A VERY BRIEF HISTORY OF MMWS OPERATIONS

DISCLAIMER: This is my (Barry M.'s) understanding of MMWS operations history. I have not been able to find very much written history of all of this so some of what I am writing here is oral history.

TREATMENT PLANT

I'm not sure of the build date for the treatment plant but, the early plans that I have for the distribution system are from 1971 so I would guess it was constructed around that time. The treatment plant was originally laid out for sand filters but, in the end the board at the time elected to use a settling tank for water treatment. They purchased a used settling tanks that had been used by the highway department to clean water for road construction.

According to Ken Brock, when he first encountered the treatment plant, treatment consisted of gravity feeding water from the inlets to the settling tank without level control. The tank was usually overflowing onto the floor of the plant and draining to the sump pit. During runoff, they used a gunny sack to catch the pine needles and debris coming in. Once a week or so, someone would pour some chlorine into the tank but this was not very effective as the tank was constantly overflowing. Pipes were crisscrossing the plant to feed the distribution system.

Ken did a lot of the first work to improve the plant. He added float control valves to the inlet lines and redid the plant plumbing in an organized way. Some of the remaining copper pipe in the plant on the plant inlets and the old clearwell is part of this work.

Around 1993, major work to the treatment plant was initiated by Duane Davis and Don Newton and was engineered by Clyde Young & Co (Pueblo). I believe this is when bag filters and a UV sterilization system were added to the plant. This was the state of the plant when I first saw it in 2002. The UV sterilizers were difficult to maintain and were of questionable effectiveness. As the filter bags accumulated dirt, there was considerable fluctuation in plant production rate and chemical dosing. There was a lot of issue with "green tea" water, particles in the water and turbidity issues during this time particularly during spring runoff. End users experienced a lot of sedimentation in bathtubs, toilets and appliances.

The MMWSC office building located on the corner of N. Skinner Rd. and Dale Dr. was owned by the water company but was sold to Bill Peirce in 1993.

ULTRAFILTERS

In the late 2000's/early 2010's, there started to be pressure from the CDPHE on the turbidity issues. Finer bag filters were added to sequentially filter the water down to 0.5 microns. This helped but keeping the turbidity under the limits was still a challenge and the "green tea" issue continued. In August 2011, they put us on an enforcement order after turbidity limits were exceeded during the runoff period. During the 2012 and 2013 runoff period, the turbidity levels were low which made it difficult to study the problem. There was a lot of debate about whether the issue was due to small particles or dye from tannin in rotting vegetation. The turbidity issue came to a head during the 2013 flood. The plant was not able to produce water that met the regulatory requirements and the system

had to issue a “boil water” notice. Rachel was able to collect water from this event which was tested with the result that the discoloration/turbidity was 75% particles that were smaller than the 0.5 micron bag filtering capability

Our issue was put on the COWARN system and Innovative Water Technologies (IWT) responded. IWT offered to temporarily install two of their stand-alone ultrafilter systems to get the system through the flood crisis and they worked. They not only cleaned up the flood water but cleaned up the turbidity and most of the green tea issues (turbidity from .3 to .02 immediately). The board, led by Rachel Barkworth, took on a project to take out the UV sterilizers and added a bank of 10 IWT ultrafilters to the treatment process. The PER was submitted in 12/2013 and the new ultrafilter pallet was installed in 2014. We were told at the time that expected life of the filters was 10 years and a filter replacement fund was started to replace the filter cartridges at the end of the 10 year period. The filter cartridges have since become obsolete and are not available for the current configuration of ultrafilters.

The Ultrafilters have done their job of producing clean, low turbidity water but they have not been without their problems. There have been lots of issues around learning how to operate them so that they do not clog, failing bladders, valves, controllers, etc. The ultrafilter pallet has been modified several times to get them to continue doing their job. A second higher pressure pump was also added to the system to be able to produce enough water for winter bleeding. In 2019, due to failing backwash bladders and the unavailability of the obsolete replacements, additional backwash bladders were added to the system.

CHLORINE DOSING CONTROL

At the same time that the ultrafilters were installed, an in-line turbidity meter and an inline CL17 chlorimeter were added to the system.

With the addition on the in-line chlorimeter, the system was set up to adjust the chlorine injection levels based on the chlorimeter readings. This had trouble from the start due in part to the 5 minute start-up time for the chlorimeter (where chlorine dosing was minimal) and in part to a lack of understanding of how the control system worked. A lot of adjustments to the system were attempted to the point that it wasn’t working at all and no one knew how to set it up correctly. The system was switched back to manual control of chlorine dose rate. Plant production flow rate had large variations due to backwash cycles of the ultrafilters and dirt/clogging status of the prefilter bags. This caused problems with being able to control chlorine dosing effectively. When production was cut in half, chlorine dosing would more than double. Luckily, mixing in the clearwell helped average things out a bit.

In 2019, I added a circuit to control the chlorine dosing during chlorimeter startup and worked with Hach to reverse engineer the chlorimeter and controller settings. The chlorine dosing is now under closed loop control for 11 months out of the year. Chlorine dosing still needs to be put in manual mode to deal with the heavy chlorine demand/consumption during spring runoff.

LEAD/COPPER ENFORCEMENT

In 2018, the system was over the lead and copper rule (LCR) action level for lead and we had to do a round of Water Quality Parameter Testing (WQPT). In 2019, the action level was exceeded again and we were put under an enforcement order that included a study of Optimal Corrosion Control Treatment (OCCT), and the requirement that we act on correcting the lead levels. Wenke engineering was hired to

help us with this. The OCCT concluded that we needed to increase the pH of our distribution water by injecting soda ash. The CDPHE recommended us for and ultimately provided a grant to put this system in.

PRETREATMENT MODIFICATIONS

Around the same time that we were dealing with the lead/copper enforcement changes, the settling tank was showing a lot of corrosion and the plumbing for the plant pumps and bag filters was starting to come apart. While we were considering doing the necessary maintenance, we came to the realization that the settling tank was not really doing much for water treatment. We decided to replace the settling tank and bag filters with self-cleaning screen prefilters. An additional benefit of this was that the water inlet pressure could be used to help run the plant with smaller pumps. With increased pressure available, a pressure control valve was added to the ultrafilter pallet input which significantly increased the control of the water flow rate through the system. Previously, ultrafilter pressures dropped every time one of the ultrafilters backwashed and overall production flow dropped in half and created problems with chlorine dosing. The ultrafilter pressure control valve has worked to gain control over plant production rates and chemical dosing.

The space gained by removing the settling tank provided the opportunity to increase the clearwell capacity indoors which had the added benefit of having redundant tank capability, increasing chlorine contact time and significantly reducing the minimum chlorine residual level requirements. This work was added to the BDR for pH adjustment and the work was completed in 2021.

DISTRIBUTION SYSTEM

The earliest design drawings that I have are from 1971 and I believe that the distribution system was put in around that time. The Distribution system was installed using galvanized steel pipe and is laid out to create 5 dead end mainlines. The mains were buried to the level of bedrock and so the depth of the mains is very inconsistent throughout the system. To try and prevent freezing, the ends of the 5 dead ends were bleed to the point that there was very little water left over in Willow creek to feed the Allenspark water system. The system was installed without appropriate pressure zones and the pressures are currently as high as 200psi at the bottom of the lower loop and 170 psi on the upper loop at the plant.

HIGHLINE SYSTEM

The two distribution lines above the plant were pressurized by pump. There is a shed half way up the upper high line (across from the Mayne's property) that contained two pressure tanks connected to the main that helped maintain a constant pressure on the lines. The two tanks are still in place but are not currently connected to the mains.

When the Lakes built in 1993, the system in place was not supplying a reliable water supply to them. The Lakes deeded over a small piece of their land and the highline pressure shed was built in 11/94 to replace the lower pressure shed with two pressure tanks. The old pressure shed was decommissioned in 1/95. Rick Oppermann and Triple R backhoe did a lot of this work. The line froze almost immediately after the pressure tanks were installed. They also found that when the highline pumps cycled off,

pressure at the plant dropped to 0 almost immediately. In 9/95 they found a check valve on the main line in front of the old pressure tank building that was responsible for this. They removed the flapper on the valve and this valve is still in place without the flapper.

There is a maze of distribution pipes, valves, and a bleeder outside the highline pressure tanks and I have not been able to find a reliable diagram of them. They were still bleeding on both the upper highline (at Lake's) and the lower highline (at the Johnson bleeder) at this time.

HIGHLINE FREEZE PREVENTION SYSTEM

Both the upper and lower highlines continued to experience a lot of freeze events. At the time, some thawing of lines was done with electrical welding equipment.

In 2001, Brad Eaton engineering was hired to design and install a system to stop freezes and reduce the bleeding….The highline freeze prevention system. This system, still in place, pumped water up to the highline pressure tanks and then shut off to allow the water to flow back downhill. The idea was to stop freezing by keeping the water constantly moving. The upper and lower highline distribution pipes were connected at the plant so that the water returning downhill exited into the lower highline and out the bleeder at the end of this line. The upper highline bleeder was turned off. The system on/off cycles were controlled by a pressure switch and a programmable logic controller (PLC) at the plant. I've found a hard paper copy of the PLC program but not the actual code and I'm not sure that the PLC can be service or changed any longer The pumps were equipped with VFD's that were intended to gradually start and stop the pumps to prevent water hammer.

Unfortunately, this system did not do much to stop the freezing on the lines as it was installed. It was theorized that the problem was that the water was too cold and that it froze when the water direction was reversed. The VFD's were reconfigured to start and stop the pumps instantly which is how they are configured today. The freezes continued. There was argument between Eaton Engineering and the board at this time with the board not wanting to pay the whole contracted fees until the system worked.

The next thought was that with only two pressure tanks, the water in the distribution lines was not being replaced in each cycle particularly at the distal ends of the lines. Water was just moving back and forth and was getting colder and colder until it froze. Six more pressure tanks were placed in the highline shed, added by Rick Oppermann and this actually seemed to work for the upper highline.

The lower highline continued to experience some freezing. The BOD president at the time (Don Landwer) believed that the lower highline freezes were occurring where the mains crossed shallowly under the creek culverts (Fox crossing close to the fox inlet, Fox crossing at the intersection of S. Skinner and Meadow Mtn Dr., and Willow crossing close to the Willow inlet). These crossings were all dug up and they were indeed very shallow and close to the culverts. The mains were insulated with blue structural foam and filled with gravel so that they would drain. Welding cable was also attached to the main on both sides of the crossings.

In 2005 when Johnson built, dirt from the excavation was added to the road in front of his place to increase the cover over the main.

In 2012 when Ross built, the main was extended up Meadow Mountain Dr to their construction. This work was done by Dan Crane and was buried a full 8'. The bleeder for the lower highline was moved

from the Johnson bleeder to the current site of the Kesson bleeder. In 2014, at the request of Allenspark water, a dechlorination station and a line to return the bleeder water to Willow creek was added to the Kesson bleeder.

In 2015, a second generator was added to service the highline pumps. The existing generator was insufficient to run the treatment plant (with 5 HP pumps at the time) and the highline pumps at the same time. During power outages, the highline pumps were allowed to be off and the highline distribution mains depressurized risking backflow issues and system freezing. The new pump was sized to be sufficient to run the entire system if necessary but the old generator was left in place to split the load. This work was organized by Penny Ross.

All these pieces made the freeze situation better but there have still been a few freezes and close calls since. The system is very sensitive to everything working perfectly and the pressure settings being set correctly. To my knowledge, there has not been a main freeze on the lower loop.

BYPASS PIT

Before the current water distribution system was installed, there was an older system in place that supplied water from the spring that is currently on the Barkworth property to the Wildwood lodge (currently Oppermann, Barrett, etc.). The pipe used was what we are currently calling the Bypass pipe. When the current system was installed, they put a main in the road that is on the maps as a 1 ½" line between the Barkworth and Connolly properties. The bypass line was extended to tee into this line creating a parallel path for water for this section. The bypass pit was put in that contained the upper tee and had a valve that could shut off water flowing into the bypass line. I speculate that 1 ½" was used in the road because they intended to also keep the 2" bypass open. The problem that this caused was that the bypass line was a much lower resistance path for water to flow (bigger and shorter) and the main in the road was starved of sufficient flow. They then closed the bypass line at the upper tee and had water enter the bypass line to supply water to Oppermann, Barrett, and Tonkinson properties through the lower tee. I believe that this caused some pressure issues to these properties. All of the water to the lower half of the distribution system went through the 1 ½ " main in the road.

After several more houses were built in the lower part of the distribution system, the 1 ½" line was no longer large enough to supply all of the demand with sufficient pressure and the properties on the hill (Ruch, et al) were not getting any water. To deal with this the team at the time decided to open up the bypass line to supply more water to the lower distribution system. The problem that this caused was that the bypass line was a much lower resistance path for water to flow (bigger and shorter) and opening this line again starved the main in the road of sufficient flow. To force water to continue to flow in the 1 ½" road main and supply water through the bypass also, they put a PRV on the bypass line to restrict the amount of water flowing into the bypass. They also put a meter on the 1 ½" line so that they could see that water was flowing into the 1½" line. The PRV and the meter are in the PRV pit and most of this new work was done with copper pipe. This work was done by Ken Brock in the early 2000's.

Feb 2023 the 1 ½" line froze in two places; between the bypass pit and the Barkworth tap and between the Connolly tap and the gate valve at the Oppermann driveway. 3 houses were out of water until the pipes thawed in May. Temporary water was provided to the Barkworth home from the PRV pit through heated RV hoses. The cause this freeze was determined to be a failed PRV in the PRV pit which allowed all the water to flow through the lower resistance bypass pipe and thereby starving the 1 ½" line of

water flow. It was determined at this time that the meter in the PRV pit had been taken apart and was none operational. Both the PRV and the 1 ½' meter in the meter pit were repaired June 2023 after the frozen pipe had thawed.

The board hired Stewart Environmental sometime in the late 2000's to do a pressure/hydraulic model of the distribution system to help understand some of these flows. This model was never finished as there was too much missing data (pipe sizes, pipe resistance, etc.) and I don't believe any usable information every came from this attempt.

LOT 55 OUTLOT

Lot 55 was not originally part of Triple Creek, however, the earliest maps of the system that I have show this property being included in 1971 so the main line extension in CR 90 to this property was probably put in with the original distribution system. Warren drains his cabin every year and he is not able to open it back up each year until May as the line freezes every year. He is not sure if the freeze is in the main or in his service line. One of our maps shows a bleeder at the end of this short section of main but, I have not verified that it is there. It should be tested during late winter to see if it is open as others along CR90 are interested in being connected to this main.

LOT 1 WELL ATTEMPT

According to Ken Brock, Lot 1 has water rights associated with N. Fox creek. When they built, they attempted to drill a well on the property but were unsuccessful after drilling over 600' (the property is on glacier moraine). They built in 1989 and added a ¾" main extension (service line?) on the border between the two properties to service Lot 1 and lot 2.

LOT 23 REMOVAL FROM SYSTEM

Lot 23 (Dwayne Davis) was originally serviced by MMWS. At some point, the service line to the property sprang a leak and it was fixed by the water company. After the fix, there was a dispute between Dwayne and the board over who should pay for the work and Dwayne withdrew his property from the water system. Apparently, he had some water right to N. Fox creek and put in his own water treatment system to service his property.

CLOGGING INLETS

There has historically been issues with the inlet filters clogging. When the settling tank was in place, there was a backwash pump available to push settling tank water back through the inlet filters. This would temporarily open the inlets but every 3-5 years, the inlets would need to be dug up, cleaned, and have new gravel laid for them to work. The green pipes that are still at each of the inlets are to divert the stream while this work is being done.

Around 2019, Andrew Griffiths started a program of using a trash pump to clean dirt out of the inlet filter media each year after spring runoff. Hopefully, this will reduce the need to dig up the inlets as frequently. Additionally, a new backwash circuit was added to the plant when the new prefilter work was done. This allows water to be pulled from one inlet and pumped to backwash the other inlet from the plant. The additional pressure from the supply inlet has helped increase the backwash flow and effectiveness. The new system also allows for flushing the inlet pipes. The inlet pipes were found to have been significantly filled with sediment which had been negatively impacting water treatment

capabilities. After thorough flushing, water input to the plant has been notably cleaner reducing strain on the treatment filters.

HIGHLINE LEAK

On or about August 2021, a significant leak started somewhere in the highline system. The leak was not located until May 2023 when water from the leak surfaced in the water plant driveway. This leak was repaired in September 2023. It was found at that time that the main line in this area was severely corroded from the outside. One of the corrosion pits had breached the pipe. The water main and the inlet line are side by side with 6' of cover at this location and are about 6-8" apart. The water jet from the main drilled a hole into the inlet pipe and the extra water from the inlet pipe brought the water to the surface. The water jet from the main was pushing small sand and gravel into the inlet line which was enough to restrict the flow of water through the inlet. We had been seeing but not understanding this restriction from about December 2022 in the plant. Frequent backwashes had been required to keep the line flowing at sufficient pressure.

INLET VALVES

Before we were able to do the main line/inlet line repair, the Fox inlet needed to be shut off at the inlet. There were no shutoff valves installed on the inlets with the original installation. In 2009, Rick Oppermann installed a valve on the Willow inlet but there was not one on the Fox inlet. In August 2023, George Ackermann was contracted to excavate the Fox inlet pipe and a 4" ball valve was installed in a valve pit on the line. A cleanout pipe was also added to aid with air removal and also serve as an access point in the event that a tracing wire was required for future pipe locating.

HIGHLINE SHED VALVE DAMAGE

In the early 2010's and delivery truck drove over the valve area in front of the highline shed damaging the curbstops for the highline shed as well as the Lake and Bullman properties. These valves were excavated and repaired. This work does not appear to have been documented and the underground plumbing currently in place is difficult to trace and understand.

MAIN GATE VALVE DAMAGE

The gate valve on the main below the Connolly property before the lower bypass tee was damaged by a snow plow in 2020. The valve pipe leading to this valve was filled with about 3' of dirt and rock. We were able to remove enough of the dirt in May 2023 to operate the valve but just enough.

DISTRIBUTION SYSTEM REPLACEMENT

The distribution system was potholed in 2015/16 to obtain pipe samples to understand when the distribution mains might need to be replaced. This was done in three places: ~100 feet above the water plant driveway, on Dale dr. in front of the spring, and on dale dr. in front of the Lawrence/Jones property. During this work, the Fox creek inlet line was damaged creating some road flooding. Fox creek had to be diverted to make repairs. The engineering report on the sampling concluded that the main pipes had 43 years of useful life left. However, one of the PVC inlet pipes was hit while digging and the condition was found to be very poor with ~7 years of remaining life. Additionally, the main valve on the lower Dale Dr. branch was found to be defective during this work and was replaced. The board began planning for eventual distribution system replacement.

Because of the cost of total replacement, the project was divided into 3 phases with the goal of starting the first phase as soon as money was available. A grant proposal was submitted in 2016 (?) to start the first phase of distribution system replacement. We lost out on the grant by a few points. It was felt at the time that we may have been successful if we had engineering plans in place for the project and if we had money in the bank for matching funds. The board started an annual assessment to build up funds for eventual distribution system replacement.

In 2017 a line depth survey was conducted to help understand the priorities for main pipe replacement. The survey team had issues measuring depths in several sections of the line which they blamed on telephone lines. I think that the issues were probably more likely due to inappropriate tool electrical attachment points. Main lines were found to be very shallow at several locations. From this study and other observations, it is pretty clear that the main line depths are getting shallower from road material disappearing (e.g. snow plow removal).

Wenke was contracted in 2018 to draft the initial plans for replacing the distribution system. A preliminary engineering report and environmental impact statement were prepared in 2023 by Chris Lidstone for a USDA loan to do the first phase of the replacement. In 2024, The USDA approved a package including ~$440K in low interest loans and ~$1950K in grant funding. This work is ongoing and includes replacement of upper loop mains, Willow and Fox creek inlet lines, distribution branch metering, a fire hydrant at the low end of the upper loop, and the first half of a pipeline and plumbing to connect the AWSD and MMWS treatment plants.

SYSTEM EXPANSION

In 2024, 4 properties on County Rd. 90 were added to the water company. The system will be adding the mains and equipment to service these properties in spring 2025.

METER REPLACEMENT

An automatic read meter system has been ordered and residential meters are scheduled for replacement during summer 2025.