (b) Rent additional CBT as required.
- (c) **Sell only water taps with CBT transferred and available for District use in the current water year.**
- (d) Have two (2) or more full-time “water police” monitoring tapholder non-compliance with water restrictions.

Demand Management Measures: All requirements of Stage 2 shall remain in effect during Stage 3 except:

- (a) The District shall lower system pressures.
- (b) The District shall read meters and bill monthly during critical summer months.
- (c) The District shall implement new rate structure during critical summer months based on a percentage of winter use.
- (d) Tapholders shall be discouraged from installing new lawns (sod or seeded) by not allowing variances for new lawns.
- (e) The District shall provide tapholder notice by mail to all tapholders and providing press releases to local newspapers and radio stations.
- (f) Tapholder penalty for non-compliance
 - i. First offense is a written warning.
 - ii. Second offense is a \$50 fine.

- iii. Third offense is a \$100 fine.
 - iv. Fourth offense results in a flow restrictor in the meter pit or termination of water service at the discretion of the District Manager or the Manager's designee. (Subject to current District shutoff/turn-on fees.
- (d) The District shall post notices in public buildings:
- i. Front doors of all commercial buildings where allowed
 - ii. All public restrooms
 - iii. Schools and other public buildings – public notice boards; flyers sent home with kids
- (a) **Mandatory Water Use Restrictions**: All requirements of Stage 2 shall remain in effect during Stage 3 except: Irrigation of non-turf, landscaped areas shall be limited to designated watering days between the hours of 6:00 a.m. and 10:00 a.m. and between 6:00 p.m. and 10:00 p.m. and shall be by means of hand-held hoses, hand-held buckets, drip irrigation, or hose-end sprinklers only. The use of permanently installed automatic sprinkler systems is prohibited at all times.
- (b) Irrigation of turf areas shall be limited to designated watering days between the hours of 6:00 a.m. and 10:00 a.m. and between 6:00 p.m. and 10:00 p.m. and shall be by means of hand-held hoses or hose-end sprinklers only. The use of permanently installed automatic sprinkler systems is prohibited at all times.
- (c) The watering of golf course tees is prohibited, unless the golf course utilizes a water source other than that provided by the District.
- (d) The use of water through construction meters from designated fire hydrants under special permit is to be discontinued unless CBT water is provided.
- (e) All restaurants are prohibited from serving water to patrons except upon request of the patron (public awareness).
- (f) Use of water to wash any motor vehicle, motorbike, boat, trailer, airplane or other vehicle is prohibited except on designated watering days between the hours of 6:00 a.m. and 10:00 a.m. and between 6:00 p.m. and 10:00 p.m. Such washing, when allowed, shall be done with a hand-held bucket or a hand-held hose equipped with a positive shutoff nozzle for quick rinses. Vehicle washing may be done at any time on the immediate premises of a commercial car wash or commercial service station. Further, such washing may be exempted from these regulations if the health, safety, and welfare of the public is contingent upon frequent vehicle cleansing, such as garbage trucks and vehicles used to transport food and perishables.
- (g) Use of water to fill, refill, or add to any indoor or outdoor swimming pools, wading pools, ornamental fountains and ponds, or Jacuzzi-type pools is prohibited except on designated watering days between the hours of 6:00 a.m. and 10:00 a.m. and between 6:00 p.m. and 10:00 p.m.

Stage 4: CRITICAL Water Shortage Conditions

Trigger Criteria

Requirements for initiation: Tapholders shall be required to comply with the requirements and restrictions on certain non-essential water uses for Stage 4 of this Plan when one or more of the following events occur:

- (a) NCWCD declares a fixed quota of less than 50%.
- (b) NCWCD declares a variable quota of **50%** or less **or** the most conservative projected quota for the next year is less than 50%.
- (c) When total daily water demand at CLFP equals or exceeds **32** MGD (**90%** of plant capacity) for **21** consecutive days.
- (d) At any time when projected demand is greater than or equal to **140%** of the expected supply.

Requirements for termination: Stage 4 of the Plan may be rescinded when all of the conditions listed as triggering events have ceased to exist. Upon termination of Stage 4, Stage 3 becomes operative.

Response Requirements

Goal: Achieve a minimum of **30** percent reduction in total water use or daily water demand as required and increase raw water supply a minimum of **10%** with supply management measures.

Supply Management Measures: All requirements of Stage 3 shall remain in effect during Stage 4 except the District shall:

- (a) Sell only water taps with CBT transferred in time to be available during the water year
- (b) Accept CBT transferred water to increase quota for individual tapholders.
- (c) Perform water audits on all taps $\frac{3}{4}$ -inch and larger and the top **20%** of $\frac{5}{8}$ -inch tapholders.
- (d) Have two (2) or more full-time “water police” monitoring tapholder non-compliance with water restrictions.

Demand Management Measures: All requirements of Stage 3 shall remain in effect during Stage 4 except:

- (a) The District shall read meters and bill monthly year round.
- (b) The District shall implement new rate structure based on a percentage of winter use or quota allocation.
- (c) Tapholder penalty for non-compliance
 - i. First offense is a written warning.
 - ii. Second offense is a \$100 fine.
 - iii. Third offense is a \$250 fine.
 - iv. Fourth offense results in a flow restrictor in the meter pit or termination of water service at the discretion of the District Manager or the Manager’s designee. (Subject to current District’s shutoff/turn-on fees.)

- (g) The District shall provide additional public notices by press releases to local television stations.
- (h) The District shall post notices in public buildings:
 - i. All motel and hotel rooms
 - ii. At every table in restaurants

Mandatory Water Use Restrictions: All requirements of Stage 2 and 3 shall remain in effect during Stage 4 except:

- (a) Irrigation of non-turf, landscaped areas shall be limited to designated watering days between the hours of 6:00 a.m. and 8:00 a.m. and between 6:00 p.m. and 8:00 p.m. and shall be by means of hand-held hoses, hand-held buckets, or drip irrigation only. The use of hose-end sprinklers or permanently installed automatic sprinkler systems is prohibited at all times.
- (b) Irrigation of turf areas with District water is prohibited.
- (c) Use of water to wash any motor vehicle, motorbike, boat, trailer, airplane or other equipment or vehicle not occurring on the premises of a commercial car wash and commercial service stations and not in the immediate interest of public health, safety, and welfare is prohibited. Further, such vehicle washing at commercial car washes and commercial service stations shall occur only between the hours of 6:00 a.m. and 8:00 a.m. and between 6:00 p.m. and 8:00p.m.
- (d) The filling, refilling, or adding of water to swimming pools, wading pools, and Jacuzzi-type pools is prohibited.
- (e) Operation of any ornamental fountain or pond for aesthetic or scenic purposes is prohibited except where necessary to support aquatic life or where such fountains or ponds are equipped with a recirculation system.

Stage 5: EMERGENCY Water Shortage Conditions

Trigger Criteria

Requirements for initiation: Tapholders shall be required to comply with the requirements and restrictions for Stage 5 of this Plan when the District Manager, or the Manager's designee, determines that a water supply emergency exists based on one or more of the following events:

- (a) NCWCD fixed and variable quota combined are less than a **50%** quota ***and*** the most conservative projected quota for the next year is less than **50%**.
- (b) At any time when projected demand is greater than or equal to **150%** of the expected supply.
- (c) Major water line breaks, or pump or system failures occur, which cause unprecedented loss of capability to provide water service.
- (d) Natural or man-made contamination of the water supply or source supply.

Requirements for termination: Stage 5 of the Plan may be rescinded when all of the conditions listed as triggering events have ceased to exist. Upon termination of Stage 5, Stage 4 becomes operative.

Response Requirements

Goal: Achieve a minimum of **35** percent reduction in total water use or daily water demand as required and increase raw water supply a minimum of **15%** with supply management measures.

Supply Management Measures: All requirements of Stage 4 shall remain in effect during Stage 5 except the District shall:

- (a) Sell no new water taps while in Stage 5.
- (b) Pursue emergency temporary use permit for other waters with NCWCD and the State Engineer.

Demand Management Measures: All requirements of Stage 4 shall remain in effect during Stage 5 except:

- (a) The District shall read meters every two weeks and bill monthly.
- (b) Implement new water rate structure based on % of winter water use.
- (c) Tapholder penalty for non-compliance
 - i. First offense is a \$100 fine.
 - ii. Second offense results in a flow restrictor in the meter pit or termination of water service at the discretion of the District Manager or the Manager's designee.

Mandatory Water Use Restrictions: All requirements of Stage 2, 3, and 4 shall remain in effect during Stage 5 except:

- (a) Irrigation of landscaped areas is absolutely prohibited.
- (b) Use of water to wash any motor vehicle, motorbike, boat, trailer, airplane or other vehicle is absolutely prohibited.
- (c) No application for new, additional, expanded, or increased-in-size water service connections, meters, service lines, pipeline extensions, mains, or water service facilities

of any kind shall be approved, and time limits for approval of such applications shall be suspended for such time as this water shortage response stage shall be in effect.

Section IX: Notification of the Tapholders and Public

The District Manager, or the Manager's designee, shall monitor water supply and demand conditions in accordance with the triggering criteria set forth in Section VIII of this Plan, shall determine that a mild, moderate, severe, critical, emergency or water shortage condition exists and shall implement the following notification procedures:

Notification of the Tapholders and Public: The District Manager or the Manager's designee shall notify the tapholders and public by means of:

- Direct mail to each tapholder (monthly update except for billing months, all stages)
- Bill stuffer (all stages)
- Press releases to local newspapers (start at Stage 2)
- Door hang each tapholder (start at Stage 3)
- Public service announcements – radio (start at Stage 3)
- Signs posted in public places – front doors and other areas (start at Stage 3)
- Take-home fliers at schools (start at Stage 3)
- Public service announcements – television (start at Stage 4)
- Signs posted in public places – all public restrooms, hotel rooms, each table at restaurants (start at Stage 4)

Additional Notification: The District Manager or the Manager's designee shall notify directly, or cause to be notified directly, the following individuals and entities during **all** changes in Stages of this Plan:

- District Board of Directors
- Carter Lake Filter Plant Manager
- Master Meter Tapholders
 - Long's Peak Water District
 - North Carter Lake Water District
 - Town of Mead
 - City of Loveland
 - Town of Milliken
 - Town of Berthoud
- Fire Chiefs of all nine Fire Districts providing fire protection in the District's water service area
- Regional Water Providers with Interconnections to the District
 - Central Weld County Water District
 - Fort Collins/Loveland Water District
 - City of Loveland
- School Districts having schools served by the District
- Boulder, Larimer and Weld County Emergency Management Coordinators
- Boulder, Larimer and Weld County sheriffs and other local law enforcement
- Boulder, Larimer and Weld County commissioners
- Other Regional Water Providers & Affected Utilities
 - Northern Colorado Water Conservancy District

- City of Longmont
- City of Greeley
- City of Fort Collins
- Left Hand Water District
- East Larimer County Water District
- North Weld County Water District
- St. Vrain Sanitation
- Town of Mead
- Select water users (dairies and feedlots)
- State of Colorado – Colorado Water Conservation Board

Section X: Enforcement

The District Manager, or the Manager’s designee, may issue warnings, assess fines, insert water restrictors, provide intermittent water supply and/or discontinue water service for tapholders who fail to observe water use restrictions during the stages of a water shortage. At increasing stages of water shortage, compliance with the water use restrictions becomes more critical and it is necessary to have measures in place to force compliance.

Section XI: Variances

The District Manager, or the Manager’s designee, may, in writing, grant temporary variance for existing water uses otherwise prohibited under this Plan if it is determined that failure to grant such variance would cause an emergency condition adversely affecting the health, sanitation, or fire protection for the public or the person requesting such variance and if one or more of the following conditions are met:

- (a) Compliance with this Plan cannot be technically accomplished during the duration of the water supply shortage or other condition for which the Plan is in effect.
- (b) Alternative methods can be implemented which will achieve the same level of reduction in water use or increase raw water supply.

Persons requesting an exemption from the provisions of this Plan shall file a petition for variance with the District within five days after the Plan or a particular water shortage response stage has been invoked. All petitions for variances shall be reviewed by the District Manager, or the Manager’s designee, and shall include the following:

- (a) Name and address of the petitioner(s).
- (b) Purpose of water use.
- (c) Specific provision(s) of the Plan from which the petitioner is requesting relief.
- (d) Detailed statement as to how the specific provision of the Plan adversely affects the petitioner or what damage or harm will occur to the petitioner or others if petitioner complies with this Plan.
- (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 Plan and the compliance date.

- (h) Variances granted shall include a timetable for compliance.
- (i) No variance shall be retroactive or otherwise justify any violation of this Plan occurring prior to the issuance of the variance.

Variances granted shall expire when the Plan is no longer in effect and when the petitioner has failed to meet the specified requirements. Variances shall be subject to review at any time when the District moves to a higher Stage of this Plan.

Source: The template for Little Thompson Water District's ***Water Shortage Contingency Plan*** was the Texas Natural Resource Conservation Commission's *Drought Contingency Plan Template*.
(<http://www.tnrcc.state.tx.us/permitting/waterperm/wrpa/drought.html>)

Appendix D: Public Comments

For this water planning process, the public was notified of the 71-day comment period from August 20, 2019 to October 31, 2019 and how to submit comments. Notifications were made in the District newsletter. The plan was available on the District's website and in the office for review.

There were written comments received during the public period. The comments were punctuation and clarification edits. The edits were incorporated into the Water Efficiency Management Plan. The District will continue to make the Water Efficiency Management Plan available and will incorporate comments into the Plan and the District's practices when appropriate.

The following notice was posted for public input:

"The Little Thompson Water District is pleased to announce the availability of the NEW Water Efficiency Management Plan for review and comment by our customers. This Water Efficiency Management Plan is currently available in hardcopy at the District office and online at www.ltwd.org. The Water Efficiency Management Plan will be submitted to the Colorado Water Conservation Board for approval upon completion of the public comment period and incorporation of public input. Your comments, concerns and questions can be directed to Amanda Hoff, District Water Resources Technician, at 970-344-6304 or ahoff@ltwd.org. The public comment period will begin on August 20, 2019 and close on October 31, 2019."

Appendix E: District Board Water Efficiency Management Plan
Adoption

**LITTLE THOMPSON WATER DISTRICT: BOARD RESOLUTION 2019-18 FOR THE
ADOPTION OF A WATER EFFICIENCY MANAGEMENT PLAN**

WHEREAS,

the State of Colorado has declared that in view of the increasing competition and demand for water in the State of Colorado, it is the policy of the State to enhance the efficiency with which water is used to meet end uses, with the objective of making water available for all beneficial uses in Colorado; and

WHEREAS,

the State of Colorado enacted House Bill 91-1154 known as the "Water Conservation Act of 1991" and amended the bill through the "Water Conservation Act of 2004", §37-60-126 C.R.S, requiring publicly-owned entities with a legal obligation to supply, distribute or otherwise provide water at retail to domestic, commercial, industrial or public facility customers, and which have a total demand for such customers of two thousand acre-feet of more to develop, adopt, make publicly available and implement a water use efficiency plan; and

WHEREAS,

the Board of Directors of the Little Thompson Water District believes that it is in the best interest of the District and its customers to foster the conservation of the District's water by promotion and implementation of sound measures to enhance water use efficiency in order to serve all the water needs of the District, to assure the availability of adequate supplies for future uses and to assure that necessary water services are provided at a reasonable cost;

THEREFORE,

the Board of Directors of the Little Thompson Water District, Larimer, Weld, and Boulder counties, Colorado, formally adopts the Little Thompson Water District's "Water Efficiency Management Plan":

IN TESTIMONY WHEREOF,

the Board of Directors of the Little Thompson Water District, acting by and through its water activity enterprise, has caused this Water Conservation Plan to be signed by the facsimile signature of the President of the District, sealed with a facsimile of the seal of the District, and attested by the facsimile signature of the Secretary thereof, all as of the 14th day of November, 2019.

LITTLE THOMPSON WATER DISTRICT
LARIMER, WELD, AND BOULDER COUNTIES
STATE OF COLORADO

By: [Signature]
President

ATTESTED:

By: [Signature]
Secretary

