Town of Paonia

Water System Evaluation

May 2021

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Executive Summary

This report inventories the Town of Paonia (Town, Paonia) water system for planning purposes. The impetus for the report was a critical 2019 water supply issue that resulted in loss of water service to the community. Section 8 addresses this event specifically. Other elements of this report give focus to water demand (Section 3) and supply (Section 4) with a focus on limitation and efforts that can be made to optimize collection and delivery of existing water resources. This includes a detailed description in Section 6 of a water system hydraulic model that was created to identify critical vulnerabilities and limitations and support capital improvement recommendations. In Section 7, water system operations and maintence practices are discussed relative to day-to-day operation as well as future planning and improvement efforts. Combined, the elements of this report provide a catelog of water system information for future reference. The purpose of this report was to identify limitations of and vulnerabilities to existing water system infrastructure and provide recommendations that would result in a more resilent water system able to support future growth.

In January 2020, JDS-Hydro Consultants (JDS-Hydro) met with Paonia staff and board members to review the scope of services to be provided. During this "kick-off" meeting, an analysis of raw water supplies was emphasized as a critical element of concern for the community. More generally, a list of recommended capital improvement projects was requested. Specific recommendations regarding each element of the water system can been found in their respective sections of the report. Section 9 is a summary of JDS-Hydro recommendations. Generally, a wholistic approach was taken and thus recommendations are not limited to capital improvements and include additional planning efforts and adminstrative improvements.

Additional planning efforts and recommended administrative improvements would position the Town of Paonia to have greater confidence in long-term needs. For example, based on a review of 2013-2018 financial audits, JDS-Hydro would recommend an updated Rate Study Analysis be conducted in conjuction with a water system master planning effort. While cost was considered in making recommendations, this was relative only to other alternative that would achieve the same result. Generally, recommendations in this report do not account for the Town's ability to fund any one specific improvement. Other non-capital improvement recommendations include the following:

- **Transient Analysis**: A transient analysis looks at the integrity of a water system by evaluating specific pressure events that may occur during various operational scenarios. A transient or pressure event is caused by rapid changes in operational conditions in a system such as a valve closing suddenly. These events can cause leaks, break or collapes. A transient analysis is analagous to a stress test. Current modeling efforts did not include transient modeling.
- **Additional Data Collection:** The analysis described by this report was based on a limited data. Specifically, monthly demand, treatment production and spring collection data would greatly improve the percision of forecasts and conclusions. Temporal data is especially critical when it comes to sizing raw or finished-water storage infrastructure
- **Increased Staffing:** The Town of Paonia water system is relatively complex. Even relative to a less complex system, existing staffing levels are below what would be recommended by industry benchmarking references. Moreover, with only one licensed treatment and distribution operator, Paonia is particularly vulnerable to staff turn-over. JDS-Hydro recommends hiring at least one (1)

additional full-time utlity operator with certifications matching those required for treatment and distribution (Level C and 2, respecitively) or with the ability to obtain the required certifications within a reasonable time period.

- **Water Loss Analysis:** Unaccounted for water appears to represents 35-40% of water produced. A water loss analysis that results in better understanding production versus demand will greatly improve long-term forecasting and planning efforts and may even result in Paonia being able to support additional growth.

In regards to capital improvement specifically, JDS-Hydro recommends prioritizing those that enable both the Upper (Lamborn) and Lower (Clock) treatment facilities to operate at capacity on a regular basis. These would include:

- Means to fill the lower finished-water storage tank with treated water from the upper finished water storage tank via a flow control valve.
- A detailed evaluation, design and potential rebuild of each pressure reducing valve (PRV) vault and ensuring sizes and bypasses enable each of the two service routes into Town to remain in operation under the largest range of emergency operating conditions.
- Replacing the entirety of remaining old 8-inch steel pipe from the upper treatment plant along the westerly route into town. Currently this line experiences almost routine failure. A failure of an 8-inch main removes half distribution capacity into town.
- Repairing/replacing all flow meters in each treatment plant that record raw water (spring) flows into each treatment plant. Without these in operation providing reliable data, any assumptions on the condition of raw water collection pipelines and yields is conjecture.

Generally, JDS-Hydro is of the opinion that with both the upper and lower treatment plants online and in service, The Town of Paonia should be able to provide water to the remaining 416 residential standby taps. With additional temporal demand and production data, JDS-Hydro would be able to comment for specifically. However, the 2019 Water Supply Issue occurred while nearly half of existing raw water and treatment capacity and 33% of storage capacity was offline. In combination with increased staffing and execution of the above recommended capital improvement, existing data suggests exisiting standby taps can be serviced. However, JDS-Hydro would recommended suspending sales of additional taps until further analysis of additional data can be performed.

Accommodating future demands is largely dependent on the ensuring the reliability of its raw water sources. Improved raw water collections followed by implementation of raw water storage may prove necessary depending on growth targets. Importantly, if raw water storage is employed this would also result in an increased level of required treatment. Currently, only the lower (Clock) treatment plant may be able to accommodate surface water treatment requirements. Additional treatment would become necessary at the upper (Lamborn) treatment plant.

JDS-Hydro recommends amending this report once additional data is available. With additional data, greater confidence in forecasting the long-term needs of the community would be possible.

2. Introduction

2.1 Background

The Town of Paonia (Town, Paonia) published a request for proposals (RFP) in July 2019 for qualified engineering firms to conduct a water system analysis. The impetus for this analysis was a critical water supply issue in February 2019 that resulted the loss of water service for the entire system. Specifically, the objective of the study is to identify acute vulnerabilities within the system and establish a list of priorities to ensure reliable, sustainable water system into the future.

JDS-Hydro Consultants, Inc. (JDS-Hydro) was contracted to begin work on a water system analysis in December 2019 and made a visit to Paonia in January 2020 to meet with Public Works staff and Town of Paonia Board members. During this (Kick-off) meeting, JDS-Hydro and Paonia staff outlined specific analysis objectives. Kick-off meeting minutes are attached to this report as ***Appendix A.***

2.2 Previous Water System Studies

This section summarizes previous water system studies conducted by Paonia. With the exception of the most recent West Water Engineering report, previously reports are largely focused on maximizing Paonia's water supply to support growing demand.

- **1995: Consolidated Consulting Services 'Reconnaissance Assessment, Raw Water Supply'**

This report largely focuses on raw water storage alternatives and leans heavily on a 'Hydrology Report' by Minion Hydrologic. The Minion Hydrologic that appears to have evaluated specifically sources of supply from the Town's springs and associated raw water collection pipelines. Minion Hydrologic also conducted as assessment of the Town's water rights. Neither of the Minion Hydrologic reports were reviewed as part of this analysis. The Consolidated Consulting Services report concluded that employing the Reynolds Reservoir for raw water storage, improving spring collection systems and water conservation were the best areas of focus to improve overall water supply.

- **2000: GEI Consultants – Feasibility Study, Alternative for Expansion, and Improvement of Paonia's Water Supply System**

This report more closely analyzed supply versus demand than the 1995 Consolidated Consulting Services report. However, it also concluded that additional supply was needed to satisfy demand and provided recommendations thereto. Specifically, this report recommended that year-round data metering at each of the Town's water sources (i.e., Springs) be implemented to better gauge a realistic 'Firm Yield' or total amount of potential raw water is available to be collected. It also concluded that enlarging 'Lone Cabin Reservoir' was the best alternative for raw water storage.

- **2004: Wheeler Feasibility – Report for Improving the Water Supply System (2004)**

This report presented a master plan approach for improving Paonia's water supply system and appears to be the final product of the 2000 GEI Consultant's Feasibility Study. The first recommendation was to purchase Ark Land Property that held claims to additional taps that the Town was unable to support. The second, third and fourth steps included utilizing and optimizing the Lone Cabin Reservoir for raw water storage.

- **2012: TerraVision Consultants – Small Hydroelectric Plant Feasibility Study 2012**

This was a minor study that evaluated how Paonia might leverage the elevation difference within the system to generate power that could offset operational costs associated with the water system. The report concludes that at the return on a $93,000 investment was equal to 23 years.

Currently, the Colorado Water Control Board is accepting low interest loans for projects exceeding $100,000 for hydroelectrical projects. While maybe not the Town's top priority, the potential ROI period may be less if the same study was conducted today.

- **2012: WestWater Engineering – Lamborn Treatment Plant Membrane Filtration Upgrade (Amended in 2016 and 2018)**

This report largely focuses on necessary improvements to the Town's Upper (Lamborn) Water Treatment Plant. Changes to source water designations (groundwater under the influence of surface water) and corresponding treatment requirements necessitated an increased level of treatment. This resulted in Paonia constructing a 600-gpm ultrafiltration treatment system provided by Filter Tech Systems, a manufacturer located in Grand Junction, Colorado.

This report also recommended interconnecting the Reynolds Springs Supply Pipeline to allow for flow to reach the Upper Treatment Plant from this raw water source as well as construction a second two (2) million gallon (MG) storage tank for redundancy. A final recommendation included rehabilitating a currently off-line 500,000-gallon storage tank.

2.3 Study Objectives

2.3.1 Planning Scope

JDS-Hydro's planning efforts have focused on three principal elements: optimizing the Town's raw water supply, providing a list of priority capital improvements for the Town's distribution system, and evaluating water system operations including standard operating procedures to staffing levels.

JDS-Hydro has also been tasked with evaluating the existing water system's capacity to support existing and additional taps. Specifically, a separate Memorandum (will) address(es) the Town's tap moratorium and its ability to support addition water services.

2.3.2 Technical Scope

JDS-Hydro has not provided preliminary or final design of any specific element. Rather, through its water modeling efforts, it has attempted to identify those areas where vulnerabilities exist, and specific improvements are recommended.

2.3.3 Financial Scope

JDS-Hydro has provided very budgetary numbers for alternatives to improve the water system. It has not conducted a review of the Town of Paonia's ability to finance any specific capital improvement effort. Based on a review of 2016-2018 audits, JDS-Hydro would encourage the Town of Paonia to conduct a formal Rate Study Evaluation in consideration of capital improvement needed at this time. Water and Sewer

Rates should be reconsidered every 2-5 years depending on a water system's needs. In this case, every three years, may be warranted depending on growth and the phasing of capital improvement efforts.

2.4 Study Limitations

JDS-Hydro presents this (DRAFT) report based on the information available to it. Outstanding questions remain regarding monthly water supply and demand. Without monthly data, accounting for seasonal variations was not accounted for in finished-water storage recommendations. Moreover, raw water inflow to each the Town's two water treatment facilities is an unknown, thus limiting the ability to analyze the raw water currently available or make recommendation to optimize raw water collections. Lastly, water model calibration is based on a very limited data set; further model calibration is warranted.

3. Drinking Water Demand

3.1 Existing Demands

The Town of Paonia (Town, Paonia) demand on a per user basis appears to be significantly lower today than previously documented by past engineering efforts. Conservation efforts have been emphasized by the District for going on 20-years. The results of public awareness of Paonia water system vulnerabilities, encouraging environmental stewardship as well as tiered service rates that promote conservation appear to have had the desired impact on customer behavior. **Table 1** presents annual average metered demand between 1999-2001 versus 2018-2020.

Table 1. Annual Average Water Demands

Years	# Active Water Taps	Annual Average Demand (gallons)	Gallons / SFE / day [2]	Gallons / person / day [2]
1999-2001	1,387	141,219,250	279	112
2018-2020	1508 [1]	96,094,958	175	71.6

[1] Average # reported taps between 2018-2020.

[2] SFE = Single Family Equivalent. For the purposes of this report, 1 tap is assumed equal to 1 SFE, and 1 SFE is assumed equal to 2.5 persons.

In its 2004 Feasibility Report, engineering firm W.W. Wheeler and Associates noted that a total 164 million gallons (MG) of raw water was treated to meet a demand of 141 MG. Thus, roughly 23 percent of treated water was unaccounted for. This same report noted that the portion of unaccounted for water was about twice as high in the lower part of the distribution system.

In comparison, between June 8, 2016 and May 5, 2021, annual average treated water production equaled approximately 157 MG per year. As referenced in **Table 1** above, between 2018 and 2020, annual average metered demands within the distribution system equaled approximately 96 MG. This equates to roughly 39 percent unaccounted for water. The cause for an increase in the percentage of unaccounted for water is difficult to ascertain based on currently available information.

Ideally, evaluating demand would include an analysis of temporal data. Understanding seasonal fluctuations in demand is important for understanding peak demand, which can then be compared to raw water availability, support in sizing storage and distribution infrastructure as well as understanding the water system's available capacity to support additional taps. For the sake of this report, temporal demand data from previous reports was used to estimate peak day demand, which is presented in **Table 2** below. This demand data was also used in modeling efforts, which are detailed in Section 6.

Table 2 Town of Paonia Peak Month Demands

Demand	Annual Average Monthly Demand	Peak Month Average Customer Demand	Peak Month Average Production Demand	Peak/Average Month Demand Ratio
	MG/month	MG/month	MG/month	
1999-2001	11.8	19.8	-	1.7
2018-2020	8.0	13.6	22.2	1.7

Importantly, as discussed in Section 4 below, satisfying peak month and peak day demands may require full utilization of both upper and lower treatment and storage facilities.

Data Limitations

The Town meters water based on the following classification:

- In-Town Residential
- In-Town Commercial
- Out-of-Town Residential
- Out-of-Town Commercial

Available information used in this evaluation included annual totals for each of these classifications for the years 2016-2020. These records are provided as ***Appendix B***. Since June 2016, only the upper treatment plant has been in operation. Available data to evaluate treated water production versus metered customer demand is a single totalized meter reading at the upper plant over the period June 8, 2016 and May 5, 2021. A picture of this meter reading is provided as **Figure 1** below.

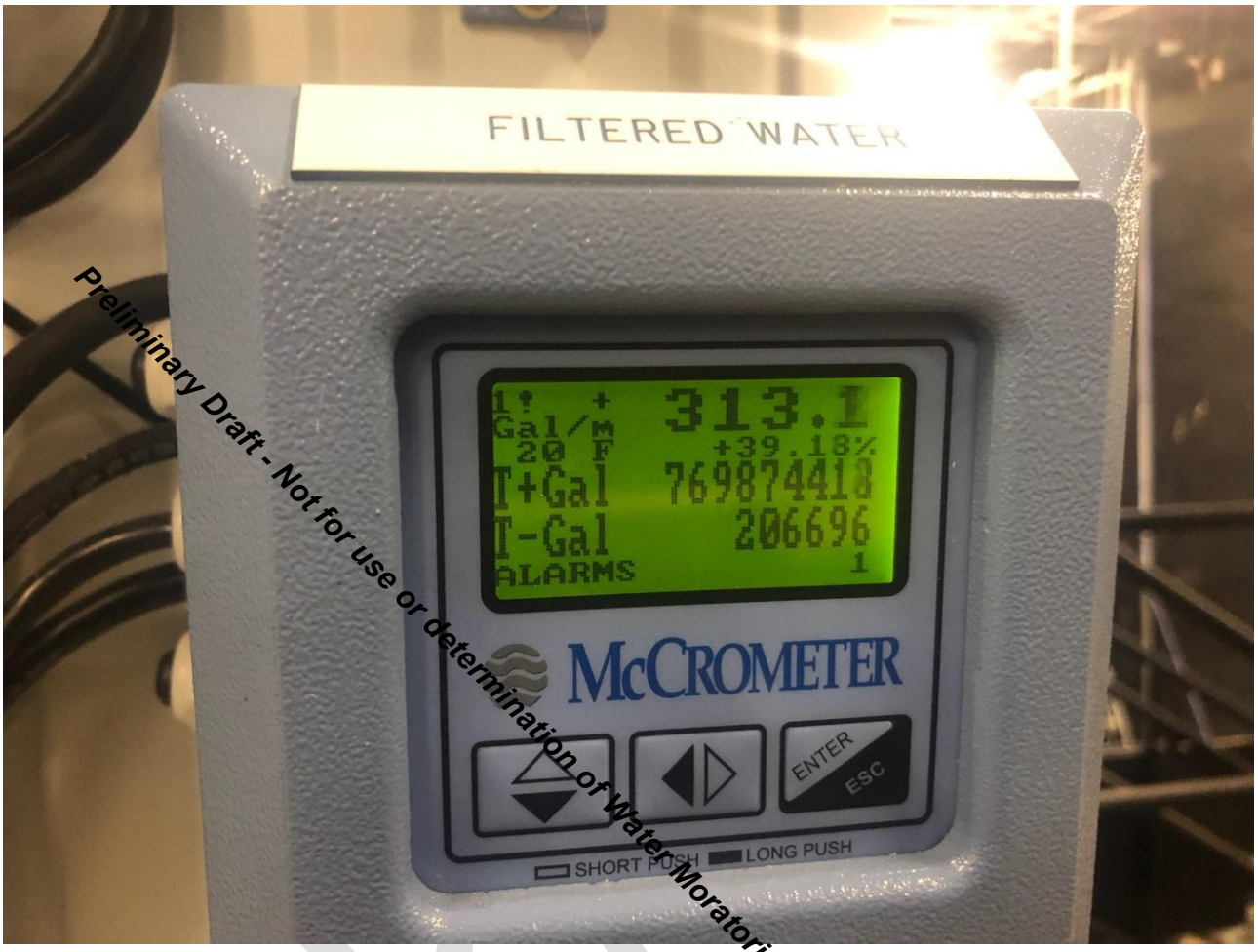


Figure 1. Upper (Lamborn) Treatment Plant - Filtered Water Meter Reading

A reported 39 percent unaccounted water warrants further investigation. Additional demand data, both monthly customer meter readings as well as monthly treated (filtered) meter readings would allow for a more detailed understanding of unaccounted for water over time. E.g., is unaccounted for water increasing or decreasing? A temporal comparison of raw water availability versus demand would also allow for identifying possible seasonal demand limitations. Understanding seasonal supply versus demand would then allow for a far more accurate evaluation of raw- and finished-water water storage needs. Furthermore, projecting future demands and evaluating community growth limitations would be best conducted with monthly data.

3.2 Future Demands

Projection of future demands presented herein are based on available data. They are hypothetical projections that do not account for historical or recent growth in the Town of Paonia or nearby communities. They also assume an average user demand over the entire water system and do not account for such variability between in-town versus out-of-town customers. Out-of-town per customer demand characteristics appear higher than those of in-town customers. In **Table 3** below, demands are projected forwards based on growth of 1, 2 and 3 percent.

Table 3. Town of Paonia Projected Future Water Demands

Future Demand Projections - gallons						
Year	Metered Demand			Water Treatment Production [1]		
	1%	2%	3%	1%	2%	3%
2018-2020 Data	96,094,958	96,094,958	96,094,958	156,810,359	156,810,359	156,810,359
2030	106,148,616	117,139,217	129,143,588	173,216,192	191,150,952	210,740,009
2040	117,254,110	142,792,052	173,558,183	191,338,438	233,011,944	283,216,950
2040 Demand in Acre-Feet	**360**	**438**	**533**	**587**	**715**	**869**

[1] Water treatment plant production projects based on single 2016-2021 meter reading, and values are not adjusted for any improvements that may reduce unaccounted for water.

3.3 Constraints on Future Growth

In Section 4 raw water supplies are detailed and compared with current demand. While raw water supplies appear adequate to satisfy current demand, available temporal data is limited, and thus seasonal limitations may exist. For example, monthly raw water inflow data to each treatment plant as well as monthly production demand data would allow for a more complete evaluation of supply versus demand. Generally, primary constraints on future growth are raw water supply and unaccounted for water. Unaccounted for water is the difference in treated water produced and customer metered water demand within the system. As presented in **Table 4** below, available data suggests unaccounted for water is between 35-40% of water treated.

Table 4. Town of Paonia Estimated Unaccounted for Water 2018-2020

Unaccounted for Water				
Year	Treated Water gallons	Customer Demand gallons	Unaccounted for Water gallons	
2018	156,810,359	97373038	59,437,321	38%
2019	156,810,359	88790059	68,020,300	43%
2020	156,810,359	102121776	54,688,583	35%

While significant efforts have been made by Paonia staff to identify leaks and replace and repair old water lines, current levels of unaccounted for water suggest improved record keeping and water accounting is needed. Additional efforts may also include a water loss analysis, which would look at everything from meter records and meter accuracy to an audit of the distribution system to more strategically identify where water loss could be occurring.

As detailed below, raw water inflow data is also currently limited, thus it is difficult to compare current raw water supplies versus hypothetical future demand. However, if unaccounted for water includes water lost via pipeline leaks, then future constraints on growth could be lessened by reducing water loss in combination with improved raw water collection. Addressing constraints on growth is likely to be an incremental process whereby efforts are measured as a return on investment. Ultimately, based on most

recently available Financial Audits, current water system financing is also a significant limit on growth. Recommendations for the Town of Paonia water system are detailed in Section 9 of this report. Implementation of recommendations will likely require significant effort relating to water system financial planning and may warrant an updated rate study that takes into consideration Town of Paonia water system improvement priorities.

4. Raw Water Supply

4.1 Water Rights

The Town of Paonia is served by a conglomerate of water rights which have been assembled over the course of almost 140 years. The source of the majority of water rights emanate from a complex network of springs or raw water pipelines at diversions located on Mt. Lamborn Mesa. Source water is collected at a variety of infiltration galleries as described in Section 4.2 below. The source of the water which comprises the majority of Paonia's water rights is generally believed to be derived from subsurface flows along the slide rock on Mt. Lamborn Mesa atop the Mancos shale. This source water generally results in a high quality, alluvial well type pre-filtered water that generally does not require much treatment. However, because of the exposure to surface contaminants the Colorado Department of Health and Environment has classified all spring sources as Groundwater Under the Direct Influence of Surface Water (GWUDI) which generally requires more advanced treatment prior to public consumption. Overall, the sources have been collected and serve an upper and lower collections and treatment system as described in Section 4.2. In December of 1994 Minion Hydrologic compiled all available water rights information for the Town of Paonia and prepared a very comprehensive summary of all available water rights in an executive type report. The below water rights summary is derived from this effort developed by Minion Hydrologic.

Overall, there are 20.82 cfs of described water rights associated with the Town of Paonia. Of these 20.82 cfs of water rights, 9.90 cfs can be confirmed as legal diversion rights to the Town of Paonia. This translates into 7,169.18 AF of total annual legal diversion rights on paper. Of the 9.90 cfs available to the Town, 4.50 cfs can be collected at the upper plant and serve the upper zone while 5.4 cfs can be collected at the lower plant and serve the lower zone. A description of the water rights available to each zone is described below:

1) Beaver Dam Ditch rights – overall the Town of Paonia has been allocated a total of 3.12 cfs through the Beaver Dam Ditch, which had historically diverted off Minnesota Creek. Of those 3.12 cfs, **0.50 cfs** are confirmed as legal diversion rights through the Beaver Cam Ditch. The actual source of these rights is known as the Lake Fork Springs which ultimately feed into the German Springs Pipeline and into the Upper Water Treatment Plant. The 0.50 cfs are considered senior through the Wade and Clarke in 1883 as described in Case 567 (P-1).

2) German Creek Springs – There are a total of 8.45 cfs available at the German Creek diversion point. Of the 8.45 cfs, **4.0 cfs** are authorized for diversion through Case No. 85CW100 and W-3188. German Creek Springs #1, #2, and #3 are covered under this case for 4.0 cfs of authorized diversion. Municipal, irrigation, and commercial uses were authorized under this case number. These springs are collected in the German Creek Springs collection box and then transferred to the Upper Water Treatment Plant via the German Creek Springs Pipeline.

3) Reynolds Spring Pipeline – this diversion point is decreed for a total of 4.50 cfs. Of the 4.5 cfs, only **1.40 cfs** is considered absolute and able to be legally diverted. Of the 0.9 cfs is decreed under Case

No. 475, which transfers irrigation rights off the Lucas Ditch. The two springs which operate under Case No. 475 are Old Original and Reynolds Creek, both of which are collected in their own structure and then discharge to the Upper Paonia Pipeline. The remaining 0.50 cfs are diverted off the Mr. Lamborn Ditch, which is comprised of Kauer Springs, Stephen Springs, and Spore Springs. These rights are decreed under Case No. 3695 as irrigation rights and are ultimately collected and transferred through the Middle Paonia Pipeline. All water collected through the Reynolds Creek Spring Pipeline are transferred to the Lower Water Treatment Plant.

4) Corral Springs – Corral Springs #1 and #2 are decreed and legalized through Case Number 4808. Approximately **1.0 cfs** is decreed through this right. These springs are diverted off Bell Creek through the water right and then diverted at the Bone Mesa Pipeline or through the Mays Sump into the Middle Paonia Pipeline. Ultimately, these flows are sent to the Lower Treatment Plant for treatment and distribution.

5) Paonia (Middle) Pipeline – A total of **1.0 cfs** is available through the Paonia Pipeline diversion off Bell Creek through Court Case 2574. Court Case 80CW81 added municipal use to the original irrigation right. From the right, 0.5 cfs is available through Mays Spring and another 0.5 available through the Pole Patch Spring. Both of these springs are collected at the Mays Spring diversion. However, only 75% of the total flow at the Mays Spring Box (up to 1.0 cfs) can be diverted between the months of April 1 to November 1. From November 1 to April 1 (essentially winter and spring) 100% of the flow at the Mays Spring box must be diverted to Bone Mesa Water District. These flows from the Mays Spring Collection box that go to Paonia are transferred into the Middle Paonia Pipeline and then transferred to the Lower Water Treatment Plant.

6) Gelwick Springs – **1.85 cfs** are legally decreed through Court Case No. 5625 to be diverted off McDonald Creek via the Gelwick Springs Pipeline. The legal source for this right are Gelwick Springs No. 1, No. 2, and No. 3. Two of these sources spill directly into the Gelwick Springs Pipeline while the third spills into Todd Reservoir. The Gelwick Springs Pipeline feeds into the Middle Paonia Pipeline, which ultimately transfers water to the Lower Treatment Plant.

7) Todd Springs – Case No. 83CW161 legally decrees approximately **0.15 cfs** from the Todd Springs. These springs essentially feed into Todd Reservoir, which is allocated 24.55 AF of storage through Case No. 1424. The spring rights are currently decreed for storage and irrigation, though the springs have not yet technically been developed at this point. Once developed, these springs will ultimately feed into the Middle Paonia Pipeline and to the Lower Water Treatment Plant.

A schematic representing the legal water rights, diversion points, water sources, points of collection, transmission lines, and amount of each right was prepared by W.W. Wheeler and Associates. This schematic is included in ***Appendix D.*** The schematic depicts the total legal diversion right of 9.90 cfs out of the available 20.82 cfs water rights described in the Minion Hydrologic Report. Ultimately, the legal right to divert 9.90 cfs from the portfolio of water rights was derived from the 2004 Feasibility Report from W.W. Wheeler and associated Water System Schematic. Reasons for the lesser legal amount of water available for diversion may come from the recommendations section of the Minion Hydrologic Water Rights Analysis Report. A summary of these recommendations is included below:

1) The Town needs to clarify ownership amounts, associated priorities for water rights diverted in the Beaver Dam Ditch. From the W.W. Wheeler report it appears that the ownership amounts associated with Case Number 567 (P-1) through the Clark & Wade Ditch (Case Number W-3216).

2) Water rights associated with the Beaver Dam Ditch and Todd Reservoir Rights should be changed to include municipal, commercial, domestic, and augmentation uses. The information that JDS has now does not stipulate whether the uses at the Lake Fork Spring includes these other uses. However, though it appears that the water rights associated with the Todd Reservoir Springs does authorize legal diversion of this right the collection of these springs has not yet been developed.

3) It is unclear whether the municipal use for the Reynolds Spring Pipeline is a year-round right, or only for use during the typical irrigation season.

4) There may be location errors associated with some of the water rights described above. Overall, a location of a decreed water right needs to be within 200 feet of the actual location of the water source to be considered valid. The Minion Hydrologic report identified at least a couple of springs under the Reynolds Spring Water right which may need to be verified, but JDS-Hydro does not know if this impacts some of the non-legal rights associated with the Reynolds right.

5) Based on Minion's review of the decrees and the USGS Paonia Quadrangle it appears there are diversions of technically unadjudicated water resources into the Town's distribution system. This question may ultimately be the reason why so many other water rights are not considered to be "legal diversions", especially when considering that some of the diversions researched in the analysis appear to be diversions of other unadjudicated sources tied decreed to associated Paonia diversion points.

6) Verification of the potential availability of the 2.25 cfs priority 1 water right decreed to the Meyer & Orth Ditch. This right is associated with German and Creek Springs and would be a reason why only 4.0 cfs of the potential 8.45 cfs is legally available for diversion.

7) Transfer to the Town of the first 0.25 cfs of the 0.75 cfs priority A-85 decreed to the Mt. Lambert Ditch in Case 617 should be clarified in the SEO water rights tabulation (Under the Reynolds Spring Pipeline section – Case 3695).

Overall, the water rights and raw water system currently employed by the Town of Paonia should be considered one of the most complex systems within Colorado Water District 40 (i.e., North Fork of the Gunnison). A description of the associated raw water collection system is provided below.

4.2 Existing Raw Water System

4.2.1 Description of Springs

To collect all of the Town's water rights off of Mt. Lamborn Paonia has developed an elaborate raw water collection system, essentially dividing the collections system (and subsequently the distribution system) into two separate galleries. These facilities have grown and morphed into what they are now and have been assembled according to their ability to provide water supply and pressures to serve two distinct parts of the town. As mentioned above the distribution system is essentially split up into an Upper and Lower collections, treatment, and distribution system.

The following raw water sources serve the Upper Treatment Plant:

- Lake Fork Springs (Beaver Dam Ditch) @ 0.5 cfs and German Springs #1, #2, and #3 @ 4.5 cfs. These springs are collected at the German Springs Collection Box and then transferred to the Upper Plant via the 8" German Springs Pipeline. Overflows from the Lake Fork Springs are captured in Roeber Reservoir while spills from the German Creek Springs are lost to German Creek. Overflows from the German Creek Springs Collection Box and Pipeline can be collected in the North Ditch and ultimately into Roeber Reservoir.

The following raw water sources serve the Lower Treatment Plant:

- Old Original Spring and Reynolds Creek Spring @ 0.9 cfs. Old Original Spring is collected in its original infiltration gallery while Reynolds Creek Spring is collected via pipeline upstream of its measuring point. Ultimately both springs feed into the 5" Upper Paonia Pipeline and serve the lower treatment facility, though they could be sent to either water treatment facility. Spills from these structures would ultimately flow into Roeber Reservoir via the North Ditch. ***Note:*** *this source may be diverted to serve the Upper Water Treatment Plant and thus is able to serve both treatment plants*
- Spore, Kauer, and Stephens Springs @ 0.50 cfs. These springs essentially are piped into the 6" Middle Paonia Pipeline and piped down into the lower water treatment plant. Spore spring can be directed to the Reynold's Gallery for collection through the Middle Paonia Pipeline.
- Corral Springs #1 and #2 @1.00 cfs is collected and piped to the lower collection box at Mays Sump where it is measured and then transferred to the 6" Middle Paonia Pipeline. Corral Springs #1 and #2 can also be directed to the Bone Mesa Water District at the Mays Splitter box if desired. Spills from the Mays Sump flow natural into the Bell Drainage and are currently lost. However, spills could be piped over to Roeber Reservoir.
- Pole Patch Springs and Mays Springs @ 1.00 cfs. These springs are first collected at the Mays Splitter Box where they can be directed to either Bone Mesa Water District or the Town of Paonia. From the Mays splitter box these flows are sent to the lower collection box at the Mays sump where they are measured and then sent to the lower treatment plant through the 6" Middle Paonia Pipeline. As mentioned above spills from the Mays sump flow naturally into the Bell Drainage and are currently lost.
- Gelwick Springs and Clark Springs @ 1.85 cfs. The Gelwick Springs are the furthest south springs located on Mt. Lambert and are piped over to the upper collection box at the Mays Sump through a 4" pipeline (also known as the Gelwick Box). Gelwick flows are combined with Clark Springs #1 and #2 flows at the upper collection box, measured at the Gelwick flume, and then transferred to the lower water treatment plant through the 6" Middle Paonia Pipeline.

A schematic map of these spring locations can be found in ***Appendix F.***

4.2.2 Description of Raw Water Facilities

The following section describes the existing raw water facilities which the Town of Paonia currently employs to collect, transfer, and store raw water.

Collection Boxes

- Lake Fork / Beaver Dam Infiltration Gallery: this facility is essentially a buried manhole with open bottom to allow spring water to flow into a manhole, then collect in a pipe and flow to its Parshall flume measuring location. The structure is in relatively good condition and does not appear to be in disrepair. The structure is responsible for collecting and transferring water from the Lake Fork Spring down to the German Springs Collection Box.
- German Creek Collection Box: this structure is the newest of the collection boxes for the springs located on Mt. Lamborn. It is responsible for collecting flows from the three German Creek Springs as well as the Lake Fork springs described above. The structure is comprised of a cast-in-place collection box, aluminum grating, splitter box, and associated gates. The collection box is in very good condition and located just uphill from the upper water treatment plant.
- Old Original Collections Box: this structure is one of the first collections boxes located on Mt. Lambert serving the Town of Paonia. The box is responsible for collecting water from the Old Original Spring from the Reynolds Creek Diversion. The structure essentially manifolds water from a variety of 4" collection pipelines and then passes flows on for measurement. Overall, the structure is very old comprised of a concrete foundation with tin roof. The structure is roughly 15'x15' and given its service life is in relatively good condition.
- Spore / Reynolds Galleries 2-7 collection point: this location is more of a central measuring point where these galleries are piped together and then fed through a Parshall flume. Some improvement is recommended at this location to ensure that all flows are measured through the flume.
- Mays Spring splitter box – this structure is responsible for splitting flow from the Mays Spring to either Bone Mesa Water District or the Town of Paonia. This is a relatively new structure where flows can be split to either entity according to the water right and time of year. The structure is comprised of three manholes and a solar panel responsible for powering the recording unit so that real time flows to the two entities can be measured. Flows from the Mays Spring splitter box then flow to the Mays sump for collection with other springs and measurement.
- Mays collection box (lower collection box) – this structure is responsible for collection and measurement of flows from Corrall Springs, Mays Springs, and Pole Patch Springs. The structure, again, is old and similar in condition to the Old Original Spring box. The structure is made of cast-in-place concrete with tin roof. The chute out to the Parshall flume is not in the best condition, but serviceable. The box could be in use of replacement at some point in the future, but probably is OK for now.
- Gelwick collection box (upper collection box) – this structure is responsible for collection of flows from the Gelwick Springs and Clark Springs. The structure is similar in age and build to Old Original and Mays collection boxes. As with other collection facilities, this structure could very well use some work but is in serviceable condition for the time being. The Mays collection box and Gelwick collection box share the same flume, which is read monthly by the Colorado Division of Water Resources District 40 office.

Pipelines

- **Lake Fork Springs Pipe:** approximately 10,700 LF of 10" Steel Pipe carrying spring flows from Lake Fork Springs to the German Creek Springs collection box.

- **Upper Water Treatment Plant Pipe:** approximately 7,150 LF of 8" transmission line from the German Creek Springs collection box to the 2 MG tank and upper treatment plant. Another 13,000 LF of 8" line can carry water from the 2 MG tank and upper treatment plant to the 1 MG concrete tank and lower treatment plant.
- **Roeber Reservoir Line:** approximately 11,060 LF of 6" steel line carries overflow water from the German Creek Springs collection box to Roeber Reservoir.
- **Upper Paonia Pipeline:** approximately 20,000 LF of 5" steel pipeline carries flows from Old Original and Reynolds #1 to the 0.5 MG tank as part of the lower distribution system. There is a lateral off this line that takes water to the 1 MG storage tank and lower water treatment plant.
- **Middle Paonia Pipeline:** approximately 18,300 LF of 6" steel pipe carries raw water from the Mays collection box and Gelwick collection box to the Lower Water Treatment Plant.
- **Gelwick Springs Pipeline:** approximately 10,200 LF of 4" steel pipeline brings spring flows from the Gelwick springs to the collection box.

Reservoirs

- **Todd Reservoir:** Todd Reservoir was purchased by the Town of Paonia in 1992, along with its associated springs as described above in Section 4.2. The storage right associated with Todd Reservoir is 400 AF, though that structure probably holds less than that volume. In 1994, the Town of Paonia attempted to fill the reservoir using diverted water from Gelwick Springs. According to reports, the reservoir never filled above 20' in depth, and even dropped 8' over the winter of 1994 to 1995, even though one of the Gelwick Springs was still flowing into the reservoir. Overall, the opinion is that Todd Reservoir needs to be lined to provide sufficient storage and use to store raw water for Todd Springs and Gelwick Springs.
- **Roeber (Reynolds) Reservoir:** Roeber Reservoir is not owned by the Town of Paonia but has been used on occasion for overflow storage or for purchase of water from the Roeber Family. The Roeber Family owns and operates the reservoir and is situated almost exclusively on their property. The reservoir holds approximately 100 AF and is situated centrally to most raw water facilities described above. If Paonia were to utilize the reservoir it may have to expand its capacity and increase its storage. Over the past 20-25 years the Town of Paonia has considered either expanding or leasing storage in Roeber Reservoir to store overflow water from its springs. However, nothing substantial has occurred with the reservoir over the past 20-25 years in regards to sharing storage with Paonia.
- **Lone Cabin Reservoir:** Lone Cabin Reservoir is also not owned by the Town of Paonia, but discussions with the Lone Cabin Reservoir stakeholders have occurred over the years. Between 1995 to 2002 there were substantial investigations into increasing storage at Lone Cabin Reservoir. Currently, the storage at Lone Cabin Reservoir stands at around 160 AF and is classified as a small Class III reservoir and is generally filled by spring runoff from the watershed above the reservoir. Lone Cabin also serves as a major stockholder to the Beaver Reservoir. There have been evaluations recommending increasing the storage of Lone Cabin Reservoir to capture an additional 171 AF to 690 AF while capturing spills from the upper end of the raw water collection system (i.e., Lake Fork and German Creek Springs). However, the Town of Paonia does not use this structure for any raw water storage currently.

- **Other reservoirs:** there are other reservoirs in and around the Mt. Lamborn drainage basin that have been considered for use by the Town of Paonia. However, these reservoirs are either two far away, would need to be constructed, or are not feasible for any further consideration. These reservoirs include Beaver Reservoir, Little Roeber Reservoir, Inter-Ocean Reservoir, and Stephens Spring Reservoir.

A schematic rendering of these raw water facility locations can be found in ***Appendix E***.

4.3 Monitoring Program for Raw Water Sources

Currently, Colorado Water District 40 records monthly flows from the following structures:

- German Creek Springs Collections box (German Creek Springs and Lake Fork Springs under Case W3188 and later 85CW0100) – Mr. Luke Reschke has mentioned that the German Creek Springs rights have been covered in an augmentation plan approved under case W2693.
- Paonia Pipeline (Gelwick / Clark Springs / Pole Patch / Corral Springs 1 & 2 / Mays Springs / T&M Springs) – all of these springs are measured together at the Paonia Pipeline / Gelwick measuring box. However, the majority of the flows measured at this box come from the Gelwick Springs. Mr. Reschke noted that he has not seen Paonia take any water from the Mays diversion sump in his time as water commissioner, so the vast majority of this water does come from the Gelwick source.
- Reynolds Spring Pipeline (Old Original) Collection Box – not much flow is measured out of this structure which collects flows decreed in case CA0475 and is described as the head of Lucas Creek. This structure does collect from multiple springs upstream of the collection box and has the capability to flow directly down into Roeber Reservoir.
- Reynolds Spring (Upper Reynolds / Spore Springs) Monitoring Flume – decreed in case CA3695 and is described as the Reynolds Creek Spring. This structure can flow around the flume and ultimately flow into Roeber Reservoir, if necessary.

Mr. Reschke acquires readings from these measuring points monthly and tabulates them. Generally, these four points capture most of the flows from the raw water system but cannot distinguish between actual sources. The following locations are points where Mr. Reschke has observed flows but cannot measure them accurately.

- Spor Springs Pipeline – this location does not specifically have a decree associated with this collection point. But the springs do dump back into a tributary of Reynolds Creek, specifically at the same Spor Springs monitoring flume site mentioned above. Measurement of Spor Springs Pipeline separately from Reynolds Creek may be possible.
- Pole Patch Springs - decreed in cases CA2574 and 80CW0081, Pole Patch ultimately dumps into the Mays Spring collection box and is measured with the other springs at the Gelwick monitoring flume. Multiple springs are collected in this pipe and Mr. Reschke has talked with Travis about monitoring this point a bit more efficiently. This is another collection point that should have its flows monitored independently of the Gelwick / Mays sump collection area.

In addition to these measuring points the Paonia Raw Water system also features monitoring capabilities at the following locations:

- Lake Fork Springs Parshall Flume: is not read by the DWR and does not have real time monitoring, but can be read manually
- Metered Lake Fork Springs Flows to Roeber Reservoir, if necessary
- Metered or Parshall Flume spill flows to German Creek for German Creek Springs and German Creek collection box
- Metered spill from Upper Paonia Pipeline for Old Original Spring Box and Reynolds Creek Springs (including Spor Springs)
- Parshall flume from the Mays sump to measure spills for Carrol Springs, Pole Patch Springs, and Mays Springs.
- Spills from Lower Water Treatment Facility
- Calculate spills from Upper Water Treatment Facility

In discussions with Luke Reschke, District 40 Water Commissioner for the North Fork of the Gunnison, he would prefer to see some sort of monitoring device on each spring source, if possible. In addition, providing additional monitoring devices to track spills if possible, would be recommended as well. The following locations should be equipped with some sort of Parshall flume or weir to measure concentrated flows, if possible:

- Spor Springs Pipeline
- Pole Patch Springs Pipeline
- Kauer Springs
- Stephen Springs
- Corral Springs #1 and #2
- Mays Springs from Splitter Box (this may be possible with the current flow split at the sump)
- Clark Springs
- Spills from Clark Springs
- Spills from Gelwick Springs
- Spills from Lake Fork Springs
- Spills from Old Original Springs, Upper Reynolds Springs, and Spor Springs

More than likely a network of Parshall style flumes will be needed to measure flows from each of these locations. Many of these multiple spring locations have been manifolded into one collection point (i.e. Upper Reynolds Creek Springs 1-7). Because the majority of these springs are networked into the Upper Reynolds / Spor Springs measuring point just measuring the Spor Springs separately would probably suffice since Upper Reynolds springs is administered under one right. Ultimately, the network of flumes would need to be coordinated with the District 40 Water Commissioner. It is assumed that each of the flumes

would ultimately need to be equipped with at least a data recorder to record flow data at some point in the future. However, for now a simple flume similar to those currently employed would probably suffice.

Being able to monitor overflow spills from these spring monitoring points would also be necessary, especially if the intent in the future would be to capture these spills in one of the proposed raw water storage reservoirs below. Monitoring overflow spills could be very difficult but will probably be necessary. A more thorough site visit with Luke Reshke and Travis in the future to assess might need to be conducted to gauge the final location and types of these flumes. For a schematic rendering of these proposed new monitoring points please see ***Appendix G***.

4.4 Overall Water Supply Versus Demand Evaluation

JDS-Hydro Consultants was provided the following information to develop supply vs. demand characteristics for the raw water system and distribution system:

1) Monthly spring collection data between the years of 2015 through 2019 by Luke Reschke, Colorado District 40 Water Commissioner:

   German Creek Springs Collection Box (German Springs and Lake Fork Springs)
   Middle Paonia Pipeline from Gerwick Springs and Mays Springs Collection Boxes
   Reynolds Springs Pipeline (Old Original Springs and Reynolds Springs #1)
   Reynolds Springs Collection Box (Upper Reynolds Springs and Spor Springs)

   Annual Spring Production from this information is summarized below:

   - 2015 – 802.94 AF
   - 2016 – 1098.89 AF
   - 2017 – 1343.92 AF
   - 2018 – 1093.25 AF
   - 2019 – 758.36 AF (through October 2019)

2) Annual Metered demands for all distribution users (including residential in-town and out-of-town and then commercial in-town and out-of-town) for 2016 through 2020. This information was provided by the Town of Paonia but was not available on a monthly basis. Annual demand data is summarized below:

   - 2016 – 101.015 MG (310.01 AF)
   - 2017 – 86,001 MG (263.93 AF)
   - 2018 – 97.373 MG (298.83 AF)
   - 2019 – 88.790 MG (272.49 AF)
   - 2020 – 102.121 MG (313.40 AF)

3) The Town of Paonia water operations estimate that the water plant produces roughly 157 MG per year.

4) Supply and Demand Information for 1999 and 2000 from the Final Feasibility Report for Improving the Water Supply System of the Town of Paonia, 2004 edition. Supply and Demand Information was available over a monthly basis from this report and is summarized below:

1999 – in Million Gallons

Month	Demand	Inflow	Outflow	Spilled
January	6.6	13.4	10.4	3.0
February	9.7	12.1	9.7	2.4
March	9.3	14.9	12.0	2.8
April	9.3	21.1	12.1	9.0
May	13.4	34.5	13.9	20.6
June	16.6	38.1	20.0	18.1
July	12.1	29.5	20.9	8.7
August	12.8	30.2	20.3	10.0
September	12.5	25.2	16.3	8.9
October	10.4	21.0	13.9	7.2
November	10.3	16.6	11.0	5.6
December	8.5	15.0	10.5	4.6
TOTAL	131.5	272.8	171.0	100.9

2000 – in Million Gallons

Month	Demand	Inflow	Outflow	Spilled
January	6.9	14.8	9.9	4.9
February	7.0	13.7	11.4	2.3
March	11.0	13.1	10.3	2.8
April	9.7	24.8	14.3	10.5
May	15.7	33.1	22.4	10.7
June	19.8	28.8	24.9	3.8
July	20.9	29.0	24.2	4.8
August	19.2	25.7	20.9	4.8
September	13.7	22.5	15.0	7.5
October	10.9	27.8	13.1	14.6
November	9.0	22.1	13.9	8.2
December	7.0	20.3	16.3	4.0
TOTAL	150.7	276.7	196.6	78.9

Because finished water production from both wells was limited JDS-Hydro has resolved to prepare a Drinking Water Supply vs. Demand Evaluation using the following information.

1) Extrapolating demand vs. supply data from the W.W. Wheeler Report to estimate production data from the 2016 – 2019 Town of Paonia information. Because the W. W. Wheeler report had access to reputable supply and demand data some relationships can be derived from this report. These relationships include the following:

- Demand vs. supply – on average, in the 1999 to 2000 data referenced by W.W. Wheeler in the 2005 Feasibility Study, demand lagged supply by an average of 22.92% over the 2-year evaluation period. In fact, the standard deviation between the two years was very small, so the confidence in this relationship can be considered fairly high.
- WTP Inflow vs. WTP Outflow (Production) – while the relationship in the efficiency of the water plant production vs. spring inflow was not as consistent between the two years, it was still considered close enough between the two years to develop a standard percentage. These spills are generally the result of backwash losses or overflows from too much spring water coming into the facility. In 1999 the percent lost between inflow to production of the two water treatment plants was 37.32%. In 2000, that relationship was 28.95%. The average between these two years is 33.13%. This percent will be used to "back" into the overall WTP inflow from the estimated production values described above.

2) Inflow spring data – the spring data provided by Colorado Division of Water Resources District 40 is considered reliable at this point. However, there is no real way to determine spills after the measurement of spring flows at the respective Parshall flume locations described in Section 4.3. By using the estimated inflow data derived in the manner described above an estimated annual spill volume from the springs to the plant can be estimated.

3) Estimated production data – the Town of Paonia has estimated a rough overall annual production volume of 157 MG (460.33 AF). While this volume does appear to be plausible to meet recent demands it is well below the production numbers of 1999 – 2000. In this case, JDS-Hydro will prepare annual comparisons for 2016 – 2019 using both the 1999 – 2000 relationships to derive the estimated production and then the estimated production of 150 MG / year as described above.

It is hoped that more representative information will become available after the development of this draft report. However, in the meantime, the above-described assumptions should be able to yield some helpful information to determine the volumes of spills produced from the springs. Also, because monthly information was not available from the majority of information obtained above, only annual information will be analyzed. This, unfortunately, will not be able pinpoint seasonal fluctuations in raw water spillage, which might assist in the sizing and evaluation of raw water equalizing storage alternatives in later sections.

The **Table 5** represents the annual water supply vs. production between the years 2016 – 2019 as described above.

Table 5. Demand versus Supply Analysis, 2016-2019

	2016		2017		2018		2019	
	Paonia Data	150 MG	Paonia Data	150 MG	Paonia Data	150 MG	Paonia Data	150 MG
Spring Data	1098.89	1098.89	1343.92	1343.92	1093.25	1093.25	758.36	758.36
WTP Inflow	601.50	688.40	512.05	688.40	579.52	688.40	528.60	688.40
Spring-Inf (Spring Spill)	**497.39**	**410.49**	**831.87**	**655.52**	**513.73**	**404.85**	**229.76**	**69.96**
WTP Outflow	402.20	460.33	342.42	460.33	387.50	460.33	353.50	460.33
Inf-Out Diff (WTP Spill)	199.30	228.07	169.63	228.07	192.02	228.07	175.10	228.07
% Diff	33.13%	33.13%	33.13%	33.13%	33.13%	33.13%	33.13%	33.13%

Demand	310.01	310.01	263.93	263.93	298.83	298.83	272.49	272.49
Out-Demand Diff	92.19	150.33	78.49	196.41	88.67	161.51	81.01	187.85
% Diff	22.92%	32.66%	22.92%	42.67%	22.88%	35.08%	22.92%	40.81%

From **Table 5** listed above an estimated range of 229 AF to over 800 AF of raw water is spilled from the springs. When the majority of these spills occur is not known due to a lack of seasonal production data. However, in **Figure 2** below the maximum spring production months are shown. It can be assumed that due to the relatively flat demand depicted in the W.W Wheeler report and estimated 2016 -2019 demand data that the fluctuations in spring production shown in **Figure 2** show much higher spring production, and conversely higher spillage from the springs over the spring runoff months of May – August.

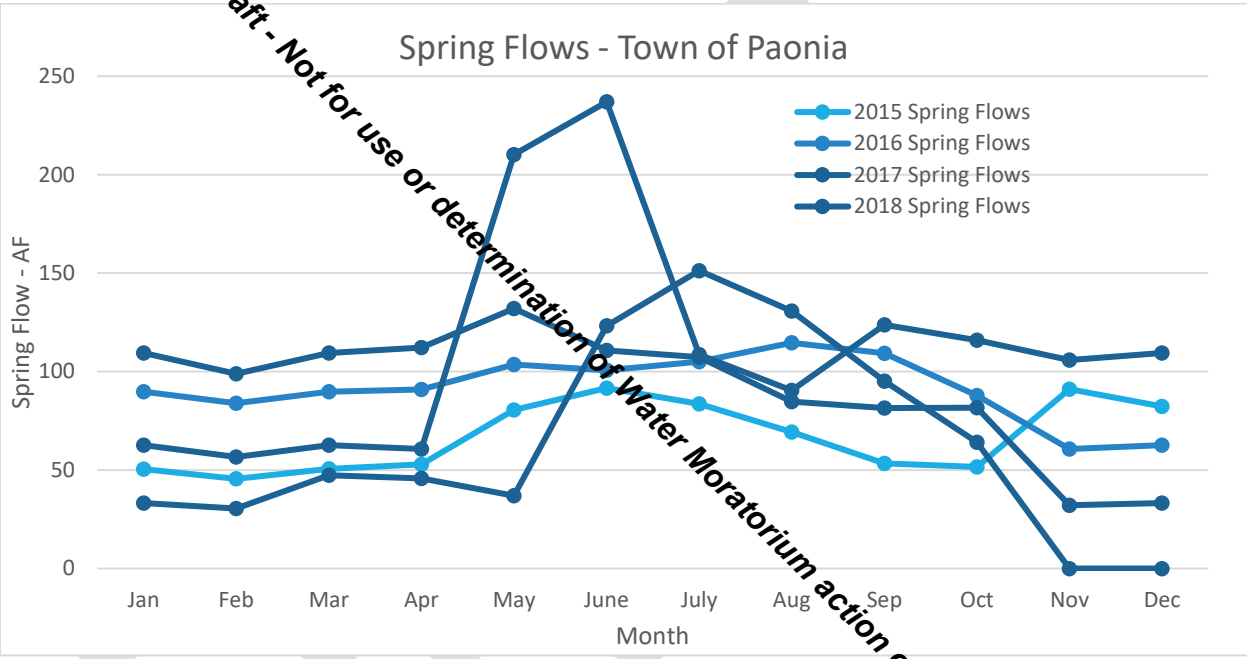


Figure 2. Town of Paonia Spring Flows, 2016 - 2019

Because of the amount of potential raw water available over the spring and summer months which spills because of lower demands vs. high spring inflows, having some type of raw water storage or means to maximize the raw water collection system would benefit the Town of Paonia. The next section investigates some potential raw water maximization alternatives which the Town may want to consider.

4.5 Assessment of Alternatives for Raw Water Storage

As described above in Section 4.1 the Town of Paonia has an estimated 20.82 cfs in decreed water rights and 9.90 cfs of legally divertible water rights. Though the 9.90 cfs in legal water rights may appear as deficient vs. the decreed total, the 9.90 cfs of water rights per year translates into 7,169 AF of legally divertible water per year. This annual volume is more than almost any potential growth or expansion of demand within the Town of Paonia now or in the future. The challenge is not having enough water on paper available in the Town of Paonia portfolio, but monitoring, capturing, and holding the water year-round to make it available to its constituents. While other sources such as wells and surface water tend to be available year-round, springs tend to be more sensitive to drought conditions due to their strict dependence upon snow fall and runoff season. A case could be made for surface water rights contained in creeks, streams,

and rivers, but these water features tend to be located at concentration points fed by many springs or laterals and may be less susceptible to seasonal fluctuations in runoff than springs. Because of this phenomenon JDS would encourage the Town of Paonia to focus on the following raw water optimization techniques as it looks to capitalize on its unique raw water sources. These optimization considerations would include:

1) Accurate monitoring of raw water inflows and raw water spillage
2) Maximize ability to capture raw water from springs more efficiently
3) Ability to transfer raw water from one water plant to the other
4) Ability to store excess raw water flows during high runoff / low demand seasons.

These alternatives are further described below:

4.5.1. Accurate monitoring of raw water inflows and raw water spillage –

as evidenced in the supply vs. demand evaluation in Section 4.4, the accurate monitoring of raw water inflows to the water treatment plant and raw water spillage is important to gauge not only available raw water year-in and year-out, but to also estimate potential spills that may be available for equalizing storage. Section 4.3 provides a description of potential additions to the overall raw water monitoring program. JDS has proposed adding numerous monitoring flumes to the spill sides of currently unmeasured spill locations or spring locations. Overall, JDS has proposed adding eleven (11) new spill metering locations and six (6) new Parshall flume locations. At this point JDS has not visited all of the proposed spill monitoring and spring monitoring locations. However, it is assumed that Parshall flumes would be used to monitor all additional spring locations while simple V-Notch weirs secured in the ground could capture centralized spring spill flows. Either DWR District 40 or Paonia staff would need to take monthly readings of the flumes and V-Notch weirs. Because neither of these devices are proposed to provide constant measurement provisions (unless requested by DWR District 40) constant monitoring of these devices is proposed, which could prove to be cumbersome and difficult. However, to the degree that Paonia would like to monitor its raw water and spill potential, that is the effort in which Paonia will need to put into this monitoring effort.

An estimate of each type of monitoring effort is provided below:

Parshall Flumes - $7,500 installed @ $45,000 TOTAL
V-Notch Weirs - $ 500 installed @ $ 5,500 TOTAL

4.5.2. Maximize ability to capture raw water from springs more efficiently

This is a difficult alternative to quantify since each spring location is so unique. JDS-Hydro has not had the opportunity to view all of the spring locations, but has seen some of them such as Mays, Reynolds, Spor, Lake Fork, and German Springs. Some of these locations have been improved to capture springs flows more efficiently (i.e. German Springs collection box) while others certainly have been identified as locations which could stand to implement more stringent improvements. These locations would include the following:

- Reynolds Springs / Spore Springs Collections area: this area features quite a bit of water simply spilled on the ground and then collected through an existing Parshall flume into the Upper Paonia Pipeline. A widened rip rap lined collection basin would be recommended at this location.
- Because of the function of the structure, it is not recommended that Old Original, Mays Sump, or the Gellwick sump be replaced. This is because these structures serve more as a collection location than an actual infiltration gallery.

- Spring infiltration galleries: overall, there are 32 active infiltration galleries and 37 decreed infiltration galleries and sources. Much of the overflow and spills occur at the infiltration galleries. The ability to capture raw water rather than spill the raw water lies at these infiltration / well points. For the most part, these infiltration galleries appear to resemble the structure at Lake Fork Springs. These types of structures do not have much in the way of equalizing storage should flows increase during spring runoff so providing larger infiltration gallery manholes or vaults should be considered. While this may be expensive for 32 infiltration galleries, an evaluation of the most suspect vaults should be conducted by the Town of Paonia.
- Repair of broken spring collection pipes. Currently, the number of pipes which may have become frozen or continually leak is not known. However, given the fact that most of these collection lines run on the surface or have shallow bury depths the Town of Paonia is recommended to conduct an inventory of the potentially leaky collection pipes and allocate a certain amount of money per year to repair these lines.

An estimate of the proposed alternatives is provided below:

▪	Reynolds Springs Collection Area:	Installed	=	$ 50,000
▪	Infiltration gallery improvement:	Installed	=	$ 25,000 each
		Total	**=**	**$ 800,000**
▪	Repair of broken collection pipes:	Per Year	=	$ 50,000 annually

4.5.3. Ability to transfer raw water from the upper plant to the lower plant (and vice versa):

Currently, only the raw water collected from the Old Original Gallery and Reynolds Creek Springs can be transferred to either the upper water treatment plant or lower water treatment plant. If the Town of Paonia had the ability to transfer more water from location from the other, it might afford the ability to circumvent shortages at either of the water treatment plants. This particular alternative does not include each facility's ability to discharge to one of the storage reservoirs (i.e., Spore / Reynolds and Pole Patch overflow line). However, the following raw water spring locations may be able to be redirected from its current water plant destination to a new destination:

- German Creek Springs / Lake Fork Springs: currently these springs are directed towards the upper water treatment plant. However, it appears that it may be possible to also direct flow from these springs and send them as source water to the lower water treatment plant. Currently, it appears that finished water from the upper water treatment plant may be directed down to the lower 1 MG tank by constructing approximately 12,360 LF of 8" pipe (similar in size to the German Creek Springs pipe carrying water from the German Springs Collection Box to the upper water treatment plant).
- It may also be possible to route the Pole Patch / Spore Springs and Upper Reynolds Springs to the Upper Water Treatment Plant. As mentioned above, one of Paonia's current projects is to route joint overflow line from Upper Reynolds Springs / Pole Patch Springs / Spore Springs down to Roeber Reservoir. However, it may also be possible route these springs over to the Upper Water Treatment Plant by constructing approximately 15,150 LF of 6" gravity water line from the springs collection point into the Upper Water Treatment Plant.

The remaining springs to the west of the Pole Patch / Upper Reynolds / Spore Springs location do not appear to be able to be routed by gravity to the Upper Water Treatment Facility and would only be able to be routed to the Lower Water Treatment Facility. Estimates for the two proposed alternatives are presented below:

German Creek Springs / Lake Fork Springs raw water line to Lower WTP = $ 1,515,600
Pole Patch / Upper Reynolds / Spore Springs raw water line to Upper WTP = $ 1,818,000

4.5.4. Raw Water Storage Alternatives

Since 1995 the Town of Paonia has commissioned at least three feasibility studies to investigate potential raw water equalizing storage alternatives to store raw water spills. Most of these alternatives involve storing water in existing or modified reservoirs which already exist on the face of Mt. Lamborn below the existing springs. JDS-Hydro has reviewed and evaluated the following reports which contained information on the most feasible raw water storage alternatives. For the most part, these alternatives included the following:

- Filling Todd Reservoir (owned by the Town of Paonia) with overflow water from Todd Springs and Gelwick Springs.
- Increase storage at Lone Cabin Reservoir (owned by Lone Cabin Water Company) to store overflow water from Lake Fork Springs and German Creek Springs.
- Develop an agreement with the Roeber Family to store overflow water from a multitude of springs in existing Roeber Reservoir. This alternative may involve some sort of expansion at the reservoir.
- Develop one to two raw water buried or ground storage tanks.

There have been other potential raw water storage or raw water acquisitions evaluated in previous reports. However, the majority of these alternatives have either proved to be too expensive, not feasible, too difficult to construct or implement, or simply not viable. A list of these other alternatives which JDS has not elected to evaluate are as follows:

- Do nothing
- Development of Town owned sites into raw water storage structures such as Stephen's Springs Dam Site or Mays Spring Dam site
- Development of Little Roeber Reservoir
- Development of Corral Springs Reservoir
- Purchase of stock / storage in Beaver Dam
- Water exchange at Overland Reservoir
- Purchasing additional water rights through ranch lands
- Drilling more reliable groundwater sources such as wells

From the supply vs. demand elevation, it appears that overall annual spill volumes from ALL springs can range anywhere from just over 200 AF per year to as much as 800 AF per year. Because of the lack of spill data available it is difficult to estimate exactly when this spill overage can occur. But in talking with Town of Paonia Public Works and from typical seasonal patterns it is assumed that the spills occur during higher flow seasons. When looking at **Figure 2** it appears that this would occur between the months of May to August. While it is not feasible to collect spill volumes as high at 800 AF/year, it may be beneficial to collect volumes in the 100 AF/year range. Since demands currently are ranging in the 300 AF/year vicinity having 50 AF/year to 100 AF/year of equalizing spill storage would probably be more than enough to meet any potential raw water shortages at current demands. If 100 AF of equalizing storage were available into the future that would probably meet any future demands as well, at least for the foreseeable future.

4.5.4.1. Todd Reservoir

The Town of Paonia currently owns Todd Reservoir, which is located in the northwest corner of Section 4, T155, R19W on Us Forest Service Land. The reservoir has a storage right of 400 AF, though probably is not capable of holding that much water. The estimated volume of Todd Reservoir from the 1995 Consolidated Consulting Service report estimated that the reservoir could hold roughly 110 AF at its current emergency spillway elevation. The dam is currently rated as a Minor, Low Hazard (formerly Class III) dam with a jurisdictional height of 28 feet. With the reservoir's emergency overflow spillway height of 28', this roughly translates into maximum current storage of 110 AF. However, the high-water mark of the reservoir the dam crest translates into a storage volume of 244.70 AF. It is unlikely that the reservoir could ever hold this much due to leakage issues and safety concerns (the Dam Safety Branch at one time ordered a storage restriction of 10' below the dam crest).

Because the drainage basin above Todd Reservoir is not very large, the source water for the reservoir would be direct inflow from Todd Springs and spills from Gelwick Springs. There are no other sources available to fill Todd Reservoir. Flow from Todd Springs have been roughly estimated between 10 gpm to 20 gpm, while diversions from Gelwick springs can flow in excess of that. No other springs are able to flow to Todd Reservoir by gravity, and discharges from Todd Reservoir can only flow to the lower Water Treatment Facility. However, the Town did construct a 500 LF connection to bring water from the Todd Reservoir to the existing 4" Gelwick Springs pipeline, which would allow the flows from the reservoir to flow to the Gelwick sump and ultimately to the lower Water Treatment Plant.

Another concerning development with Todd Reservoir is the fact that the reservoir is prone to leakage. In 1995 the Town of Paonia diverted water directly from the Gelwick Springs into Todd Reservoir. It was hoped that the reservoir would be able to fill to above 20' or be able to store above 50 AF. However, within the 1994-1995 calendar year the reservoir was filled with Gelwick spring water but was unable hold water at the 20' watermark, even while Gelwick spring water was released into the reservoir. Overall, reports disclosed that the reservoir lost 8' of storage during this time and could only store about 33 AF of water. To make Todd Reservoir a viable raw water storage alternative it will need to be lined up to at least the emergency spillway mark, assumed to be at 28' of depth. Because of its location and operation, the liner should be buried to protect against wildlife slipping into the reservoir. Overall, lining the reservoir will be a very expensive endeavor and may make the location unattractive to store such limited resources. Overall, lining the reservoir will be a very expensive endeavor and may make the location unattractive to store such limited resources.

Another item of concern is the quality of the water associated with storing raw water in an open reservoir. Water stored in this reservoir (as with any other open reservoir) will require surface water style treatment. Though the existing treatment at both the upper and lower water treatment plants have been designed according to CDPHE Surface Water Drinking regulations for Ground Water Under the Direct Influence of Surface Water (GWUDI), the water plants will need to be upgraded to treat direct surface water. These reservoirs will have the propensity to collect sediment, fecal matter from wildlife, and algae growth (especially in the summer months). This type of raw water influent may be more challenging for the existing water treatment trains to treat. It may also be necessary to provide surface aerators to provide additional oxygen transfer to the reservoir substrates or potentially release water and refill if the water becomes too tepid.

Advantages:

- Town owns reservoir
- Provides sufficient raw water storage
- Has storage rights already allocated

- Modifications to reservoir (other than lining) already complete

Disadvantages:

- Current reservoir leaks. Needs reservoir to be lined
- Very expensive
- Drainage basin is very small
- Will not be able to store overflow spills from many of the springs in the area
- Will only be able to provide overflow equalizing storage to the lower water treatment plant.
- Open storage of raw water may require additional treatment at the existing treatment facilities

Estimated Alternative Cost: $2,500,000

4.5.4.2. Lone Cabin Reservoir

The Lone Cabin Reservoir is located in the NW ¼ of Section 13, T14s, R91W on US forest Service land. It is currently classified by the Dam Safety Branch as a Low Hazard, small reservoir with a capacity of around 160 AF. The reservoir currently does not have any documented safety issues and features a jurisdictional dam height of 37'. The Lone Cabin reservoir is one of three major stockholders in the Beaver Reservoir. The reservoir is currently filled from spring runoff within the watershed, which traditionally fills and then is used by its current stockholders by late July. After which additional water can be released from Beaver Reservoir and then stored in the Lone Cabin for another 30-days. From about August through the next runoff season the reservoir will traditionally remain empty. Overall, the Lone Cabin Reservoir has not even filled during most years, and especially not during dry years. Water from the Lone Cabin (compliments of Beaver Reservoir) has traditionally been used directly on stakeholder property. It does not appear that there is stakeholder interest in selling any shares of its storage to the Town of Paonia. This would mean that the Town of Paonia would either need to contribute its own water to store in Lone Cabin or purchase additional shares from Beaver Reservoir rather than from Lone Cabin stockholders. Either way, this would require the Town of Paonia to increase the storage of Lone Cabin reservoir on its own.

Currently, the only springs that could overflow by gravity into Lone Cabin reservoir is Lake Fork Springs. The overall yield from Lake Fork Springs overflows probably do not equal 100 AF/year, but the proposed increase to Lone Cabin reservoir probably should be about this large. This could either be accomplished by raising the dam embankment and spillway by another 2' or by constructing a brand-new dam downstream of the existing Lone Cabin reservoir. Given concerns with the stability of increasing the dam embankment and the existing outlet works at Lone Cabin the prevailing opinion was to construct a new dam embankment as part of the Stage 1 Lone Cabin Reservoir Enlargement presented in the W.W. Wheeler Report. This alternative proposes building a brand new 330 AF reservoir, where 160 AF of the reservoir is dedicated to the existing Lone Cabin Reservoir stakeholders and the remaining 170 AF of storage would be dedicated to storing Lake Fork Springs spills or any other Town of Paonia water that might be purchased from Beaver Reservoir. The report also suggests a second stage to the construction where volumes would be increased from 70' in height to 105' in height while adding another 690 AF of storage to the raw water system. It is JDS's opinion that spending the money to increase raw water storage to this magnitude is probably premature, and it would recommend that focusing on Stage 1 for this alternative is more viable.

One other note of concern with this alternative is the difficulty in administering this storage right with the combined Paonia water and Lone Cabin water. Disagreements are bound to occur when trying to account for inflows and releases from both sources into and out of the same reservoir. If this alternative were to be considered there must be a very robust accounting system for all participants in this joint effort. And as noted in the Todd Reservoir alternative there will be concerns with how the existing water treatment plants

will be able to handle surface water flows from the reservoirs. More than likely, raw water flows from Lone Cabin reservoir will go to the upper water treatment plant rather than the lower water treatment plant. That said, use of the existing 8" German Creek Springs raw water line might be used to bring water down to the lower water treatment plant.

Advantages:

- Location of reservoir may be able to feed both the upper and lower treatment Plants.
- Would be able to add significant capacity to the raw water storage system
- Location is expandable, if necessary

Disadvantages:

- Requires construction of a new reservoir
- Additional permitting would be required through the Colorado Division of Water Resources Dam Safety Branch, US Department of Fish and Wildlife, and the US Army Corp of Engineering.
- Will only be able to collect overflows from Lake Fork Springs
- Town may not have water available to fill its portion of the reservoir after July or in dry years.
- Enlarged dam may increase the hazard classification and insurance requirements
- May be difficult to account for water between Paonia and Lone Cabin constituents.
- Treatment challenges similar to those which would occur at Todd Reservoir
- Construction of Lone Cabin Stage 1 expansion will be expensive

Estimated Alternative Cost: $ 5,250,000

4.5.4.3. Roeber (Reynolds) Reservoir

Roeber (Reynolds) Reservoir is located in the SE ¼ of Section 21, T14S, R91W. The reservoir is owned by the Roeber family and is almost completely located on the Roeber property, with just the toe located on federal land. The structure currently features approximately 100 AF of storage with a current reservoir depth of around 18 feet. Currently, there is an agreement dated 1978 that allows the Town to store 25 acre feet of water in the reservoir. However, the Roebers claim that this right was transferred down to the Small Roeber because the structure is closer to the existing pipelines. The agreement also seems to stipulate that the Town of Paonia may be able to store an additional 75 AF of water in the structure, but only after the reservoir has encountered its early fill of Roeber water. The structure is in relatively good condition, and the North Ditch which runs to the Roeber that can collect overflow water from the Lake Fork Springs, German Creek Springs, Old Original (Reynolds) Springs, and Upper Reynolds Springs has been improved. In addition, the Town is also providing a manifold spill line as described above that can collect overflow water from the Pole Patch Springs, Spore Springs, and Upper Reynolds Springs. Thus, the amount of overflow water that the location of the Roeber Reservoir can collect is considerably greater than those that can be collected by either Todd Reservoir or Lone Cabin. The problem with the Roeber Reservoir is that it may be too small in its current condition to store both Roeber Water and Paonia overflow water year-round. Currently, the Town can only store significant overflow water after Roeber has been filled initially with Roeber family water. Because significant overflows usually happen in the spring through summer

months the filling period allotted by the current agreement would not allow for significant storage in the Roeber for the Town of Paonia. Therefore, a potential expansion of the reservoir might be considered.

Because the drainage basin to the Rober Reservoir is relatively small the Division of Water Resources does not believe that the basin could develop more than the allotted 100 AF of storage in the reservoir. In previous reports an expansion of the Roeber Reservoir was considered. Preliminary calculations estimate the expansion could expand the reservoir storage from around 100 AF to almost 330 AF. While an increase of 230 AF may not be necessary in this case, and an expansion of at least 100 AF might be justified. At this point to raise the dam between 8' to 12' might be worth considering. This would require roughly 60,000 CY of additional embankment material, plus the provision of a new outlet structure. Also, the expansion of the reservoir would require the revising of some of the spring rights into storage rights so that they may be stored in the Roeber Reservoir. Also, a revision to the 1978 agreement would need to be implemented as well. In recent conversations with the Roeber Family there still is some interest in developing a storage sharing agreement with the Town of Paonia. The Roeber's have been aware of Paonia's interest in utilizing the reservoir for many years and continue to be open to entertaining such an arrangement. While there would be some difficulty in administering and accounting the rights to store in such a structure, accounting for two entities would be vastly simpler than accounting for multiple storage right such as the case with Lone Cabin Reservoir.

Difficulties may remain in treating surface water from the reservoir (similar to the other reservoirs), but the reservoir's location affords sufficient topography to provide gravity water down to the upper water treatment plant and lower water treatment plant. Overall, the structure does seem to afford the flexibility to store the most water in regard to its location vs. the existing springs while requiring the least amount of work to make the structure viable.

Advantages:

- Location allows the structure to store the most spill water from the existing springs.
- Cheapest of the reservoir alternatives
- Should not include US Department of Fish and Wildlife Approval
- Required enlargement will be minor per DSB requirements
- Structure is in relatively good condition and does not appear to need lining
- Can serve both the upper and lower water treatment plants
- Influent ditch has been improved to capture most spring overflows
- Appears that there may be enough spring overflow water to fill the expanded capacity
- Owner is interested in working with the Town to come to an agreement

Disadvantages:

- Will require some construction to increase capacity of reservoir
- Expansion costs are not cheap
- Will require some revisions to existing spring decrees
- Will require completion of the Pole Patch / Spore Springs / Reynolds Springs collection line
- Will require Dam Safety Branch Approval and US Army Corp of Engineering Approval

- As with the other reservoir options, revisions to the existing water treatment plants may be necessary to treat surface water

Estimated Alternative Cost: $ 1,636,000

4.5.4.4. Covered Storage

Because of the treatment issues associated with treating surface water stored in a reservoir exposed to elements such as algae growth, stagnant water, contamination by animals, and sedimentation the Town may wish to consider covered storage such as buried tanks or ground storage tanks. Because of construction restrictions these structure may be small, providing only 1 MG to 2 MG of overflow spills storage. However, in the scope of storage tanks, 1 MG to 2 MG of storage is considered quite large and can be expensive. Generally, buried concrete storage tanks can be more expensive than bolted steel ground storage tanks. However, construction of buried tanks can eliminate unsightly construction that exposed ground storage tanks might provide.

The proposed location of the storage tanks would be roughly in the vicinity of the Roeber Reservoir property, which is central to the majority of the overflow spring locations as well as allowing the tanks to serve either water treatment plant. It would be advantageous for Paonia to purchase land from the Roebers to avoid having to avoid US Forest Service issues. Currently, storage is recommended to be anywhere from 2 MG to 4 MG (or 6.13 AF to 12.27 AF). While this represents a fraction of the overflow spill storage that is available at the reservoir sites is does provide an element of control and autonomy to how the raw water is collected, stored, and discharged to the water treatment sites. The 6.13 AF to 12.27 AF of storage could provide sufficient equalizing volume to carry the Town beyond potentially challenging peaks in the summertime, or through situations where only one finished storage tank is online (similar to the incident in 2019). This alternative may be considered if treating raw water from the proposed reservoir alternatives becomes challenging. This alternative would include the following elements:

- Purchase property to construct new storage tanks
- Two (2) new bolted ground storage tanks or buried prestressed concrete storage tanks
- Associated inlet and outlet pipe to both structures
- Run outlet piping to tie-in to Upper Paonia Pipeline down to lower water treatment plant
- Run outlet piping to ditch to flow into upper water treatment plant

Advantages:

- Proposed central location allows the structure to store most overflow spills from springs
- Covered storage allows for reduction of raw water contamination prior to treatment
- Allows for control of raw water collection by Paonia
- Allows for discharge of raw water to upper and lower reservoirs

Disadvantages:

- Not a lot of storage
- Very expensive
- Bolted ground storage tanks can be unsightly

- May not provide the return necessary to substantiate the cost

Estimated Alternative Cost (Not including property purchase):

- **Buried Tank (Each) = $ 3,500,000**
- **Bolted Tank (Each) = $ 2,600,000**

5. Water Treatment and Finished Water Storage

This section represents a general summary of existing water treatment systems and finished-water storage.

5.1 Raw Water Quality

Paonia source water is collected from a network of springs and collection pipelines. It is relatively free of suspended matter and turbidities are typically less than 0.5 NTU. Limited historical data is available to analyze whether turbidity/water quality fluctuations occur seasonally, or periodic spikes occur during specific weather events. However, anecdotally Town staff has said that raw water quality treated at the upper (Lamborn) plant has always been within the design parameters of this treatment system.

Currently, Paonia source water is designated groundwater under the influence of surface water (GWUDI). This designation resulted in improvements to the lower (Clock) water treatment plant in 2011 and the upper (Lamborn) water treatment plant in 2016. Importantly, if raw water were to be stored in a reservoir in the future, then this water would (likely) no longer retain its GWUDI designation and instead be classified as surface water. Surface water treatment requirements would require further evaluation of both the upper and lower treatment plants.

5.2 Evaluation of Existing Water Treatment Systems

5.2.1 Lower (Clock) Water Treatment Plant

The lower (Clock) water treatment plant utilizes a dual membrane filtration system manufactured by Pall Corporation. Liquid sodium hypochlorite is used to provide chemical disinfection of filtered water. This facility has an operational capacity of 660 gpm (0.95 MGD) and includes a backwash recovery system to maximize water production efficiency. This facility was constructed in 2011 as a result of Paonia source water being reclassified as GWUDI. Single-stage bag filtration units salvaged from the previous facility can be employed upstream of membrane filtration. These may prove valuable should Paonia elect to store raw water in a reservoir, which would increase treatment requirements to surface water standards.

Water produced by the lower treatment plant enters a 1-MG (concrete) finished-water storage tank that was relined in 2018. This lower tank services the lower pressure zone, which includes most of the Town's core area. To a limited extent it can service some upper pressure zone areas at lower service pressures. Areas that cannot be serviced by this lower tank include: XXXXXXX and XXXXXX. An exhibit in ***Appendix C*** illustrates the service area of the lower treatment plant.

Limitations:

- Manufacturer Service Support. Pall Corporation doesn't provide routine service packages that would support operation and maintenance system operation.
- **Contact time for chemical disinfection is provided by the storage tank. If the storage tank is taken offline, then contact time would be provided only by the length of pipe from the plant to the first service.**
- A comparison of rated capacity vs. potential inflow should be conducted once plat inflow data is available

5.2.2 Upper (Lamborn) Water Treatment Plant

The upper (Lamborn) water treatment plant also utilizes a dual membrane filtration system. The upper water treatment plant was manufactured by Filter Tech Systems (Filter Tech) located in Grand Junction, CO. FilterTech provides scheduled maintenance and calibration assistance to support system operation.

Liquid sodium hypochlorite is used to provide chemical disinfection of filtered water. This facility has an operational capacity of 600 gpm (0.86 MGD) and includes a backwash recovery system to maximize water production efficiency. This facility was constructed in 2016 as a result of source water being reclassified as GWUDI. No additional upstream treatment (e.g., bag filtration or sedimentation) is employed upstream of the Filter Tech membrane units. Thus, should Paonia elect to store raw water in a reservoir, increased treatment requirements at the upper treatment plant would be required to meet surface water treatment standards and protect existing treatment equipment.

Water produced by the upper treatment plant enters a 2-MG (bolted-steel) finished-water storage tank that was last recoated in 2016. This upper tank services the entirety of the Paonia water system, including in-town and out-of-town users as well as all consecutive systems. Based on its current condition, the upper finished-water storage tank needs to be recoated again. This will require taking the 2-MG tank off-line for the duration of the recoating effort. It is expected the treatment system will direct feed into the distribution system while the upper tank is being recoated. The lower (Clock) treatment plant and 1-MG finished-water storage tank should also be in service at this time.

Limitations

- **Contact time for chemical disinfection is provided by the storage tank. If the storage tank is taken offline, then contact time would be provided only by the length of pipe from the plant to the first service.**
- **Note**: A comparison of rated capacity vs. potential inflow should be conducted once plat inflow data is available

5.3 Evaluation of Existing Finished Water Storage

As noted in Section 3 above The Town of Paonia demand on a per user basis appears to be significantly lower today than previously documented by past engineering efforts. Recommended finished-water storage calculations and ultimate recommend storage volume reflect more recent user demand. However, storage calculations are based on a very limited data. Specifically, significant uncertainty remains about unaccounted for water (Unaccounted for water equals the difference between treatment plant production and versus customer metered demand). Additional monthly data would allow for a more detailed and accurate evaluation of finished-water storage.

Paonia has two (2) finished water storage tanks with a total available volume of three (3) million gallons (MG). At the time of this report, only the upper 2-MG finished-water storage tank is in service. The lower 1-MG finished-water storage tank is expected to be brought back in service in May 2021. When both the upper and lower tanks are in service, in-town commercial and residential customers are provided redundancy should either tank need to be taken out of service for emergency reasons. However, the lower tank is not able to service all out-of-town customers. The exhibit in ***Appendix C*** illustrates the service area of the lower finished-water storage tank. Areas that cannot be serviced include: XXXXXXX and XXXXXXX.

A second finished-water storage tank at the upper plant would provide service redundancy to the entire Paonia water system. Currently, when the existing upper 2-MG tank is taken offline for servicing, the water treatment system would need to keep up with demand in the upper pressure zones. While treatment capacity exists to meet demand, the availability of raw water to treat in this event may become the limiting factor. The combination of optimizing raw water collection and raw water storage as well as provision of additional finished-water storage would improve Paonia water system reliability. Furthermore, as detailed in Section 3, a better understanding of unaccounted for water is recommended.

Fire Flow: Fire flow demand is outlined by International Fire Code and is enforced by the local fire protection authority. Currently, the Town is required to provide 1,000 gpm for a two (2) hour duration or 120,000 gallons. That flow rate can only be reduced with an approval from the fire authority where automatic sprinklers or other means of fire suppression are provided.

The Colorado Department of Public Health and Environment has established a minimum emergency storage volume requirement that is equal to baseline fire flow volume (120,000 gallons) plus the volume required to satisfy average day demand. However, this is only a minimum required volume. Other considerations are often a warranted. For example - peak day demand, unaccounted for water, and treatment production capacity. Only the upper tank provides sufficient storage volume required to satisfy peak day base-line customer demand plus fire flow requirements. In **Table 6,** a summary of (assumed) peak month average day demand and fire is provided.

5.4 Assessment of Alternatives for Finished-Water Storage

An assessment of alternatives for additional finished water storage included:

- Do Nothing
- Additional finished-water storage at upper treatment plant
- Additional finished-water storage a lower treatment plant
- Additional finished water storage at a to-be-determined location within the system.

Importantly, conveyance of fire flow to in-town customers from the lower tank only begins to stress distribution system infrastructure. Specifically, water velocity through existing pipelines begin to exceed recommended maximums. Piping into the Town center from the upper tank is either through a new 8-inch PVC line (east loop) or through an old thin-walled 8-inch steel pipe (west loop). This routing is illustrated in **Figure 6** below. Water velocities remain within recommended ranges when routed in both directions, i.e., via both the east and west loops. A more detailed discussion of fire flow operations and system limitations of providing fire flow from one tank based on existing pipe sizes is presented in Section 6 below.

Additional finished-water storage at the upper treatment plant would improve system reliability. The Colorado Department of Public Health and Environmental establishes design criteria for minimum storage volumes required. This minimum storage volume is equal to fire flow plus average day demand. For many system, especially smaller systems or those with very high fire flow requirements, this storage volume proves to be an adequate target for sizing finished-water storage volume. In its 2012 report, WestWater Engineering recommended a tank sized for fire flow plus three-days of average daily flow and an operating storage volume of 35% for operating and equalizing storage. This equated to between 2.47 and 2.88 MG of additional recommended storage volume. Ultimately, WestWater Engineering recommended a minimum additional storage volume of 1 MG and 2 MG for operational reasons.

JDS-Hydro believes that additional finished-water storage at the upper treatment plant would provide meaningful system resiliency. Firstly, it provides water security in the event an existing tank needs to be taken off-line. Importantly, with both the upper and lower finished-water storage tanks online, system reliability is already greatly improved except to a few upper pressure zones areas as previously discussed. Secondly

Table 6. Town of Paonia Finished-Water Storage Volume Basis of Design Data

Recommended Finished-Water Storage Volume		
Type of Demand	**Storage Volume Demand Basis**	**Storage Volume Production Basis**
Fire Flow	120,000	180,000
(Annual) Average Day Demand - Entire System	258,615	410,959
(Peak Month) Average Day Demand	524,413	859,235
CDPHE Minimum Operating Volume	378,615	590,959
Out-Of-Town (Peak Month) Average Daily Demand (Commercial and Residential)	238,542	357,812
Calculated Storage Volume - 3 days PM ADD (Whole System)	1,693,240	2,757,705
Calculated Storage Volume - 1 day PM ADD (Whole System)	644,413	1,039,235
Min. Recommended Finished-Water Storage Volume	**500,000 gallons**	

Importantly, JDS-Hydro is limited in its ability to conduct a detailed analysis of finished-water storage. Additional data, specifically monthly supply, and demand volumes for a minimum of three months, but ideally, multiple years would enhance any effort to specify additional finished-water storage volume recommendations. Especially because of the substantial cost burden of finished-water storage and because of other CIP efforts taking higher priority, JDS-Hydro would recommend Paonia collect this additional data

and revisit finished-water storage volume recommendations before committing to any specific tank design or concept.

For preliminary planning purposes, estimated finished water storage costs are estimated at between $1-2.5 per gallon depending on the size of the tank. For example, a 500,000-gallon finished-water storage tank may cost $1.25 million dollars while a 2-MG finished-water storage tank may cost closer to $2 million dollars **.

*** Current price volatility poses a particular challenge to budgetary cost estimating. These estimates are based on 2021 JDS-Hydro project history.*

6. Water Distribution System

6.1 Water Model Summary

Info Water Pro was the modeling software utilized to model the Town of Paonia's water distribution system. The primary purpose of modeling was to evaluate system function including pressure, pipe velocity, fire flow and identification of potential system limitations and improvements.

The distribution system configuration was developed from GIS data provided by SGM Inc. Base GIS file included water mains, water valves, fire hydrants, curb stops (data appears to be incomplete) and water service connections. Configuration was then verified by Town staff with corrections and additions, as necessary. See **Figure 3** for an overall illustration of Paonia water system.

Model elevations were derived through Info Water Pro, using Lidar data from the USGS (USGA_13_n39w108, https://www.usgs.gov/core-science-systems/ngp/tnm-delivery/gis-data-download). This data is in geographic coordinates in units of decimal degrees, and in conformance with the North American Datum of 1983 (NAD 83). All elevation values are in meters and are referenced to the North American Vertical Datum of 1988 (NAVD 88). Elevations of system critical infrastructure including storage tanks was verified using GPS point data collected by JDS-Hydro.

The model was calibrated by comparing the modeled results to field observations and static fire hydrant pressure tests completed by the Town of Paonia.

Note: Some pressure reducing valve set points were modified in the model from the original set points given by the Town to better match actual field pressures, also supplied by the Town.

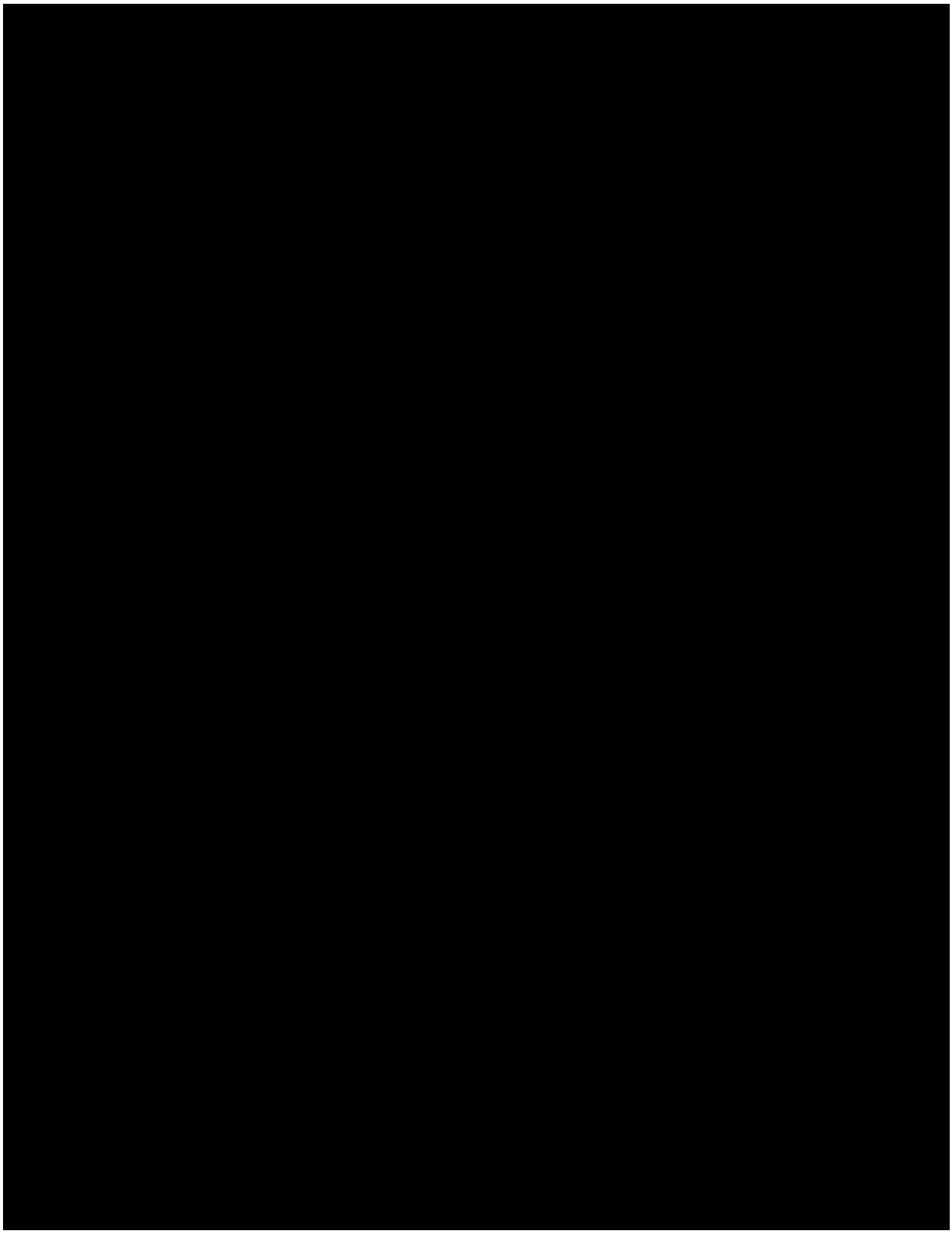


Figure 3. General Town of Paonia Water Model Schematic with Pipe Diameters

6.2 Water Model Assumptions

Water demands throughout the distribution system play a critical role in the overall performance of the system. Demands in the water model were developed based on yearly water billing and production data during 2018, 2019 and 2020. The production data provided is based on the Upper Plant cumulative meter reading divided by the time it has been in operation. The ADD used in the water model is 410,959 gallons, as defined in Section 5.4.

The maximum day demand (MDD) is based on a 2.0 factor, meaning the MDD is twice the ADD or 821,918 gallons. The MDD factor is an assumed factor based on other system of equal size. A Town specific MDD factor could be determined but additional daily water production data would need to be collected. A peak hour demand (PHD) factor of 4.0 was utilized in the peak hour model scenarios. See **Table 7** for a summary for modeled scenario flows.

Table 7. Water Model Demands by Scenario

Water Model Demand Design Criteria				
Scenario	**Base Flow, gpd**	**Factor**	**Model Flow, gpd**	**Model Flow, gpm**
Average Day Demand (ADD)	410,949	1	410,949	285
Maximum Day Demand (MDD)	410,949	2	821,898	571
Peak Hour Demand (PHD)	410,949	4	1,643,796	1,142

A diurnal curve has been employed to better mimic actual customer usage during high and low use periods of the day. A graphical representation for the diurnal curve can be seen in **Figure 4**.

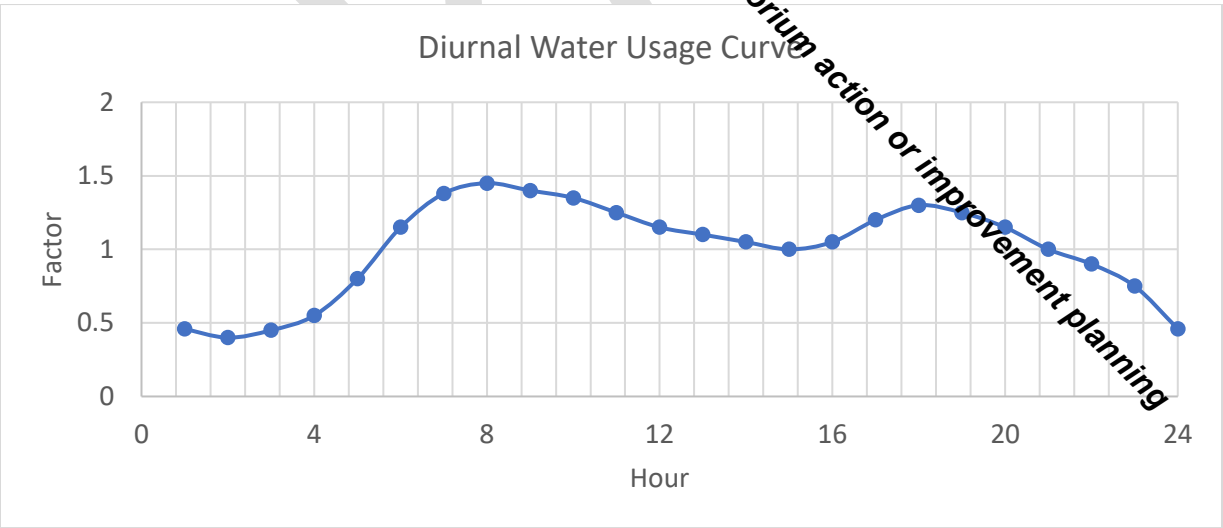


Figure 4. Diurnal Water Usage Curve

6.3 Water Model Results

6.3.1 System Pressure

The Paonia water distribution system involves large changes in elevation of nearly 930 feet. This difference in elevation requires the use of numerous pressure reducing valves (PRVs) to reduce pressure incremental in the system. There are currently eight PRV vault locations (see **Figure 5)** and one which is currently not in use, a suggested PRV location and settings will be provided based on modeling results for the single PRV not in use. Based on pipe connectivity and PRV locations the system is divided into eight pressure zones as depicted in the **Figure** below.

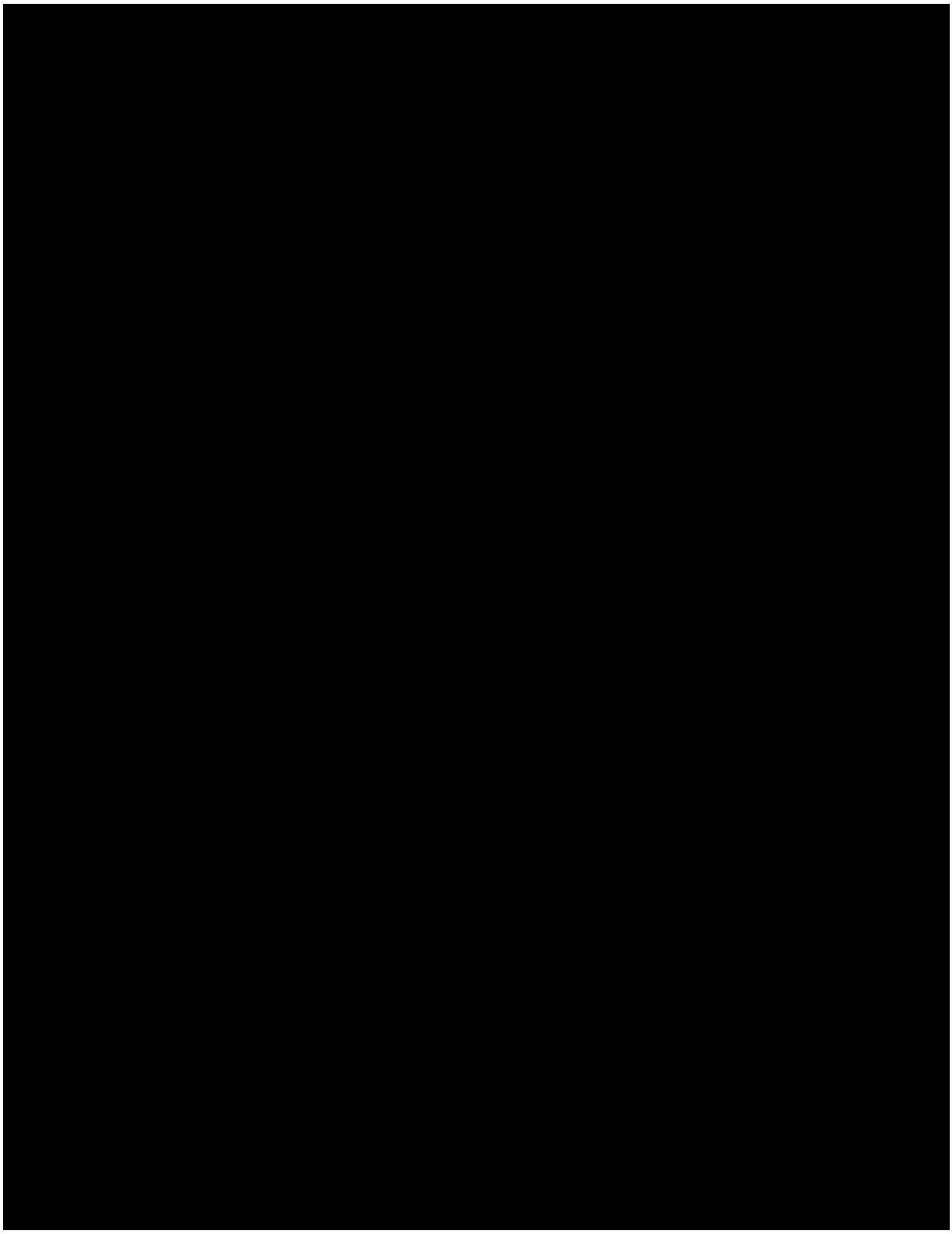


Figure 5. Town of Paonia Pressure Zone Exhibit

The typical desired distribution system pressure is 60 psi. Per the State of Colorado Design Criteria for Potable Water Systems, a system must be designed to maintain a minimum of 20 psi at ground level at all points in the distribution system under all conditions of flow. The system was analyzed using the water model created under the flow conditions of average daily demand, maximum daily demand, and peak hour flow with the tank at an average level of 20 feet. As expected, the pressure was lower at higher elevations and downstream of PRVs and higher at lower elevations. Generally, the distribution pressure within the system was over 60 psi (See **Figure 7**: Water Model System Pressures). There are no pressures, not located at the water storage tanks, that are below 40 psi during non-fire flow events.

There are some areas which system pressure becomes higher than would be recommended. One section of the distribution system which pressures exceed 200 psi is the water main located downstream of the currently unused PRV vault 1, see **Figure 6**. The current absence of PRV 1 increases the pressure of almost a mile of distribution main to as high as 217 psi. The higher pressures created likely exacerbates the effects of water hammer and leakage. For recommendations regarding PRV 1 location, use and settings refer to Section 6.5.

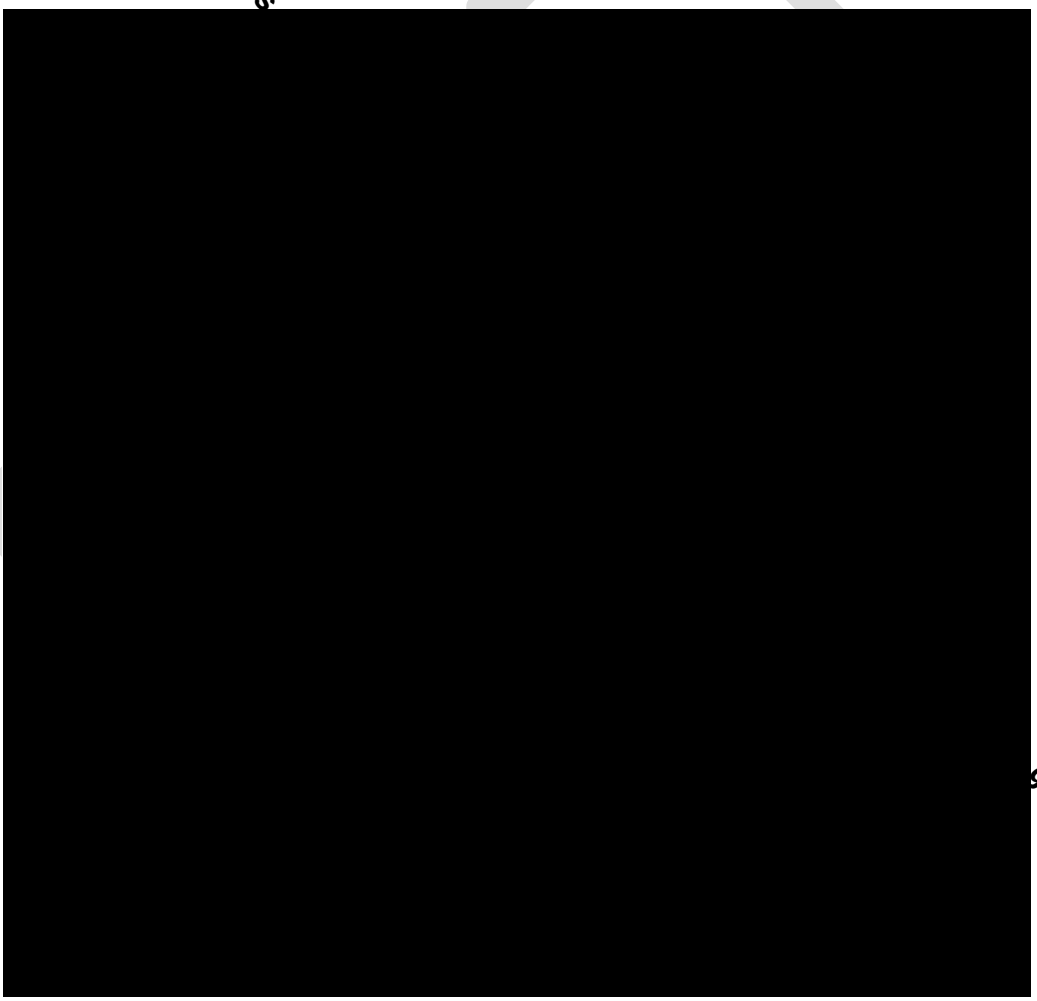


Figure 6. High Water Main Pressure Area

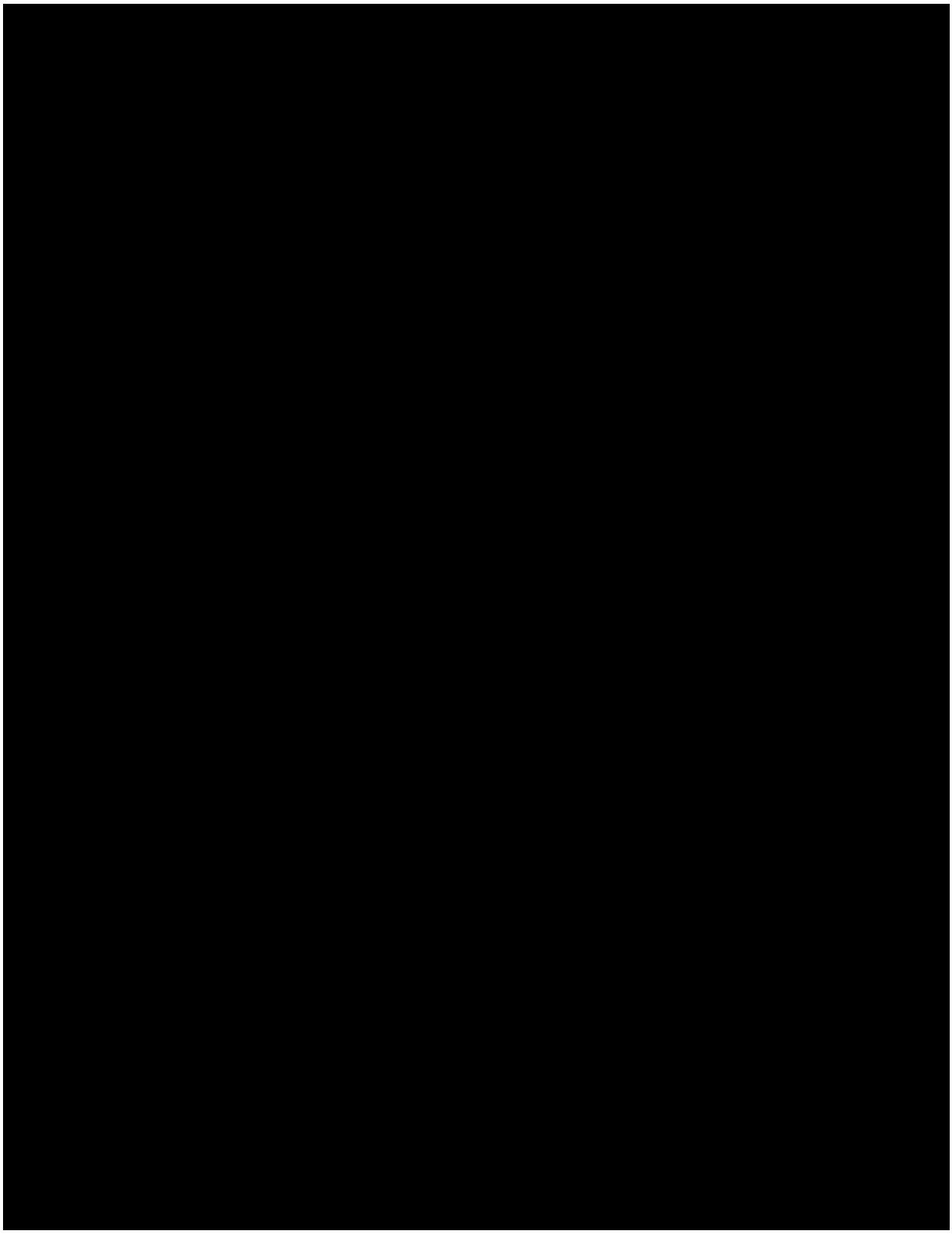


Figure 7. System Pressures during Maximum Daily Demand

6.3.2 Pipe Velocity

Generally, pipeline velocities within a water system should remain under 5 ft/s during normal PHD operation. Pipe velocities were modeled and analyzed during peak hour demand; **Figure 7** shows the pipeline velocities in the system as modeled. As show in **Figure 7** there is one section of water main that exceeds 5 ft/s, during PHD, this is the 8-inch main that is the outlet from the upper tank. Most of the system however, experiences velocities below 3 ft/s with a few exceptions as shown.

Additional model scenarios were evaluated to see how the system reacts to outages in different lines. The most evident reaction is when one of the primary supply loops from the upper tank to the Town is out of service see **Figure 6**. When either of these loops is not in service the water must flow through the other loop which causes increased velocities, to above 5 ft/s and reduces the available fire flows.

While the emergency use of only one of the primary supply loops is inevitable that time should be minimized to the extent it can. Each of the primary supply loops consists of a long run of 8-inch pipe before they combine in pressure zone 5. The use of 8-inch water main over such long distances can result in excessive frictional head loss, which reduces system pressure and flows. This is most evident on the eastern loop as water flows through pressure zones 1, 2, 3, and 4. The natural elevation change across zone 4 produces lower pressures, 45 psi, at the higher elevations generally located near Pan American Ave and Cedar Dr. When these lower pressures are coupled with the frictional head loss of MDD and fire flow they are sufficient to reduce the system to below 20 psi, see Section 6.3.3 for an analysis for fire flow.

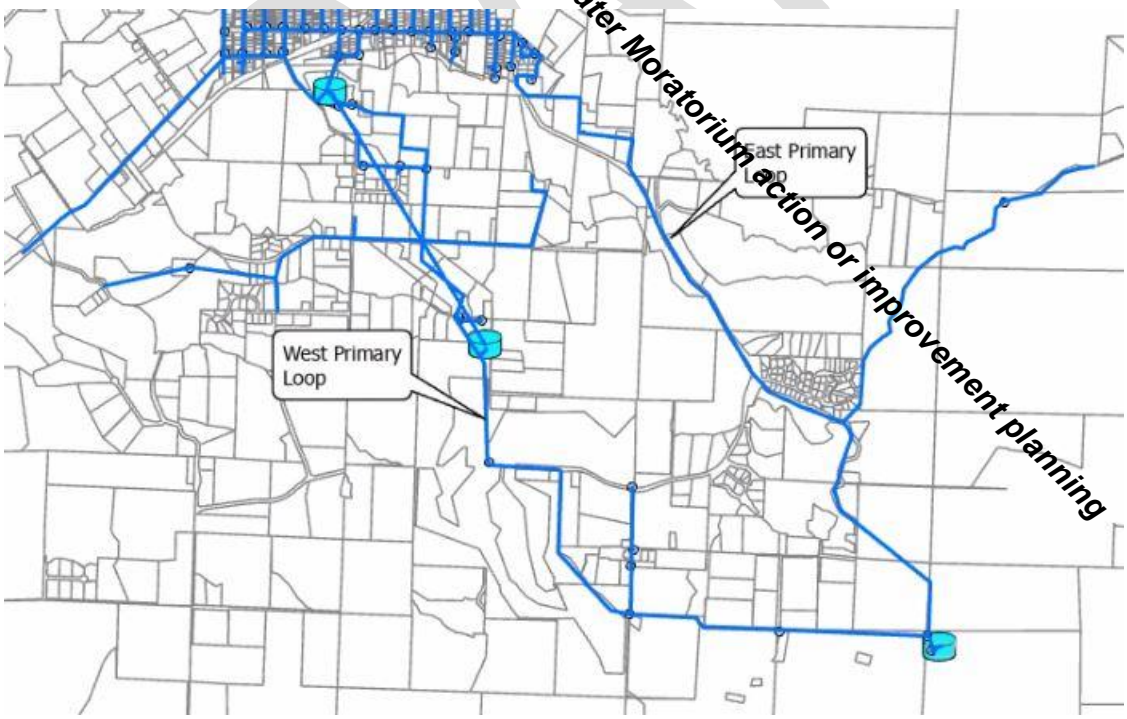


Figure 6. Primary Distribution Loops

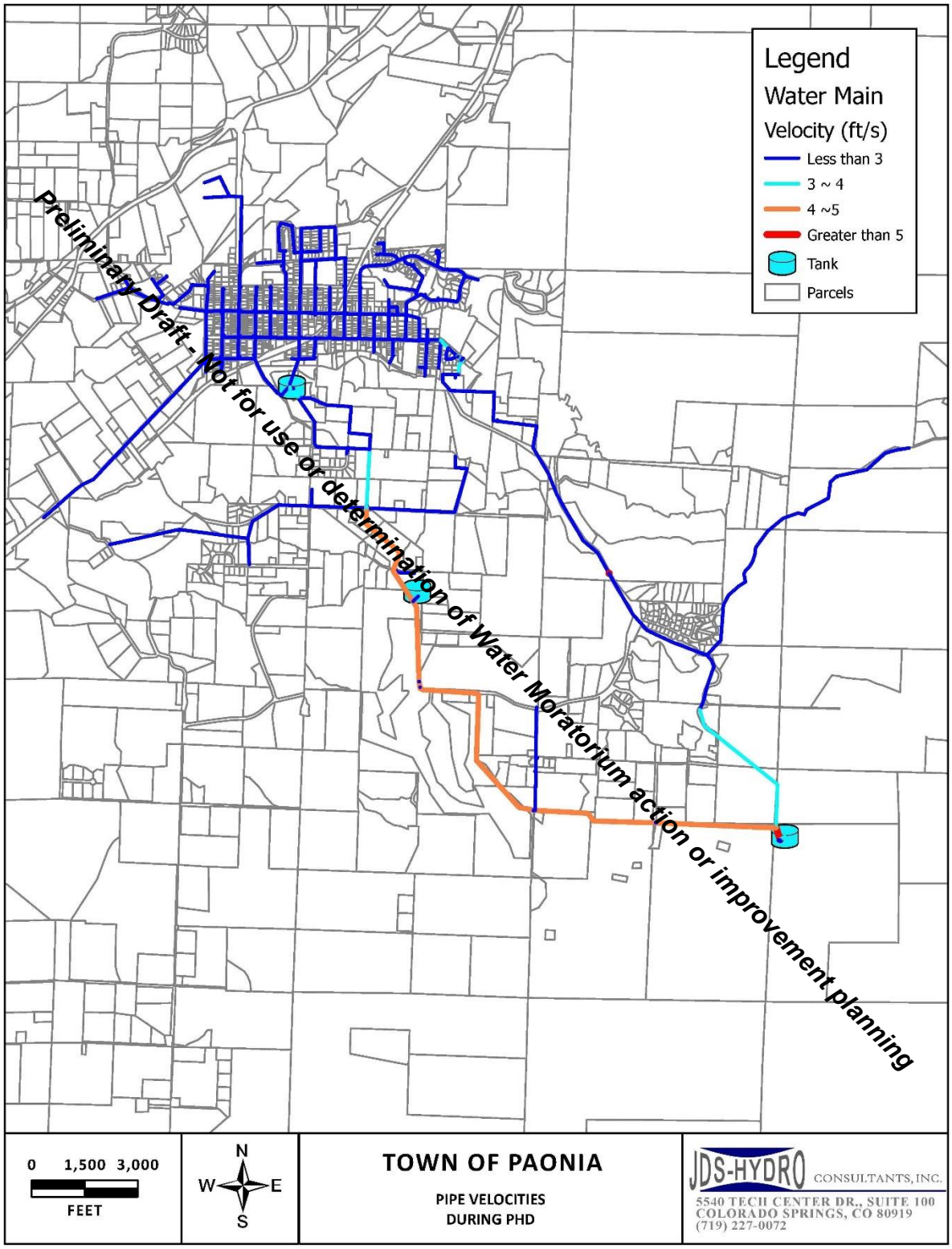


Figure 7: Pipe Velocities during Peak Hour Demand

6.3.3 Fire Flow

A fire flow analysis was completed on the existing water distribution system. A required flow of 1,000 gpm, as specified by the Town, was applied to all fire hydrant junction locations. A minimum residual pressure of 20 psi throughout the entire system was required during fire flow modeling.

The results of the fire flow analysis are presented in **Figure 8** and **Table 8**. **Figure 8** shows the locations of hydrants analyzed during the analysis and hydrants and areas that do not provide the required 1,000 gpm fire flow. **Table 8** provides the available flow and general location of the hydrants unable to provide 1,000 gpm fire flow.

As shown in **Figure 8** many of the fire hydrants in pressure zone 4 are unable to meet the 1,000 gpm required fire flow. This is primarily due to the use of 8-inch water main supplying flow from the Upper Tank and a 6" water main used in Vista Dr, Pan American Ave and Rio Grande Ave. Over the long distances involved with flowing water to the area, from the Upper Tank, excessive frictional head loss reduces system pressure and flows. This is most evident as water flows through pressure zones 1, 2, 3, and 4. Coupled with the natural elevation changes across zone 4, higher elevation in the northeast and lower elevation in the southwest, these normally lower pressures and the frictional head losses of MDD and fire flow are sufficient to reduce the system to 20 psi or lower. For suggested system improvements that many increase fire flow availabilities see Section 6.5.

Table 8. Fire hydrants Unable to Provide 1,000 gpm Fire Flow

ID	Fire-Flow Demand (gpm)	Hydrant Available Flow (gpm)	Hydrant Pressure at Available Flow (psi)	Location Description
HYD34	1000	719	20	Rio Grand Ave
HYD35	1000	811	20	Pan American Ave and Rio Grande Ave
HYD36	1000	498	20	Alder Dr and Pan American Ave
HYD37	1000	89	20	Alder Dr
HYD38	1000	448	20	Pan American Ave
HYD39	1000	343	20	Ceader Dr
HYD40	1000	720	20	Box Elder Dr
HYD54	1000	976	20	Vista Senior Center
HYD61	1000	839	20	1st St and Dorris Ave
HYD62	1000	772	20	Colorado Ave and Dorris Ave
HYD70	1000	997	20	Price Rd North of Samuel Wade Rd
HYD71	1000	973	20	Samuel Wade Rd north of Stahi Rd
HYD72		910	20	Stahi Rd West of Samuel Wade Rd
HYD73	1000	271	20	O Rd
HYD74	1000	839	20	Omega Rd and Lamborn Mesa Rd
HYD75	1000	836	20	Omega Rd and Lamborn Dr
HYD76	1000	840	20	Omegan Rd east of Lamborn Dr
HYD77	1000	856	20	East of Cresthaven Rd
HYD78	1000	858	20	East of Cresthaven Rd
HYD82	1000	478	20	Minerich Rd and Lamborn Mesa Rd
HYD83	1000	555	20	Minerich Rd south of Lamborn Mesa Rd
HYD85	1000	466	20	Minerich Rd and Foothills Rd
HYD87	1000	840	20	Lamborn Mesa Rd west of 4150 Rd
HYD88		895	20	Lamborn Mesa Rd
HYD89		898	20	Lamborn Mesa Rd
HYD90	1000	339	20	Minnesota Creek Rd

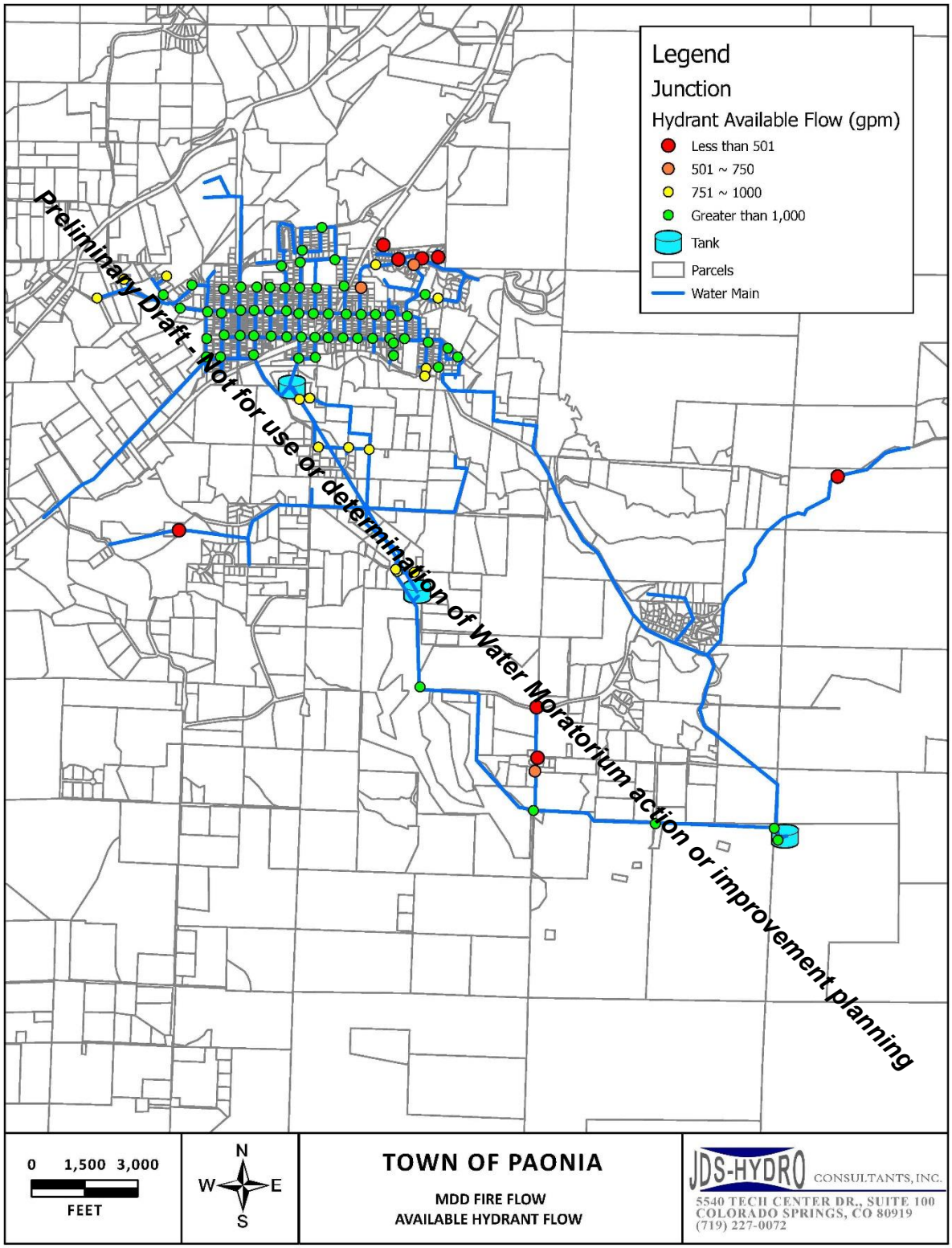


Figure 8 – Available hydrant fire flow

6.4 Recommended Pressure Zones

The Town's distribution system is currently separated in to nine distinct pressure zones, see **Figure 5**. The operation of these pressure zones is paramount to the overall functionality of the system. The system overall changes significantly in elevation, creating pressure well beyond what a typical distribution system is designed for. To reduce the pressures as water flows down from the storage tanks, the Town has constructed the PRV vaults as show in **Figure 5**. The pressure zones created are based on the upstream controlling PRV or PRVs. Currently, pressure zone 5 is the only zone fed from two distinct PRV vaults, PRV 5 and PRV 9. The Town could, however, consolidate some of the zones in the future if development or loops are created between certain existing zones. The pressure zones 1 & 6 and 2 & 7 could be combined as they have similar HGLs. Additionally, zone 4 and 5 could be combined as described in Section 6.5.

The combination of pressure zones would require minor analysis to determine the most effective new pressure, while still providing adequate pressure to consumers. Another potential benefit to combining zones with similar HGLs is the redundancy provided. The current system is generally fed by two primary loops, the West Loop and the East Loop as described in **Figure 6**, which feed the majority of the Town's center. If these loops are connected via the merging of two pressure zones, that provides additional ways to supply water to that zone and the downstream zones. Thus, creating redundancy in the event of a line break or fire flow scenario. Furthermore, water can be routed through the system more freely, potentially reducing velocities and frictional head losses.

6.5 Model Results for Suggested Improvements

The water model development and subsequent analysis have highlighted several suggested distribution system upgrades. The purpose of the suggested upgrades is to increase the available fire flow and improve reliability of the system during all modeled scenarios.

- **Installation and use of PRV 1.** At a point in the past PRV 1 was removed from service. The concrete vault and general piping still exist, and it is suggested that a PRV be reinstalled at this location. The use of a PRV in this location will significantly reduce the pressure downstream. The suggested PRV configuration includes a 3" primary, or low flow PRV and a 6" high flow PRV. The suggested pressure setting of this new 3" PRV is 80 psi and the 6" is 75 psi. This will reduce downstream pressure by 60 psi.
- **Verification of and the balancing of PRV 5 and PRV 9.** Both PRV 5 and PRV 9 feed into pressure zone 5. Each PRV is supplied through separate sections of the distribution system. Their balanced operation makes noticeable improvements in certain pipe velocities, mainly the primary East and West loops. Suggested initial PRV setting are 13 psi for PRV 9 and 84 psi for PRV 5. Some minor adjustment may need to be made after the initial setting to ensure they both operate at the same hydraulic grade line (HGL) pressure, so basically both PRVs supply water at the same time.
- **The removal of PRV 5.** Pressure zones 4 and 5 are separated by PRV 5 and two normally closed valves. These two zones differ in their HGL by 15 psi. The combination of these zones would increase pressure in zone 5 by 15 psi. However, the systems' available fire flow could be improved by the combination of these two zones, especially in the area located near Pan American Ave and

Cedar Dr. If these zones were combined, then PRV 4 and PRV 9 would need to be balanced to ensure the most efficient operation.

- **Use of Lower (Clock) Water Storage Tank.** At the time of this analysis the 1 MG Clock water storage tank is not being utilized. This tank connects to the distribution system just upstream of PRV 9, and its use significantly reduces the velocities in the water main from the upper tank to PRV 9. Additionally, the use of the Clock tank increases the available fire flow and the available water storage of the system.
- **Pipeline to fill Lower Clock WTP Tank from Upper Lamborn Tank.** A water main connecting the existing distribution system, in the area of the Clock WTP and storage tank, directly into the Clock Tank. A connection of this type would require the use of an altitude or control valve to prevent the overfill of the tank. Additionally, a valve would need to be closed or additional PRV added to prevent back feeding up the tank outlet line. This connection would allow for the upper treatment plant and tank to fill the Clock tank along with the Clock WTP. This provides increased redundancy and reduces flow and velocity through the western primary loop.
- **Redesign of PRV 9.** The current PRV 9 consist of a single 12" PRV. A 12" PRV is oversized for this location, having a minimum flow of 50 gpm, and presents operational issues in setting and balancing the PRV. JDS-Hydro suggests converting to a 3" primary PRV with a 6" high flow PRV.

7. Operation and Maintenance

7.1 Staffing

Paonia's water system is managed by the Public Works Department. The public works staff supports a variety of services that include:

- Trash
- Streets
- Parks and Recreation
- Storm Water
- Water
- Wastewater

Total Public Works staffing levels include one (1) department manager and four (4) field staff. The Colorado Department of Public Health and Environment (CDPHE) requires water systems to be operated by licensed professionals according to the criteria established in Regulation 100 (5 CCR 1003-2). As of May 2021, the water system employs only one (1) person with treatment and distribution system certifications. A table summarizing CDPHE operator requirements for the Paonia's water system and staffing levels is provided in the following **Table**.

Table 9. Town of Paonia Water System Operator Certifications

Water System Component	CDPHE Certification Requirement	Town of Paonia Staffing Certification Level
Treatment	C	C

Distribution	2	2

New water distribution certification requirements became effective March 1, 2021 that increased the requirement for the Town of Paonia from a 1 to a 2. At the time of this report, staff operator, Travis Loberg, fulfills the requirements for both treatment and distribution. No other Town staff is currently certified in water or distribution.

The American Water Works Association (AWWA) provides industry standards and benchmarking. In a 2019 AWWA publication for Utility Benching, staffing levels are measured by number of accounts served per Full Time Employee (accounts/FTE). The following is a summary of AWWA benchmarking utility staffing levels versus the Town of Paonia:

- AWWA Benchmarking Aggregate Data for Water (accounts/FTE)

Table 10. AWWA Utility Benchmarking

	75th Percentile	Median	25 Percentile
Water Utilities	585	424	321
Combined Utilities	600	501	352

- In 2019, The Town of Paonia reported 1179 billable accounts, of which 20 were consecutive systems. These consecutive systems represented 340 additional individual services and 30 standby taps. For the purposes of evaluating Town of Paonia water system staffing levels, it is being assumed that water system operations are responsible for 1519 accounts (1199-20+340).
- The Town of Paonia employs one (1) certified operator who is responsible for both the wastewater and water systems as well as other Town services listed above. For the sake of this evaluation, it is assumed that this staff member represents 0.5 FTE.
- The Town of Paonia hired in early 2021 a new employee whose responsibilities are entirely dedicated to the Town's water and wastewater system. For the sake of this evaluation, it is assumed this staff member represents 1.0 FTE.
- It is being assumed the Town of Paonia employs 1.0 FTE to operate and maintain its water system. This equates to roughly 1013 accounts/FTE, which suggests current staffing levels are low.

7.2 Standard Operating Procedures and Record Keeping

Typically, a water system would maintain standard operating procedures and record keeping protocols. Current staff did not inherit standard operating procedures (SOP) for water treatment and distribution infrastructure beyond what was provided by manufacturers. The basis for record keeping is to satisfy customer billing requirements and the water system's CDPHE approved monitoring plan. A copy of the water system's monitoring plan is included as ***Appendix H***. Additional SOP are recommended for training, operational and planning purposes. A sample list of recommended SOPs is provided as ***Appendix I.***

Record keeping is the basis for accurate accounting and future decision making. In addition to facilitating day-to-day operation, SOPs provide insurance in the event of unforeseen events such as staff turn-over.

While it is recommended that Paonia prioritize creation of additional SOPs and improved record keeping, this may prove especially difficult at current staffing levels.

7.3 Recommendations

The Town of Paonia water system includes a uniquely complex network of raw water collection pipelines, and, especially for its size, has a relatively sophisticated distribution system. Relative to AWWA benchmarking for accounts/FTE and in consideration of the physical nature of the Town's water system, current staffing levels appear inadequate. Anecdotally, current staff appears to be tasked with more responsibility than is reasonable and healthy. Moreover, with only a single licensed operator, the Town is vulnerable to turn-over.

A minimum of one (1) additional licensed water treatment and distribution operator is recommended. Ideally, this person's qualifications would match the certification requirements for the system (C treatment, 2 distribution per **Table 7.1** above). An employee with lesser certifications would still prove valuable especially if they were motivated to develop their career and advance their operator certifications. With at least one additional employee, not only will keeping pace with routine maintenance become more manageable but being able to "get-ahead' would become more likely. "Getting ahead" may include, but is not limited, to developing SOPs, improving data collection, accelerating replacement of old water lines, etc. It is understood that additional staff would increase operational expenses and may warrant further evaluation in the form of a 'Rate Study Analysis' of the Town's customer service rates. However, given the extent to which current staff are over-worked, JDS-Hydro considers hiring at least one additional water system employee to be a high priority recommendation.

8. February/March 2019 Water Supply Issue (James)

A critical water crisis occurred between February and March 2019, whereby acute water loss from multiple water pipeline breaks exceeded the production capacity of the Town's water treatment and storage infrastructure. This event is generally referred to as the 2019 Paonia Water Supply Issue. An 'After Action Report' (AAR) details the event, the actions taken by the Town, and lessons learned. Additionally, within the AAR report is an 'Improvement Plan' that details next steps for the Town to take in order be better prepared should a similar event happen in the future. The last item on this list is identified as 'Water System Assessment and Baseline Data'. It is understood that this JDS-Hydro report is the referenced water system assessment in the AAR.

JDS-Hydro has reviewed the AAR, reviewed relevant news articles, and conducted discussions with water system staff regarding the event. A separate JDS-Hydro 'Technical Memorandum' addresses the 2019 Paonia Water Supply Issue specifically. The following is a brief summary for reference:

Timeline of 2019 Paonia Water Supply Issue

- February 14, 2019: Staff alerted my system alarms of dropping tank levels in the 2-MG finished water storage tank
- February 18, 2019: Low system pressure resulted in a boiler alert and declaration of a local emergency
- February 18-21, 2019: Staff identifies and repairs tow (2) major leaks.
- February 22, 2019: System pressures reestablished, and boil order is lifted.

- February 23-25, 2019: Supply is not able to meet demand.
- February 26, 2019: Water to services out-side the central business district are turned off.
- February 27, 2019: Delta County issues County Emergency declaration and begins to mobilize additional resources.
- End of February A: Working with support from City of Westminster, City of Montrose, Denver Water and CDPHE Water Quality another large leak is identified and repaired.
- End of February B: Additional leaks identified and repaired along with correcting an issue on a supply line leading from a raw water source. Supply begins to exceed demand.
- March 4, 2019: 2-MG finished water storage tank reaches targeted volume of 8-feet. Decision made to start re-pressurizing all zones and monitor for additional leaks.
- March 6, 2019: Water service is restored to all customers.
- March 8, 2019: Boil Order lifted, and normal operations resumed.

JDS-Hydro Assessment of 2019 Critical Water Supply Issue

- The lower treatment plant and 1-MG storage tank were not in service during this event. Roughly one half of the Town's raw water supply, half of its treatment capacity, and 33% of its finished-water storage capacity was thus unavailable to support demand during the emergency.
- The Town's one (1) licensed operator was at a professional development event in Denver at the time of the incident. Staffing limitations discussed in Section 7 leaves the Town especially vulnerable to emergency situations.
- Standard SOPs for responding to distribution line breaks are unavailable.
- At the time of the event, water system mapping was inadequate to easily communicate to others the functionality and layout of the Town's water system, thus hindering Town staff's ability to employ others to support in identifying and repairs leaks.
- Anecdotally, it is understood that the fire department had been flushing and testing fire hydrants in early February 2019 and that hydrant testing within the central part of Town resulted in water hammer reverberating through the lower pressure zone. Water hammer is a pressure surge that occurs when water is forced to stop or change direction suddenly. These forces can result in pipeline breaks. The Town of Paonia operates a relatively complex network of pressure reducing valves (PRVs) to serve the lower pressure zone from two different routes. These PRVs need to be accurately sized, located and operated to ensure flows and pressures are maintained within target ranges. While JDS-Hydro has performed water modeling of the Paonia water system, a transient analysis was not included or performed. However, in conjunction with evaluating the design of each PRV in greater detail, JDS-Hydro would recommend Paonia conduct a transient analysis to better anticipate pressure surges and incorporate mitigating measures, if necessary.
- ***Conclusions:*** The 2019 Water Supply issue was the result of not having recognized the system's vulnerability and development of an emergency plan prior to. Previous engineering studies (see Section 2.2 above) have largely focused on optimizing the Town's Raw Water supply. However, the extent to which further planning effort was made to better position the Town to prevent a 2019 Water Supply Issue event is unclear. JDS-Hydro presents three principal causes for the 2019 water crisis:

    1. Consistent with the AAR, had better emergency response protocols been in place prior to, the duration and extent of the event may have been reduced.

2. Had the lower water treatment plant and/or finished water storage tank been in service during the event, then it is possible that the leaks that occurred during that event may not have resulted in loss of system pressure. Roughly half of the Town's raw water supply, half of its treatment capacity and 33% of its finished-water storage capacity exist at the lower plant. Moreover, this lower plant can support a majority of the Town's service area.

3. Staffing levels are inadequate. While JDS-Hydro has 100% confidence in its current licensed operator, the Town of Paonia water system is relatively complex and covers a relatively large area and while the Town has efforted to replace old water lines incrementally, much of the system remains vulnerable to age (e.g., line breaks). Currently staffing levels are barely sufficient to keep up with normal operations and are unlikely to keep pace with recommended planning and improvements needed to prevent such an event from reoccurring. Additional planning recommendations are presented in Section 9 below.

Generally, it is the opinion of JDS-Hydro that the Town of Paonia is taking many positive steps to prevent such an event from reoccurring. For example, it is understood that Paonia has purchased equipment to assist in identifying leaks. It has efforted to inventory and map water system infrastructure and is working with JDS-Hydro on hydraulic modeling of the water system to better understand system vulnerabilities. However, additional steps are recommended – E.g., Water loss analysis, transient analysis, various capital improvements, increased staffing, master planning and rate study analysis, development of additional system operation SOPs and improved record keeping. These are detailed in the following section.

9. Study Recommendations

9.1 Accommodating Future Growth

The Town of Paonia (Town, Paonia) is currently under a tap moratorium which curbs connection of new water services. The most recent tap moratorium is not the first for the Town. However, the most recent tap moratorium was implemented first and foremost as a result of a critical 2019 Water Supply Issue, an acute event during which raw water supply and treatment production was not able to keep up with demand; during this event, water losses were occurring because of multiple concurrent water line breaks. Historically, trap moratoriums were implemented as a result of seasonal demand straining or exceeding demand. However, water demand has lowered over the past twenty (20) years even though the number of services has increased.

Currently, Paonia has 416 standby services that are unable to be connected to the town's water system because of the outstanding tap moratorium. Based on current average demands, these 416 services represent an estimated additional 26.6 MG (or roughly 17%) demand. Existing raw water flow records suggest would be able to support these taps, but JDS-Hydro would caution that available data used in this evaluation is limited and further analysis is warranted.

Accommodating future growth will likely require additional planning and capital improvement efforts on behalf of the Town. These efforts are described in their respective sections of the report in detail and are summarized below for easy reference. Principally, accommodating future growth will require an optimization of currently available water supplies. This will include a water loss analysis to identify unaccounted for water within the distribution system, which is estimated between 35-40%. It will also include efforts to improve collection of existing raw water supplies and may even warrant construction of a raw water storage facility in the future. Importantly, implementation of any of the recommendations presented herein carries with it a cost burden. Financial limitations may prove a critical constraining factor

to accommodating growth. How recommendations are implemented should be done in consideration of their impact on the efficacy of other recommendations. A detailed master planning effort that accounts for financial limitations and growth targets is highly recommended.

9.2 Raw Water Storage

In Section 4.5.4 an evaluation of raw water alternatives was conducted to maximize potential raw water availability. As mentioned in this section it was difficult to pinpoint data which could identify ways to either improve raw water accountability, raw water capture, or raw water storage. The data used to evaluate raw water capture, seasonal raw water availability, or annual raw water overages due to spring spillage was rudimentary at best, and a lot of assumptions had to be applied which was derived from previous reports. That said, there was enough spring data and demand data from the Division of Water Resources and Town of Paonia to develop some alternatives for consideration which might be able to maximize the Town's ability to monitor, capture, and store raw water. In turn, this might enable the Town to avoid distribution challenges as was experienced in 2019.

Prioritized Raw Water Recommendations:

1) Accounting for raw water inflow and spillages – knowing what comes into the water treatment plans, and what is not, is the first step to developing sufficient information to identify whether maximizing the raw water capture of the springs on Mt. Lamborn can address its water shortage issues or not. There are still a lot of individual springs and spring spill locations which are unmonitored, and these should be added to the monitoring list. From Section 4.5.1. a combination of Parshall flumes and V-Notch weirs is recommended to provide at least some means of raw water accounting for all spring inflow and spill locations. Overall, the total cost of implementing this alternative is $50,000

2) Identifying and repairing broken collection pipes – while improving the individual collection galleries and infiltration galleries would probably be a wise endeavor, it may not provide the financial return above what the galleries provide as far as collection potential. Increasing the size and capture ability of these galleries may be an investment which Paonia could look at down the road, but if Paonia could implement a raw water storage facility which could capture spilled water at the same rate then avoiding the improvement of these galleries may be well supported. However, repairing or replacing sections of damaged or broken raw water collection lines might prove to be more useful since these lines are well established. JDS-Hydro would recommend allocating approximately $50,000 annually to the identification, repair, and replacement of these lines, as necessary.

3) Roeber Reservoir – Because of its central location and ability to capture the majority of spring overflows while being able to serve both water treatment plants; JDS would recommend the pursuit of an agreement with the Roeber Family to share storage in Roeber Reservoir. In addition, JDS would also recommend the increase in storage for the reservoir up to 100 AF or so (depending upon costs and agreements with the Roeber Family). Of the four alternatives presented in Section 4.5.4. this is recommended as the best and most viable raw water storage alternative. Conservative estimates for increasing storage at Roeber Reservoir are as high as $ 1,636,000

4) Transferring Spring Water – this alternative is probably the least developed of the four raw water maximization alternatives. The ability to transfer raw water from the spring collections locations may provide flexibility but may also prove to be difficult given the topography of Mt. Lamborn. While there is flexibility in sending raw water to either the upper or lower water treatment facilities from the Old Original and Upper Reynolds collection locations, there is not a lot of flexibility from the other collections locations. However, it does appear that it may be possible to move water from the German Creek Springs / Lake Fork Springs collection point to the lower water treatment plant at roughly $ 1.5 million, and then water from the Pole Patch / Upper Reynolds / Spore Springs collection point to the upper water treatment plant at $ 1.8 million.

In considering raw water alternatives as a means of solving the Town's potential water shortages JDS-Hydro would recommend focusing on means of optimizing delivery and accountability within the distribution system first before moving on to more financially intensive means of accounting for, capturing, and storing raw water ahead of treatment.

9.3 Finished Water Treatment and Storage

Treatment upgrades at the lower (Crook) and upper (Lamborn) plants in 2011 and 2016, respectively, were the result of source water reclassification from groundwater to groundwater under the direct influence of surface water. Maintenance items aside, these plants have operational capacities compatible with ability to divert raw water to each location. No improvement to either treatment plant is recommended at this time. However, disinfection contact time is currently provided by the storage volumes provided at each location. It may prove beneficial in the future to provide disinfection contact time via contact pipe rather than storage volume. This would ensure that contact time is provided when storage is offline for servicing.

Finished-water treatment and storage system capital improvements in order or recommended priority are as follows:

- Recoat 2-MG Storage Tank
- Additional finished-water storage tank at upper plant (minimum size 500,000 gallons)

Furthermore, should the Town of Paonia commit to constructing raw water storage infrastructure that results in a surface water designation to its raw water supply, then additional treatment would be required at the upper plant. This may take the form of additional preliminary treatment, disinfection improvements or both.

9.4 Distribution

Specific distribution system improvement recommendations are detailed in Section 6 above. Those recommendations listed in Section 6 are driven by system hydraulics. In addition to those driven by system hydraulics, JDS-Hydro recommends prioritizing the replacement of the entirety of the west loop pipeline into town. Ideally, each pipeline loop would be 10 or 12-inch in diameter. A minimum 8-inch line is needed to facilitate fire flow volumes. In the future 10 or 12-inch piping from the upper (Lamborn) treatment plant into town via both the east and west loop may be necessary to support additional growth. Distribution system capital improvements in order or recommended priority are as follows:

- PRV Improvements: $75,000-$250,000
- Replace remaining 8-inch steel pipe on east loop into Town

- (Altitude) Valve to fill Lower Tank from Upper Tank

9.5 Additional Recommendations

Beyond capital improvements, JDS-Hydro offers the following administrative and planning recommendations:

- **Staffing:** Hiring one additional licensed water/wastewater utility operator.
- **Water Loss Analysis:** AWWA provides standard means and methods which include field and administrative efforts in a process aimed at reducing unaccounted for water, which is currently estimated at between 35-40%.
- **Transient Analysis**: Performing a transient analysis of distribution system infrastructure to better understand risks of transient events and employs means of mitigating these risks. This activity would be best performed in conjunction with PRV improvements.
- **Rate Study Analysis:** To better prioritize improvements capital or otherwise, district financing will likely need to be revisited every 2-5 years.
- **Master Planning:** A Water System Master Plan would take into consideration detailed growth targets both spatial and temporarily. This activity would involve more strategic long-term analysis of Paonia water system needs. This report is largely focused on identify critical short-term needs and evaluating approaches to optimizing raw water supply.

Appendix A

JDS-HYDRO CONSULTANTS, INC.

PROJECT (KICK-OFF) MEETING MINUTES

Project:	Paonia Water Infrastructure Analysis
Project No.:	333.01
Date:	January 30, 2020 (revised February 19, 2020)
Time:	9:00 AM
Location:	Paonia Town Hall
Meeting Facilitator:	Corrine Ferguson, Town of Paonia
Attendees:	(See Below)

The meeting commenced at 9:00am. Meeting minutes herein are generally outlined as follows – Introduction, Discussion of Project Expectations, Discussion of System History and a Discussion of Existing System Files that can be used to support JDS-Hydro Consultant's efforts. At the conclusion of the meeting, JDS-Hydro Consultants (JDS-Hydro) worked with Town of Paonia Public Works Director, Travis Loberg, to inventory critical water system infrastructure and strategize survey efforts for the remainder of the day.

**** The Town of Paonia is encouraged to add to and/or recommend revisions to these minutes based on their own notes. Revised meeting minutes can then be committed to record.***

I. Introductions: Project Team

A. Town of Paonia - Owner
   1. Mary Bachran – Trustee, Planning and Zoning
   2. Bill Bear – Trustee, Planning and Zoning
   3. Corinne Ferguson – Administrator/Town Clerk
   4. Travis Loberg – Public Works Director/Water and Wastewater ORC

B. JDS-Hydro Consultants, Inc. – Engineer
   1. Douglas Schwenke – Project Manager
   2. James Plumb-Starnes – Project Engineer

II. Project Expectations: Town of Paonia representatives communicate that the desired deliverable and assistance from JDS-Hydro may differ some from the scope of services described by the original RFP. Comments on each element of the RFP scope of services as follows:

1. An analysis of the Town's raw water supply from its multiple sources;

Generally, a review of previous reports by Minon Hydrologic (1994), GEI Consultants, Inc. (2000) and W.W. Wheeler (2004), Westwater (2012), Town of Paonia Water Rights and diversion records from the Water Commissioner.

Deliverable Description: Summary status of water rights, raw water spring production and discussion of raw water storage options. Per Travis Loberg, approximately 100-acre feet raw water storage would provide substantial benefit to

Town of Paonia water security.

2. *An analysis of the delivery system of the raw water supply to the Town's treatment plants;*

   JDS-Hydro to provide professional opinion of existing raw water collection system and how it impacts Town of Paonia water security.

3. *An analysis of the delivery systems from each of the raw water supplies and a review and recommendation of the possibility of cross-connecting the supplies to both water treatment plants;*

   To be addressed as part of items 1 and 2

4. *The development of a monitoring program of the raw water flows from the spring boxes and any other system analysis to track raw water on a regular basis;*

   JDS-Hydro to provide recommendations to improve Town of Paonia accounting of existing raw water sources. This effort will include communication/coordination with Water Commission, Luke Reshkee,

5. *An analysis of the treatment plants and treated water storage;*

   JDS-Hydro understands this effort as being of lower importance to the Town of Paonia at this time. Generally, JDS-Hydro will comment on how existing treatment plant capacity and operation impacts recommendations made to the distribution system and overall Town of Paonia water security. JDS-Hydro will work with Public Works Direction, Travis Loberg, to account for potential improvements to treatment plants and treated water storage could provide measurable benefit to the system as a whole. However, review and comment on the condition and potential CIP plan for both treated water storage tanks would be a viable effort in this analysis and will be included in the overall analysis.

6. *An analysis of the February/March water crisis including a report on causes, failures, possible preventative measures;*

   JDS-Hydro will include this analysis in its final analysis report. It may take the form of an attachment to the report to be more easily referenced by the Board of Directors.

7. *An analysis of the distribution system of treated water to the Town's direct customers along with consecutive water systems and smaller water companies that make up the Town's customer base. The analysis of the distribution system should include a system pressure analysis;*

   a. *both during normal production;*

   b. *and with fire flows.*

   c. *Placement of isolation values, and the effect of opening and closing of isolation on the system operations and pressure;*

   This effort will be wrapped into modeling of the existing system. Based on scenarios to be defined, infrastructure improvements may be included in JDS-Hydro's final analysis report.

8. *An analysis of the raw water availability, treatment capacity, and distribution system functionality as to how many water taps the Town can reasonability provide service for;*

   Generally, this is effort is an overall water system mass balance. The question as to the number of water taps the Town can reasonably provide service to may be a function of where additional taps are wanted. JDS-Hydro understands that the Town of Paonia has enacted a moratorium on new taps until an engineer report addresses system capacity and ability to support new taps more specifically. The Town of Paonia has requested JDS-Hydro generate a separate document that addresses the moratorium specifically.

9. *An analysis of the staffing levels and required competencies the Town utilizes for the Water system;*

   To be included in final analysis report

10. *A system model of the Water system compatible with Windows based operating system; Training on the system model to the Town's water system operator(s);*

    The Town of Paonia does not intend to become managers/operators of a sophisticated water model, which would require purchasing new (costly) software. JDS-Hydro will convert its models generated using Innovyze software to EPANET, a free public domain software application and spend up to one day with the Town of Paonia on how to manipulate the EPANET model. It is understood that the Town of Paonia may request assistance in the future to run specific scenarios and/or provide further engineering support.

11. *Recommendations on potential new raw water storage;*

    To be included in final analysis report. This item is of particular interest to the Town of Paonia as it is felt that the lack of raw water storage is a particular constraint on their overall potable water system.

12. *Recommendations of system upgrades, as well as any deficiencies that could be corrected to improve system functionality.*

    JDS-Hydro understands the importance of this task and will consider the system holistically and, building on previous engineering reports, summarize in its final analysis report a list of recommended CIP efforts.

Additional Discussion

- Town of Paonia would like general assistance and recommendations managing Town of Paonia water system assets
- Town of Paonia would like an Operations Schedule that provides recommended service intervals for individual parts of the water system
- Town of Paonia would like the final analysis report to include commentary on how to anticipate water line breaks
- Town of Paonia is looking for easy references, a library of its water system, to more easily and confidently communicate with the public thereby improving consumer confidence
- Town of Paonia would like the final analysis report to address longevity of the system in order to better anticipate potential future CIP expenses

- Town of Paonia would like a line break repair worksheet
- Town of Paonia would like JDS-Hydro to considering the following in development of a water distribution system model
  - Understand existing pressure zones and plan for future pressure zones, if necessary
  - Identify areas that may be operating at high or low pressures
- Town of Paonia has a new hire who is learning GIS to help interface with SGM

III. System History

A. Line breaks have been a chronic problem for many years
B. Per Travis Loberg, most line breaks have been on old thin wall steel pipe, tar wrapped, often where pipe was welded but not (re)wrapped.
C. Town received a Tier 1 capital inventory grant through DOLA
D. Corrine is working on updated tap count (existing, committed and planned). Expects to be done by next week.
E. ARC Land Company owns 300+ unused taps that have been in their possession since 1970s
F. River is already over-decreed
G. Winter demand is hardest to maintain
H. Online information is not correct regarding how much is treated/spilled. Most water into treatment plants is not treated, rather bypassed into irrigation ditches.
I. Two up gradient resevoirs (Lake Cabin and Lake Ruberish) are owned by others, but they are good neighbors and may potentially be considered as part of a raw water storage and management plan.
J. Todd Reservoir is abandoned, jurisdictional dam. It does not hold water and may require considerable work to bring it within a serviceable condition
K. 2016: 186 Line Breaks
L. 2012: Significant line breaks
M. 2012 PER – What was not done? The only thing not done was the 2MG Tank. The extra money was spent on the distribution system.
N. Travis has been with Paonia for 14 years
O. County does not have a separate building department
P. Public Works Staff Count
   1. Two (2) Trash
   2. Three (3) Other – e.g. roads, misc maintenance, storm sewers
   3. Water: Travis is C water, 1 distribution, and the only operator
   4. Wastewater: Travis is D wastewater, 1 collections and the only operator
Q. Wastewater System is 11 years old, 0.495 MGD Pond System
R. Meter readings are now digitized. AMR provided by Badger.
S. One (1) million gallon (MG) tank was down when two (2) MG Tank was down for recoating.

T. One (1) MG Tank now was poly-urea coating
U. Largest Water Users
    1. Stewart Mesa
    2. Valley Farms
    3. Schools are mostly separate (not on City Water)
V. Water Quality – No known issues.
W. Bury depth doesn't seem to be an issue for main lines, mostly service lines. Main lines approx.. 4+ feet deep
X. Water Commissionor: Luke Reshkee (970.234.4922), maybe Steve Tuck
Y. Dam Safety Branch Manager: Unknown
Z. Fire Flows: Mike Byers (970.208.7995)
AA. Cedar Ridge, Hotchkiss also have Pall Water Treatment Plants
BB. Town of Paonia does not currently have a water attorney. Previously Aaron Clay and Keith out of Gunnison.
CC. Previous Funding by WP Authority, DOLA, USDA, Colorado River Basin (Gunnison) for raw water

IV. Existing System Files Requested

A. Water Rights **(Provided)**
B. Raw Water Data from Water Commissioner (**JDS-Hydro**)
C. Water System Ordinance and Resolution for in-town and out-of-town (**Corrine**)
D. Consecutive System Contracts (**Corrine**)
E. Fee Structure, if different from what's online (Including tap fees and future planned changes - **Corrine**)
F. Consumer Confidence Reports (Past 10 years, **Corrine**)
G. Existing system drawings (raw water, treatment, tank, distribution, PRV Vaults, construction drawings, distribution system schedmatics,etc, **Travis**)
H. Existing system engineering documentation including design/planning reports (**Travis**)
    - Specifically reports by GEI Consultants, Inc. (2000) and W.W. Wheeler (2004)
I. Water records since 2012 Westwater PER Report (**Corrine**)
J. Meter records (10 years, **Corrine**)
K. Wastewater Treatment Data (**Travis**)
L. Survey Files (Travis to look, may not exist. JDS-Hydro may contact previous engineering firms)
M. Historical Pressure Testing (**Travis**)
N. Historical Hydrant Testing Records (None)
O. Water Leak/Line Break Records – Where/What Size/Repair Details (**Travis**)
P. Tank Inspection Reports (**Travis**)
Q. Raw Water Quality Data (**Travis**)
R. Finished Water Quality Data (**Travis**)
S. Treatment Plant O&M Manuals (**Travis**)

T. Audits: Minimum 3 years of financial audits (**Online**)

U. Detailed accounts of water system CIP efforts in the past 10 years (**Travis**)

Appendix B

Report Criteria:
Selected services: Water
Usage from Quantity
Rates without levels suppressed

Level	From	To	Quantity	Consumption Per Level	Rate	Calculated Amount	Customers Within This Level	Customers Ending Within This Level	Total Customers With Usage	Active Customers Using Rate
Rate: 101 (Water-Residential In Town										
1	-201,700	0	-201,700	-803,251	0.00000000	.00	49	49	846	822
2		1,000	1,000	835,625	0.00240000	2,005.50	770	24		
3	1,001	4,000	3,000	2,389,593	0.00270000	6,451.90	746	39		
4	4,001	9,000	5,000	3,723,029	0.00300000	11,169.09	707	49		
5	9,001	19,000	10,000	6,640,870	0.00330000	21,914.87	658	90		
6	19,001	34,000	15,000	7,688,881	0.00360000	27,679.97	568	168		
7	34,001	54,000	20,000	6,546,171	0.00390000	25,530.07	400	148		
8	54,001	84,000	30,000	5,533,702	0.00420000	23,241.55	252	133		
9	84,001	124,000	40,000	3,552,172	0.00450000	15,984.77	119	66		
10	124,001	174,000	50,000	1,700,025	0.00850000	14,450.21	53	35		
11	174,001	249,000	75,000	585,470	0.01000000	5,854.70	18	13		
12	249,001	349,000	100,000	402,120	0.01100000	4,423.32	5	1		
13	349,001	999,999,999	999,999,999	1,270,614	0.01200000	15,247.37	4	4		
Total Rate: 101 (Water-Residential In Town):				40,065,02		173,953.32				
Rate: 102 (Water-Residential Out of Town										
1	-877,090	0	-877,090	-1,328,239	0.00000000	.00	28	28	213	208
2	1	1,000	1,000	606,101	0.00240000	1,454.64	203	5		
3	1,001	4,000	3,000	1,753,077	0.00270000	4,733.31	198	11		
4	4,001	9,000	5,000	2,852,187	0.00300000	8,556.56	187	10		
5	9,001	19,000	10,000	5,571,570	0.00330000	18,386.18	177	21		
6	19,001	34,000	15,000	7,033,972	0.00360000	25,322.30	156	37		
7	34,001	54,000	20,000	8,067,601	0.00390000	31,463.64	119	46		
8	54,001	84,000	30,000	6,475,728	0.00420000	27,198.06	73	34		
9	84,001	124,000	40,000	1,312,284	0.00450000	5,905.28	39	22		
10	124,001	174,000	50,000	435,980	0.00850000	3,705.83	17	11		
11	174,001	249,000	75,000	289,720	0.01000000	2,897.20	6	5		
12	249,001	349,000	100,000	20,020	0.01100000	220.22	1	1		
13	349,001	999,999,999	999,999,999	0	0.01200000	.00	0	0		
Total Rate: 102 (Water-Residential Out of Town):				33,090,001		129,843.22				
Rate: 111 (Water-Commercial In Town										
1	-124,600	0	-124,600	-84,480	0.00000000	.00	6	6	127	126
2	1	1,000	1,000	128,470	0.00240000	308.33	114	3		
3	1,001	4,000	3,000	373,188	0.00270000	1,007.61	111	6		
4	4,001	9,000	5,000	579,900	0.00300000	1,739.70	105	6		
5	9,001	19,000	10,000	995,380	0.00330000	3,284.75	99	23		
6	19,001	34,000	15,000	1,186,543	0.00360000	4,271.55	76	18		
7	34,001	54,000	20,000	1,207,272	0.00390000	4,708.36	58	14		
8	54,001	84,000	30,000	1,201,740	0.00420000	5,047.31	44	17		
9	84,001	124,000	40,000	1,076,043	0.00450000	4,842.19	27	8		
10	124,001	174,000	50,000	820,490	0.00850000	6,974.17	19	6		
11	174,001	249,000	75,000	988,160	0.01000000	9,881.60	13	3		
12	249,001	349,000	100,000	771,070	0.01100000	8,481.77	10	4		
13	349,001	999,999,999	999,999,999	3,353,520	0.01200000	40,242.24	6	6		
Total Rate: 111 (Water-Commercial In Town):				12,597,296		90,789.58				

Level	From	To	Quantity	Consumption Per Level	Rate	Calculated Amount	Customers Within This Level	Customers Ending Within This Level	Total Customers With Usage	Active Customers Using Rate
Rate: 112 (Water-Commercial Out of Town										
1	-13,030	0	-13,030	0	0.00000000	.00	2	2	11	10
2	1	1,000	1,000	12,000	0.00240000	28.80	9	0		
3	1,001	4,000	3,000	34,384	0.00270000	92.84	9	1		
4	4,001	9,000	5,000	55,000	0.00300000	165.00	8	0		
5	9,001	19,000	10,000	110,000	0.00330000	363.00	8	0		
6	19,001	34,000	15,000	165,000	0.00360000	594.00	8	0		
7	34,001	54,000	20,000	210,740	0.00390000	821.89	8	1		
8	54,001	84,000	30,000	269,660	0.00420000	1,132.57	7	1		
9	84,001	124,000	40,000	268,940	0.00450000	1,210.23	6	2		
10	124,001	174,000	50,000	250,000	0.00850000	2,125.00	4	0		
11	174,001	249,001	75,000	360,410	0.01000000	3,604.10	4	1		
12	249,001	349,000	100,000	400,000	0.01100000	4,400.00	3	0		
13	349,001	999,999,999	999,999,999	13,127,330	0.01200000	157,527.96	3	3		
Total Rate: 112 (Water-Commercial Out of Town):				15,263,464		172,065.38				
Rate: 198 (Water-Cap Usage										
1	1	10,000	10,000	18,000	0.00180000	32.40	2	1	2	2
2	10,001	20,000	10,000	10,000	0.00205000	20.50	1	0		
3	20,001	30,000	10,000	9,200	0.00360000	33.12	1	1		
4	30,001	100,000	70,000	0	0.00460000	.00	0	0		
5	100,001	100,099,999	99,999,999	0	0.00560000	.00	0	0		
Total Rate: 198 (Water-Cap Usage):				37,200		86.02				
Grand Totals:				101,052,982		566,737.53				

Report Criteria:
Selected services: Water
Usage from Quantity
Rates without levels suppressed

Level	From	To	Quantity	Consumption Per Level	Rate	Calculated Amount	Customers Within This Level	Customers Ending Within This Level	Total Customers With Usage	Active Customers Using Rate
Rate: 101 (Water-Residential In Town										
1	-292,210	0	-292,210	-969,314	0.00000000	.00	18	18	849	829
2		1,000	1,000	858,630	0.00240000	2,060.71	810	32		
3	1,001	4,000	3,000	2,484,630	0.00270000	6,708.50	778	39		
4	4,001	9,000	5,000	3,866,108	0.00300000	11,598.32	739	55		
5	9,001	19,000	10,000	6,903,921	0.00330000	22,782.94	684	96		
6	19,001	34,000	15,000	8,044,700	0.00360000	28,960.92	588	148		
7	34,001	54,000	20,000	7,367,376	0.00390000	28,732.77	440	157		
8	54,001	84,000	30,000	6,447,337	0.00420000	27,078.82	283	141		
9	84,001	124,000	40,000	3,859,048	0.00450000	17,365.72	142	86		
10	124,001	174,000	50,000	2,027,670	0.00850000	17,235.20	56	36		
11	174,001	249,000	75,000	737,930	0.01000000	7,379.30	20	15		
12	249,001	349,000	100,000	257,050	0.01100000	2,827.55	5	3		
13	349,001	999,999,999	999,999,999	1,906,820	0.01200000	22,881.84	2	2		
Total Rate: 101 (Water-Residential In Town):				43,791,900		195,612.58				
Rate: 102 (Water-Residential Out of Town										
1	-9,996,490	0	-9,996,490	-20,115,770	0.00000000	.00	16	16	219	214
2	1	1,000	1,000	615,041	0.00240000	1,476.10	211	3		
3	1,001	4,000	3,000	1,836,710	0.00270000	4,959.12	208	5		
4	4,001	9,000	5,000	2,923,950	0.00300000	8,771.85	203	6		
5	9,001	19,000	10,000	5,394,390	0.00330000	17,801.49	197	23		
6	19,001	34,000	15,000	7,525,990	0.00360000	27,093.56	174	38		
7	34,001	54,000	20,000	8,543,499	0.00390000	33,319.65	136	47		
8	54,001	84,000	30,000	8,484,089	0.00420000	35,633.17	89	40		
9	84,001	124,000	40,000	5,285,285	0.00450000	23,783.78	49	33		
10	124,001	174,000	50,000	1,318,890	0.00850000	11,210.57	16	7		
11	174,001	249,000	75,000	1,408,650	0.01000000	14,086.50	9	4		
12	249,001	349,000	100,000	410,350	0.01100000	4,513.85	2	2		
13	349,001	999,999,999	999,999,999	2,776,370	0.01200000	33,316.44	3	3		
Total Rate: 102 (Water-Residential Out of Town):				26,407,444		215,966.07				
Rate: 111 (Water-Commercial In Town										
1	-9,762	0	-9,762	-9,604	0.00000000	.00	1	1	141	140
2	1	1,000	1,000	146,432	0.00240000	351.44	132	12		
3	1,001	4,000	3,000	406,620	0.00270000	1,097.87	120	10		
4	4,001	9,000	5,000	587,510	0.00300000	1,762.53	110	18		
5	9,001	19,000	10,000	978,603	0.00330000	3,229.39	92	17		
6	19,001	34,000	15,000	1,223,670	0.00360000	4,405.21	75	12		
7	34,001	54,000	20,000	1,274,370	0.00390000	4,970.04	63	18		
8	54,001	84,000	30,000	1,300,590	0.00420000	5,462.48	45	17		
9	84,001	124,000	40,000	970,700	0.00450000	4,368.15	28	9		
10	124,001	174,000	50,000	1,008,910	0.00850000	8,575.74	19	3		
11	174,001	249,000	75,000	994,670	0.01000000	9,946.70	16	6		
12	249,001	349,000	100,000	806,043	0.01100000	8,866.47	10	4		
13	349,001	999,999,999	999,999,999	5,449,260	0.01200000	65,391.12	6	6		
Total Rate: 111 (Water-Commercial In Town):				15,137,774		118,427.14				

Level	From	To	Quantity	Consumption Per Level	Rate	Calculated Amount	Customers Within This Level	Customers Ending Within This Level	Total Customers With Usage	Active Customers Using Rate
Rate: 112 (Water-Commercial Out of Town										
1	1	1,000	1,000	9,000	0.00240000	21.60	7	0	9	9
2	1,001	4,000	3,000	27,000	0.00270000	72.90	7	0		
3	4,001	9,000	5,000	41,880	0.00300000	125.64	7	1		
4	9,001	19,000	10,000	71,410	0.00330000	235.65	6	1		
5	19,001	34,000	15,000	105,000	0.00360000	378.00	5	0		
6	34,001	54,000	20,000	124,970	0.00390000	487.38	5	1		
7	54,001	84,000	30,000	158,380	0.00420000	665.20	4	1		
8	84,001	124,000	40,000	82,190	0.00450000	369.86	3	2		
9	124,001	174,000	50,000	44,100	0.00850000	374.85	1	1		
10	174,001	249,000	75,000	0	0.01000000	.00	0	0		
11	249,001	349,000	100,000	0	0.01100000	.00	0	0		
12	349,001	999,999,999	999,999,999	0	0.01200000	.00	0	0		
Total Rate: 112 (Water-Commercial Out of Town):				663,930		2,731.08				
Rate: 198 (Water-Cap Usage										
1	1	10,000	10,000	0	0.00180000	.00	0	0	0	0
2	10,001	20,000	10,000	0	0.00205000	.00	0	0		
3	20,001	30,000	10,000	0	0.00360000	.00	0	0		
4	30,001	100,000	70,000	0	0.00460000	.00	0	0		
5	100,001	100,099,999	99,999,999	0	0.00560000	.00	0	0		
Total Rate: 198 (Water-Cap Usage):				0		.00				
Grand Totals:				86,001,054		532,736.87				

Report Criteria:
Selected services: Water
Usage from Quantity
Rates without levels suppressed

Level	From	To	Quantity	Consumption Per Level	Rate	Calculated Amount	Customers Within This Level	Customers Ending Within This Level	Total Customers With Usage	Active Customers Using Rate
Rate: 101 (Water-Residential In Town										
1	-103,367	0	-103,367	-169,671	0.00000000	.00	11	11	824	810
2		1,000	1,000	856,180	0.00240000	2,054.83	806	34		
3	1,001	4,000	3,000	2,443,563	0.00270000	6,597.62	772	52		
4	4,001	9,000	5,000	3,812,608	0.00300000	11,437.82	720	46		
5	9,001	19,000	10,000	6,899,405	0.00330000	22,768.04	674	83		
6	19,001	34,000	15,000	7,998,601	0.00360000	28,794.96	591	148		
7	34,001	54,000	20,000	7,229,713	0.00390000	28,195.88	443	160		
8	54,001	84,000	30,000	5,999,345	0.00420000	25,197.25	283	156		
9	84,001	124,000	40,000	3,353,509	0.00450000	15,090.79	127	73		
10	124,001	174,000	50,000	1,857,950	0.00850000	15,792.58	54	34		
11	174,001	249,000	75,000	780,369	0.01000000	7,803.69	20	16		
12	249,001	349,000	100,000	267,270	0.01100000	2,939.97	4	3		
13	349,001	999,999,999	999,999,999	17,080	0.01200000	204.96	1	1		
Total Rate: 101 (Water-Residential In Town):				41,345,927		166,878.39				
Rate: 102 (Water-Residential Out of Town										
1	-1,185,840	0	-1,185,840	-552,060	0.00000000	.00	9	9	216	215
2	1	1,000	1,000	611,412	0.00240000	1,467.39	210	7		
3	1,001	4,000	3,000	1,806,660	0.00270000	4,877.98	203	7		
4	4,001	9,000	5,000	2,976,690	0.00300000	8,930.07	196	8		
5	9,001	19,000	10,000	5,687,390	0.00330000	18,768.39	188	19		
6	19,001	34,000	15,000	7,540,756	0.00360000	27,146.72	169	31		
7	34,001	54,000	20,000	9,083,334	0.00390000	35,425.00	138	46		
8	54,001	84,000	30,000	9,625,831	0.00420000	40,428.49	92	52		
9	84,001	124,000	40,000	4,846,120	0.00450000	21,807.54	40	24		
10	124,001	174,000	50,000	1,067,466	0.00850000	9,073.46	16	10		
11	174,001	249,000	75,000	190,850	0.01000000	1,908.50	6	5		
12	249,001	349,000	100,000	100	0.01100000	1.10	1	1		
13	349,001	999,999,999	999,999,999	0	0.01200000	.00	0	0		
Total Rate: 102 (Water-Residential Out of Town):				42,884,549		169,834.64				
Rate: 111 (Water-Commercial In Town										
1	-100,000	0	-100,000	-80,000	0.00000000	.00	3	3	140	139
2	1	1,000	1,000	147,037	0.00240000	352.89	130	8		
3	1,001	4,000	3,000	413,384	0.00270000	1,116.14	122	7		
4	4,001	9,000	5,000	628,710	0.00300000	1,886.13	115	15		
5	9,001	19,000	10,000	1,031,086	0.00330000	3,402.58	100	20		
6	19,001	34,000	15,000	1,205,440	0.00360000	4,339.58	80	22		
7	34,001	54,000	20,000	1,198,700	0.00390000	4,674.93	58	15		
8	54,001	84,000	30,000	1,307,600	0.00420000	5,491.92	43	13		
9	84,001	124,000	40,000	1,062,170	0.00450000	4,779.77	30	14		
10	124,001	174,000	50,000	751,890	0.00850000	6,391.07	16	5		
11	174,001	249,000	75,000	664,280	0.01000000	6,642.80	11	5		
12	249,001	349,000	100,000	633,330	0.01100000	6,966.63	6	1		
13	349,001	999,999,999	999,999,999	3,459,280	0.01200000	41,511.36	5	5		
Total Rate: 111 (Water-Commercial In Town):				12,422,907		87,555.79				

Level	From	To	Quantity	Consumption Per Level	Rate	Calculated Amount	Customers Within This Level	Customers Ending Within This Level	Total Customers With Usage	Active Customers Using Rate
Rate: 112 (Water-Commercial Out of Town										
1	1	1,000	1,000	10,000	0.00240000	24.00	8	1	9	9
2	1,001	4,000	3,000	27,000	0.00270000	72.90	7	0		
3	4,001	9,000	5,000	32,100	0.00300000	96.30	7	3		
4	9,001	19,000	10,000	60,000	0.00330000	198.00	4	0		
5	19,001	34,000	15,000	90,000	0.00360000	324.00	4	0		
6	34,001	54,000	20,000	120,000	0.00390000	468.00	4	0		
7	54,001	84,000	30,000	133,510	0.00420000	560.74	4	3		
8	84,001	124,000	40,000	40,000	0.00450000	180.00	1	0		
9	124,001	174,000	50,000	50,000	0.00850000	425.00	1	0		
10	174,001	249,000	75,000	75,000	0.01000000	750.00	1	0		
11	249,001	349,000	100,000	82,050	0.01100000	902.55	1	1		
12	349,001	999,999,999	999,999,999	0	0.01200000	.00	0	0		
Total Rate: 112 (Water-Commercial Out of Town):				719,660		4,001.49				
Rate: 198 (Water-Cap Usage										
1	1	10,000	10,000	0	0.00180000	.00	0	0	0	0
2	10,001	20,000	10,000	0	0.00205000	.00	0	0		
3	20,001	30,000	10,000	0	0.00360000	.00	0	0		
4	30,001	100,000	70,000	0	0.00460000	.00	0	0		
5	100,001	100,099,999	99,999,999	0	0.00560000	.00	0	0		
Total Rate: 198 (Water-Cap Usage):				0		.00				
Grand Totals:				97,373,038		428,270.32				

Report Criteria:
Selected services: Water
Usage from Quantity
Rates without levels suppressed

Level	From	To	Quantity	Consumption Per Level	Rate	Calculated Amount	Customers Within This Level	Customers Ending Within This Level	Total Customers With Usage	Active Customers Using Rate
Rate: 101 (Water-Residential In Town										
1	-779,200	0	-779,200	-195,790	0.00000000	.00	7	7	829	825
2		1,000	1,000	871,140	0.00240000	2,090.74	802	36		
3	1,001	4,000	3,000	2,448,280	0.00270000	6,610.36	766	49		
4	4,001	9,000	5,000	3,771,455	0.00300000	11,314.37	717	48		
5	9,001	19,000	10,000	6,742,160	0.00330000	22,249.13	669	115		
6	19,001	34,000	15,000	7,721,973	0.00360000	27,799.10	554	158		
7	34,001	54,000	20,000	6,420,670	0.00390000	25,040.61	396	182		
8	54,001	84,000	30,000	4,475,940	0.00420000	18,798.95	214	122		
9	84,001	124,000	40,000	2,497,710	0.00450000	11,239.70	92	55		
10	124,001	174,000	50,000	1,060,020	0.00850000	9,010.17	37	28		
11	174,001	249,000	75,000	445,720	0.01000000	4,457.20	9	6		
12	249,001	349,000	100,000	161,320	0.01100000	1,774.52	3	2		
13	349,001	999,999,999	999,999,999	7,220	0.01200000	86.64	1	1		
Total Rate: 101 (Water-Residential In Town):				36,427,810		140,471.47				
Rate: 102 (Water-Residential Out of Town										
1	-200,000	0	-200,000	-152,630	0.00000000	.00	2	2	220	219
2	1	1,000	1,000	616,181	0.00240000	1,478.83	215	10		
3	1,001	4,000	3,000	1,825,790	0.00270000	4,929.63	205	4		
4	4,001	9,000	5,000	3,003,410	0.00300000	9,010.23	201	11		
5	9,001	19,000	10,000	5,800,731	0.00330000	19,142.41	190	29		
6	19,001	34,000	15,000	8,176,480	0.00360000	29,435.33	161	27		
7	34,001	54,000	20,000	9,003,260	0.00390000	35,112.71	134	52		
8	54,001	84,000	30,000	7,128,737	0.00420000	29,940.70	82	42		
9	84,001	124,000	40,000	3,721,180	0.00450000	16,745.31	40	29		
10	124,001	174,000	50,000	477,010	0.00850000	4,054.59	11	6		
11	174,001	249,000	75,000	161,060	0.01000000	1,610.60	5	5		
12	249,001	349,000	100,000	0	0.01100000	.00	0	0		
13	349,001	999,999,999	999,999,999	0	0.01200000	.00	0	0		
Total Rate: 102 (Water-Residential Out of Town):				39,761,209		151,460.34				
Rate: 111 (Water-Commercial In Town										
1	-494,000	0	-494,000	-483,850	0.00000000	.00	1	1	137	136
2	1	1,000	1,000	151,982	0.00240000	364.76	128	6		
3	1,001	4,000	3,000	412,380	0.00270000	1,113.43	122	13		
4	4,001	9,000	5,000	593,100	0.00300000	1,779.30	109	12		
5	9,001	19,000	10,000	961,500	0.00330000	3,172.95	97	27		
6	19,001	34,000	15,000	1,063,610	0.00360000	3,829.00	70	18		
7	34,001	54,000	20,000	1,058,780	0.00390000	4,129.24	52	12		
8	54,001	84,000	30,000	1,136,910	0.00420000	4,775.02	40	14		
9	84,001	124,000	40,000	920,380	0.00450000	4,141.71	26	8		
10	124,001	174,000	50,000	733,290	0.00850000	6,232.97	18	6		
11	174,001	249,000	75,000	652,190	0.01000000	6,521.90	12	7		
12	249,001	349,000	100,000	451,290	0.01100000	4,964.19	5	1		
13	349,001	999,999,999	999,999,999	4,382,730	0.01200000	52,592.76	4	4		
Total Rate: 111 (Water-Commercial In Town):				12,034,292		93,617.22				

Level	From	To	Quantity	Consumption Per Level	Rate	Calculated Amount	Customers Within This Level	Customers Ending Within This Level	Total Customers With Usage	Active Customers Using Rate
Rate: 112 (Water-Commercial Out of Town										
1	-59,850	0	-59,850	-59,630	0.00000000	.00	1	1	11	11
2	1	1,000	1,000	11,220	0.00240000	26.93	9	1		
3	1,001	4,000	3,000	26,620	0.00270000	71.87	8	2		
4	4,001	9,000	5,000	36,320	0.00300000	108.96	6	1		
5	9,001	19,000	10,000	62,280	0.00330000	205.52	5	1		
6	19,001	34,000	15,000	90,000	0.00360000	324.00	4	0		
7	34,001	54,000	20,000	120,000	0.00390000	468.00	4	0		
8	54,001	84,000	30,000	170,400	0.00420000	715.68	4	1		
9	84,001	124,000	40,000	48,970	0.00450000	220.37	3	2		
10	124,001	174,000	50,000	50,000	0.00850000	425.00	1	0		
11	174,001	249,000	75,000	10,560	0.01000000	105.60	1	1		
12	249,001	349,000	100,000	0	0.01100000	.00	0	0		
13	349,001	999,999,999	999,999,999	0	0.01200000	.00	0	0		
Total Rate: 112 (Water-Commercial Out of Town):				566,740		2,671.93				
Rate: 198 (Water-Cap Usage										
1	1	10,000	10,000	0	0.00180000	.00	0	0	0	0
2	10,001	20,000	10,000	0	0.00205000	.00	0	0		
3	20,001	30,000	10,000	0	0.00360000	.00	0	0		
4	30,001	100,000	70,000	0	0.00460000	.00	0	0		
5	100,001	100,099,999	99,999,999	0	0.00560000	.00	0	0		
Total Rate: 198 (Water-Cap Usage):				0		.00				
Grand Totals:				88,790,059		388,220.96				

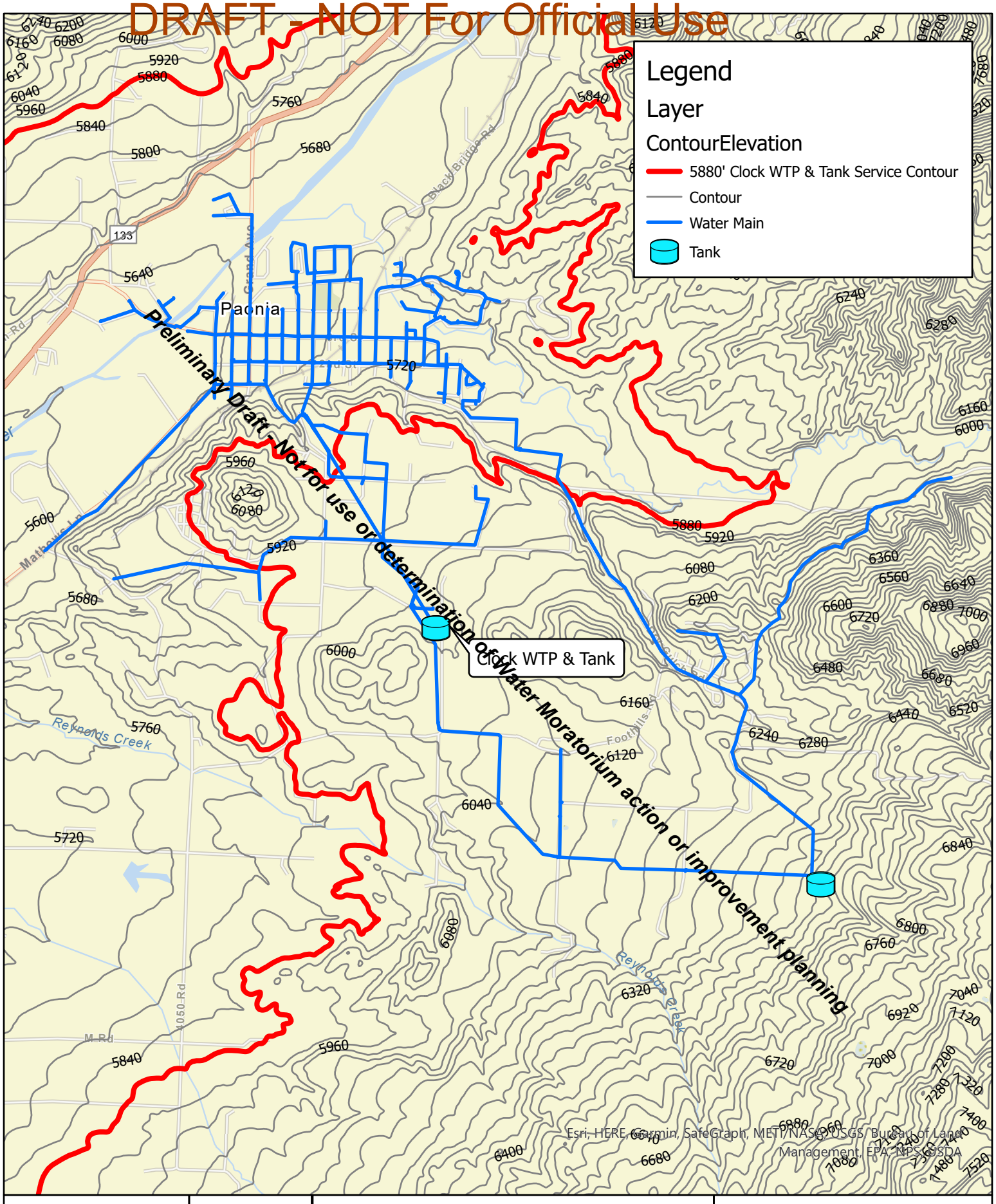
Report Criteria:
Selected services: Water
Usage from Quantity
Rates without levels suppressed

Level	From	To	Quantity	Consumption Per Level	Rate	Calculated Amount	Customers Within This Level	Customers Ending Within This Level	Total Customers With Usage	Active Customers Using Rate
Rate: 101 (Water-Residential In Town										
1	-27,710	0	-27,710	-19,110	0.00000000	.00	2	2	832	832
2		1,000	1,000	861,500	0.00240000	2,067.60	806	24		
3	1,001	4,000	3,000	2,488,000	0.00270000	6,717.60	782	41		
4	4,001	9,000	5,000	3,913,671	0.00300000	11,741.01	741	42		
5	9,001	19,000	10,000	6,933,540	0.00330000	22,880.68	699	89		
6	19,001	34,000	15,000	8,264,980	0.00360000	29,753.93	610	151		
7	34,001	54,000	20,000	7,455,320	0.00390000	29,075.75	459	160		
8	54,001	84,000	30,000	6,430,530	0.00420000	27,008.23	299	154		
9	84,001	124,000	40,000	3,993,320	0.00450000	17,969.94	145	82		
10	124,001	174,000	50,000	2,187,920	0.00850000	18,597.32	63	38		
11	174,001	249,000	75,000	1,279,280	0.01000000	12,792.80	25	15		
12	249,001	349,000	100,000	467,020	0.01100000	5,137.22	10	9		
13	349,001	999,999,999	999,999,999	118,650	0.01200000	1,423.80	1	1		
Total Rate: 101 (Water-Residential In Town):				44,374,620		185,165.88				
Rate: 102 (Water-Residential Out of Town										
1	-163,500	0	-163,500	-48,030	0.00000000	.00	5	5	224	224
2	1	1,000	1,000	622,540	0.00240000	1,494.10	218	3		
3	1,001	4,000	3,000	1,847,689	0.00270000	4,988.76	215	12		
4	4,001	9,000	5,000	3,037,900	0.00300000	9,113.70	203	9		
5	9,001	19,000	10,000	5,858,330	0.00330000	19,332.49	194	23		
6	19,001	34,000	15,000	8,124,000	0.00360000	29,246.40	171	31		
7	34,001	54,000	20,000	9,479,080	0.00390000	36,968.41	140	46		
8	54,001	84,000	30,000	8,594,331	0.00420000	36,096.19	94	39		
9	84,001	124,000	40,000	5,737,260	0.00450000	25,817.67	55	25		
10	124,001	174,000	50,000	1,887,750	0.00850000	16,045.88	30	17		
11	174,001	249,000	75,000	581,170	0.01000000	5,811.70	13	8		
12	249,001	349,000	100,000	272,060	0.01100000	2,992.66	4	4		
13	349,001	999,999,999	999,999,999	22,890	0.01200000	274.68	1	1		
Total Rate: 102 (Water-Residential Out of Town):				46,016,970		188,182.63				
Rate: 111 (Water-Commercial In Town										
1	1	1,000	1,000	140,275	0.00240000	336.66	126	9	133	133
2	1,001	4,000	3,000	404,160	0.00270000	1,091.23	117	4		
3	4,001	9,000	5,000	627,470	0.00300000	1,882.41	113	11		
4	9,001	19,000	10,000	1,050,560	0.00330000	3,466.85	102	25		
5	19,001	34,000	15,000	1,150,730	0.00360000	4,142.63	77	25		
6	34,001	54,000	20,000	1,083,960	0.00390000	4,227.44	52	15		
7	54,001	84,000	30,000	1,140,910	0.00420000	4,791.82	37	11		
8	84,001	124,000	40,000	926,500	0.00450000	4,169.25	26	11		
9	124,001	174,000	50,000	700,650	0.00850000	5,955.53	15	3		
10	174,001	249,000	75,000	579,960	0.01000000	5,799.60	12	6		
11	249,001	349,000	100,000	387,790	0.01100000	4,265.69	6	3		
12	349,001	999,999,999	999,999,999	2,884,790	0.01200000	34,617.48	3	3		
Total Rate: 111 (Water-Commercial In Town):				11,077,755		74,746.59				
Rate: 112 (Water-Commercial Out of Town										

Level	From	To	Quantity	Consumption Per Level	Rate	Calculated Amount	Customers Within This Level	Customers Ending Within This Level	Total Customers With Usage	Active Customers Using Rate
1	1	1,000	1,000	10,000	0.00240000	24.00	8	0	10	10
2	1,001	4,000	3,000	30,000	0.00270000	81.00	8	0		
3	4,001	9,000	5,000	50,000	0.00300000	150.00	8	0		
4	9,001	19,000	10,000	99,900	0.00330000	329.67	8	1		
5	19,001	34,000	15,000	109,080	0.00360000	392.69	7	2		
6	34,001	54,000	20,000	120,530	0.00390000	470.07	5	2		
7	54,001	84,000	30,000	120,530	0.00420000	506.23	3	1		
8	84,001	124,000	40,000	112,390	0.00450000	505.76	2	2		
9	124,001	174,000	50,000	0	0.00850000	.00	0	0		
10	174,001	249,000	75,000	0	0.01000000	.00	0	0		
11	249,001	349,000	100,000	0	0.01100000	.00	0	0		
12	349,001	999,999,999	999,999,999	0	0.01200000	.00	0	0		
Total Rate: 112 (Water-Commercial Out of Town):				652,430		2,459.41				
Rate: 198 (Water-Cap Usage										
1	1	10,000	10,000	0	0.00180000	.00	0	0	0	0
2	10,001	20,000	10,000	0	0.00205000	.00	0	0		
3	20,001	30,000	10,000	0	0.00360000	.00	0	0		
4	30,001	100,000	70,000	0	0.00460000	.00	0	0		
5	100,001	100,099,999	99,999,999	0	0.00560000	.00	0	0		
Total Rate: 198 (Water-Cap Usage):				0		.00				
Grand Totals:				102,121,776		450,554.50				

Appendix C

DRAFT - NOT For Official Use



0 1,500 3,000
FEET

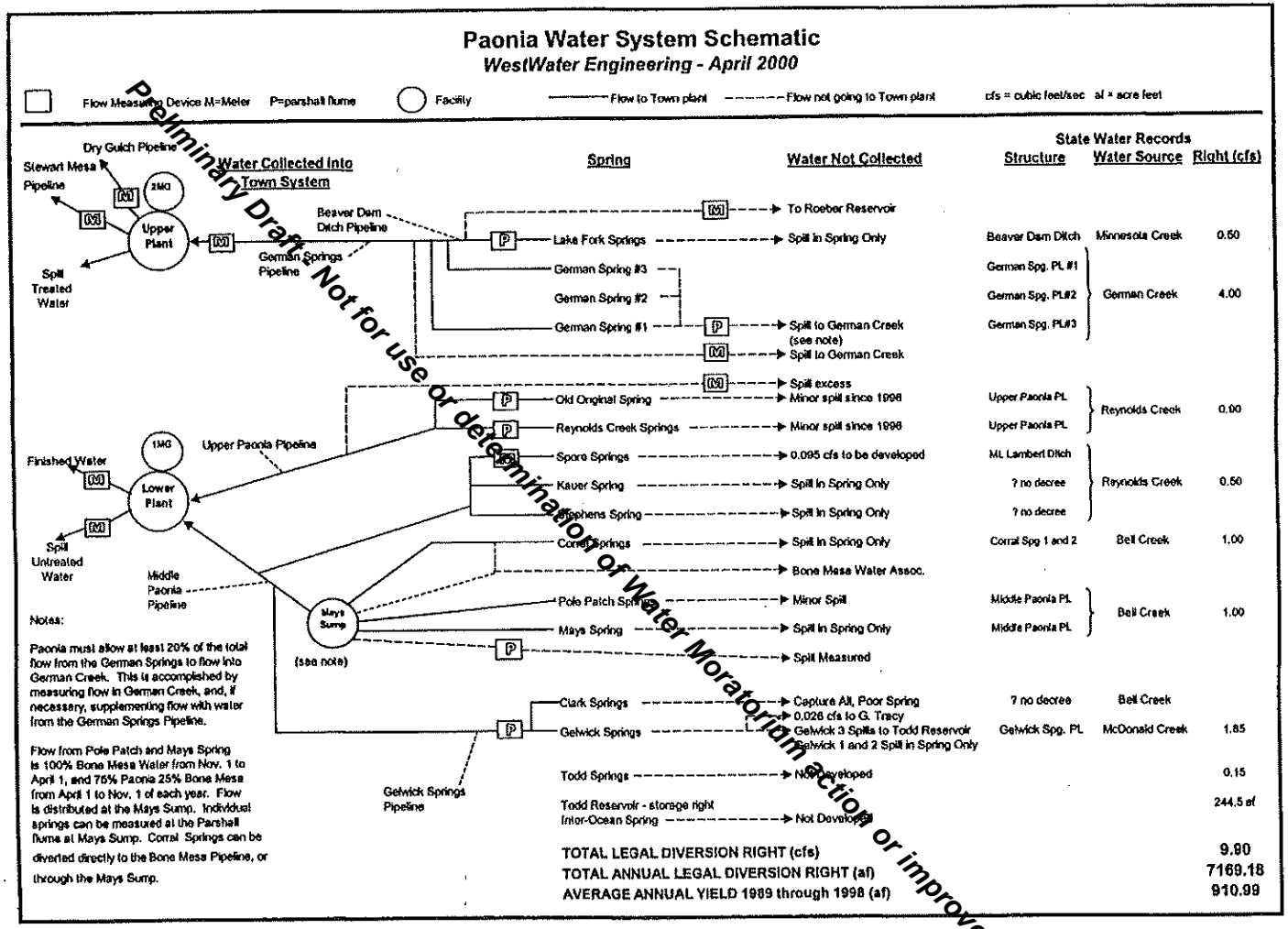
N
W E
S

TOWN OF PAONIA

CLOCK WTP & TANK SERVICE AREA

JDS-HYDRO CONSULTANTS, INC.
5540 TECH CENTER DR., SUITE 100
COLORADO SPRINGS, CO 80919
(719) 227-0072

Appendix D



W. W. Wheeler and Associates, Inc.
Water Resources Engineers

Raw Water Collection System
Schematic

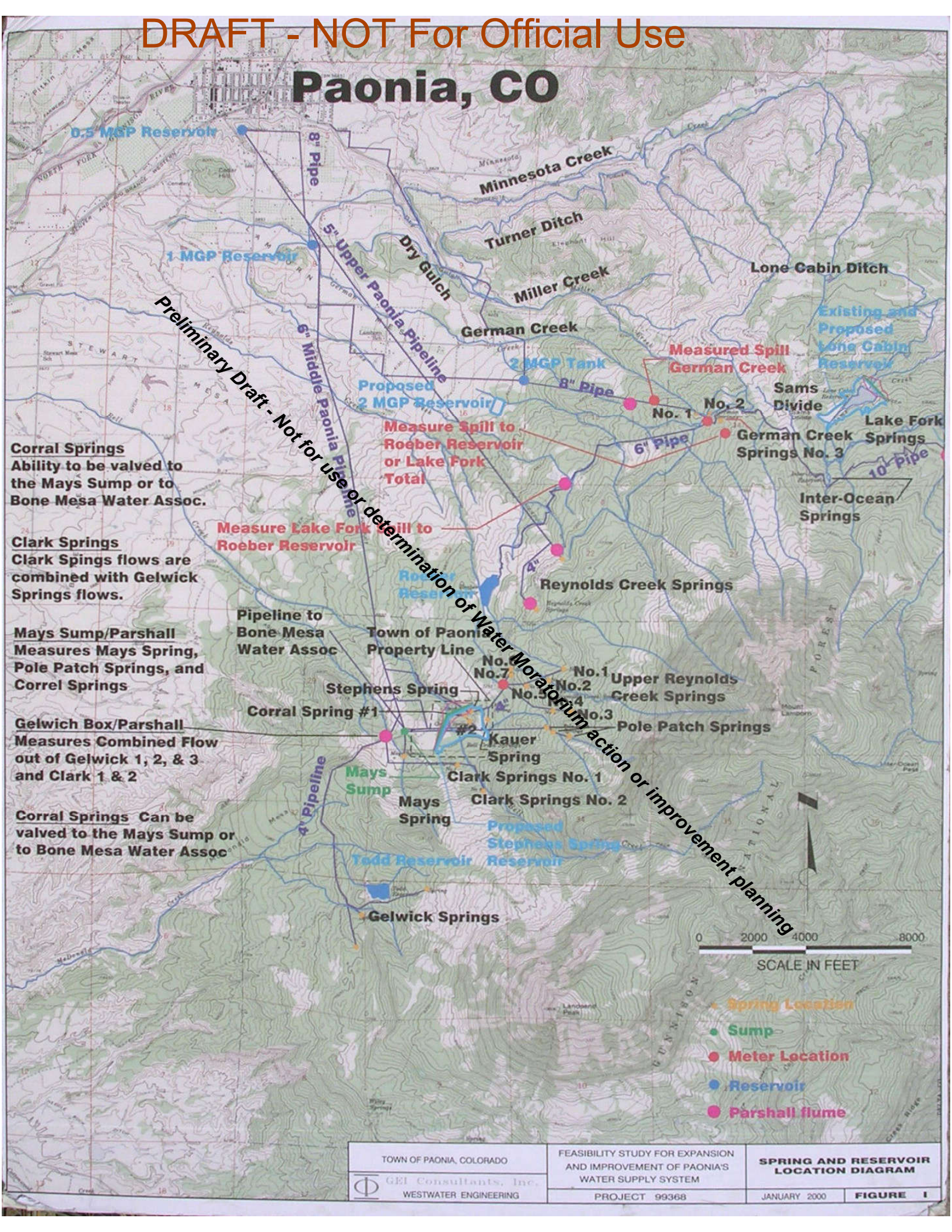
Job Number
1589.01

Figure 3

Appendix E

DRAFT - NOT For Official Use

Paonia, CO

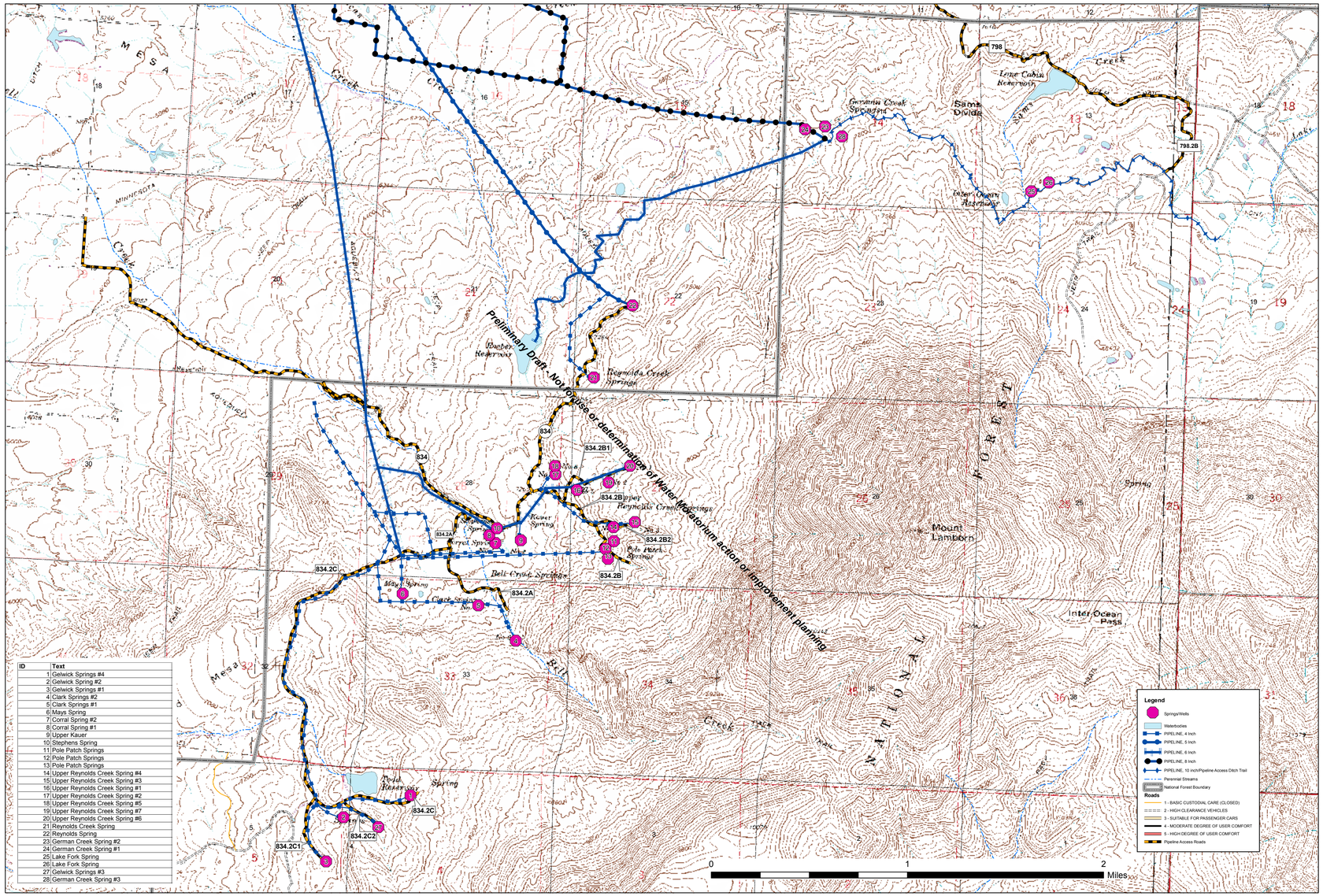


TOWN OF PAONIA, COLORADO	FEASIBILITY STUDY FOR EXPANSION AND IMPROVEMENT OF PAONIA'S WATER SUPPLY SYSTEM	SPRING AND RESERVOIR LOCATION DIAGRAM	
GEI Consultants, Inc. WESTWATER ENGINEERING	PROJECT 99368	JANUARY 2000	FIGURE 1

Appendix F

DRAFT - NOT For Official Use

Exhibit A



ID	Text
1	Gelwick Springs #4
2	Gelwick Spring #2
3	Gelwick Springs #1
4	Clark Springs #2
5	Clark Springs #1
6	Mays Spring
7	Corral Spring #2
8	Corral Spring #1
9	Upper Kauer
10	Stephens Spring
11	Pole Patch Springs
12	Pole Patch Springs
13	Pole Patch Springs
14	Upper Reynolds Creek Spring #4
15	Upper Reynolds Creek Spring #3
16	Upper Reynolds Creek Spring #1
17	Upper Reynolds Creek Spring #2
18	Upper Reynolds Creek Spring #5
19	Upper Reynolds Creek Spring #7
20	Upper Reynolds Creek Spring #6
21	Reynolds Creek Spring
22	Reynolds Spring
23	German Creek Spring #2
24	German Creek Spring #1
25	Lake Fork Spring
26	Lake Fork Spring
27	Gelwick Springs #3
28	German Creek Spring #3

Legend

- Springs/Wells
- Waterbodies
- PIPELINE, 4 Inch
- PIPELINE, 5 Inch
- PIPELINE, 6 Inch
- PIPELINE, 10 inch/Pipeline Access Ditch Trail
- Perennial Streams
- National Forest Boundary

Roads

- 1 - BASIC CUSTODIAL CARE (CLOSED)
- 2 - HIGH CLEARANCE VEHICLES
- 3 - SUITABLE FOR PASSENGER CARS
- 4 - MODERATE DEGREE OF USER COMFORT
- 5 - HIGH DEGREE OF USER COMFORT
- Pipeline Access Roads

RIGHT OF WAY ACROSS NATIONAL FOREST SERVICE LANDS
Gunnison National Forest, Paonia Ranger District
Sections: 13, 14, 27, 28, 29, 32, & 33, T. 14 S., R. 91 W., and Sections 4 & 5, T. 15 S., R., 91W., Paonia Quad
Total Length of Right of Way: 13.6 miles
Width of Right of Way: Pipeline - 10' Access Routes - 10'

Instrument: Special Use Permit

Grantor: USDA Forest Service Grantee: Town of Paonia 07/12/2007 cobrien

N
W E
S

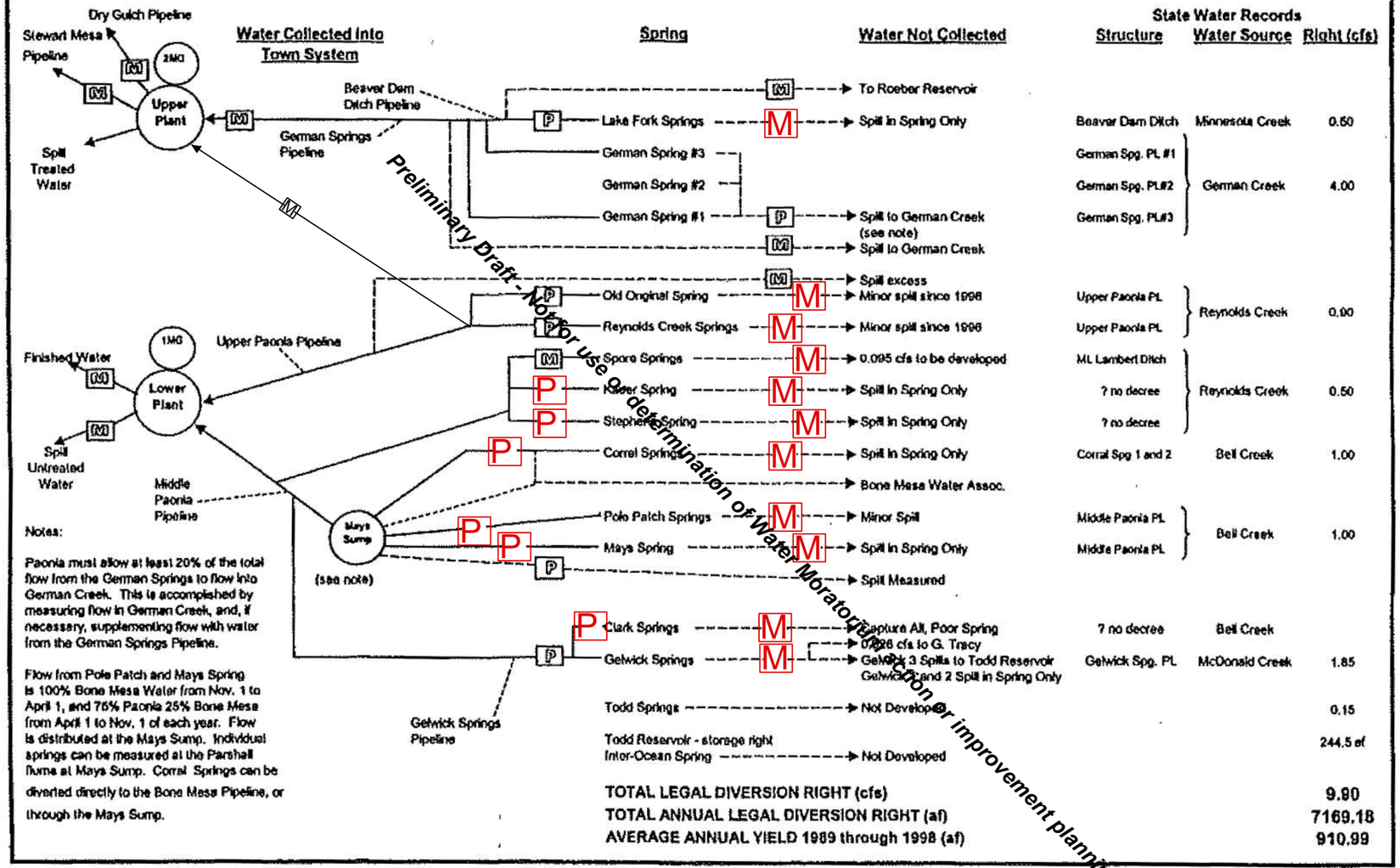
Appendix G

NOTES:
RED EQUALS PROPOSED.

Paonia Water System Schematic

WestWater Engineering - April 2000

Flow Measuring Device M=Meter P=parshall flume | Facility | Flow to Town plant | Flow not going to Town plant | cfs = cubic feet/sec af = acre feet



Notes:

Paonia must allow at least 20% of the total flow from the German Springs to flow into German Creek. This is accomplished by measuring flow in German Creek, and, if necessary, supplementing flow with water from the German Springs Pipeline.

Flow from Pole Patch and Mays Spring is 100% Bone Mesa Water from Nov. 1 to April 1, and 75% Paonia 25% Bone Mesa from April 1 to Nov. 1 of each year. Flow is distributed at the Mays Sump. Individual springs can be measured at the Parshall flume at Mays Sump. Corral Springs can be diverted directly to the Bone Mesa Pipeline, or through the Mays Sump.

W. W. Wheeler and Associates, Inc.
Water Resources Engineers

Raw Water Collection System

Schematic

Job Number	Figure 3
1589.01	

JDS-HYDRO CONSULTANTS, INC.
5540 TECH CENTER DR., SUITE 100
COLORADO SPRINGS, COLORADO 80919
(719) 227-0072

TOWN OF PAONIA
RAW WATER SYSTEM
NEW MONITORING POINTS

REVISIONS			
NO.	DESCRIPTION	BY	APP.	DATE
1				
2				
3				
4				
5				
6				
7				

EXHIBIT

Project No.:	333.01
Date:	05/10/21
Design:	DES
Drawn:	ACH
Check:	DES

SHEET 1 OF 1

Appendix H

PAONIA TOWN OF
Calendar Year 2021 Monitoring Schedule
Mailing Address: PO BOX 460 PAONIA, CO 81428

Public Water System ID	Water System Name	Federal System Type	State Source Type	Service Connections	Population
CO0115601	PAONIA TOWN OF	Community	Groundwater UDI Surface Water	929	2499

Primary County	Minimum Certification for Treatment Operator	Minimum Certification for Distribution System Operator	Last Inspection	Seasonal	Water Hauler
DELTA	B	2	09/10/2020	No	No

Contact Information
All public water systems are required to maintain an Administrative Contact, Treatment Operator (if applicable), Distribution System Operator (if applicable), and Owner. If the information below is incorrect or blank please send us a contact update form. This form and operator certification information is available by visiting wqcdcompliance.com/forms.

Administrative Contact	Treatment Operator	Distribution System Operator	Owner
CORINNE FERGUSON	ALAN D LESLIE	ALAN D LESLIE	PAONIA TOWN OF

General Information
Samples must be collected at the location specified in the Monitoring Plan or Record of Approved Waterworks.

- Schedules are updated every Wednesday evening. Please contact your specialist with questions wqcdcompliance.com or call us at 303-692-3556.
- **System info, online records, public notices, violations, and sample results (bottom of page).**
- Laboratory sample results must be analyzed by a certified laboratory using a certified method. Results must be submitted using the Online Portal wqcdcompliance.com/login and not as email attachments.
- Please identify the **Facility ID and Sample Point ID** (listed below) when submitting sample results. Facility and Sample Point IDs are used to identify general sample site locations.

Monitoring Information

Distribution System Sample Schedules

Facility ID	Facility Name	Facility Type
DS001	DISTRIBUTION SYSTEM	Distribution System

Microorganisms and Disinfectants

TOTAL COLIFORM BACTERIA (TCR) Sample Schedule:

2 sample(s) **per Month** during the collection period

Use the Facility ID and Sample Point ID listed at the end of this monitoring schedule.

Collection Period:

January 1, 2021 to December 31, 2021

FREE CHLORINE Sample Schedule:

Measure **every time** you collect a TOTAL COLIFORM BACTERIA (TCR) sample

Distribution System Sample Schedules

Facility ID	Facility Name	Facility Type
DS001	DISTRIBUTION SYSTEM	Distribution System

Disinfection Byproducts

TTHMs and HAA5s (Stage 2) Sample Schedule:

1 dual sample(s) **per sample point** for a **TOTAL of 1 dual sample(s) per Quarter** during the collection period

Collection Restriction:* Sample(s) must be collected, **at a minimum, in the following months: **March , June (Peak Month), September, December***

State Sample Point ID(s) (System Location ID(s)):
DBP001 (MINNESOTA CREEK RD)

Collection Period:

January 1, 2021 to December 31, 2021

Compliance Check:
~~**March**~~ ****Result(s) Received****
June (Peak Month)
September
December

Lead and Copper

LEAD AND COPPER Sample Schedule:

20 sample(s) **per 6 Months** during the collection period

Collection Period:

January 1, 2021 to December 31, 2021

Compliance Check:
1st 6 Months
2nd 6 Months

SAMPLES MUST BE COLLECTED FROM THE HIGHEST RISK SITES LISTED IN THE LEAD AND COPPER SAMPLE POOL INFORMATION AT THE END OF THIS MONITORING SCHEDULE.

Each sample must be reported with a State Assigned Sample Point ID (LCR###).

To ensure timely processing of results, please have the certified lab report all results electronically in CSV data format. Do NOT submit paper or PDF copies of lab reported data.

Non-Distribution System Sample Schedules

Facility ID	Facility Name	Facility Type	Sample Point ID	Sample Point Name	Sample Point Type
001	LAMBORN MESA UPPER WTP	Treatment Plant	001	ENTRY POINT	Entry Point

Daily Schedules

FREE CHLORINE (MICROBIAL INACTIVATION AND ENTRY POINT RESIDUAL) Sample Schedule:

Sample **Continuously** during the collection period

Collection Period:

While Operating

TURBIDITY (CFE) Sample Schedule:

1 sample **every 4 Hours** during the collection period

Note: Sample(s) collected at a location representative of the combined filtered water

Collection Period:

While Operating

Yearly Schedules

FLUORIDE Sample Schedule:

1 sample(s) **per Year**

Collection Period:

January 1, 2021 to December 31, 2021

INORGANICS GROUP Sample Schedule:

1 sample(s) **per Year**

Collection Period:

January 1, 2021 to December 31, 2021

Non-Distribution System Sample Schedules

Facility ID	Facility Name	Facility Type	Sample Point ID	Sample Point Name	Sample Point Type
001	LAMBORN MESA UPPER WTP	Treatment Plant	001	ENTRY POINT	Entry Point

Yearly Schedules

NITRATE Sample Schedule:

1 sample(s) **per Year**

Collection Period:

January 1, 2021 to December 31, 2021

VOLATILE ORGANICS GROUP Sample Schedule:

1 sample(s) **per Year**

Collection Period:

January 1, 2021 to December 31, 2021

3 Year Schedules

SYNTHETIC ORGANICS GROUP Sample Schedule:

1 sample(s) **per 3 Years**

Collection Period:

January 1, 2020 to December 31, 2022

9 Year Schedules

COMBINED RADIUM (-226 & -228) Sample Schedule:

1 sample(s) **per 9 Years**

Collection Period:

January 1, 2020 to December 31, 2028

COMBINED URANIUM Sample Schedule:

1 sample(s) **per 9 Years**

Collection Period:

January 1, 2020 to December 31, 2028

GROSS ALPHA, WITHOUT RADON & URANIUM Sample Schedule:

1 sample(s) **per 9 Years**

Collection Restriction: Sample(s) **must** be collected at the **same time** as the COMBINED URANIUM sample(s)*

Collection Period:

January 1, 2020 to December 31, 2028

NITRITE Sample Schedule:

1 sample(s) **per 9 Years**

Collection Period:

January 1, 2020 to December 31, 2028

Facility ID	Facility Name	Facility Type	Sample Point ID	Sample Point Name	Sample Point Type
002	CLOCK YWTP01	Treatment Plant	002	ENTRY POINT	Entry Point

Daily Schedules

FREE CHLORINE (ENTRY POINT RESIDUAL) Sample Schedule:

Sample **Continuously** during the collection period

Collection Period:

While Operating

TURBIDITY (CFE) Sample Schedule:

1 sample **every 4 Hours** during the collection period

Note: Sample(s) collected at a location representative of the combined filtered water

Collection Period:

While Operating

Yearly Schedules

FLUORIDE Sample Schedule:

1 sample(s) **per Year**

Collection Period:

January 1, 2021 to December 31, 2021

INORGANICS GROUP Sample Schedule:	**Collection Period:**
1 sample(s) **per Year**	January 1, 2021 to December 31, 2021
NITRATE Sample Schedule:	**Collection Period:**
1 sample(s) **per Year**	January 1, 2021 to December 31, 2021
VOLATILE ORGANICS GROUP Sample Schedule:	**Collection Period:**
1 sample(s) **per Year**	January 1, 2021 to December 31, 2021
3 Year Schedules	
SYNTHETIC ORGANICS GROUP Sample Schedule:	**Collection Period:**
1 sample(s) **per 3 Years**	January 1, 2020 to December 31, 2022
6 Year Schedules	
COMBINED RADIUM (-226 & -228) Sample Schedule:	**Collection Period:**
1 sample(s) **per 6 Years**	January 1, 2020 to December 31, 2025
9 Year Schedules	
COMBINED URANIUM Sample Schedule:	**Collection Period:**
1 sample(s) **per 9 Years**	January 1, 2020 to December 31, 2028
GROSS ALPHA, WITHOUT RADON & URANIUM Sample Schedule:	***Collection Period:***
1 sample(s) **per 9 Years** ****Collection Restriction:* Sample(s) **must** be collected at the **same time** as the COMBINED URANIUM sample(s)*	January 1, 2020 to December 31, 2028
NITRITE Sample Schedule:	**Collection Period:**
1 sample(s) **per 9 Years**	January 1, 2020 to December 31, 2028

Compliance and Public Notice Schedules

Public Notice Schedules - Certificate of Delivery and Notice must be submitted within 10 days after providing notification
Forms available at wqcdcompliance.com/pn

Activity Name	Activity Due Date	Activity Completion Date
MAIL/HAND DELIVER NOTICE TO CONSUMERS: FAILURE TO MEET CROSS CONNECTION CONTROL AND/OR BACKFLOW PREVENTION REQUIREMENTS - CROSS CONNECTION RULE	January 6, 2020	Activity Not Completed
MAIL/HAND DELIVER NOTICE TO CONSUMERS: FAILURE TO MEET CROSS CONNECTION CONTROL AND/OR BACKFLOW PREVENTION REQUIREMENTS - CROSS CONNECTION RULE	April 6, 2020	Activity Not Completed

Compliance and Public Notice Schedules

~~Lead Consumer Notification - Delivery to consumers is required within 30 days after receipt of data from laboratory~~ - Schedule Closed

Activity Name	Activity Due Date	Activity Completion Date
SUBMIT ONE (1) LEAD CONSUMER NOTICE AND CERTIFICATE OF DELIVERY	September 30, 2020	January 27, 2021
SUBMIT ONE (1) LEAD CONSUMER NOTICE AND CERTIFICATE OF DELIVERY	March 31, 2021	January 26, 2021

Lead and Copper Compliance Schedule
Visit wqcdcompliance.com/lcr for more information

Activity Name	Activity Due Date	Activity Completion Date
WQP MONITORING	December 31, 2020	Activity Not Completed
PUBLIC EDUCATION	February 28, 2021	February 11, 2021
SOURCE WATER PB/CU DATA SUBMITTAL	June 30, 2021	Activity Not Completed
TREATMENT RECOMMENDATIONS	June 30, 2021	Activity Not Completed

Sanitary Survey Significant Deficiency

Activity Name	Activity Due Date	Activity Completion Date
RESOLVE SIGNIFICANT DEFICIENCY/VIOLATION - F310	February 5, 2021	December 22, 2020
RESOLVE SIGNIFICANT DEFICIENCY/VIOLATION - R310	February 5, 2021	January 27, 2021
RESOLVE SIGNIFICANT DEFICIENCY/VIOLATION - R514	February 5, 2021	February 8, 2021
RESOLVE SIGNIFICANT DEFICIENCY/VIOLATION - R520	February 5, 2021	December 22, 2020
RESOLVE SIGNIFICANT DEFICIENCY/VIOLATION - R531	February 5, 2021	December 8, 2020
RESOLVE SIGNIFICANT DEFICIENCY/VIOLATION - T901	February 5, 2021	January 28, 2021
RESOLVE SIGNIFICANT DEFICIENCY/VIOLATION - M613	April 30, 2021	Activity Not Completed
RESOLVE SIGNIFICANT DEFICIENCY/VIOLATION - T119	April 30, 2021	Activity Not Completed
RESOLVE SIGNIFICANT DEFICIENCY/VIOLATION - T119	April 30, 2021	Activity Not Completed

CCR Compliance Schedule
Your 2021 *DRAFT* CCR will be posted at wqcdcompliance.com/ccr in March

Activity Name	Activity Due Date	Activity Completion Date
SUBMIT CCR REPORT TO STATE	June 30, 2021	Activity Not Completed
SUBMIT CERTIFICATE OF DELIVERY	June 30, 2021	Activity Not Completed

Lead Consumer Notification - Delivery to consumers is required within 30 days after receipt of data from laboratory

Activity Name	Activity Due Date	Activity Completion Date
SUBMIT ONE (1) LEAD CONSUMER NOTICE AND CERTIFICATE OF DELIVERY	September 30, 2021	Activity Not Completed
SUBMIT ONE (1) LEAD CONSUMER NOTICE AND CERTIFICATE OF DELIVERY	March 31, 2022	Activity Not Completed

This monitoring schedule is based on the system's current inventory and is subject to change. ***Water systems are responsible for promptly reporting schedule errors or omissions***.
Errors or omissions on monitoring schedules do not prohibit the Water Quality Control Division from enforcing monitoring requirements set forth by the Regulations.

Facility Specific Levels		
Facility ID DS001	**Facility Name** DISTRIBUTION SYSTEM	**Facility Type** Distribution System
Analyte Name	**Level**	**Level Type**
FREE CHLORINE	0.2 mg/L	Minimum
FREE CHLORINE	4.0 mg/L	Maximum
Facility ID 001	**Facility Name** LAMBORN MESA UPPER WTP	**Facility Type** Treatment Plant
Analyte Name	**Level**	**Level Type**
TURBIDITY	0.5 NTU	Maximum
TURBIDITY	0.1 NTU	95th Percentile
FREE CHLORINE (MICROBIAL INACTIVATION AND ENTRY POINT RESIDUAL)	0.5 mg/L	Minimum
Facility ID 002	**Facility Name** CLOCK YWTP01	**Facility Type** Treatment Plant
Analyte Name	**Level**	**Level Type**
TURBIDITY	0.5 NTU	Maximum
TURBIDITY	0.1 NTU	95th Percentile
FREE CHLORINE (MICROBIAL INACTIVATION AND ENTRY POINT RESIDUAL)	0.2 mg/L	Minimum

Backflow Prevention and Cross-connection Control (BPCCC) Reminders:

- Annual BPCCC Reports need to be completed by May 1, 2021 for activities completed in 2020.
- The required survey compliance ratio for 2020 is 0.90, unless you have a CDPHE approved alternate ratio.
- The required assembly testing ratio for 2020 is 0.80 and the required method inspection ratio is 0.90.
- Annual BPCCC reports should only be submitted to us if a violation occurred. Reports and supporting calculations will be reviewed during your next sanitary survey, however, we can request this information at any time.
- The 2021 required survey compliance ratio is 1.0 and will need to be documented in the May 1, 2022 BPCCC annual report.
- The 2021 required assembly testing ratio is 0.90, and will need to be documented in the May 1, 2022 BPCCC annual report.
- For more information regarding the requirements and how to compile a report please visit wqcdcompliance.com/forms or submit specific questions to cdphe_wqcd_fss_questions@state.co.us.

Storage Tank Reminders:

All storage tanks within the distribution must be inspected twice per year unless an alternative storage tank inspection schedule has been established and included in the written inspection plan. An alternative storage tank inspection schedule is subject to our review and revision, generally during a sanitary survey, but alternative inspection schedules can be requested by us at any time. All storage tanks within the distribution are required to undergo a comprehensive tank inspection every five years. The first five year cycle for completion of comprehensive tank inspections is due by the end of 2021.

Facility Information				Sample Point Information	
Facility ID	Active Status	Facility Name	Facility Type	Sample Point ID	Sample Point Name
001	A	LAMBORN MESA UPPER WTP	Treatment Plant	001	ENTRY POINT
002	A	CLOCK YWTP01	Treatment Plant	002	ENTRY POINT
003	A	GERMAN CREEK NO 3	Well	003	RAW
004	A	SPRING NO 4 OLD ORIG	Well	004	RAW
005	A	SPRING NO 5 OLD ORIG	Well	005	RAW
006	A	SPRING NO 6 OLD ORIG	Well	006	RAW
007	A	SPRING NO 7 OLD ORIG	Well	007	RAW
008	A	SPRING NO 8 OLD ORIG	Well	008	RAW
009	A	SPRING NO 9 OLD ORIG	Well	009	RAW
010	A	SPRING NO 10 OLD ORIG	Well	010	RAW
011	A	SPRING NO 11 OLD ORIG	Well	011	RAW
012	A	SPRING NO 12 OLD ORIG	Well	012	RAW
013	A	SPRING NO 13 REYNOLDS	Well	013	RAW
014	A	SPRING NO 14 REYNOLDS	Well	014	RAW
015	A	SPRING NO 15 REYNOLDS	Well	015	RAW
016	A	SPRING NO 16 MERRT METER	Well	016	RAW
017	A	SPRING NO 17 MERRT METER	Well	017	RAW
018	A	SPRING NO 18 MERRT METER	Well	018	RAW
019	A	SPRING NO 19 MERRT METER	Well	019	RAW
020	A	SPRING NO 20 MERRT METER	Well	020	RAW
021	A	SPRING NO 21 MERRT METER	Well	021	RAW
022	A	SPRING NO 22 MERRT METER	Well	022	RAW
023	A	SPRING NO 23 KAUER	Well	023	RAW
024	A	SPRING NO 24 CORRAL 1	Well	024	RAW
025	A	SPRING NO 25 CORRAL 2	Well	025	RAW
026	A	SPRING NO 26 CLARK 1	Well	026	RAW
027	A	SPRING NO 27 CLARK 2	Well	027	RAW

This monitoring schedule is based on the system's current inventory and is subject to change. ***Water systems are responsible for promptly reporting schedule errors or omissions***.
Errors or omissions on monitoring schedules do not prohibit the Water Quality Control Division from enforcing monitoring requirements set forth by the Regulations.

028	A	SPRING NO 28 MAYS	Well	028	RAW
029	A	SPRING NO 29 MAYS	Well	029	RAW
030	A	SPRING NO 30 TODD	Well	030	RAW
031	A	SPRING NO 31 TODD	Well	031	RAW
032	A	SPRING NO 32 TODD	Well	032	RAW
033	A	SPRING NO 33 GILWICK 1	Well	033	RAW
034	A	SPRING NO 34 GILWICK 2	Well	034	RAW
035	A	SPRING NO 35 TODD RES	Well	035	RAW
036	A	SPRING NO 36 POLE PATCH	Well	036	RAW
037	A	SPRING NO 37	Well	037	RAW
038	A	SPRING NO 38	Well	038	RAW
039	A	SPRING NO 39	Well	039	RAW
040	A	LAKE FORK SPRING	Well	040	RAW
041	A	GERMAN CREEK NO 1 LOW	Well	041	RAW
042	A	GERMAN CREEK NO 3 UP	Well	042	RAW
045	A	2 MG TANK	Storage	045	DIST TANK
DS001	A	DISTRIBUTION SYSTEM	Dist System/Zone	DBP001	MINNESOTA CREEK RD
				RPDN	REPEAT DOWNSTREAM
				RPOR	REPEAT ORIGINAL
				RPOT	REPEAT OTHER
				RPUP	REPEAT UPSTREAM
				RTOR	ROUTINE ORIGINAL
				TCR001	RTOR001
				TCR002	RPDN001
				TCR003	RPUP001
				TCR004	RTOR002
				TCR005	RPDN002
				TCR006	RPUP002
				TCR007	RTOR003
				TCR008	RPDN003
				TCR009	RPUP003
				TCR010	RTOR004
				TCR011	RPDN004

This monitoring schedule is based on the system's current inventory and is subject to change. ***Water systems are responsible for promptly reporting schedule errors or omissions***.
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DS001	A	DISTRIBUTION SYSTEM	Dist System/Zone	TCR012	RPUP004
				TCR013	RTOR005
				TCR014	RPDN005
				TCR015	RPUP005
				TCR016	RTOR006
				TCR017	RPDN006
				TCR018	RPUP006
				TCR019	RTOR007
				TCR020	RPUP007
				TCR021	RPDN007
				TCR022	RPOR008
				TCR023	RPDN008
				TCR024	RPUP008
				TCR025	RTOR009
				TCR026	RPDN009
				TCR027	RPUP009
				TCR028	RTOR010
				TCR029	RPDN010
				TCR030	RPUP010
SS001	A	COMBINED RAW SOURCE 001	Sampling Station	CRS001	COMBINED RAW SOURCE
SS002	A	COMBINED RAW SOURCE 002	Sampling Station	CRS002	COMBINED RAW SOURCE
043	I	0 5 MG TANK	Storage	043	NOT ENTRY POINT
044	I	1 MG TANK FOR CT	Storage	044	DIST TANK

Lead and Copper Sample Pool Information

The supplier must collect lead and copper samples from different **Department - approved** sample sites below until the minimum number of samples required is collected. Contact your compliance specialist if there are questions about unapproved sites. The supplier can add, manage, or inactivate unavailable sample sites on the Data Portal at wqcdcompliance.com/login under My…Sample Sites. Sites have been grouped by sampling priority based on tier level:

- If present, **Tier 1** sites must be sampled unless reported as an unavailable high risk site.
- If present, **Tier 2** sites must only be sampled after all Tier 1 sites have been sampled or have been reported as an unavailable high risk site.
- If present, **Tier 3** sites must only be sampled after all Tier 1 and 2 sites have been sampled or have been reported as an unavailable high risk site.
- If present, **Non-Tier, Representative** sites must only be sampled after all Tier 1, 2, and 3 sites have been sampled or have been reported as an unavailable high risk site.

Unavailable high risk site reporting form is available at wqcdcompliance.com/lcr

TIER 1 - HIGHEST RISK SITES

State Assigned Sample Site ID (Required on Lab Chain of Custody)	Location Identifier	Current Status
LCR005	LCR005	Active - Sampling - Approved
LCR008	LCR008	Active - Sampling - Approved
LCR009	LCR009	Active - Sampling - Approved
LCR013	LCR013	Active - Sampling - Approved

NO TIER 2 - SECOND HIGHEST RISK SITES HAVE BEEN IDENTIFIED

TIER 3 - THIRD HIGHEST RISK SITES

State Assigned Sample Site ID (Required on Lab Chain of Custody)	Location Identifier	Current Status
LCR003	LCR003	Active - Sampling - Approved
LCR006	LCR006	Active - Sampling - Approved
LCR011	LCR011	Active - Sampling - Approved
LCR014	LCR014	Active - Sampling - Approved
LCR016	LCR016	Active - Sampling - Approved
LCR018	LCR018	Active - Sampling - Approved

NON-TIER, REPRESENTATIVE - FOURTH HIGHEST RISK SITES		
State Assigned Sample Site ID (Required on Lab Chain of Custody)	**Location Identifier**	**Current Status**
LCR001	LCR001	Active - Sampling - Approved
LCR002	LCR002	Active - Sampling - Approved
LCR004	LCR004	Active - Sampling - Approved
LCR007	LCR007	Active - Sampling - Approved
LCR010	LCR010	Active - Sampling - Approved
LCR012	LCR012	Active - Sampling - Approved
LCR015	LCR015	Active - Sampling - Approved
LCR017	LCR017	Active - Sampling - Approved
LCR019	LCR019	Active - Sampling - Approved
LCR020	LCR020	Active - Sampling - Approved

Time Period Definitions		
Time Period	**Start Date**	**End Date**
First Quarter	January 1, 2021	March 31, 2021
Second Quarter	April 1, 2021	June 30, 2021
Third Quarter	July 1, 2021	September 30, 2021
Fourth Quarter	October 1, 2021	December 31, 2021
First 6 Months	January 1, 2021	June 30, 2021
Second 6 Months	July 1, 2021	December 31, 2021
Year	January 1, 2021	December 31, 2021

Analyte Group Definitions		
Analyte Group Name	**Analytes in Group**	**Number of Analytes in Group**
INORGANICS GROUP	ANTIMONY | ARSENIC | BARIUM | BERYLLIUM | CADMIUM | CHROMIUM | MERCURY | NICKEL | SELENIUM | SODIUM | THALLIUM	11
SYNTHETIC ORGANICS GROUP	1,2-DIBROMO-3-CHLOROPROPANE | 2,4,5-TP | 2,4-D | ALDICARB | ALDICARB SULFONE | ALDICARB SULFOXIDE | ATRAZINE | BENZO(A)PYRENE | BHC-GAMMA | CARBOFURAN | CHLORDANE | DALAPON | DI(2-ETHYLHEXYL) ADIPATE | DI(2-ETHYLHEXYL) PHTHALATE | DINOSEB | DIQUAT | ENDOTHALL | ENDRIN | ETHYLENE DIBROMIDE | HEPTACHLOR | HEPTACHLOR EPOXIDE | HEXACHLOROBENZENE | HEXACHLOROCYCLOPENTADIENE | LASSO | METHOXYCHLOR | OXAMYL | PENTACHLOROPHENOL | PICLORAM | SIMAZINE | POLYCHLORINATED BIPHENYLS (PCB) | TOXAPHENE	31

Analyte Group Definitions		
Analyte Group Name	**Analytes in Group**	**Number of Analytes in Group**
VOLATILE ORGANICS GROUP	1,1,1-TRICHLOROETHANE | 1,1,2-TRICHLOROETHANE | 1,1-DICHLOROETHYLENE | 1,2,4-TRICHLOROBENZENE | 1,2-DICHLOROETHANE | 1,2-DICHLOROPROPANE | BENZENE | CARBON TETRACHLORIDE | CHLOROBENZENE | CIS-1,2-DICHLOROETHYLENE | DICHLOROMETHANE | ETHYLBENZENE | O-DICHLOROBENZENE | P-DICHLOROBENZENE | STYRENE | TETRACHLOROETHYLENE | TOLUENE | TRANS-1,2-DICHLOROETHYLENE | TRICHLOROETHYLENE | VINYL CHLORIDE | XYLENES (TOTAL)	21

Appendix I

Town of Paonia

Water System

Operations and Maintenance

Preliminary List of Recommend Standard Operating Procedures

- Generic water break form – what, where, suspected cause, detailed repair notes
- Sampling and testing for monitoring plan
- Treatment facilities start and stop (auto and manual)
- Backwashing
- Membrane testing
- Chemical batching for process and membrane cleaning (if necessary
- Spring operation and data collection
- PRV operations and settings
- Valve operations including normally closed valves (and why they are NC)
- Hydrant flushing
- SCADA operations
- Distribution System Meter reading (monthly and individual)