ELEMENT ENGINEERING LLC

TOWN OF RYE

WATER SYSTEM IMPROVEMENTS

BASIS OF DESIGN REPORT

JUNE 2023

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FOR
TOWN OF RYE

JUNE 2023

EE JOB NO.: 0101.0003

ELEMENT ENGINEERING LLC
DILIGENT • INNOVATIVE • RESPONSIVE

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1 INTRODUCTION

The Town of Rye has experienced heightened levels of total trihalomethanes (TTHM) and haloacetic acids (HAA5) in their drinking water in the past several years. This has resulted in an Enforcement Order (EO) from CDPHE on December 29, 2022, regarding these heightened levels of contaminants; the enforcement order is attached in Appendix A. ln September of 2021 a disinfection byproduct (DBP) mitigation study was completed for the Town of Rye. This report recommended that the town install Granular Activated Carbon (GAC) filters to remove DBP precursors prior to disinfection. Removal of precursors will reduce DBP formation and is recommended to help achieve DBP compliance. This Basis of Design Report proposes the installation of a GAC system in line with the current treatment process to remove DBP precursors found in the raw water source.

2 BASIC PROJECT INFORMATION

2.1 LOCATION AND SERVICE AREA

The Town of Rye is an incorporated town located approximately 30 miles southwest of the City of Pueblo and 5-miles west from the unincorporated community of Colorado City along Colorado State Highway 165 within Pueblo County. The town owns and operates a public water system under PWSID CO-0151700, and the Town of Rye Water Treatment Plant (WTP) is located on the north side of Park Road, approximately ¼ mile west from the town's incorporated boundary. The BDR Submittal form is attached in Appendix B.

The existing WTP property contains a recently renovated/expanded process treatment building to expand chemical handling and storage (2016); two 50,000-gallon subgrade clearwells for disinfection contact time; and one 50,000-gallon at-grade water storage tank.

The town's water system provides 117 service connections with potable water in the service area. The Rye WTP and distribution system services all residential and commercial users within the town's incorporated limits, as well as a few additional customers located outside them. Two notable commercial service connections belong to the town's public schools (Rye Elementary and Rye High). US Census 2021 Vintage Population Estimates state the town's population to be 206, and the schools combined contain approximately 640 faculty/students, for a total population served of 846.

A vicinity map of the Town of Rye is shown in Figure 1. A map of the service area boundary is shown in Figure 2. Scaled versions of these figures can be found in Appendix C and D, respectively.

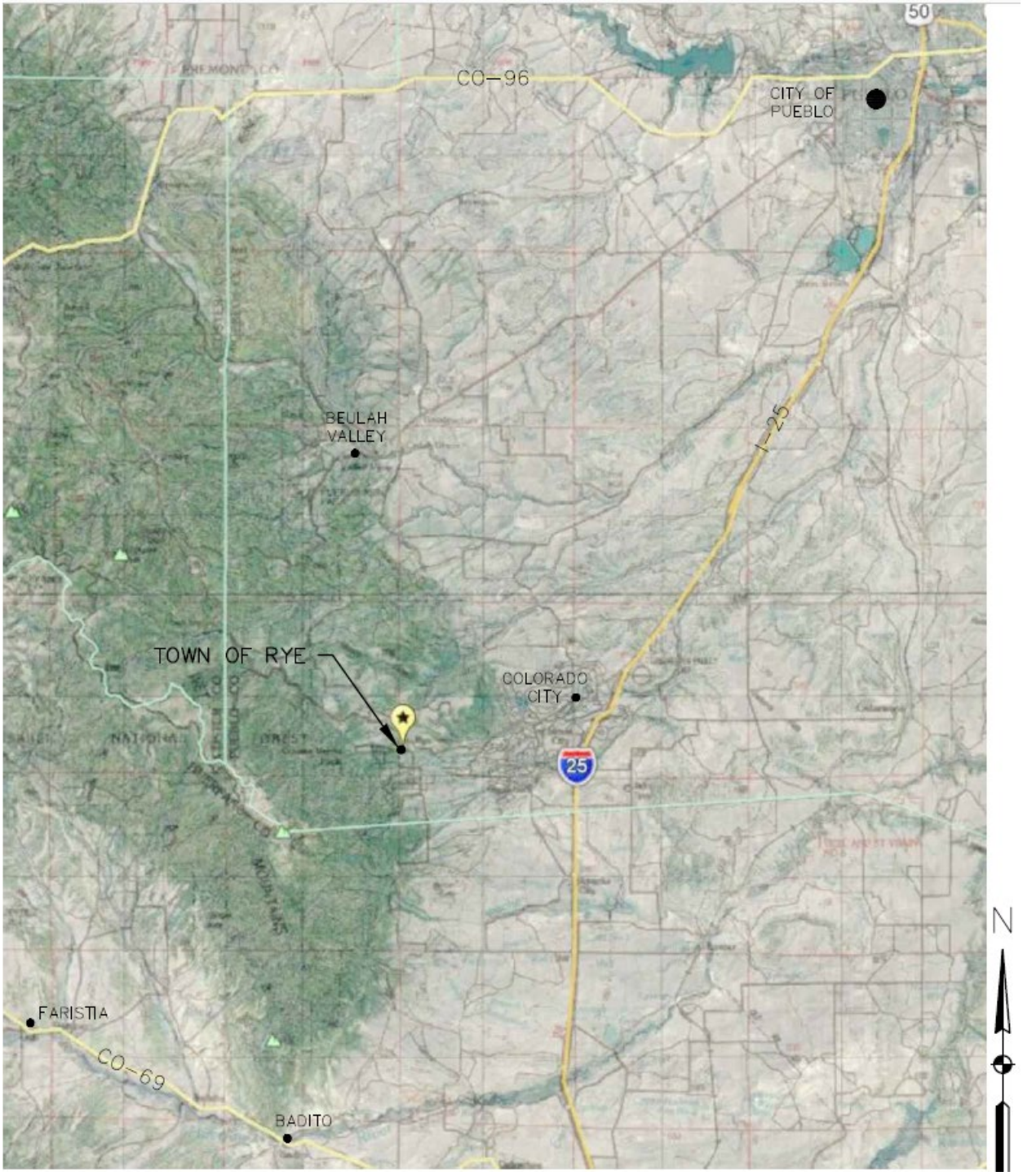


Figure 1: Town of Rye Vicinity Map

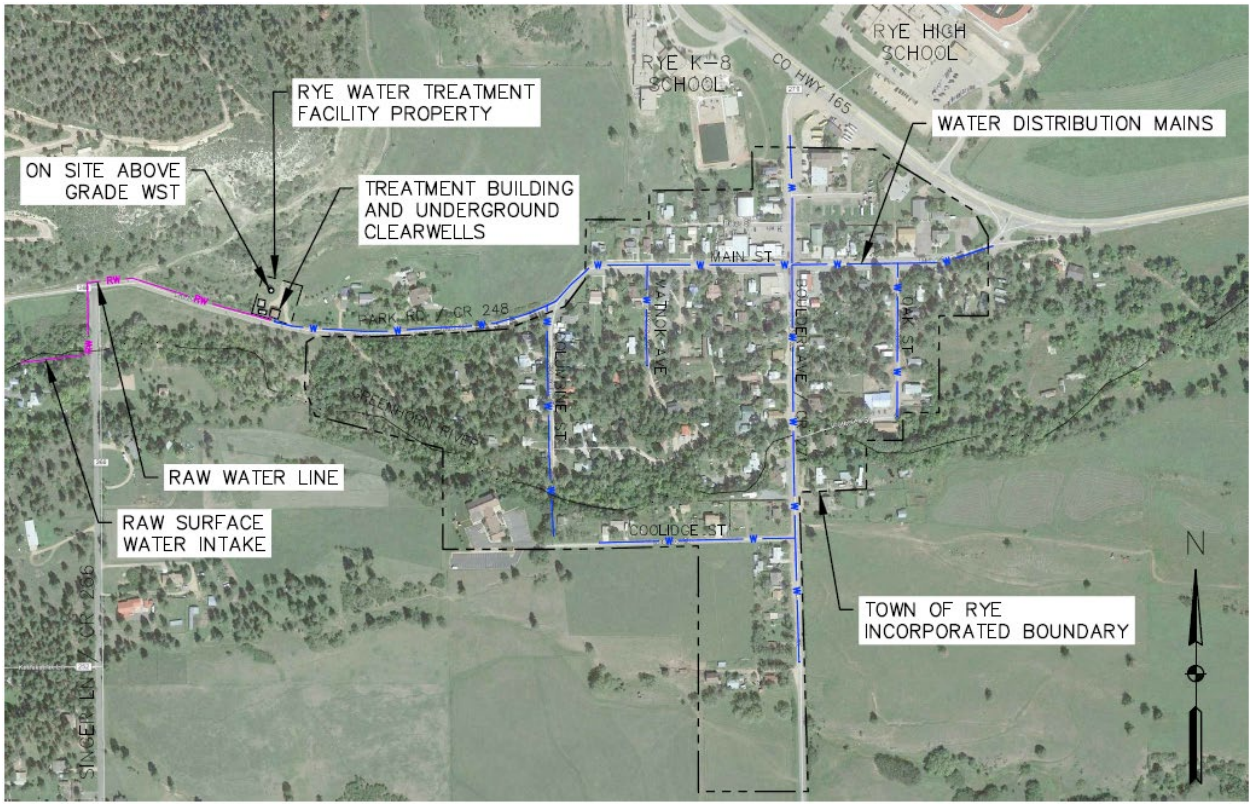


Figure 2: Town of Rye Water System Service Area

The town was issued an Enforcement Order (EO) on December 29, 2022 for violations pertaining to trihalomethanes (TTHMs) and haloacetic acids (HAA5) in the distribution system. TTHMs and HAA5s are disinfection byproducts formed when chlorine reacts with organic material in the raw water. Typically, TTHM and HAA5 formation are compounded by water age in the system. Also, raw water precursors, such as high organic carbon levels, would increase TTHM and HAA5 formation. Before the EO was issued, a disinfection byproduct (DBP) mitigation study was completed for the Town of Rye. This study concluded that in order to ensure compliance with CDPHE guidelines in the future, total organic carbon levels (TOC) need to be reduced prior to the point of disinfection/chlorination. Thus, the addition of a GAC system before disinfection is being proposed. Equipment information of the proposed GAC unit is attached in Appendix E.

2.2 100-Year Floodplain and Wetlands

The facility is just over 200 feet away from a 100-year flood zone. The installation of the GAC units will be within the existing WTP building. No wetlands are located in the project area.

2.3 Topography and Soils

The Town of Rye lies within the physiographic region of the Southern Rocky Mountains. The average elevation of the town's service area is approximately 6,800 feet above mean sea level. A USGS topography map can be found in Appendix F.

Soils information is available for the Town of Rye as compiled by the U.S. Department of Agriculture Natural Resources Conservation Service (NRCS). The primary soil types in the service area are Larkson stony loam,

Denver clay loam, Table Mountain association, and Larkson loam. Installation of the GAC units will be within the existing WTP building. The Soil Survey can be found in Appendix G.

2.4 WATER RESOURCES

The town's water system service area is bisected by Greenhorn Creek from west to east.

2.5 PRECIPITATION AND TEMPERATURE

Data pertaining to the local environment has been obtained from the Western Regional Climate Center for the Town of Rye. The climate of the area consists of warm summers and cold winters. The average maximum summer (June, July, and August) temperature is approximately 79.9°F and the average minimum winter (December, January, and February) temperature is 1.28°F. The average total yearly precipitation is 25.08 inches, and the average total yearly snowfall is 130.0 inches. Data from the Western Regional Climate Center can be found in Appendix H.

2.6 208 PLAN COORDINATION

The local 208 Agency for the Pueblo County area is the Pueblo Area Council of Governments. While there is a water quality master plan available, there are no opportunities for consolidation into a regionwide water distribution system due to the location of the system.

3 CAPACITY EVALUATION

3.1 POPULATION

The Town of Rye is a census designated area, with its population during the 2020 Census being 206 people. However, the water treatment facilities also services Rye Elementary and Rye High, bringing the total population (for the entire service area) to 846.

3.1.1 Historic Population Trends

Historical population data for the Town of Rye was obtained from the US Census Bureau and is presented in Table 1. As shown, the town's population has increased since 1940, but overall, the population has fluctuated drastically since 1940.

Table 1: Historical Rye Population

Year	Population	Annual % Change
1940	163	--
1950	166	1.84%
1960	179	7.83%
1970	207	15.64%
1980	232	12.08%
1990	168	-27.59%
2000	202	20.24%
2010	153	-24.26%
2020	206	34.64%
Average		**5.05%**
Note: All data from US Census Bureau		

3.1.2 Existing Population

The Town of Rye is a census designated area, with its population during the 2020 Census being 206 people.

3.1.3 20-Year Population Forecast

Due to the fluctuation of the population as seen in Table 1, that there have been no new major housing developments in the past ten years based on satellite imagery, and that there are no new planned developments, it is assumed that the population of the Town of Rye will approximately be the same in 20 years. No changes in the attendance of the schools are anticipated. Table 2 presents the 20-year projected population.

Table 2: 20-Year Projected Population

Year	Population (Town)	Population (Town and School)
2020	206	846
2042	206	846

3.2 CURRENT WATER DEMANDS

3.2.1 Drinking Water Demand

Table 3 presents metered water data recorded by the master meter located as water leaves the plant from 2020 – 2022.

Table 3: Drinking Water Demand

2020		2021		2022	
Month	**Total Water Use (gal)**	**Month**	**Total Water Use (gal)**	**Month**	**Total Delivered Water to Rye (gal)**
January	504,000	January	402,000	January	5,430
February	504,000	February	415,000	February	418,269
March	531,000	March	481,000	March	419,256
April	722,000	April	493,000	April	417,070
May	798,000	May	554,000	May	511,481
June	1,080,000	June	682,000	June	501,800
July	916,000	July	739,000	July	460,500
August	959,000	August	860,000	August	545,230
September	794,000	September	931,000	September	630,510
October	715,000	October	670,000	October	557,500
November	420,000	November	679,000	November	637,760
December	--	December	503,000	December	625,650
2020 Average	**722,091**	**2021 Average**	**617,417**	**2022 Average**	**477,538**

Based on the drinking water demand summarized in Table 3, monthly averages and average day demand over the three-year time span can be calculated. Table 4 summarizes this data.

Table 4: Calculated Monthly and Daily

Month	Total Use (gal)	Avg Day Use (gal/day)
January	303,810	9,800
February	445,756	15,920
March	477,085	15,390
April	544,023	18,134
May	621,160	20,037
June	754,600	25,153
July	705,167	22,747
August	788,077	25,422
September	785,170	26,172
October	647,500	20,887
November	578,920	19,297
December	564,325	18,204
2020 - 2022 Avg	**601,299**	**19,764**
Notes:		
1. Avg day use is average monthly use divided by days per month.		

Table 5 summarizes the typical water system design criteria of maximum month and average month demand.

Table 5: Max Month and Average Month Demand

Design Criteria	Total Use (gal)	Avg Day Use (gal/day)
Maximum Month	788,077	25,422
Average Month	601,299	19,764

3.3 WATER DEMAND FORECAST

Actual (in home, not including water loss) per-capita water demand is not expected to change as a result of this project. The conservative system wide water demand is 19,764 gpd on average and a maximum of 25,422 gpd. As stated previously, the population is also not expected to increase and thus water demand on the water system is predicted to stay the same.

4 EXISTING FACILITIES

4.1 SERVICE AREA FEATURES

The Town of Rye is an incorporated town located approximately 30 miles southwest of the City of Pueblo and 5-miles west from the unincorporated community of Colorado City along Colorado State Highway 165 within Pueblo County. The town own and operate a public water system under PWSID CO-0151700, and the Town of Rye Water Treatment Plant (WTP) is located on the north side of Park Road, approximately ¼ mile west from the town's incorporated boundary.

4.2 AREA PUBLIC WATER SYSTEMS

While the Town of Colorado City is only five miles away from the Town of Rye, consolidation of the water systems is not advised due to the Town of Colorado City's drinking water quality violations.

4.3 EXISTING WATER INFRASTRUCTURE

4.3.1 Raw Water

The town's water system is supplied raw water from one (1) surface water source from Greenhorn Creek through a diversion in close proximity to the town's water treatment facility (WTF). According to the state's Record of Approved Waterworks, the town has the right to divert up to 45 gpm from Greenhorn Creek. Improvements to the raw water supply line were recently completed sometime around 2015 to improve water quality and reduce clogging issues. The town also holds groundwater rights through a well installed at the WTF property (up to 120 gpm), but the well was discontinued due to poor water quality. The groundwater well is not expected to be brought back into operation in the foreseeable future because the surface water source can adequately supply the demands in the service area.

4.3.2 Water Treatment and Storage

The town's water treatment facility (WTF) consists of low-pressure membrane filtration (microfiltration - MF). The MF system consists of a packaged skid (Pall Aria AP3), containing six (6) Microza membrane models across two (2) treatment trains. Backwash waste from the MF process is diverted back into Greenhorn Creek under CDPS No. COG641125. Chemicals such as caustic and acid are used to perform enhanced backwashes on the MF units on occasion, but backwash wastes are delivered to holding tanks for disposal off-site. The WTF also contains a coagulant chemical injection pretreatment system; however, this treatment process is not currently utilized.

After filtration, sodium hypochlorite is dosed and injected with a chemical feed pump (Stenner Model SVP1) and contact time provided through two sub-grade 50,000-gal clear wells to provide primary disinfection. The town's WTF also contains an above-grade water storage tank equipped with a tank mixer, but contact time is not credited due to the close proximity of inlet/outlet piping. The town is only required to provide 4-log virus inactivation to meet the required treatment credits per the SWTR, because their MF system receives full removal credits for giardia and cryptosporidium (See Table 6).

Table 6: SWTR Pathogen Removal Requirements/Credits

Microbial Pathogen	Req. Log-Inactivation[1] SWTR	Conventional Filters Log-Inactivation Credits	Log-Inactivation Required in Disinfection	Membrane (MF) Log-Inactivation Credits[2]	Log-Inactivation Required in Disinfection
Giardia	3.0	2.5	***0.5***	3.0	***0.0***
Cryptosporidium	2.0	2.0	***0.0***	3.0	***0.0***
Viruses	4.0	2.0	***2.0***	0.0	***4.0***

Note: one (1) log inactivation corresponds to a 10-fold removal (90%)

[1] Log inactivation requirements also for CDHPE's Regulation 11

[2] Log inactivation credits for MF filtration as listed on Town of Rye's CDPHE Record of Approved Waterworks

Recent changes to the Town of Rye's water treatment system include the permitting and installation of a sodium hydroxide (NaOH) injection system in order to increase pH within the distribution system and limit internal corrosion. The chemical injection point is within the WTP and prior to sodium hypochlorite injection. The target pH for the Town of Rye's water system for lead corrosion control is pH = 8.1 with a range of +/- 0.1 s.u. at entry point. The injection system is currently operational.

The town has capacity for water storage within their two existing sub-grade clear wells and one elevated water storage tank which feeds the distribution system. The distribution system is composed of approximately 2,500 linear feet of water mains and over 3,000 linear feet of various sized laterals. Table 6 below summarizes the system's total water storage and distribution system volumes.

Table 7: Rye Water System Total Storage Capacity Summary

Storage Structure	Tot. Vol. (gal.)	
Clear Well #1	50,000	
Clear Well #2	50,000	
Elevated WST (gal)	50,000	
Sub-Total (gal)	**150,000**	
Distribution System	Length (LF)	Vol. (gal)
Distribution System Mains[1]	2,500	14,687
Distribution System Laterals[2]	3,000	7,833
Sub-Total (gal)	**--**	**22,520**
Overall Total (gal)	**172,520**	

[1]Assumed diameter of 12" for all water mains

[2]Assumed diameter of 8" for all water laterals

4.3.3 Existing Process Flow Diagram

Figure 3 displays the existing Process Flow Diagram (PFD) at the Town of Rye's water treatment facility. The CDPHE record of approved water works is included in Appendix I.

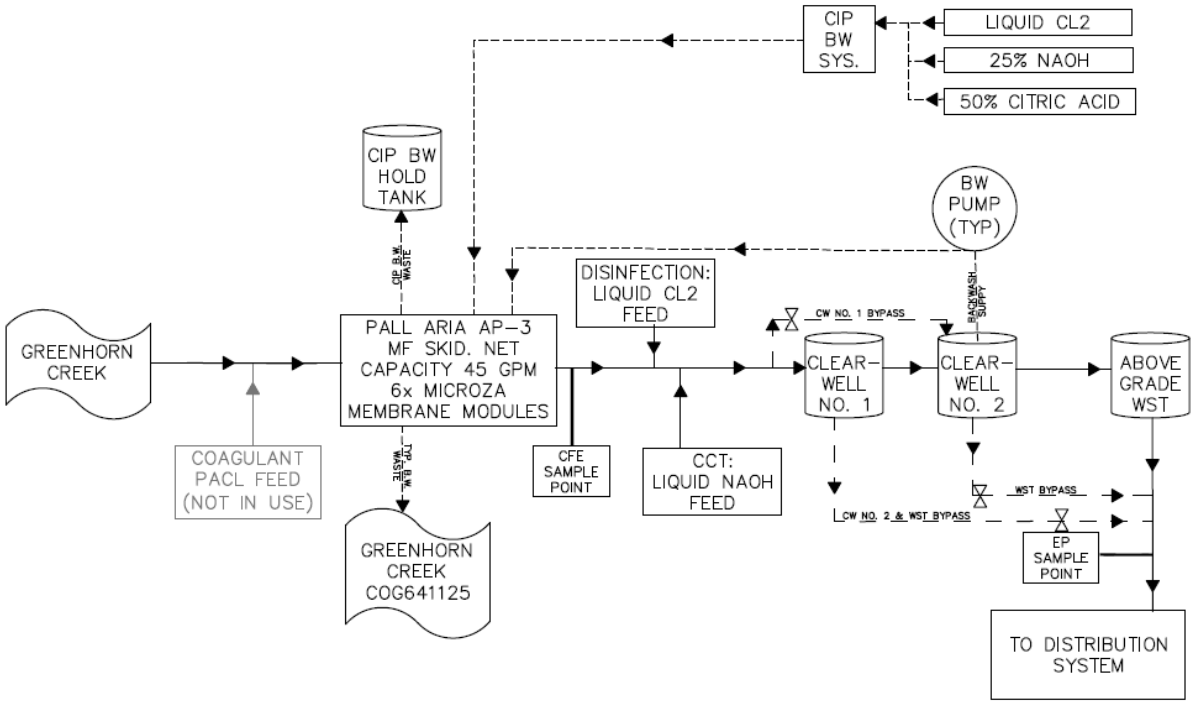


Figure 3: Existing Process Flow Diagram

4.3.4 Water Distribution System

The town's water distribution system is entirely gravity fed from the 50,000-gal above grade water storage tank located at the WTF property. There is only one pressure zone within the system, and experiences typical pressures between 50-75 psi. Overall, the town's water distribution system contains approximately 2,500 linear feet of water mains and over 3,000 linear feet of various sized laterals.

5 SOURCE WATER QUALITY

The town's water system is supplied raw water from one (1) surface water source from Greenhorn Creek through a diversion in close proximity to the town's water treatment facility (WTF). The town also holds groundwater rights through a well installed at the WTF property, but the well was discontinued due to poor water quality.

5.1 RAW WATER QUALITY

5.1.1 TOC Levels

The town has completed TOC sampling and monitoring in 2021 at the combined filter effluent (CFE) sampling location and at the raw water intake sample location as summarized below in Table 7. The WTP experienced high levels of TOC during the 2nd and 3rd quarter of 2021 with TOC levels of 9.1 mg/L in May 2021 and at 5.2 mg/L in July 2021. Also note Rye's WTP does not remove much of the raw water TOC, because microfiltration cannot remove dissolved substances such as DOC which typically accounts for up to 90% of surface water TOC.

Table 8: TOC Levels Source Water 2021

Date	TOC (mg/L)	
	Raw Water	CFE
4/20/2021	--	5.8
5/11/2021	--	9.1
6/8/2021	--	4.9
7/19/2021	5.2	5
8/18/2021	3.6	3.4

The TOC sampling data from 2021 largely confirms the raw water TOC average trend data collected in 2019 (see Table 7) as shown below in Figure 4. The trend suggests the water quality in Greenhorn Creek fluctuates with storm events and seasonal snow melt, which typically occur during the spring and summer months.

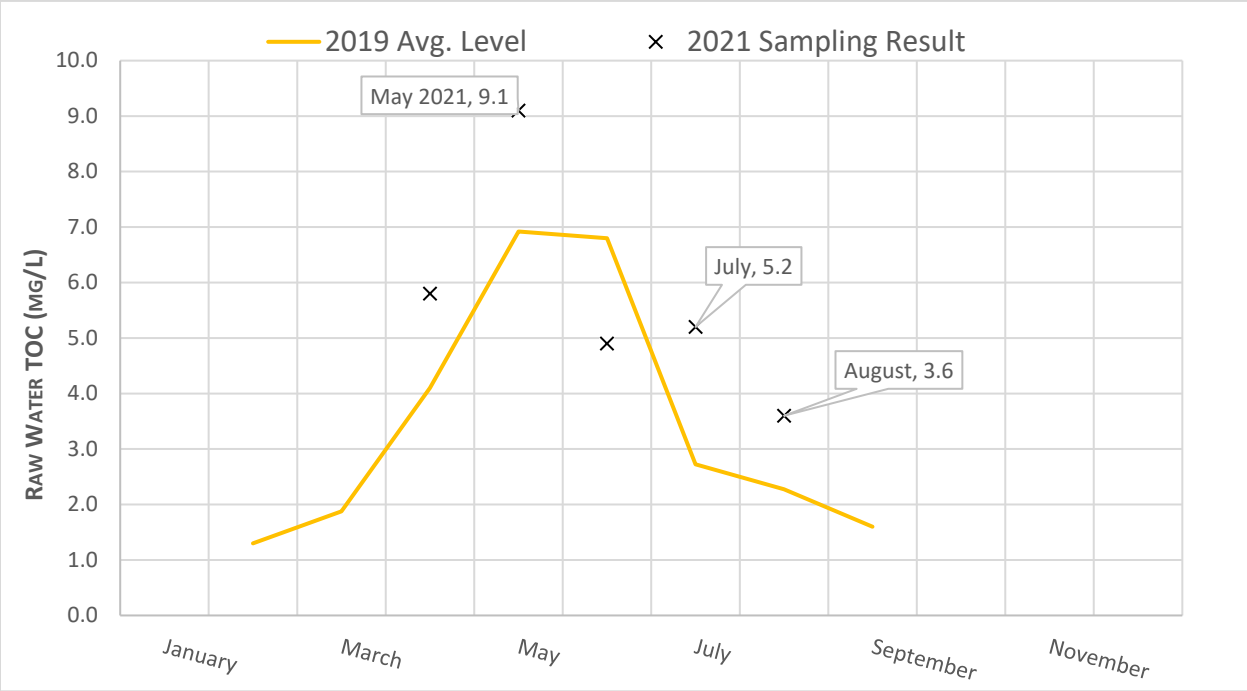


Figure 4: 2019 Average Raw Water TOC versus 2021 Sampling Events

5.1.2 Water Temperature

The rate of formation of both TTHM and HAA5 increase with temperature, thus DBP levels are typically highest in the summer months for surface water treatment facilities. The water temperature at the Rye WTP increased during the 2nd and 3rd quarters of 2021 but does not directly correlate with the increased DBP levels sampled over the same time. The increased water demands that are typical of summer months reduces residence time in the distribution system and thus offsets the effect of increasing temperature.

5.1.3 DBP Precursor Levels

According to the National Oceanic & Atmospheric Administration (NOAA) record of climatological observations for the Rye Station during the month of April 2021, the town experienced 11.7 inches of snow and 0.96 inches of rain. The latest major snowfall event was 5.8 inches on April 20th, 2021, which melted away within 1-2 days. Thus, unusually high amounts snowmelt in the Town of Rye service area are likely a contributing factor to the exceptionally high TOC level recorded on May 11th, 2021; and likewise, the TTHM/HAA5 OEL exceedance during the 2nd Quarter of 2021 (sampled on May 1st, 2021).

DBP precursors were also elevated during the sampling events during the 3rd Quarter of 2021 above 2 mg/L, and thus the excessive level of NOM present during disinfection and contact time are significantly responsible for the elevated DBP sampling results experienced in the 3rd Quarter on July 19th and August 18th, 2021. Additionally, that sampling results for both TTHMs and HAA5s decreased each time across the OEL exceedances which also corresponded with the decreasing TOC levels as historically seen in Town of Rye's raw surface water. DBP sampling results can be found in Appendix J.

5.1.4 pH and Alkalinity

The pH and alkalinity of source water can also have an effect on DBP formation. With increases to pH, the potential for TTHM increases. On the other hand, decreasing pH leads to greater potential for HAA_5 formation. As the town has experienced an increase to both DBP levels during the 2nd and 3rd quarter of 2021, the effect of pH in the source water is likely negligible. Alkalinity can be consumed during acid and base reactions and must be present to resist large pH swings. The effect of alkalinity in source water is also negligible to the 2nd and 3rd quarter 2021 OEL exceedances.

6 RESIDUALS CONTROL

Backwash from the proposed GAC filters will be discharged to holding tanks for off-site disposal.

7 OPERATIONS PLAN

The GAC media typically has a long lifespan. The exact breakthrough of the media, however, is not known. Therefore, the town will continue to sample TTHM in the distribution system as has previously been done and replace the filter media when TTHM levels reach a level of 0.06 mg/L. This will allow the town to be able to order and replace media prior to violating the TTHM MCL of 0.08 mg/L.

The proposed GAC media will be contained within a pressure vessel and will be backwashed automatically based on a system timer set in the filter vessel's control head. The manufacturer recommends backwashes one per week after startup, with backwashes being adjusted based on pressure differential across the filter. Pressure gauges will be located on each filter both upstream and downstream.

Raw water will continue to be provided by Greenhorn Creek and treated by the existing processes. The addition of the GAC system will not change distribution. Controls will not change due to the addition of the GAC system.

8 SELECTED TREATMENT TECHNOLOGY

The town wishes to install two (2) 45 gpm Skid-Mounted AquaTech GAC Pressure Filters containing 30 cubic feet of GAC media each. The GAC system will be installed between the town's membrane filtration process (microfiltration skid) and the point of application for disinfection, in order to remove the DBP precursors before chemical injection takes place. Equipment information can be found in Appendix E. CDPHE Design Criteria relevant to the GAC pressure filter system is included in Appendix K. No change to system capacity or the entry and exit point sampling or chemical injection points are proposed. The proposed equipment and media is NSF/ANSI 61 approved.

Properties of the proposed systems are as follows:

Media Properties:

- 37" deep 12 x 40 mesh granular activated carbon (GAC)
- Filtrasorb 400 by CalgonCarbon
- NSF 61 certified

Vessel Properties:

- Pentair Water 40" diameter vessel
- Model ACH31283
- NSF 61 certified
- Underdrain: Spears Schedule 80 PVC (NSF 61 certified)
- PLC-Based Filter Control Panel

At 45 gpm the surface loading rate of each filter is 4.7 gpm/sf which is below that of the maximum allowable 7.0 gpm /sf in the CDPHE drinking water design criteria.

Inlet and outlet line size for the proposed unit is 3-inch diameter, the drain size for the proposed unit is 2-inch diameter. The system backwash will be controlled by a PLC-Based Filter Control Panel.

8.1 PROPOSED PROCESS FLOW DIAGRAM

The proposed process flow diagram is shown in the attached schematic plans which are found in Appendix L.

8.2 CAPACITY EVALUATION

The addition of the proposed GAC units will not alter the capacity of the system. The approved water works record shows that the filtration system sets the capacity at 45 gpm. No capacity changes are being requested in this report. The town is not expected to have any growth, so the system does not need to be designed for demand growth.

APPENDIX A

CDPHE ENFORCEMENT ORDER

COLORADO
Department of Public Health & Environment

December 29, 2022

Certified Mail Number: 7020 1290 0001 3027 8936

PWSID# CO0151700
Marty Rahl, Mayor
Town of Rye
PO Box 236
Rye, CO 81069

Service of Drinking Water Enforcement Order DW.12.22.151700

Town of Rye (the "Supplier") is hereby issued the enclosed Enforcement Order (the "Order"). This Order is issued by the Colorado Department of Public Health and Environment, Water Quality Control Division (the "Department") pursuant to the authority given to the Department by sections 25-1.5-203 and 25-1-114.1 of the Colorado Revised Statutes ("C.R.S."), and section 11.1(6)(c), 5 CCR 1002-11.

With the issuance of Enforcement Order Number DW.12.22.151700, the Department hereby closes the previous Enforcement Order Number DW.11.15.151700 issued to the Supplier on November 13, 2015 and its subsequent amendment on January 10, 2018.

Violations cited in the Order:

I. Exceedance of the total trihalomethanes (TTHM) maximum contamination level (MCL) – 4 violations
II. Exceedance of the haloacetic acids (HAA5) maximum contamination level (MCL) – 13 violations

Please contact Ben Keilly by phone at 720.507.7761 or by email at ben.keilly@state.co.us with any questions regarding the content of the Order.

Enclosures:
Drinking Water Enforcement Order DW.12.22.151700
Drinking Water Enforcement Requirements Summary
Drinking Water Enforcement Response Forms

cc: Drinking Water Enforcement File DW.12.22.151700
ec: Marty Rahl, Mayor and Administrative Contact, ryerahl1948@gmail.com
Town of Rye, Owner Representative, rye.town.clerk@gmail.com
Richard Hopp, Operator, richard@rhww.net

Jody Carrillo, Pueblo City-County Health Department, jody.carrillo@co.pueblo.co.us
Erica Espeseth, Pueblo City-County Health Department, espeseth@pueblocounty.us
Chad Wolgram, Pueblo City-County Health Department, chad.wolgram@pueblocounty.us
Tara Marshall, Colorado Department of Local Affairs, tara.marshall@state.co.us
Randi Snead, Colorado Department of Local Affairs, randi.snead@state.co.us
Sean Scott, Division of Environmental Health and Sustainability, CDPHE
Christina Carballal, EPA Region VIII, carballal-broome.christina@epa.gov

COLORADO

Department of Public Health & Environment

WATER QUALITY CONTROL DIVISION

ENFORCEMENT ORDER **NUMBER: DW.12.22.151700**

IN THE MATTER OF: **TOWN OF RYE**
AS OWNER AND/OR OPERATOR OF
PUBLIC WATER SYSTEM IDENTIFICATION NUMBER: CO0151700
PUEBLO COUNTY, COLORADO

Pursuant to the authority vested in the Colorado Department of Public Health and Environment (the "Department") by sections 25-1-109 and 25-1.5-203 of the Colorado Revised Statutes ("C.R.S."), which authority is implemented through the Department's Water Quality Control Division (the "Division"), the Department hereby makes the following findings and issues the following Enforcement Order ("Order"):

DRINKING WATER REGULATIONS

1. The Colorado Primary Drinking Water Regulations are published in the Code of Colorado Regulations at 5 CCR 1002-11 and are collectively referred to in this Order as "Regulation 11."

2. The Water and Wastewater Facility Operators Certification Requirements, Regulation No. 100, is published in the Code of Colorado Regulations at 5 CCR 1003-2 and are referred to in this Order as "Regulation 100".

GENERAL FINDINGS

3. Town of Rye is a person as defined by section 11.3(54), Regulation 11.

4. At all times relevant to the violations cited herein, Town of Rye was a statutory town registered with the Colorado Department of Local Affairs (Local Government ID Number 51018).

5. Town of Rye is a supplier of water within the meaning of section 25-1.5-201(2), C.R.S., and its implementing regulation, section 11.3(81), Regulation 11. Hereafter, Town of Rye will be referred to as **"the Supplier."**

6. The Supplier owns and/or operates a drinking water system, located in the Town of Rye, in Pueblo County, Colorado **(the "System").**

7. The System is a public water system as defined by section 25-1.5-201(1), C.R.S. and its implementing regulation, Regulation 11, section 11.3(60).

8. The Public Water System Identification Number ("PWSID") assigned to the System by the Department is PWSID #: CO0151700.

9. Pursuant to section 11.1(5), Regulation 11, the System is subject to the Colorado Primary Drinking Water Regulations (Regulation 11), which were adopted pursuant to section 25-1.5-203, C.R.S.

10. Pursuant to section 11.3(11), Regulation 11, if a system provides water for human consumption to at least fifteen (15) service connections used by year-round residents of the area served by the system and/or regularly serves at least twenty-five (25) year-round residents it is classified as a "community water system." Department records establish that the System serves one hundred fifty-three (153) year-round residents and a daily average of five hundred ninety-two (592) non-transient consumers and is therefore classified as a "community water system" as that phrase is defined in section 11.3(11), Regulation 11.

11. The System's source of water is surface water as defined by section 11.3(82), Regulation 11.

12. The Department notified the Supplier of violations of the TTHM MCL for public water supplies in letters dated March 31, 2015, July 10, 2015, July 17, 2017, October 4, 2017, December 15, 2017, March 16, 2018, September 3, 2021, December 10, 2021 and March 8, 2022.

13. Pursuant to section 11.45(6), Table 11.45-VII, Regulation 11, the maximum contaminant level (MCL) of 0.080 mg/L for TTHM is applicable to all community and non-transient, non-community water systems. Pursuant to the health effects language in table 11.33-VI, Regulation 11, "[s]ome people who drink water containing trihalomethanes in excess of the MCL over many years may experience problems with their liver, kidneys, or central nervous system, and may have an increased risk of getting cancer."

14. Shown graphed in Figure 1, the individual TTHM sample results for the drinking water system from first quarter 2018 to fourth quarter 2022 demonstrate the repeated occurrence of individual TTHM sample results above the MCL.

15. Shown graphed in Figure 1, the TTHM locational running annual average (LRAA) values calculated from individual sample results show a history of TTHM MCL violations.

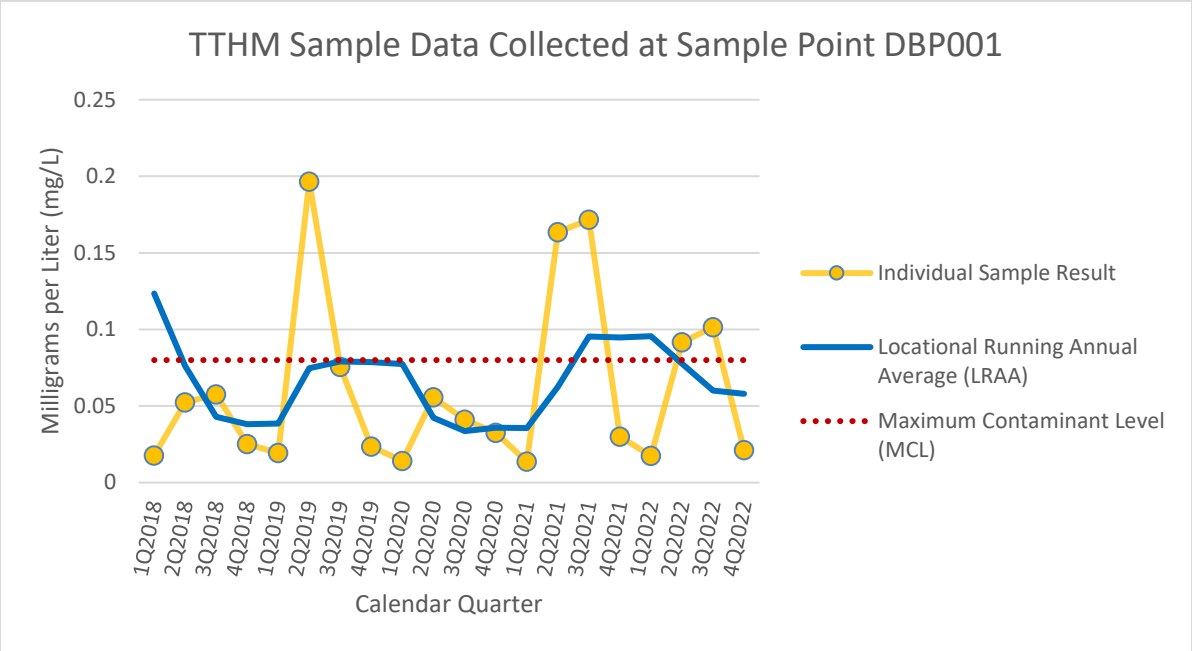


Figure 1: TTHM individual sample result data collected in the distribution system and calculated LRAA values for the Town of Rye drinking water system from first quarter 2018 to fourth quarter 2022.

16. The Department notified the Supplier of violations of the HAA5 MCL for public water supplies in letters dated October 9, 2007, December 3, 2007, February 12, 2008, May 14, 2008, October 7, 2014, January 29, 2015, March 31, 2015, July 10, 2015, September 11, 2015, December 31, 2015, April 25, 2016, June 30, 2016, October 6, 2016, January 9, 2017, March 29, 2017, July 17, 2017, October 4, 2017, December 15, 2017, March 16, 2018, June 18, 2018, July 15, 2019, August 26, 2019, December 20, 2019, March 6, 2020, June 16, 2021, September 3, 2021, December 10, 2021, March 8, 2022 June 10, 2022, September 2, 2022 and December 22, 2022.

17. Pursuant to section 11.45(6), Table 11.45-VII, Regulation 11, the maximum contaminant level (MCL) of 0.060 mg/L for HAA5 is applicable to all community and non-transient, non-community water systems. Pursuant to the health effects language in table 11.33-VI, Regulation 11, "[s]ome people who drink water containing haloacetic acids in excess of the MCL over many years may have an increased risk of getting cancer."

18. Shown graphed in Figure 2, the individual HAA5 sample results for the drinking water system from first quarter 2018 to fourth quarter 2022 demonstrate the repeated occurrence of individual HAA5 sample results above the MCL.

19. Shown graphed in Figure 2, the HAA5 locational running annual average (LRAA) values calculated from individual sample results show a history of HAA5 MCL violations.

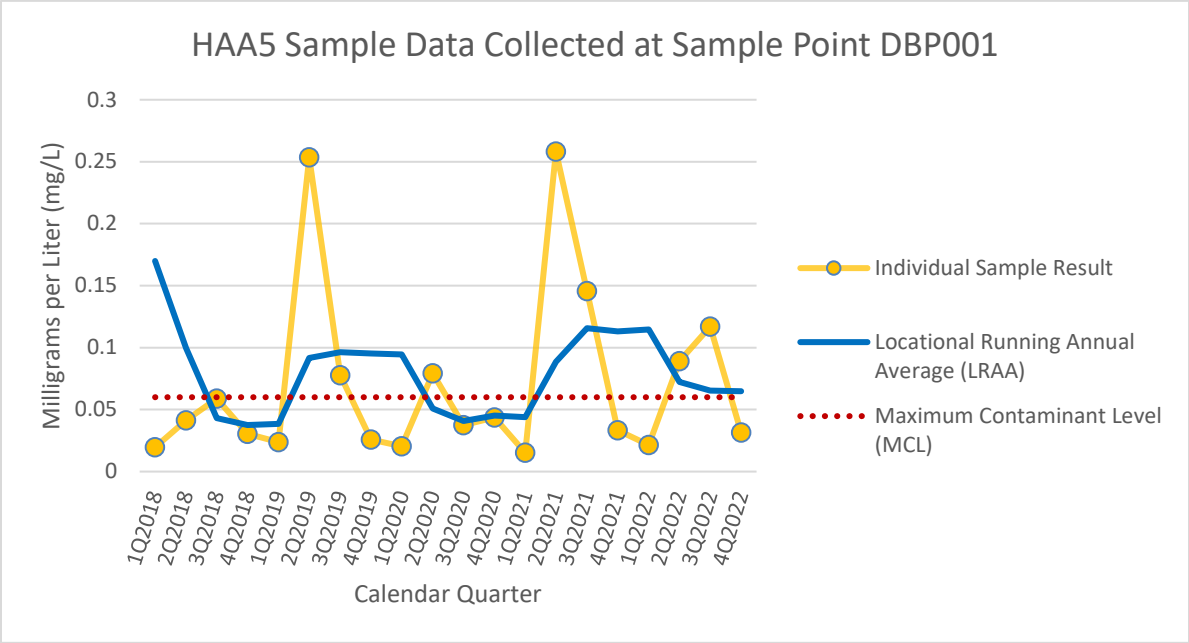


Figure 2: HAA5 individual sample result data collected in the distribution system and calculated LRAA values for the Town of Rye drinking water system from first quarter 2018 to fourth quarter 2022.

20. On November 13, 2015, the Department issued Enforcement Order Number DW.11.15.151700 ("2015 Order") to the Supplier for their exceedances of the MCL and the HAA5 MCL. The 2015 Order required the Supplier to evaluate and upgrade the System's water sources and/or treatment processes to ensure long-term compliance with the TTHM MCL and HAA5 MCL. On January 10, 2018, the Department issued Amendment One to the 2015 Order, revising the Supplier's deadlines for completing the required System improvements.

21. From 2016 to 2018, the Supplier completed the System improvements, as required by the 2015 Order. The Supplier added coagulation injection before the existing membrane filters, changed to flow-paced chlorine dosing, added baffle curtains to the tanks used for disinfection contact time, and added tank mixers in the finished water storage tank. However, according to the Supplier's Disinfection Byproduct Formation and Mitigation Study report that was submitted to the Department on July 27, 2022, the Supplier discontinued operation of the coagulation treatment around the first quarter of 2019 because it was not noticeably removing total organic carbon (TOC).

22. Subsequently, the System maintained compliance with the TTHM MCL and HAA5 MCL for an extended period of time. The System was in compliance with the TTHM MCL based on calculated locational annual averages, from second quarter 2018 to second quarter 2021. The System was in compliance with the HAA5 MCL based on calculated locational annual averages, from third quarter 2018 to first quarter 2019 and again from second quarter 2020 to first quarter 2021.

23. In 2020, the Supplier communicated to the Department that they suspected the recurrence of elevated TTHM and HAA5 was related to contamination entering one of the tanks used for disinfection contact time. The Supplier completed a rehabilitation of the tank in early 2021. However, the tank rehabilitation did not appear to decrease the System's finished water TTHM and HAA5 levels.

24. On February 23, 2022, the Department requested additional information from the Supplier in order to evaluate how the Supplier intends to achieve and maintain long-term compliance with the TTHM MCL and HAA5 MCL.

25. On March 31, 2022, June 29, 2022 and July 27, 2022, the Department received responses from the Supplier indicating that they intend to reduce water age by managing the tanks used for disinfection contact time and implementing a flushing program. They also stated that they need to calculate the *Giardia lamblia* and virus inactivation to decide if they can lower the chlorine dosage. Additionally, the Supplier stated that they need to pursue the recommendations presented in a Disinfection Byproduct Formation and Mitigation Study report that was completed for the Supplier by a Professional Engineer in September 2021.

26. The Supplier's Disinfection Byproduct Formation and Mitigation Study report proposed a DBP mitigation strategy including installation of a granular activated carbon (GAC) filter after the existing membrane filtration system and before the existing disinfection treatment system. Additionally, the report proposed an implementation schedule in two phases, summarized as follows:

    a. *Phase I – Immediate Actions:*

        i. Bypass one of the tanks used for disinfection contact time and decrease the applied chlorine dose at the entry point to 0.5 mg/L, and

        ii. Restart the existing coagulation injection system at a higher dose than previously applied and as appropriate for the seasonal fluctuations in raw water TOC levels.

    b. *Phase II – Future Actions to Ensure Disinfection Byproduct Compliance:*

i. Change the disinfection dosing location for the purpose of reducing the chlorine contact time,

ii. Perform a full-scale demonstration pilot of the proposed GAC filter to demonstrate performance, and

iii. Receive design approval for permanent installation of the GAC filter.

27. In March 2022, the Supplier installed optimal corrosion control treatment, as required by the Lead and Copper Rule, section 11.26, Regulation 11. The Department recognizes that the corrosion control treatment increased pH, which may affect TTHM and HAA5 formation.

28. The Department acknowledges that the Supplier has made significant efforts toward maintaining compliance with the TTHM MCL and HAA5 MCL. The Supplier fully complied with the implementation schedule required in the 2015 Order, further investigated and repaired their tank used for disinfection contact time, hired a Professional Engineer to complete a DBP Formation and Mitigation Study, and intends to complete the Professional Engineer's recommendations presented in the DBP Formation and Mitigation Study report.

29. The Department reviewed the Supplier's Disinfection Byproduct Formation and Mitigation Study report and participated in several conversations with the Supplier's contract Professional Engineer to better understand the Supplier's intended corrective actions. The Department understands that that the Supplier may have adequate justification to apply for permanent installation of GAC treatment without performing a demonstration pilot. The Department recognizes that the recommended alternative(s) identified in the DBP formation and Mitigation Study report appear to be viable options for the Supplier to return to compliance and may be necessary for the Supplier to maintain sustained compliance with the TTHM MCL and HAA5 MCL in the future.

30. To date, the Supplier has not demonstrated that the System is able to maintain long-term compliance with the TTHM MCL and HAA5 MCL.

31. The Department is issuing this Order, in part, to establish an enforceable schedule for the Supplier to achieve compliance with the TTHM MCL and the HAA5 MCL and to ensure long-term compliance with Regulation 11.

VIOLATIONS

I. Exceedance of the Total Trihalomethanes (TTHM) Maximum Contaminant Level (MCL) - 4 Violations

32. All preceding paragraphs are incorporated by reference herein.

33. Pursuant to section 11.25(1)(a)(i), Regulation 11, all community water systems and non-transient, non-community water systems that supply water treated with a primary or residual disinfectant other than ultraviolet light, the supplier must comply with the requirements of the Disinfection Byproducts Rule, section 11.25, Regulation 11.

34. Pursuant to section 11.45(6), Regulation 11, Table 11.45-VII, the maximum contaminant level (MCL) of 0.080 mg/L for total trihalomethanes (TTHM) is applicable to all community and non-transient, non-community water systems.

35. Section 11.25(1)(c)(iv), Table 11.25-II, Regulation 11, describes the routine disinfection byproduct monitoring frequency and sample locations required for suppliers. Accordingly, the Supplier, which uses surface water and serves 500 – 3,300 people, must monitor for TTHM on a quarterly frequency at one (1) sampling location with the highest TTHM concentration.

36. Pursuant to section 11.25(1)(f)(i), Regulation 11, if the supplier samples at a quarterly frequency, MCL compliance is based on the locational running annual average (LRAA), as defined section 11.3(42), Regulation 11.

37. Department records establish that, prior to the first quarter 2018, the Supplier incurred six (6) violations of the TTHM MCL. These violations were documented in the 2015 Order and its subsequent amendment on January 10, 2018.

38. The following table documents the TTHM monitoring data submitted to the Department for the System from first quarter 2018 to fourth quarter 2022 and includes the LRAA calculated according to section 11.3(42), Regulation 11.

TTHM Sampling Data from Sample Point DBP001 in the Distribution System				
Compliance Quarter	**Sample Date**	**Result (mg/L)**	**LRAA (mg/L)**	**MCL Violation**
1st Quarter 2018	2/20/2018	0.0176	0.123*	**YES**
2nd Quarter 2018	5/17/2018	0.0524	0.076*	No
3rd Quarter 2018	8/27/2018	0.0576	0.043*	No
4th Quarter 2018	11/19/2018	0.0251	0.038	No
1st Quarter 2019	2/13/2019	0.0193	0.039	No
2nd Quarter 2019	6/13/2019	0.1966	0.075	No
3rd Quarter 2019	8/1/2019	0.0756	0.079	No
4th Quarter 2019	11/24/2019	0.0235	0.079	No
1st Quarter 2020	2/10/2020	0.0142	0.077	No
2nd Quarter 2020	5/22/2020	0.0557	0.072	No
3rd Quarter 2020	8/6/2020	0.0411	0.034	No
4th Quarter 2020	11/12/2020	0.0324	0.036	No

1st Quarter 2021	2/17/2021	0.0137	0.036	No
2nd Quarter 2021	5/11/2021	0.2179	0.063	No
	6/28/2021	0.1091		
3rd Quarter 2021	8/18/2021	0.1716	0.095	**YES**
4th Quarter 2021	11/15/2021	0.030	0.095	**YES**
1st Quarter 2022	2/15/2022	0.0174	0.096	**YES**
2nd Quarter 2022	5/23/2022	0.0917	0.078	No
3rd Quarter 2022	8/15/2022	0.1015	0.060	No
4th Quarter 2022	11/21/2022	0.213	0.058	No

** LRAA is calculated using previous sample data not shown in this table*

39. Pursuant to section 11.25(1)(g), Regulation 11, the following constitute a TTHM MCL violation:

    a. The LRAA at any sampling location is greater than the MCL for TTHM.

    b. The LRAA, calculated before four consecutive quarters of samples have been collected at a sampling location, is greater than the MCL for TTHM regardless of the subsequent sample results.

40. The Supplier's failures to comply with the TTHM MCL constitute violations of sections 11.45(6) and 11.25(1)(g), Regulation 11.

II. Exceedance of the Haloacetic Acids (HAA5) Maximum Contaminant Level (MCL) – 13 Violations

41. All preceding paragraphs are incorporated by reference herein.

42. Pursuant to section 11.45(6), Regulation 11, Table 11.45-VII, the maximum contaminant level (MCL) of 0.060 mg/L for haloacetic acids (HAA5) is applicable to all community and non-transient, non-community water systems.

43. Section 11.25(1)(c)(iv), Table 11.25-II, Regulation 11, describes the routine disinfection byproduct monitoring frequency and sample locations required for suppliers. Accordingly, the Supplier, which uses surface water and serves 500 – 3,300 people, must monitor for HAA5 on a quarterly frequency at one (1) sampling location with the highest HAA5 concentration.

44. Pursuant to section 11.25(1)(f)(i), Regulation 11, if the supplier samples at a quarterly frequency, MCL compliance is based on the locational running annual average (LRAA), as defined section 11.3(42), Regulation 11.

45. Department records establish that, prior to the first quarter 2018, the Supplier incurred fourteen (14) violations of the HAA5 MCL. These violations were documented in the 2015 Order and its subsequent amendment on January 10, 2018.

46. The following table documents the HAA5 monitoring data submitted to the Department for the System from first quarter 2018 to fourth quarter 2022 and includes the LRAA calculated according to section 11.3(42), Regulation 11.

HAA5 Sampling Data from Sample Point DBP001 in the Distribution System				
Compliance Quarter	**Sample Date**	**Result (mg/L)**	**LRAA (mg/L)**	**MCL Violation**
1st Quarter 2018	2/20/2018	0.0196	0.170*	**YES**
2nd Quarter 2018	5/17/2018	0.0412	0.100*	**YES**
3rd Quarter 2018	8/27/2018	0.0588	0.043*	No
4th Quarter 2018	11/19/2018	0.0306	0.038	No
1st Quarter 2019	2/13/2019	0.0238	0.039	No
2nd Quarter 2019	6/13/2019	0.2535	0.092	**YES**
3rd Quarter 2019	8/1/2019	0.0777	0.096	**YES**
4th Quarter 2019	11/24/2019	0.0259	0.095	**YES**
1st Quarter 2020	2/10/2020	0.0205	0.094	**YES**
2nd Quarter 2020	5/22/2020	0.0794	0.051	No
3rd Quarter 2020	8/6/2020	0.0375	0.041	No
4th Quarter 2020	11/12/2020	0.0436	0.045	No
1st Quarter 2021	2/17/2021	0.0152	0.044	No
2nd Quarter 2021	5/11/2021	0.3835	0.089	**YES**
	6/28/2021	0.1331		
3rd Quarter 2021	8/18/2021	0.1456	0.116	**YES**
4th Quarter 2021	11/15/2021	0.334	0.113	**YES**
1st Quarter 2022	2/15/2022	0.0214	0.115	**YES**
2nd Quarter 2022	5/23/2022	0.0891	0.072	**YES**
3rd Quarter 2022	8/15/2022	0.117	0.065	**YES**
4th Quarter 2022	11/21/2022	0.0315	0.065	**YES**

** LRAA is calculated using previous sample data not shown in this table*

47. Pursuant to section 11.25(1)(g), Regulation 11, the following constitute a HAA5 MCL violation:

    a. The LRAA at any sampling location is greater than the MCL for HAA5.

b. The LRAA, calculated before four consecutive quarters of samples have been collected at a sampling location, is greater than the MCL for HAA5 regardless of the subsequent sample results.

48. The Supplier's failures to comply with the HAA5 MCL constitute violations of sections 11.45(6) and 11.25(1)(g), Regulation 11.

COMPLIANCE REQUIREMENTS

49. Pursuant to section 11.4(1)(b), Regulation 11, "[f]or all public water systems, the supplier must not begin construction of any new waterworks, make improvements to or modify existing waterworks, or begin using a new source until the supplier submits and receives Department approval of plans and specifications for such construction, improvements, modifications, or use." A Professional Engineer registered in the State of Colorado must design all treatment systems serving a community water supply. The Department shall grant approval upon finding that the proposed facilities are in substantial conformance with the design criteria specified in Policy DW-005, *State of Colorado Design Criteria for Potable Water Systems*. Information regarding design review requirements is available on the Department's web page at https://www.colorado.gov/cdphe/design.

50. Improvements or modifications to waterworks may impact the minimum required operator certification level for the Supplier's system. Pursuant to sections 100.1.2 and 100.10.1(a), Regulation 100, the Supplier's treatment and distribution systems must be under the supervision of a certified operator who holds a certification level in a class equal to or greater than the class of the facility or system. Pursuant to section 100.10.4, Regulation 100, within 30 calendar days of changes to information for its certified operator in responsible charge, the Supplier is required to submit written notification to the Department.

Based upon the foregoing factual and legal determinations and pursuant to section 11.1(6)(c), Regulation 11, the Supplier is hereby ordered to:

51. Immediately comply with Regulation 11, 5 CCR 1002-11.

Further, the Department hereby orders the Supplier to comply with the following specific terms and conditions of this Enforcement Order.

52. In order to achieve long-term compliance with Regulation 11, specifically including the TTHM MCL and the HAA5 MCL requirements for public water supplies, the Supplier shall implement the recommended alternatives identified in the DBP Formation and Mitigation Study report, in accordance with the following schedule:

a. **By March 29, 2023,** within ninety (90) calendar days of the date of the Order, the Supplier shall develop and implement optimization procedures (SOPs and/or best practices) as an interim measure to protect public health.

i. The Supplier must consult with the chemical manufacturer or perform jar testing to determine the optimal coagulant dose calculations and procedures as appropriate for the seasonal fluctuations in raw water TOC levels.

ii. The Supplier must use log removal calculations to identify the lowest feasible chlorine dose that will meet the minimum entry point treatment technique requirements of the Surface Water Treatment Rule, section 11.8, Regulation 11 and will meet the minimum 0.2 mg/L disinfection residual in the distribution system, while maintaining an appropriate margin of safety.

iii. The Supplier must ensure that staff are adequately trained to implement the SOPs and/or operating parameters.

iv. The Supplier must submit copies of the System SOPs and/or best practices to the Department for review.

1. If the Department provides comments on the SOPs and/or best practices, the Supplier must provide a written response **within thirty (30) calendar days** that resolves all comments.

v. The Supplier is encouraged to consult with the Department to determine if a design application is required for the SOPs and/or operating parameters. Department approval of design plans and specifications is required prior to implementing or constructing any deviations from the current Record of Approved Waterworks (i.e. a change in coagulant chemical or a change in disinfection treatment location). If applicable, the Supplier must submit those changes in a complete drinking water design application for Department review in accordance with paragraph 52(c) of the Order.

b. **By June 27, 2023,** within one hundred eighty (180) calendar days of the date of the Order, the Supplier shall submit a proposed funding plan for the recommended alternative(s) identified in the DBP Formation and Mitigation Study report. The plan must include, but is not limited to, the following information.

i. The Supplier must submit a written explanation of their funding strategy to manage increased and ongoing operational costs for the System optimizations SOPs and/or operating parameters implemented pursuant to paragraph 52(a) of the Order.

ii. The Supplier must submit a written explanation of their funding strategy to complete construction of the recommended System improvements identified in the Supplier's DBP Formation and Mitigation Study report.

iii. If the Supplier intends to submit applications for grants and/or loan funding, the Supplier must identify the date(s) by which the Supplier will submit applications for each funding source and the date(s) by which the Supplier anticipates having a full funding package in place. The Supplier is encouraged to identify one or more backup funding options and application dates in case the preferred funding option cannot be attained or, if attained, does not fully fund the upgrades.

c. **By June 27, 2023,** within one hundred eighty (180) calendar days of the date of the Order, the Supplier shall submit a complete drinking water design application (Basis of Design Report and applicable plans and specifications) for the recommended System improvements identified in the Supplier's DBP Formation and Mitigation Study report, for Department review.

i. The design application must include, but is not limited to, the addition of GAC filtration.

ii. The design application must be prepared by a Professional Engineer licensed in the state of Colorado and experienced in drinking water treatment design.

iii. The design application must be submitted in accordance with Policy DW-005, *State of Colorado Design Criteria for Potable Water Systems*. Information regarding design review requirements is available on the department's web page at https://www.colorado.gov/cdphe/design.

iv. If the Department provides comments on the design submittals, the Supplier must provide a written response **within thirty (30) calendar days** that resolves all comments.

d. **Within one hundred eighty (180) calendar days of Department approval of design plans and specifications**, the Supplier must ensure that the System improvements are constructed and implemented and that staff are adequately trained on the applicable operational and monitoring procedures.

i. **Within fourteen (14) calendar days** of construction of System improvements, the Supplier shall submit a completed *Construction As Approved Certification Form* certifying that the System improvements were constructed/installed as approved by the Department. This form is available at: https://www.colorado.gov/cdphe/wq-facility-design-and-approval-forms.

53. After the Supplier completes construction/implementation of System improvements required in the Order, the Department will review a minimum of eight (8) calendar quarters of the Supplier's TTHM and HAA5 compliance sampling results to evaluate if the System improvements are reliably and consistently achieving compliance with the TTHM MCL and the HAA5 MCL.

    a. If the Supplier's TTHM or HAA5 compliance data show more than two (2) individual sample result greater than the MCL, or require the Supplier to complete an Operational Evaluation Level (OEL) Report, or result in a TTHM or HAA5 locational running annual average (LRAA) MCL violation, the Department may require the Supplier to perform an additional engineering evaluation and/or complete additional System improvements. The Department will communicate these requirements in writing and such requirements shall become conditions of the Order.

54. The Supplier shall submit written progress reports to the Department in accordance with the following:

    a. **By January 28, 2023,** within thirty (30) calendar days of the date of the Order, submit an initial response to the Order, describing the Supplier's plan for complying with the Order. This initial response serves as the 1st quarter 2023 progress report.

    b. **By June 30, 2023**, and continuing quarterly for the duration of the Order, submit quarterly progress reports by the last day of each calendar quarter (March 31, June 30, September 30 and December 31).

        i. Each report shall clearly indicate the Supplier's compliance status with the Order and shall include a description of activities that the Supplier will be undertaking in the upcoming quarter to meet the Order requirements.

55. **No later than fourteen (14) calendar days** after full completion of all requirements of the Order, the Supplier shall submit a written notice of completion to the Department.

a. If the Department determines that the Supplier has not satisfactorily completed the requirements in the Order, the Department will reject the notice of completion in writing. If the Department rejects the notice of completion, it will include in its notice a statement identifying the requirements that the Department considers incomplete or not satisfactorily performed and a schedule for completion.

b. If the Supplier wishes to dispute the Department's rejection of its notice of completion, it shall, within fifteen (15) calendar days of receipt of the Department's rejection, submit a written statement as to its belief of full compliance, addressing in detail all outstanding requirements that were identified in the rejection letter issued by the Department.

SUBMITTALS

56. As an assistance, the Department is providing template enforcement order response forms to the Supplier as an enclosure with this Order. While the Supplier is not required to use these forms, and the Department's assistance of providing these forms does not replace the Supplier's responsibility to report to the Department, the Department encourages the Supplier to use the provided forms.

57. All documents, plans, records, reports and replies required to be submitted under this Order shall be submitted by the Supplier to the Department in accordance with one of the following:

Electronically – via the Drinking Water Portal

- The most efficient method of reporting is using the Department's Drinking Water Portal at https://wqcdcompliance.com/login.
- First-time users must create an account.
- Files submitted electronically must be in PDF format.
- The Department does not accept documents via email.

By Fax

Fax: (303) 758-1398
Please include a cover sheet addressed to the attention of Ben Keilly.

By Mail

CDPHE Water Quality Control Division
WQCD-B2-CAS Drinking Water Compliance Assurance Section
Attention: Ben Keilly
4300 Cherry Creek Drive South
Denver, Colorado 80246-1530

58. All documents submitted under this Order shall use the same titles as stated in the Order and shall reference both the Order number and the paragraph number pursuant to which the document is required.

59. All reports, notices, summaries, and certifications required to be submitted to the Department by the public water system must bear the original signature of the owner or the owner's authorized representative.

POTENTIAL ADMINISTRATIVE/CIVIL AND CRIMINAL PENALTIES

60. You are advised that, as stated in section 11.1(6)(c)(iii), Regulation 11, a supplier that violates Regulation 11 or an enforcement order(s) may be subject to civil or criminal actions pursuant to the provisions of sections 25-1-114 and 25-1-114.1, C.R.S.

REQUEST FOR HEARING OR APPEAL

61. Pursuant to section 11.1(6)(c)(iv), Regulation 11, a recipient of an enforcement order may request a hearing to contest such order. Requests for such a hearing must be filed in writing with the Department via the instructions in the Submittals section of this Order within thirty (30) calendar days after service of the order. Such requests, at a minimum, must contain the information specified in section 11.1(6)(c)(iv)(A), Regulation 11, and section 21.4(B)(2), Regulation 21 (Procedural Rules), 5 CCR 1002-21. Hearings on enforcement orders will be held in accordance with applicable provisions of the State Administrative Procedure Act, Article 4 of Title 24, C.R.S., and the procedural rules promulgated in Regulation 21, 5 CCR 1002-21. Hearings before the Department on enforcement orders will not address administrative penalty assessments.

ADDITIONAL ACTION

62. Pursuant to section 25-1-114.1(3), C.R.S., the Department may request the Attorney General to seek a temporary restraining order or permanent injunction to prevent or abate any violation of a minimum general sanitary standard or regulation adopted pursuant to section 25-1.5-203, C.R.S.

FOR THE COLORADO DEPARTMENT OF PUBLIC HEALTH AND ENVIRONMENT

_____

Nicole Graziano, P.E., Section Manager
Drinking Water Compliance Assurance Section
Water Quality Control Division

COLORADO
Department of Public Health & Environment

Drinking Water Enforcement Requirements Summary

System Name: Town of Rye	PWS ID: CO0151700
Enforcement Order Number: DW.12.22.151700	Order Issue Date: 12/29/2022

This requirements summary is provided by the Department to the Supplier to assist the Supplier. Please refer to the Order for the complete requirement language.

How to Report to the Department: As an assistance, the Department will provide template reports and forms to the Supplier. While the Supplier is not required to use these forms, and the Department's assistance of providing these forms does not replace the Supplier's responsibility to report to the Department, the Department encourages the Supplier to use the provided forms.
Submit responses to the Portal: wqcdcompliance.com/login **(preferred)** or by fax: (303) 758-1398.

Paragraph	Requirement	Deadline
51	Immediately comply with Regulation 11, 5 CCR 1002-11	Immediately & ongoing
54(a)	**Progress Report - Initial Response:** Submit an initial response to the Order, describing the Supplier's plan for complying with the Order. The initial response serves as the 1st quarter 2023 progress report.	1/28/2023
52(a)	**Maintain Interim Measure:** Develop and implement optimization SOPs and/or best practices. Refer to the Order for the SOP and/or best practices requirements. Submit the SOPs and/or best practices to the Department for review. • **Response to Department comments:** If the Department provides comments on the SOPs and/or best practices, the Supplier must provide a written response within 30 days that resolves all comments.	3/29/2023
52(b)	**Funding Plan:** Submit a funding plan for the optimization procedures and for completing the recommendations of the DBP Formation and Mitigation Study report. Refer to the Order for the required elements of the funding plan.	6/27/2023
52(c)	**Submit Design Plans and Specifications:** Submit a complete drinking water design application (Basis of Design Report, plans and specifications) for the System improvements recommended in the DBP Formation and Mitigation Study report. • **Response to Department comments:** If the Department provides comments on the design submittals, the Supplier must provide a written response within 30 days that resolves all comments.	6/27/2023
52(d)	**Complete Construction/Implementation:** Complete construction of the Department-approved System improvements and ensure that staff are adequately trained on the operational and monitoring procedures.	Within 180 days of Department approval

52(d)(i)	**Certify Construction Completion:** Submit a completed *Construction As Approved Certification Form* certifying that the System improvements were constructed/installed as approved by the Department. This form is available at: https://www.colorado.gov/cdphe/wq-facility-design-and-approval-forms	Within 14 days of construction completion
53	**Other Enforcement Requirement:** After the Department-approved System improvements are operational, the Department will review the Supplier's TTHM and HAA5 compliance sampling results to evaluate if the System improvements are reliably and consistently achieving compliance with the TTHM MCL and the HAA5 MCL.	A minimum of 8 calendar quarters
54(b)	**Progress Report - Quarterly:** Submit written progress reports to the Department for the duration of the Order.	By the last day of each calendar quarter (March 31, June 30, Sep 30, Dec 31)
Completion		
55	**Notice of Completion:** Submit a written notice of completion to the Department.	Within 14 days of completion of all requirements of the Order

COLORADO
Department of Public Health & Environment

Drinking Water Enforcement Response

Initial Response: Plan for Complying with the Order

Submit through Portal: wqcdcompliance.com/login **(preferred)** or by fax: (303) 758-1398

System Name: Town of Rye	PWS ID: CO0151700
Enforcement Order Number: DW.12.22.151700	Order Issue Date: 12/29/2022

How to use this form: The Supplier should complete the "Plan for Compliance" to clearly indicate the Supplier's plan to comply with the Order.

Due date: This initial response is due within 30 days of the Order issue date.

Paragraph	Requirement	Deadline
51	Immediately comply with Regulation 11, 5 CCR 1002-11	Immediately & ongoing
Plan for Compliance:		
52(a)	**Maintain Interim Measure:** Develop and implement optimization SOPs and/or best practices. Refer to the Order for the SOP and/or best practices requirements. Submit the SOPs and/or best practices to the Department for review. • **Response to Department comments:** If the Department provides comments on the SOPs and/or best practices, the Supplier must provide a written response within 30 days that resolves all comments.	3/29/2023
Plan for Compliance:		
52(b)	**Funding Plan:** Submit a funding plan for the optimization procedures and for completing the recommendations of the DBP Formation and Mitigation Study report. Refer to the Order for the required elements of the funding plan.	6/27/2023
Plan for Compliance:		
52(c)	**Submit Design Plans and Specifications:** Submit a complete drinking water design application (Basis of Design Report, plans and specifications) for the System improvements recommended in the DBP Formation and	6/27/2023

	Mitigation Study report. • **Response to Department comments:** If the Department provides comments on the design submittals, the Supplier must provide a written response within 30 days that resolves all comments.	
Plan for Compliance:		
52(d)	**Complete Construction/Implementation:** Complete construction of the Department-approved System improvements and ensure that staff are adequately trained on the operational and monitoring procedures.	Within 180 days of Department approval
Plan for Compliance:		
52(d)(i)	**Certify Construction Completion:** Submit a completed *Construction As Approved Certification Form* certifying that the System improvements were constructed/installed as approved by the Department. This form is available at: https://www.colorado.gov/cdphe/wq-facility-design-and-approval-forms	Within 14 days of construction completion
Plan for Compliance:		
53	**Other Enforcement Requirement:** After the Department-approved System improvements are operational, the Department will review the Supplier's TTHM and HAA5 compliance sampling results to evaluate if the System improvements are reliably and consistently achieving compliance with the TTHM MCL and the HAA5 MCL.	A minimum of 8 calendar quarters
Plan for Compliance:		
54(b)	**Progress Report - Quarterly:** Submit written progress reports to the Department for the duration of the Order.	By the last day of each calendar quarter (March 31, June 30, Sep 30, Dec 31)
Plan for Compliance:		

Name of Person Completing this Form:	Phone:	
Signature (if submitted to the Portal, no signature required):		Date:

COLORADO
Department of Public Health & Environment

Drinking Water Enforcement Response

Quarterly Progress Report

Submit through Portal: wqcdcompliance.com/login **(preferred)** or by fax: (303) 758-1398

System Name: Town of Rye	PWS ID: CO0151700
Enforcement Order Number: DW.12.22.151700	Order Issue Date: 12/29/2022

How to use this form: The Supplier should complete the "Status/Progress Report" to clearly indicate the Supplier's compliance status with the Order including a description of activities that the Supplier will be undertaking in the upcoming quarter to meet the Order requirements.

Due date: This progress report is due by the last day of each calendar quarter (March 31, June 30, September 30 and December 31).

Paragraph	Requirement	Deadline
51	Immediately comply with Regulation 11, 5 CCR 1002-11	Immediately & ongoing
Status/Progress Report:		
52(a)	**Maintain Interim Measure:** Develop and implement optimization SOPs and/or best practices. Refer to the Order for the SOP and/or best practices requirements. Submit the SOPs and/or best practices to the Department for review. • **Response to Department comments:** If the Department provides comments on the SOPs and/or best practices, the Supplier must provide a written response within 30 days that resolves all comments.	3/29/2023
Status/Progress Report:		
52(b)	**Funding Plan:** Submit a funding plan for the optimization procedures and for completing the recommendations of the DBP Formation and Mitigation Study report. Refer to the Order for the required elements of the funding plan.	6/27/2023
Status/Progress Report:		

52(c)	**Submit Design Plans and Specifications:** Submit a complete drinking water design application (Basis of Design Report, plans and specifications) for the System improvements recommended in the DBP Formation and Mitigation Study report. • **Response to Department comments:** If the Department provides comments on the design submittals, the Supplier must provide a written response within 30 days that resolves all comments.	6/27/2023
Status/Progress Report:		
52(d)	**Complete Construction/Implementation:** Complete construction of the Department-approved System improvements and ensure that staff are adequately trained on the operational and monitoring procedures.	Within 180 days of Department approval
Status/Progress Report:		
52(d)(i)	**Certify Construction Completion:** Submit a completed *Construction As Approved Certification Form* certifying that the System improvements were constructed/installed as approved by the Department. This form is available at: https://www.colorado.gov/cdphe/wq-facility-design-and-approval-forms	Within 14 days of construction completion
Status/Progress Report:		
53	**Other Enforcement Requirement:** After the Department-approved System improvements are operational, the Department will review the Supplier's TTHM and HAA5 compliance sampling results to evaluate if the System improvements are reliably and consistently achieving compliance with the TTHM MCL and the HAA5 MCL.	A minimum of 8 calendar quarters
Status/Progress Report:		

Name of Person Completing this Form:	Phone:
Signature (if submitted to the Portal, no signature required):	Date:

COLORADO
Department of Public Health & Environment

Drinking Water Enforcement Response

Notice of Completion

Submit through Portal: wqcdcompliance.com/login **(preferred)** or by fax: (303) 758-1398

System Name: Town of Rye	PWS ID: CO0151700
Enforcement Order Number: DW.12.22.151700	Order Issue Date: 12/29/2022

Date that the Supplier completed all requirements of the Order: _____

Completion Details

OPERATIONS: If the Supplier improved operations, describe the improvements.

PERFORMANCE: If the Supplier upgraded/added/improved a source, treatment or distribution system, describe the performance of the upgrade/addition/improvement.

MANAGEMENT: If the Supplier made improvements to administration/management/training, describe the improvements.

PLAN FOR CONTINUING COMPLIANCE: Describe the Supplier's plan to comply with Regulation 11 and Regulation 100.

Name of Person Completing this Form:	Phone:
Signature (if submitted to the Portal, no signature is required):	Date:

APPENDIX B

BASIS OF DESIGN REPORT APPLICATION FORM

COLORADO
Department of Public Health & Environment

APPENDIX B: BDR Template
Drinking Water Design Submittal
Safe Drinking Water Program
Implementation Policy #5

4300 Cherry Creek Drive South, B2
Denver, Colorado 80246-1530
CDPHE.WQEngReview@state.co.us, 303-692-6298

COVER PAGE - BASIC INFO

A. Project and System Information	
Supplier Name	Town of Rye
PWSID (Assigned by Division)	CO0151700
Project Title	Water System Improvements - GAC
Submittal date	June 27, 2023
Person to contact with design submittal questions	Alice Arsenault
Email	alicea@elementengineering.net
Phone	303-981-0453

Signatures of System Representatives

Role	Date	Typed Name	Signature
Owner	6/28/23	Jocelyn Mower, Clerk	
The owner is an individual, corporation, partnership, association, state or political subdivision thereof, municipality, or other legal entity.			
Applicant / System Legal Representative	6/28/23	Marty Rahl, Mayor	Marty Rahl, Mayor
The system legal representative is the legally responsible agent and decision-making authority for a public water system (e.g. mayor, president of a board, public works director). The Designer or Consulting Engineer is not the legal representative.			

Directions: Prior to submission to the department, the construction application must be signed by the Owner and/or a System Legal Representative. The department expects the public water system to send a duplicate copy to the local county health authority or county commissioner (if no county health authority) in whose jurisdiction(s) the drinking water facility is to be located. Signature is not required from the county.

For Community Systems, a Professional Engineer licensed in Colorado must stamp and sign design documents in accordance with Section 11.4(1)(b)(iii) of Regulation 11 and Item 1.1.2 of the Design Criteria. .

I was the engineer in responsible charge for (identify portions of work)

Basis of Design Report, Schematic Plans, Specifications

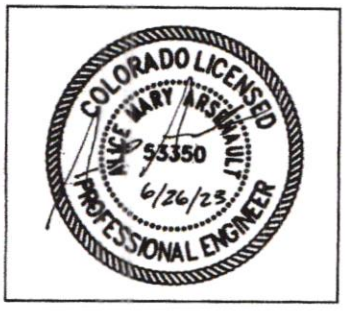
during the preparation of the basis of design report for the above-referenced project. To the best of my knowledge, the design is consistent with the most recent published version of the *Design Criteria for Potable Water Systems*, and that all site-specific deviations requests are listed in this report.

Alice M Arsenault, PE
Typed Name of Professional Engineer

Signature of Professional Engineer

6/26/23
Date Signed

53350
License #



P.E. Stamp and Signature

Basis of Design Report (BDR)

In accordance with Regulation 11 and the *Design Criteria for Potable Water Systems*, the design review process must include a 'complete design' consisting of a basis of design report (BDR) and corresponding plans and specifications for review and approval by the Department. Please see Appendix A.1: Design Review Matrix for the required design submittal items for various project types. If Appendix A.1 indicates that a BDR submittal item is not required then please just put "n/a" in that section of the application.

Section 1: Application for Construction Approval Form (DCPWS Section 1.2.1)

A/B. System information	
Supplier name	Town of Rye
PWSID (assigned by Division)	CO0126715

C. Project description

Please provide a project description including the description of existing waterworks, water treatment plants, unit processes, tank sizes, and distribution systems flows that affect and are affected by the project.

The Town of Rye has experienced heightened levels of total trihalomethanes (TTHM) and haloacetic acids (HAA5) in their drinking water in the past several years. This has resulted in an Enforcement Order (EO) from CDPHE on December 29, 2022, regarding these heightened levels of contaminants; the enforcement order is attached in Appendix A. ln September of 2021 a disinfection byproduct (DBP) mitigation study was completed for the Town of Rye. This report recommended that the town install Granular Activated Carbon (GAC) filters to remove DBP precursors prior to disinfection. Removal of precursors will reduce DBP formation and is recommended to help achieve DBP compliance. This Basis of Design Report proposes the installation of a GAC system in line with the current treatment process to remove DBP precursors found in the raw water source.

D. Scaled map illustrating any proposed structure or waterworks

Please attach a scaled map illustrating any proposed structure or waterworks.

Note: Suppliers serving less than 500 people may submit an aerial photograph (i.e., satellite image) or equivalent showing existing and proposed structures.

See Appendix C of BDR

E. Vicinity map illustrating any new of affected sources

Please attach a vicinity map illustrating any new or affected sources with regard to the pertinent watershed.

Note: Suppliers serving less than 500 people may submit an aerial photograph (i.e., satellite image) or equivalent showing existing and proposed waterworks.

Refer to Appendix C and the body of the BDR for maps of the proposed project location. There are no expected affected sources in this project.

F. Rated capacity

Please provide the requested rated capacity for the project.

- *Sources: maximum flowrate in gallons per minute*
- *Water treatment plants: Please fill out Section 5B below with the rated capacity in gallons per minute.*
- *Water storage tanks: volumes in gallons*

The rated capacity of the WTF will not change as a result of this project. The proposed GAC system will operate at 45 gpm.

G. Approximately total project cost including construction and design

Please provide an approximate construction cost for the project including both design costs and construction costs.

Note: Suppliers serving less than 500 people are exempt from this requirement.

$200,000

H. Requested Deviations

Please list any requested site specific deviation information below or provide a list of requested deviations. Suppliers may request site specific deviations from any Design Criteria requirement under Section 1.4 of the Design Criteria. Site specific deviation are for situations where the supplier has a technical justification for an alternative design parameter or alternative strategy for meeting the intention of the Design Criteria. Deviation requests must specify the Design Criteria requirement and justification for the deviation request.

No.	**DCPWS Requirement** (e.g., Section 4.3 Redundant filters)	**Site Specific Deviation Request** (e.g., The supplier requests a deviation from the Section 4.3 redundant filter requirement since the supplier has a backup connection to another public water system that could provide daily flows for the approximately 2 week period while replacement filter parts are shipped to the site)
1	None	
2		
3		
4		

I. Implementation Plan and Schedule

Please discuss the proposed date to start construction and the estimated start up/completion date.

BDR Submittal – June 2023

Install GAC Filters – August 2023

Section 2: Sources of Potential Contamination (DCPWS Section 1.2.2)

A. 100 Year Flood Plain

Please fill out the flood plain information below.

General flood plain information (all suppliers):

All water facilities must have the potential 100-year flood threat evaluated based on available floodplain data from one or more of the following sources: the Colorado Water Conservation Board, U.S. Army Corps of Engineers, Housing and Urban Development, County Government, local flood districts, etc. A copy of any background information used in the 100-year flood threat determination process must be included along with a comparison of the site vertical elevation datum and floodplain reference elevation datum.

The 100-year flood threat was evaluated for:

N/A

(e.g. Well, Water Treatment Facility, Tank)

100-year flood threat determination was based on the information enclosed from:

N/A

(e.g. FEMA floodplain map, U.S. Army Corp, elevation)

Non-Community Public Water Systems

For Non-Community Public Water Systems, an authorized representative of the system responsible for operation and compliance must sign the Floodplain Certification

I hereby certify that a judgment has been made after evaluating all available floodplain data and in my opinion, these waterworks, as located and designed, are not subject to flood damage by a 100-year event.

Typed Name of Authorized System Representative

Date Signed

Signature of Authorized System Representative

Community Systems

For Community Systems, a Professional Engineer licensed in Colorado must stamp and sign the Floodplain Certification.

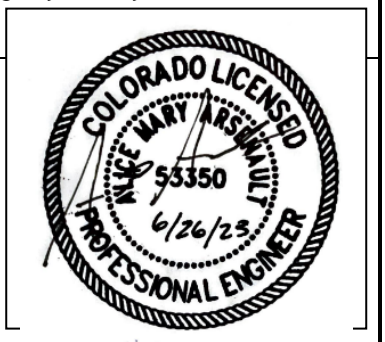
I hereby certify that a Professional Engineering judgment has been made after evaluating all available floodplain data and in my professional opinion, these waterworks, as located and designed, are not subject to flood damage by a 100-year event.

Alice M Arsenault, PE

Typed Name of Professional Engineer

6/27/2023

Date Signed



Signature of Professional Engineer

License #

B .Existing and potential contamination sources

Please discuss the location of existing and potential sources of contamination that may affect the proposed waterworks within the following distance:

i. Groundwater sources: 500 feet
ii. Surface water sources: Not applicable – the Department recommends updating the source water protection plan.
iii. Water treatment: 500 feet.
iv. Storage: Underground - 500 feet; ground level or above – 100 feet.

The proposed installation is located inside of the existing water treatment plant in a climate-controlled room. There are no potential sources of contamination or cross-contamination associated with the proposed installation.

C. Contamination source mitigation strategy

If existing and potential contamination sources are identified in Item B, then please discuss a mitigation strategy to prevent risk (see Item 1.2.2.c for examples).

N/A

Section 3: Water Quality Data (DCPWS Section 1.2.3)

A. Source Data (See table 1.1 for required sampling). Please attach lab results.

Please provide at least two sets of water quality data for new sources and discuss any results above MCL or health advisory level. Required water quality parameters and frequency (e.g., different month or different quarter) depends on public water system classification (e.g., community, transient non-community). See Table 1.1 in the Design Criteria for more information.

See Appendix M

B. Process Selection Data (See tables 1.2 and 1.3 for required sampling). Please attach lab results.

Please provide water quality results for all projects that impact treatment and discuss any relevant parameters below. Examples of waterworks projects that impact treatment works include, but are not limited to: new public water systems, new treatment plants, new sources treated at existing treatment plants, and modifications to existing treatment processes. Required water quality and frequency (e.g., different month or different quarter) depends on treatment process (e.g., disinfection, filtration), public water system classification (e.g., community, transient non-community). See Tables 1.2 and 1.3 in the Design Criteria for more information.

See Appendix J

Section 4: Process Flow Diagram/ Hydraulic Profile (DCPWS Section 1.2.4)

A. Process Flow Diagram

Please provide a process flow diagram (PFD) below or attach to the submittal. The PFD must show all major liquid and solids flow paths through various unit processes, proposed sampling locations, chemical feed locations, bypasses, flow metering and control locations.

See Appendix L

B. Hydraulic Profile

Please provide a hydraulic profile below or attach to the submittal. At a minimum, the hydraulic profile(s) must include hydraulic elevations associated with the maximum and minimum water treatment plant flow conditions. Include the summary of calculations or a summary of the model used to arrive at the elevations presented. Additional evidence of calculations may be required by the Department on a case-by-case basis.

Note: Suppliers serving less than 500 people are exempt from this requirement.

N/A

Section 5: Capacity Evaluation and Design Calculations (DCPWS Section 1.2.5)

A. For Source Projects

Please provide i) water rights information, ii) copy of the well permit (if applicable), and iii) source flowrate including permitted and pump capacity (pump curved preferred).

N/A

B. For Treatment Projects

i. Please identify treatment goals (e.g., disinfection and filtration for compliance with the surface water treatment rule).

Removal of DBP precursors.

ii. Please identify the treatment plant's disinfection compliance method. For more information on groundwater treatment see Section 11.11(4) of Regulation 11 and for surface water see "Policy 4 Guidance: Guidance on Proper Operations of Water Treatment Processes for the Control of Microbiological Contaminants"

Groundwater treatment

- ☐ *Triggered source water monitoring*
- ☐ *4 log inactivation of viruses (not typical)*

Surface water or groundwater under the direct influence of surface water treatment

- ☐ *Minimum chlorine monthly operating report*
- ☐ *Log inactivation monthly operating report*

☒ Not applicable, project does not impact disinfection

iii/iv/v/vii Please provide information on the treatment process including each unit treatment processes. Please provide the overall treatment plant flowrate taking redudancy into account (see section 2.2) and identify the flow limiting unit process (see item 4.0.2 of the Design Criteria). For each unit treatment process please provide: design flow rate, hydraulic loading rate, process and equipment design parameters, technical assumptions, and design calculations. Please attach design calculations.

Overall water treatment plant flowrate (gallons per minute): 45 gpm

Flow limiting unit treatment process:

Unit Processes (e.g. flocculation, hypochlorite addition)	**Unit Process Description at Rated Capacity**
GAC Filter	Process Addition Purpose: DBP Precursor Removal Rated for 45 GPM Removes impurities from raw water Bed Depth 37 in. Volume of GAC tank: 30 Cu. Ft. PSI Range: 150 Tank Dimensions: 42"x77"

C. For Storage Tank Projects

Please provide i) description of construction materials, ii) supporting calculations and technical assumptions for venting capacity, overflow capacity, buoyance (if applicable) and tank mixing system (if applicable), and iii) description of distribution and storage tank hydraulics and proposed operating regimes to promote adequate turnover and to minimize water age.

Please note that tanks less than 11,000 gallons do not have to submit supporting vent and overflow calculations (ii) and suppliers serving less than 500 people are exempt from the description of distribution and storage tank hydraulics and proposed operating regimes requirement.

N/A

D. For Pumping and Distribution System Projects

For pump station projects, please provide supporting pump curves and limitations to provide adequate pumping capacity. For distribution system work: please provide line sizing, construction materials, and construction standards.

N/A

Section 6: Monitoring and Sampling Evaluation (DCPWS Section 1.2.6)

A. Proposed flow metering for sources and treatment

Please discuss the flow measurement provided for any individual sources and within any treatment plants. See Section 2.13 of the Design Criteria for flow metering requirements.

The proposed installation of a GAC system will not result in any flow metering changes.

B. Water quality sampling evaluation

Please discuss the water quality sampling locations, the purpose and parameters being measured at the identified locations, and the means for feedback to operators (e.g., chlorine residual and turbidity compliance with Regulation 11, pH to monitor coagulation process via grab sample, online monitoring). Required sampling water quality locations depends on source type (e.g., groundwater, surface water) and treatment process (e.g., bag filter, conventional). See Section 2.9 of the Design Criteria for monitoring equipment requirements and Section 2.10 for sample tap requirements.

The proposed installation of a GAC system will not result in any sampling changes.

Section 7: Geotechnical Report (DCPWS Section 1.2.7)

Geotechnical report

Please attach a geotechnical report if the scope of the project includes a new structure with a foundation. At a minimum, the geotechnical report must include the following information as applicable to the design: site specific soil boring information that discusses seasonal and measured groundwater conditions, soil bearing capacity, excavation benching, shoring and sloping, bedding and backfill, compaction and moisture conditioning, alternative foundation design, an analysis of geotechnical hazards, and design recommendations based on the findings.

Note: Please note that a small slab on grade is typically not considered a foundation (e.g., supports a 10 ft by 10 ft shed). Building supported by a small slab on grade are exempt from this requirement.

N/A Backwash waste from the MF process is diverted back into Greenhorn Creek under CDPS No. COG641125. Chemicals such as caustic and acid are used to perform enhanced backwashes on the MF units on occasion, but backwash wastes are delivered to holding tanks for disposal off-site. Backwash wastes from the GAC filters will also delivered to holding tanks for disposal off-site.

Section 8: Residuals Handling (DCPWS Section 1.2.8)

Residuals handling plan – Chapter 9 of the DCPWS

If applicable, please discuss any treatment process wastewater (e.g., filter backwash, online monitoring wastewater) and the proposed discharge and/or disposal plan. See Chapter 9 of the Design Criteria for more information.

Backwash waste from the MF process is diverted back into Greenhorn Creek under CDPS No. COG641125. Chemicals such as caustic and acid are used to perform enhanced backwashes on the MF units on occasion, but backwash wastes are delivered to holding tanks for disposal off-site. Backwash wastes from the GAC filters will also delivered to holding tanks for disposal off-site.

Section 9: Preliminary Plan of Operation (DCPWS Section 1.2.9)

A/B. Staffing recommendations and relevant operator certification

Please discuss the project's impact (if any) on the operator requirements and if the supplier has a certified operator at the appropriate level. Please note that the approval letter will specify the certified operator requirement per Regulation 100.

Ryan Jacob is the facility operator. Ryan possesses a D license for Water Treatment operations.

C. Basic operating configuration

Please discuss the expected normal operating configuration and process control procedures. Where initial operating conditions will be significantly less than design capacity, please discuss the design flexibility allowing the system to operate under differing flow rates.

The facility is classified as a B facility. Even with the addition of the GAC system, the classification of the facility is not expected to change. The Town of Rye received a Violation Notice from the CDPHE for Failure to Maintain Certified Operator at Appropriate Certification Level on May 2, 2023.

D. Phased operation

If applicable, discuss any phased operation of existing waterworks to maintain compliance during construction.

Note: Suppliers serving less than 500 people are exempt from this requirement.

N/A

E. Safety issues

Please discuss any safety issues for the source, water treatment plant, distribution system, individual components and/or equipment. See Section 2.18 of the Design Criteria.

Note: Suppliers serving less than 500 people are exempt from this requirement.

No safety issues exist.

F. Redundancy

For treatment plant projects, please describe the approach towards redundancy. See Section 2.1 in the Design Criteria.

Two GAC filters rated at 45 gpm are proposed to meet redundancy requirements.

Section 10: Impact to Corrosivity (DCPWS Section 1.2.10)

Project category (Category 1 – 4: see Appendix A, Table A.2 for Category descriptions).

Please note the proposed project's default corrosivity category in Appendix A, Table A.2. Table A.2 outlines default project categories, submittal requirements and LCR monitoring impacts. Please discuss if the submittal includes information (e.g., immersion coupon study results) to support a different category.

Note: Transient Non-Community Water System are exempt from this requirement.

Category 1. Addition of Powered Activated Carbon is listed as a Category 1 according to Table A.2. No impacts to corrosivity.

For Category 3 or 4 projects.

Category 3 projects have submittal requirements outlined in Table A.2. Please discuss or attach any required information. Category 4 projects require either Appendix K.1 or Appendix K.2. Appendix K submittals are typically done as part of the OCCT designation step. Please indicate the OCCT designation date or attach the Appendix K submittal.

N/A

Section 11: Security and Emergency Response Program (DCPWS Section 1.2.11)

Physical security design

Please discuss any physical infrastructure security measures and security related operational practices associated with the project. Designs must include physical controls such as fencing to restrict access, sturdy locking hardware on waterworks access points (e.g., tank hatches, building doors), and controlled human/vehicle access. See Section 1.2.11(a) of the Design Criteria for more information.

The proposed system will be installed inside an existing water treatment plant building. The building has adequate security protections.

Security and emergency response program

Please indicate if the supplier has developed a security and emergency response program. The design must include security and emergency response measures and address critical asset redundancy, monitoring, response and recovery. See Section 1.2.11(b) of the Design Criteria for more information and required plan components. A copy of the security and emergency response program does not need to be included in the submittal but the plans may be confirmed during sanitary surveys.

Note: Suppliers serving less than 500 people with only sodium hypochlorite treatment are exempt from this requirement.

☒ Yes, the supplier has developed a security and/or emergency response program that addresses the Section 1.2.11(b) of the Design Criteria components.

☐ No, the supplier has a population less than 500 people, only sodium hypochlorite treatment, and does not have to develop a security and emergency response program.

Section 12: Supplemental/Other Information (DCPWS Section 1.2.12)

Any additional information that could be helpful for the design review?

PLANS AND SPECIFICATIONS (DCPWS Section 1.3)

Plans description and key sheets

Please attach plans and specifications for the proposed project. The purpose of plans and specifications are to confirm information contained in the BDR and to facilitate construction of the project. For suppliers utilizing the pre-accepted design packages or serving less than 500 people, process schematics and equipment cut sheets may be sufficient. See Section 1.3 of the Design Criteria for more information and required plan and specification components.

Please discuss the design status (e.g., 60% complete) and any key plans/specifications.

Plans for Permitting are attached in Appendix L.

C1 – Cover
C2 – Notes & PFD
C3 – WTP Plan
C4 – Details

Chapter 2 checklist

Chapter 2: General Design Criteria outlines design criteria that applies to most projects. Below is a list of Chapter 2 requirements that may not be specifically addressed in the basis of design report. Please indicate the submittal location or indicate that the criteria is "n/a".

Chapter 2 checklist	Submittal location
Redundancy discussion (Section 2.1), for treatment projects only	BDR
Location of structures (Section 2.4), applies to all projects	BDR
Electrical controls (Section 2.5), applies to all projects	BDR
Standby power/alternative supply (Section 2.6), applies to all projects	BDR
Plant water (Section 2.11), for treatment projects only	N/A
Disinfection of waterworks prior to initial use (Section 2.15), applies to all projects	BDR
Operations and maintenance manual (Section 2.16), applies to all projects	BDR
Operator instruction (Section 2.17), applies to treatment and pump stations projects	BDR
Safety (Section 2.18), applies to treatment plant and chemical application projects	BDR
Materials in contact with partially treated or potable water (Section 2.21), applies to all projects	BDR
Other considerations (Section 2.22), as applicable	

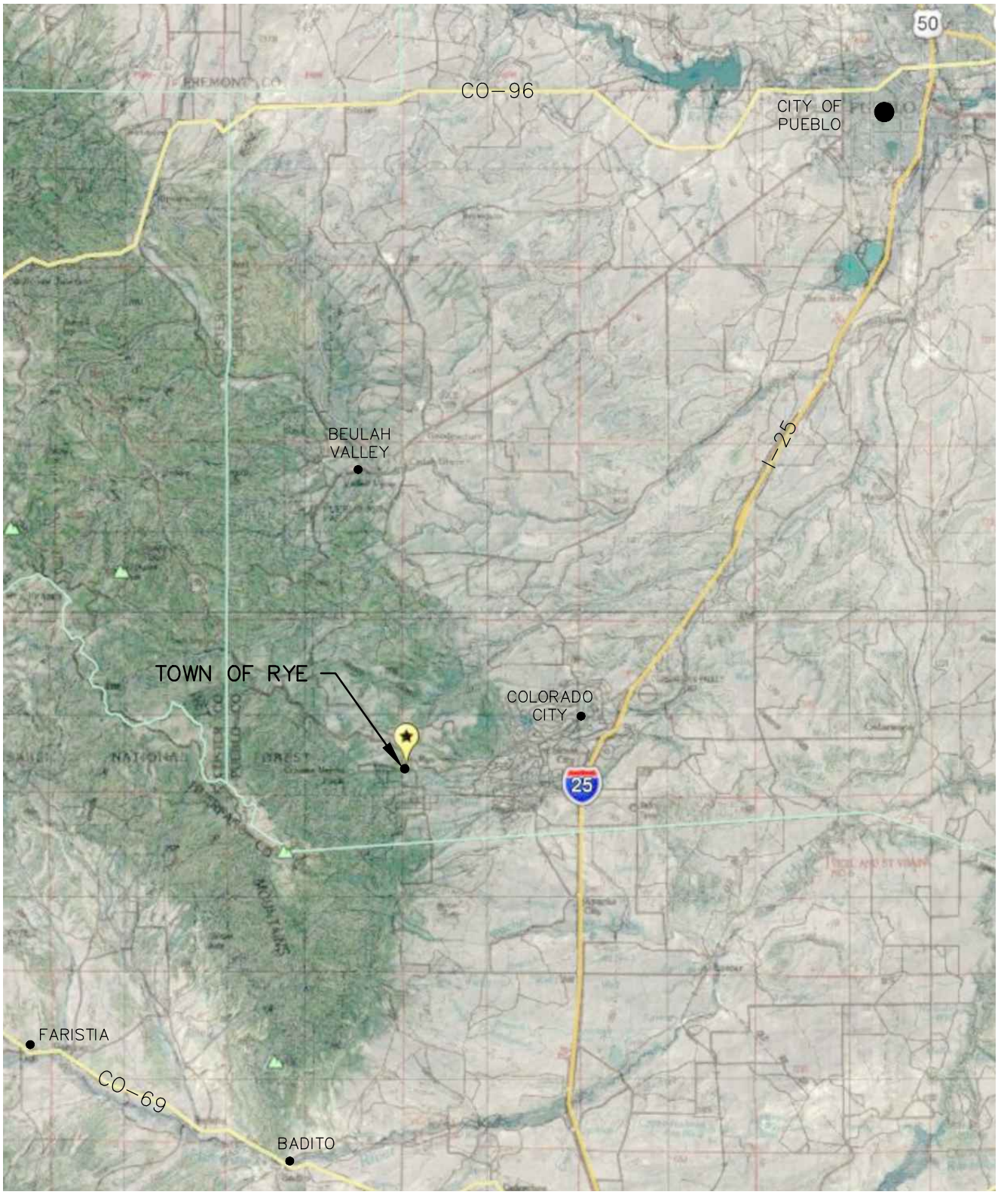
Attachments

Please list any required or provided attachments below. If any attachments are not included then please put "n/a".

Attachment list	Submittal location
Scaled map (Item 1.2.1(d))	Appendix C
Vicinity map (Item 1.2.1(e))	Appendix C
Floodplain map (Item 1.2.2(a))	N/A
Water quality data (Item 1.2.3)	Appendix M
Process flow diagram (Item 1.2.4(a))	Appendix L
Hydraulic profile (Item 1.2.4(b))	N/A
Capacity evaluation and design calculations (Item 1.2.5)	Appendix B
Geotechnical report (Item 1.2.7)	N/A
Plans (Section 1.3)	Appendix L
Specifications (Section 1.3)	Appendix E
Equipment/chemical cutsheets (Section 1.3)	Appendix E

APPENDIX C

VINCINITY MAP



TOWN OF RYE – VICINITY MAP

DATE
MAY 2021

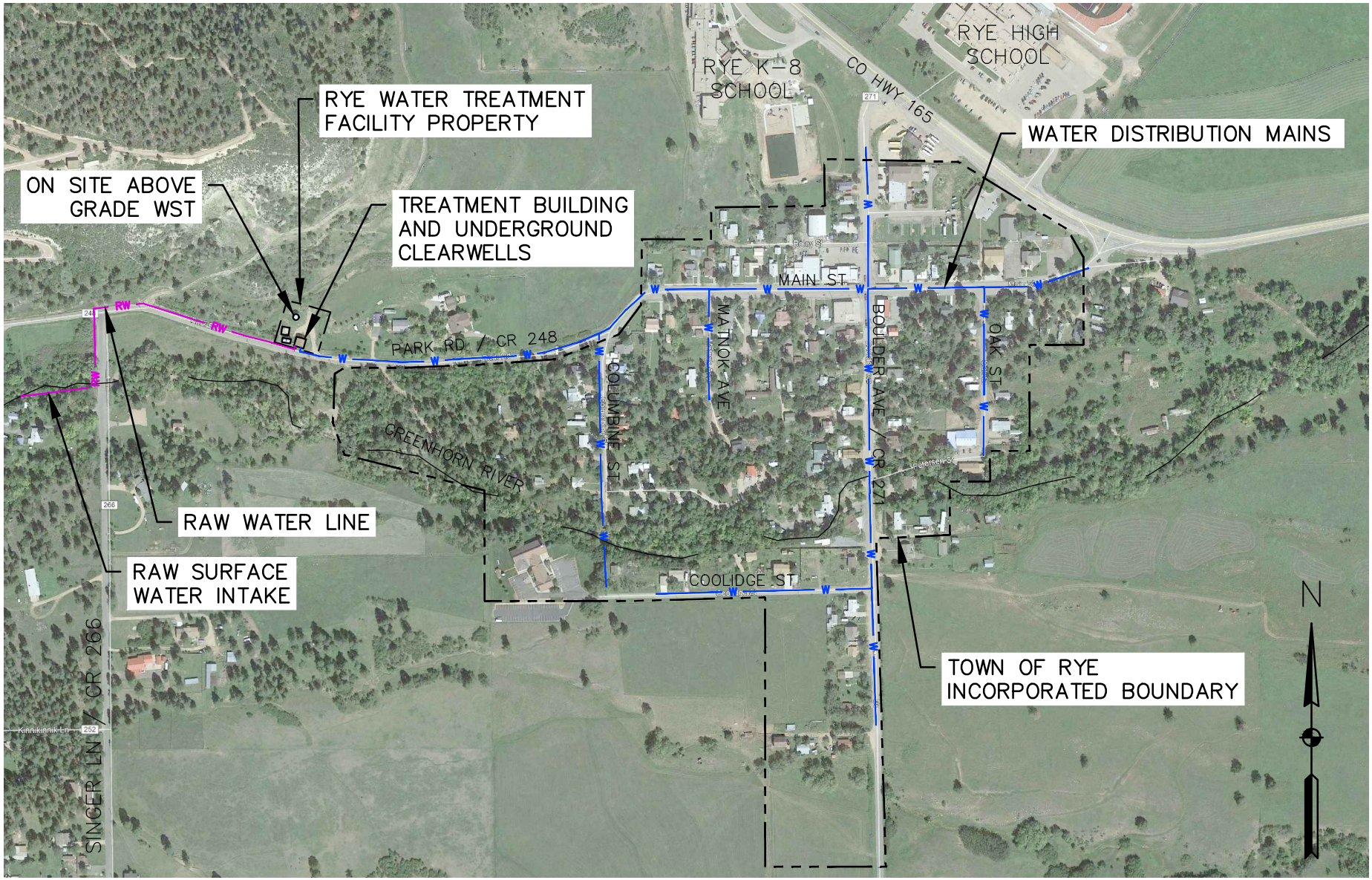
JOB NUMBER
0101.0001

SCALE
1" = 5 MI.

ELEMENT ENGINEERING LLC
12687 W. CEDAR DRIVE, SUITE 300
LAKEWOOD, CO 80228
720.749.4165
WWW.ELEMENTENGINEERING.NET

APPENDIX D

SERVICE AREA



TOWN OF RYE – WATER SERVICE AREA

ELEMENT ENGINEERING LLC
12687 W. CEDAR DRIVE, SUITE 300
LAKEWOOD, CO 80228
720.749.4165
WWW.ELEMENTENGINEERING.NET

DATE
MAY 2021

JOB NUMBER
0101.0002

SCALE
1" = 500'

APPENDIX E

EQUIPMENT INFORMATION

Filter Tech Systems, Inc.
Designers & Manufacturers of AquaSand+ Filters
2844 Chipeta Avenue Grand Junction, CO 80022
(888) 287-8292 Local (970) 254-2855 Fax (303) 970-254-2858

Proposal No. 23-1546
18 April 2023

Town of Rye, Colorado
AquaTech GAC Filter System

We are pleased to provide a **Proposal** for two (2) **45 gpm Skid-Mounted AquaTech GAC Pressure Filters** for the removal of TOC to reduce Disinfection By Products.

Filter Design Criteria:

Incoming Flow	45	gpm
Number of Filters	2	
Flow per filter	45	gpm
Filter Diameter	42	inches
Filter Area	9.62	square feet
Filtration Rate	4.7	gpm/ft^2
EBCT	4.98	Minutes Empty Bed Contact Time
Depth of Media	37	inches
Volume of media	30	Cubic Feet per filter
	90	Cubic Feet total

This Proposal Includes the following equipment:

One (1) Completely integrated, factory built, AquaTech GAC Pressure Filtration Skid. Contains Two (2) 42" AquaTech GAC Filters

All vessels to be Fiberglass Composite Construction and mounted on Epoxy-coated Steel Frame.

Pressure Vessels to be pre-piped and assembled with Sch80 PVC

Includes: Air / Vacuum Valves
Flexible Connections for Filter Flanges

Includes: Electrically Actuated Valves
Differential Pressure Transmitter
Pressure Gauges

PLC-Based Filter Control Panel with panel-mounted Touch Screen PC
Start Up & Operator Training
Operation Manuals

Two (2) Beds Filter Media
30 ft3 12/40 Granular Activated Carbon
Garnet Underbed

One Lot Start Up & Operator Training
Factory-Direct Field Installation Supervisor and Start Up Technician.

Filter Tech Systems to provide personnel for the following functions:
- Supervision of Underdrain Assembly & Installation
- Supervision of Media Installation
- Start Up & Check Out of Equipment
- Operator Training

Additional Site Visit approximately 6 Months after Start Up for Additional Operator Training and System Check Out.

One Lot Operation & Maintenance Manuals

Price for AquaTech GAC Filter Skid ..... $ 157,700

Includes all equipment listed above with freight to accessible jobsite

Items **NOT** included in this quotation (but not limited to):
- Unloading and Setting Equipment
- Piping to / from / between filter skids
- Media Installation
- Taxes, Permits, Licenses

Terms & Conditions

Delivery 12 - 14 Weeks after receipt of Approved Submittals and Notice to Proceed

Freight FOB Ship Point, Full Freight Allowed

Terms
- 10% of the contract amount with Purchase Order for Engineering & Design
- 15% of the contract amount upon delivery of Submittals
- 25% of the contract amount upon Notice to Proceed and prior to equipment being released or fabrication
- 45% of the contract amount as material is shipped or ready to ship on a pro-rata basis, net 20 days
- 5% within 30 days after start up or from date when shipped or when ready to ship, whichever is the least time.

Quotation Valid for Thirty Days

Data Sheet

FILTRASORB® 400

Granular Activated Carbon

Applications

FILTRASORB 400 activated carbon can be used in a variety of liquid phase applications for the removal of dissolved organic compounds. FILTRASORB 400 has been successfully applied for over 40 years in applications such as drinking and process water purification, wastewater treatment, and food, pharmaceutical, and industrial purification.

Description

FILTRASORB 400 is a granular activated carbon for the removal of dissolved organic compounds from water and wastewater as well as industrial and food processing streams. These contaminants include taste and odor compounds, organic color, total organic carbon (TOC), industrial organic compounds such as TCE and PCE, and PFAS.

This activated carbon is made from select grades of bituminous coal through a process known as reagglomeration to produce a high activity, durable, granular product capable of withstanding the abrasion associated with repeated backwashing, hydraulic transport, and reactivation for reuse. The raw coal is mined and subsequently manufactured into GAC in the United States to ensure the highest quality and consistency in the finished product. Activation is carefully controlled to produce a significant volume of both low and high energy pores for effective adsorption of a broad range of high and low molecular weight organic contaminants.

FILTRASORB 400 is formulated to comply with all the applicable provisions of the AWWA Standard for Granular Activated Carbon (B604) and Food Chemicals Codex. This product may also be certified to the requirements of NSF/ANSI 61 for use in municipal water treatment facilities. Only products bearing the NSF Mark are certified to the NSF/ANSI 61 - Drinking Water System Components - Health Effects standard. Certified Products will bear the NSF Mark on packaging or documentation shipped with the product.

Features / Benefits

- Produced in the United States from a pulverized blend of high quality, domestically mined bituminous coals resulting in a consistent, high quality product.
- Carbon granules are uniformly activated through the whole granule, not just the outside, resulting in excellent adsorption properties and constant adsorption kinetics.
- The reagglomerated structure ensures proper wetting while also eliminating floating material.
- High mechanical strength relative to other raw materials, thereby reducing the generation of fines during backwashing and hydraulic transport.
- Carbon bed segregation is retained after repeated backwashing, ensuring the adsorption profile remains unchanged and therefore maximizing the bed life.
- Reagglomerated with a high abrasion resistance, which provides excellent reactivation performance.
- High density carbon resulting in a greater adsorption capacity per unit volume.

Specifications[1]	FILTRASORB 400
Iodine Number, mg/g	1000 (min)
Moisture by Weight	2% (max)
Effective Size	0.55–0.75 mm
Uniformity Coefficient	1.9 (max)
Abrasion Number	75 (min)
Screen Size by Weight, US Sieve Series	
On 12 mesh	5% (max)
Through 40 mesh	4% (max)

[1]Calgon Carbon test method

Typical Properties*	FILTRASORB 400
Apparent Density (tamped)	0.54 g/cc
Water Extractables	<1%
Non-Wettable	<1%

*For general information only, not to be used as purchase specifications.

Safety Message

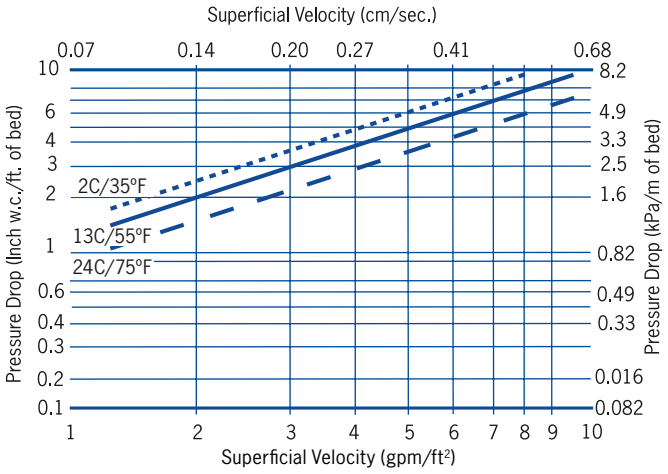
Wet activated carbon can deplete oxygen from air in enclosed spaces. If use in an enclosed space is required, procedures for work in an oxygen deficient environment should be followed.

1.800.4CARBON calgoncarbon.com

DS-FILTRA40019-EIN-E1

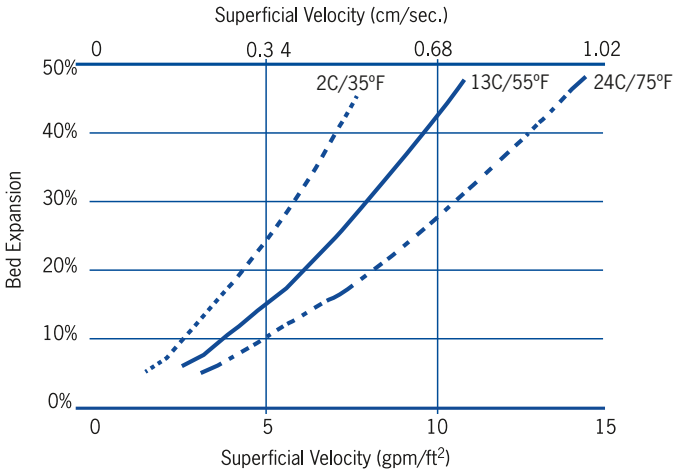
Typical Pressure Drop

Based on a backwashed and segregated bed



Typical Bed Expansion During Backwash

Based on a backwashed and segregated bed



Conditioning and Backwashing

Backwashing and conditioning fresh GAC before placing into operation is critical to GAC performance. The reasons for backwashing before placing fresh media online are to: (1) size segregate the media so subsequent backwashing will return the media to the same relative position in the bed, (2) remove any remaining air from the bed, and (3) remove media fines which can lead to excessive pressure drop and flow restriction. In addition, proper backwashing is a crucial step to collecting the most representative and meaningful post-start up data on compounds of interest, such as metals listed in the NSF/ANSI 61 standard.

Below are the recommended steps for proper conditioning and backwashing of GAC based on Filtrasorb 400 GAC being backwashed at 55°F:

1. Fully submerge GAC bed in clean, contaminant free water for at least 16 hours (overnight)
2. Open backwash inlet and begin up-flow at 3 gpm/ft² for 2 minutes
3. Increase flow to 5 gpm/ft² and maintain for 2 minutes
4. Increase flow to 7 gpm/ft² and maintain for 2 minutes
5. Increase flow to 8.5 gpm/ft² and maintain for 30 minutes*
6. Decrease flow to 7 gpm/ft² and maintain for 2 minutes
7. Decrease flow to 5 gpm/ft² and maintain for 2 minutes
8. Decrease flow to 3 gpm/ft² and maintain for 2 minutes
9. Close backwash inlet and stop flow

*Duration representative of initial backwash conditions. Required duration during operational backwashes can be shorter but will vary by utility, solids load, and GAC throughput. Contact Calgon Carbon for more information"

Design Considerations

FILTRASORB 400 activated carbon is typically applied in down-flow packed-bed operations using either pressure or gravity systems. Design considerations for a treatment system is based on the user's operating conditions, the treatment objectives desired, and the chemical nature of the compound(s) being adsorbed.

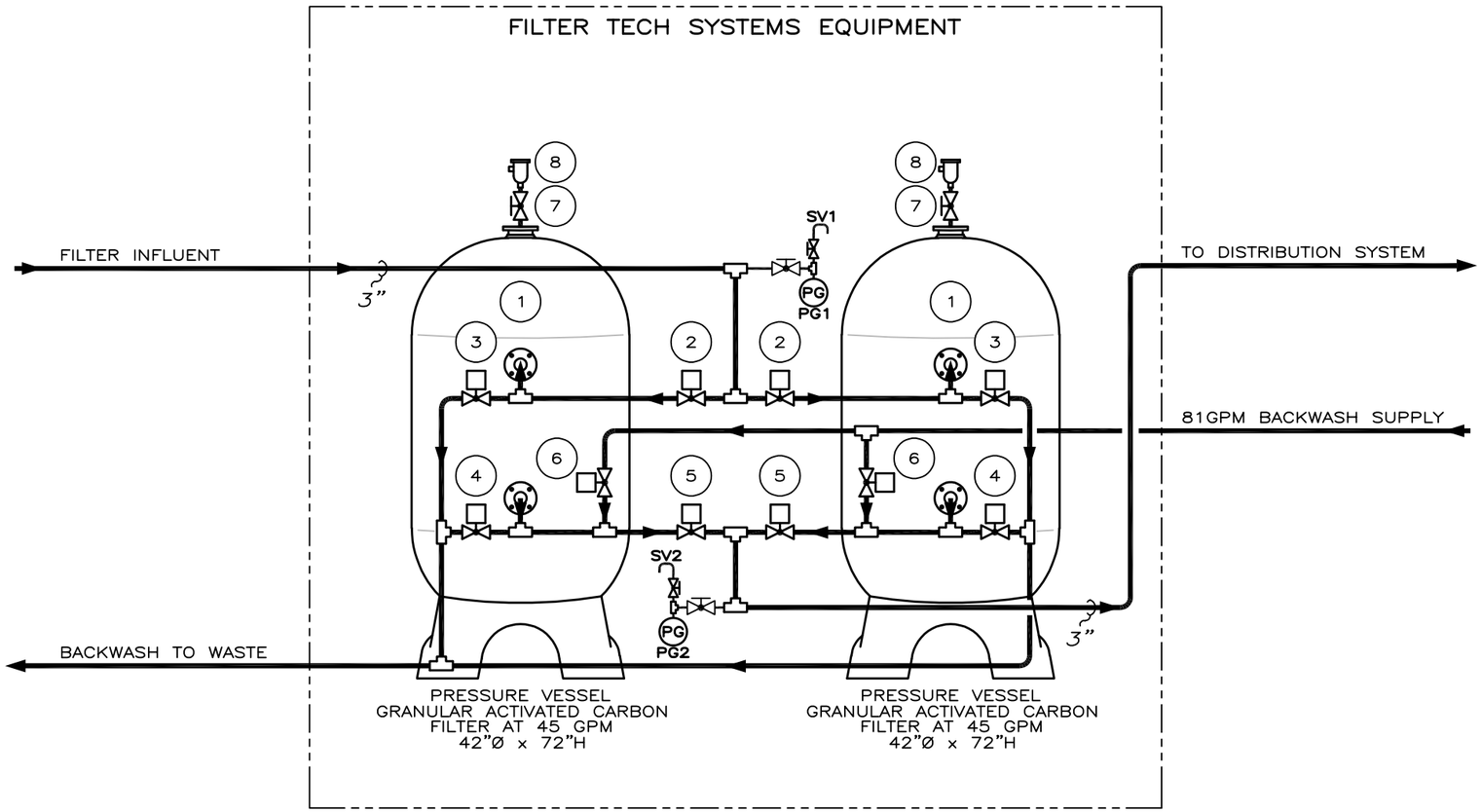
Safety Message

Wet activated carbon can deplete oxygen from air in enclosed spaces. If use in an enclosed space is required, procedures for work in an oxygen deficient environment should be followed.

Filter Tech Systems

AquaTech GAC Treatment System Item List
Two (2) 45 gpm GAC Filters
Town of Rye, Colorado

Item	Qty	Size	Item	Purpose
Filter Tech Systems Equipment				
1	2	---	AquaTech GAC Vessel 42" x 72"	TTHM and HAA5 Reduction
2	2	2"	Lug-Style Butterfly Valve w/ Electric Actuator	Raw Water Inlet Valve
3	2	3"	Lug-Style Butterfly Valve w/ Electric Actuator	Filter Backwash Effluent Valve
4	2	2"	Lug-Style Butterfly Valve w/ Electric Actuator	Filter to Waste Valve
5	2	2"	Lug-Style Butterfly Valve w/ Electric Actuator	Filter Effluent Valve
6	1	3"	Lug-Style Butterfly Valve w/ Electric Actuator	Backwash Supply Valve
FM	1	3"	Magnetic Flow Meter	Filter Effluent Flow Meter
SV1	1	1/2"	Sample Tap	Filter Influent Sample Tap
SV2	1	1/2"	Sample Tap	Filter Effluent Sample Tap
PG1	1	1/4"	0-160 Pressure Gauge	Filter Influent Pressure
PG2	1	1/4"	0-160 Pressure Gauge	Filter Effluent Pressure
PGIV	2	1/4"	Mini Brass Ball Valve	Pressure Gauge Isolation Valve
7	2	1"	Ball Valve	Air Relief Isolation Valve
8	2	1"	Air Relief Valve	Vessel Air Relief



PROCESS FLOW SCHEMATIC

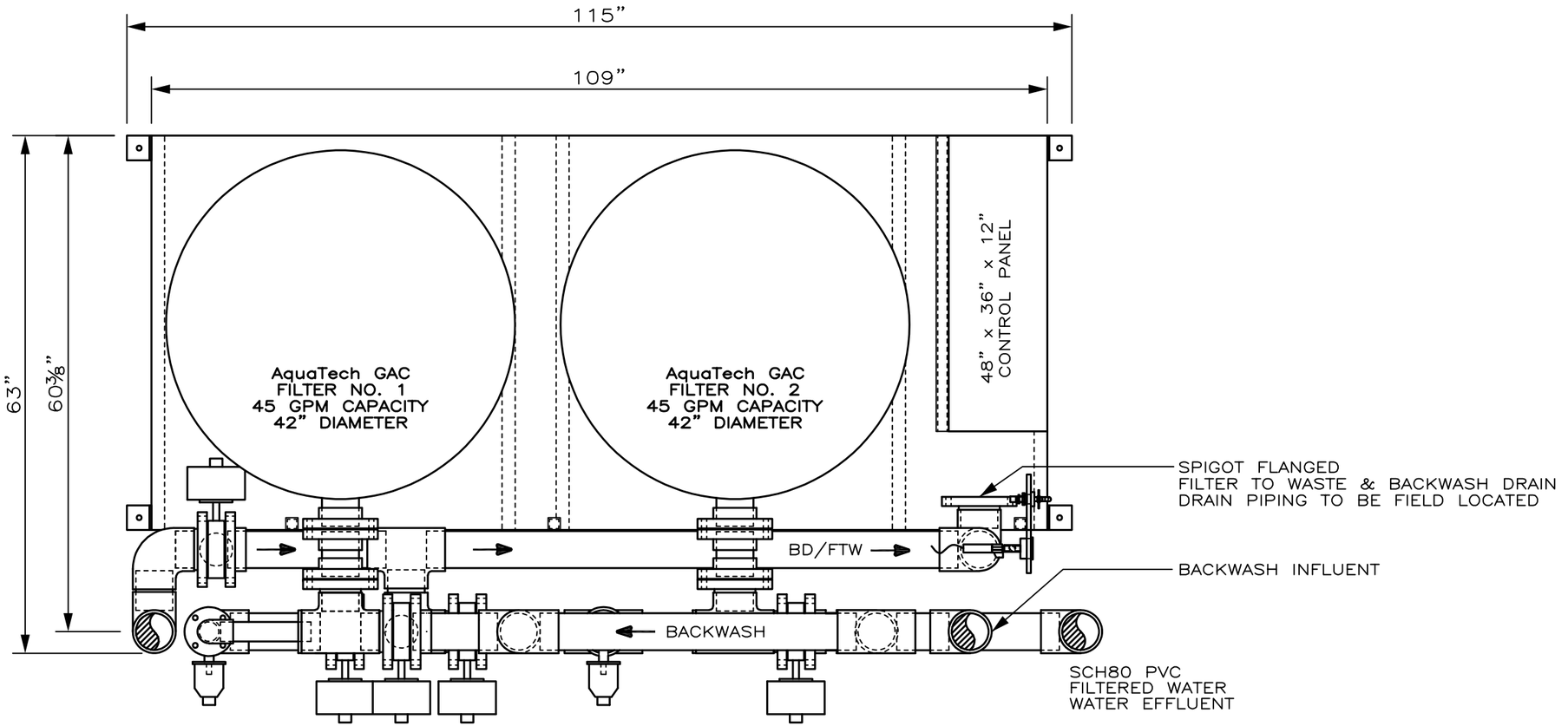
#	DATE	BY	DESCRIPTION

FILTER TECH SYSTEMS, Inc.
DESIGNERS & MANUFACTURERS OF
AquaFloc & UltraFlex FILTERS
& WATER TREATMENT SYSTEMS

888–287–8292
GRAND JUNCTION, COLORADO

PROCESS FLOW SCHEMATIC
AquaTech GAC SYSTEM
TOWN OF RYE, CO

DRAWN:	CHCKD:	DATE	SCALE	Sht.No.	REV
TAA		12 APR 23	– NONE –	1A	0
PROPOSAL No. 23–1546		PROJECT No.			



AquaTech GAC FILTER LOWER PIPING PLAN VIEW

#	DATE	BY	DESCRIPTION

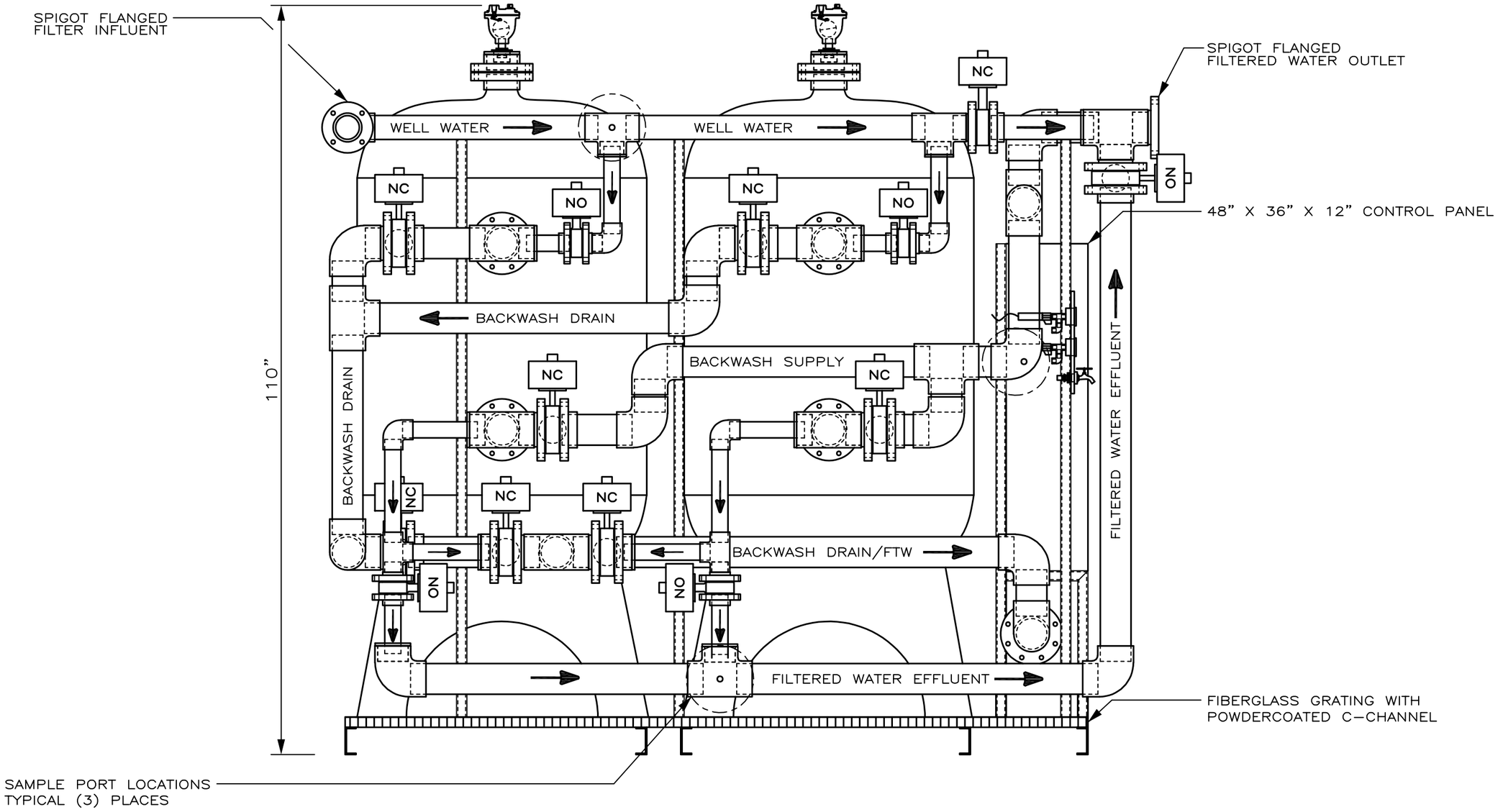
FILTER TECH SYSTEMS, Inc.
DESIGNERS & MANUFACTURERS OF
AquaFloc & UltraFlex FILTERS
& WATER TREATMENT SYSTEMS

888–287–8292
GRAND JUNCTION, COLORADO

LOWER PIPING PLAN VIEW
AquaTech GAC FILTER SKID
TOWN OF RYE, CO

DRAWN:	CHCKD:	DATE	SCALE	Sht.No.	REV
TAA		12 APR 23	3/4”=1–0’	2A–2	0

PROPOSAL No. 23–1546
PROJECT No.



AquaTech GAC FILTER ELEVATION

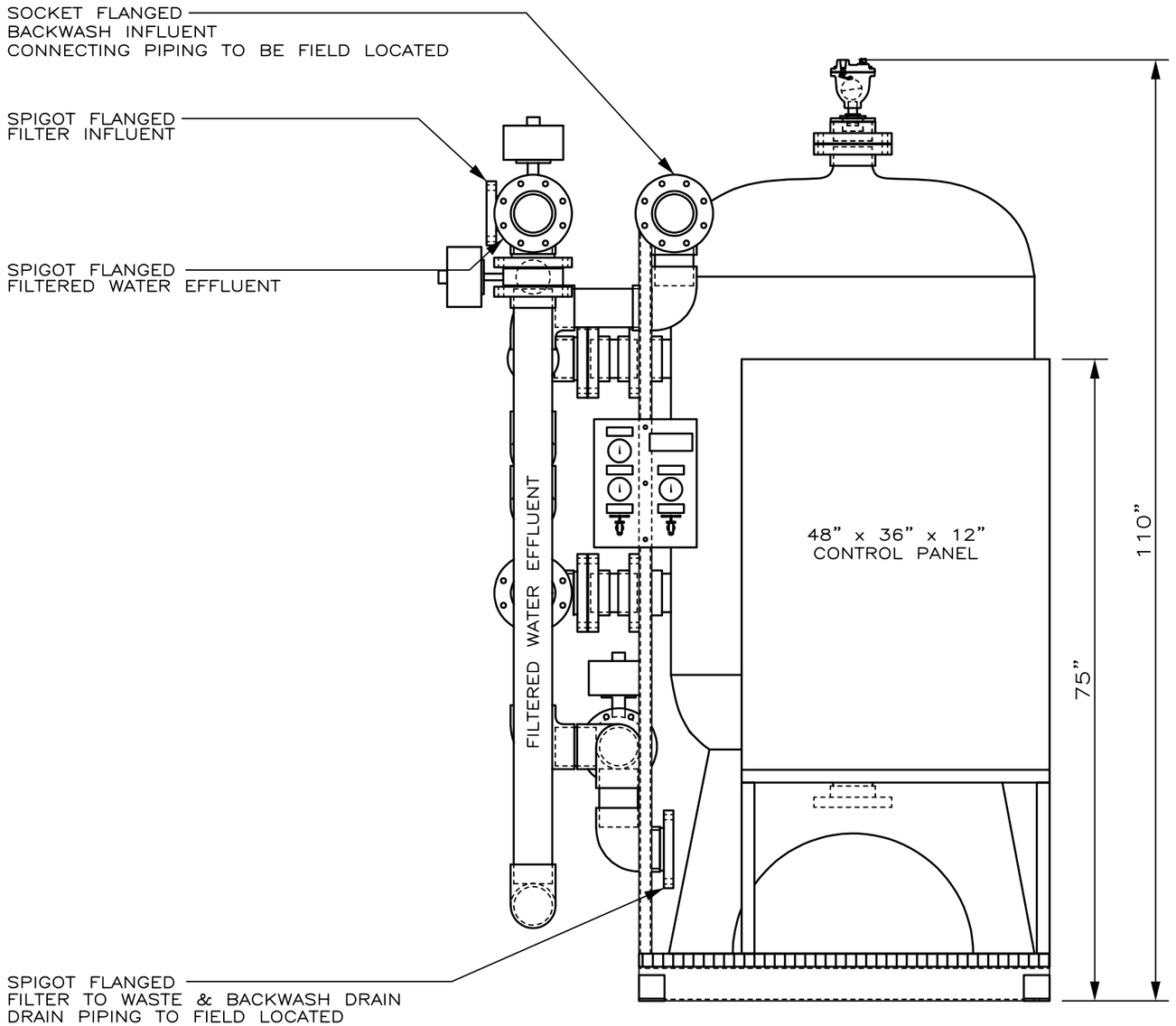
#	DATE	BY	DESCRIPTION

FILTER TECH SYSTEMS, Inc.
DESIGNERS & MANUFACTURERS OF
AquaFloc & UltraFlex FILTERS
& WATER TREATMENT SYSTEMS

888-287-8292
GRAND JUNCTION, COLORADO

ELEVATION VIEW
AquaTech GAC FILTER SKID
TOWN OF RYE, CO

DRAWN:	CHCKD:	DATE	SCALE	Sht.No.	REV
TAA		12 APR 23	3/4"=1-0'	2B-1	0
PROPOSAL No. 23-1546		PROJECT No.			



AquaSand FILTER RIGHT END VIEW

#	DATE	BY	DESCRIPTION

FILTER TECH SYSTEMS, Inc.
DESIGNERS & MANUFACTURERS OF
AquaFloc & UltraFlex FILTERS
& WATER TREATMENT SYSTEMS

888-287-8292
GRAND JUNCTION, COLORADO

RIGHT END VIEW

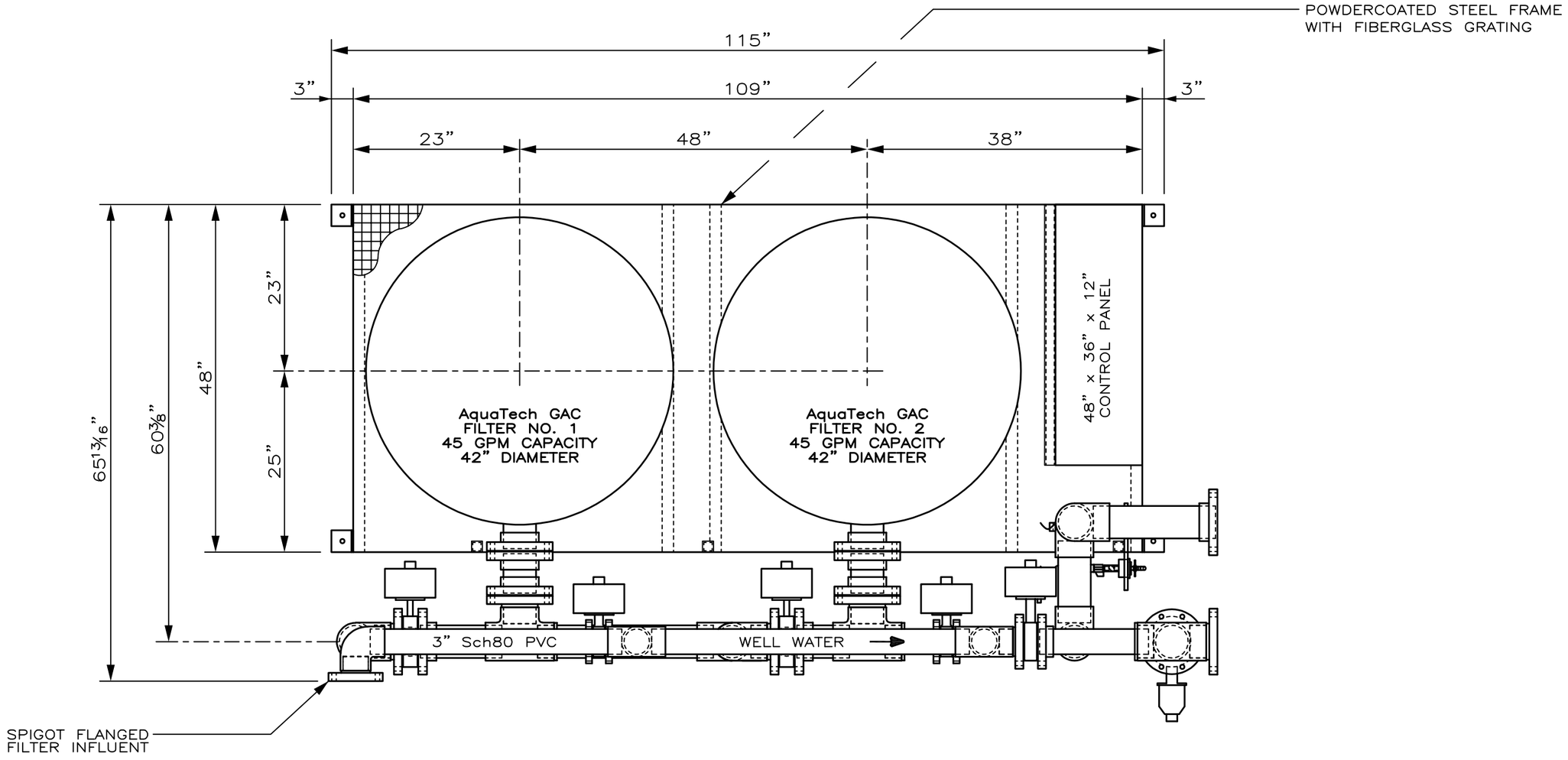
AquaTech GAC FILTER SKID

TOWN OF RYE, CO

DRAWN:	CHCKD:	DATE	SCALE	Sht.No.	REV
TAA		12 APR 23	3/4"=1-0'	2B-1	0

PROPOSAL No. 23-1546

PROJECT No.



AquaTech GAC FILTER UPPER PIPING PLAN VIEW

#	DATE	BY	DESCRIPTION

FILTER TECH SYSTEMS, Inc.
DESIGNERS & MANUFACTURERS OF
AquaFloc & UltraFlex FILTERS
& WATER TREATMENT SYSTEMS

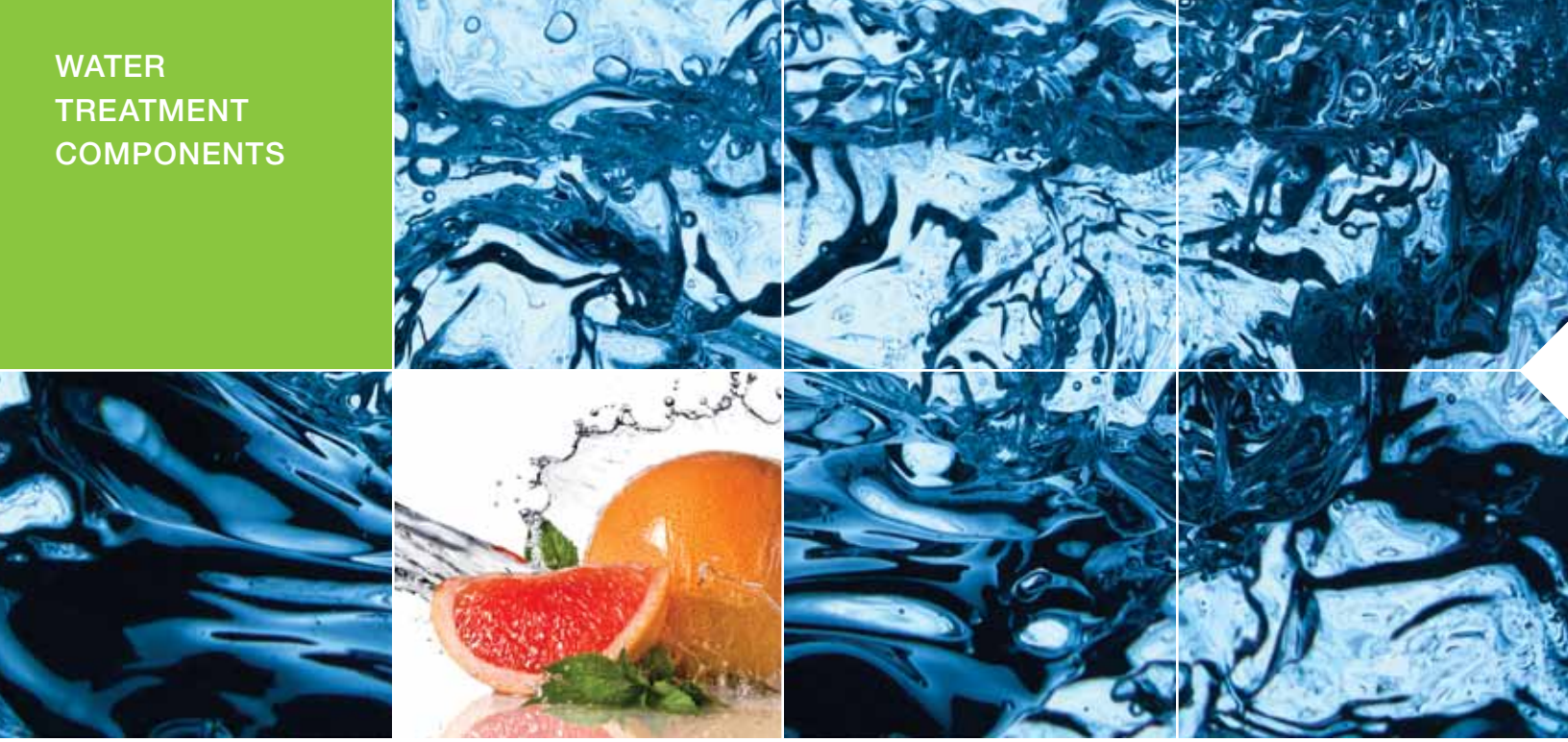
888–287–8292
GRAND JUNCTION, COLORADO

UPPER PIPING PLAN VIEW
AquaTech GAC FILTER SKID
TOWN OF RYE, CO

DRAWN:	CHCKD:	DATE	SCALE	Sht.No.	REV
TAA		17 MAY 23	3/4”=1–0’	2A–1	0

PROPOSAL No. 23–1546
PROJECT No.

WATER
TREATMENT
COMPONENTS



Structural® Composite Vessels

Structural Composite Pressure Vessels offer reinforced fiberglass construction for outstanding performance and durability. Available in capacities up to 1,600 gallons, composite vessels are available with a variety of different configurations. ASME code available.

Product Features

- For commercial and industrial water treatment and storage
- 100% composite fiberglass construction
- Outstanding performance and durability in harsh chemical environments
- Absolutely will not – and cannot – rust
- Requires little or no maintenance
- Capacities up to 1600 gallons
- Factory-backed five-year warranty
- Commercial softening & filtration

Color Options

- AL - Almond
- BL - Blue
- BK - Black
- GR - Gray
- NA - Natural

NSF®

Vessels Tested and Certified by NSF International to NSF/ANSI Standard 61 for material and structural integrity requirements.

Pentair Water

Structural® Composite Vessels

Specifications

	Part No.	Description	Height w/base inches/mm	Height w/o base inches/mm	Capacity Gallons/Liters	Cubic Feet	Base	Ship Weight lbs.
18" Dia.	CH30948	18X65 COMP 4"T	66.25 / 1683	65 / 1651	64 / 242	8.56	SMC	67
	CH31343	18X65 COMP 4"T 4"B	73.13 / 1858	65.6 / 1394	64 / 242	8.56	SMC EXT	67
	CH31693	18X65 COMP 6"TF 6"BF	84.12 / 2137	70.5 / 1791	62 / 234	8.29	SMC EXT	92
21" Dia.	CH30950	21X36 COMP 4"T	41.7 / 1059	38.2 / 970	45 / 171	6.06	SMC	46
	CH31573	21X36 COMP 4"T 4"B	47.5 / 1205	38.25 / 970	45 / 171	6.06	SMC EXT	53
	CH30953	21X62 COMP 4"T	67.1 / 1705	63.5 / 1613	84 / 318	11.23	SMC	95
	CH30954	21X62 COMP 4"T 4"B	72.8 / 1848	63.5 / 1613	84 / 318	11.23	SMC EXT	95
24" Dia.	CH31043	24X38 COMP 4"T	42.6 / 1081	38.5 / 978	61 / 231	8.15	SMC	65
	CH31053	24X50 COMP 4"T	58 / 130	52.9 / 1343	83.5 / 316	11.16	SMC	90
	CH31611	24X50 COMP 4"T 4"B	63 / 1601	52.9 / 1343	83.5 / 316	11.16	SMC EXT	90
	CH32049	24X65 COMP 4"T	65.2 / 1655	61.1 / 1552	100 / 378	13.36	SMC	109
	CH32481	24X65 COMP 4"T 4"B	70.1 / 257	60 / 1524	100 / 378	13.36	SMC EXT	115
	CH32129	24X65 COMP 6"TF	65 / 1651	61.2 / 1556	100 / 378	13.36	SMC	114
	CH32139	24X65 COMP 6"TF 6"BF	79 / 2007	65 / 1651	100 / 378	13.36	TRIPOD	114
	CH31153	24X72 COMP 4"T	74.7 / 1896	70.6 / 1793	118 / 451	15.77	SMC	109
	CH31154	24X72 COMP 4"T 4"B	80.4 / 2043	70.3 / 1786	118 / 451	15.77	SMC EXT	124
	CH31155	24X72 COMP 6"TF	77 / 1956	73.4 / 1864	118 / 451	15.77	SMC	137
	CH31157	24X72 COMP 6"TF 6"BF	88.5 / 2248	74.5 / 1892	118 / 451	15.77	TRIPOD	137
30" Dia.	CH34177	30X60 COMP 6"TF	71.6 / 1819	64.3 / 1634	151 / 572	20.2	SMC EXT	195
	CH34178	30X60 COMP 6"TF 6"BF	82.5 / 2096	68.5 / 1740	151 / 572	20.2	TRIPOD	195
	CH33653	30X72 COMP 4"T	77.2 / 1961	69.8 / 1772	187 / 708	24.99	SMC EXT	198
	CH31161	30X72 COMP 4"T 4"B	77.2 / 1961	69.8 / 1772	187 / 708	24.99	SMC EXT	198
	CH31162	30X72 COMP 6"TF	79.7 / 2025	69.9 / 1778	187 / 708	24.99	SMC EXT	195
	CH311613	30X72 COMP 6"TF 6"BF	88.9 / 2258	74.9 / 1903	187 / 708	24.99	SMC EXT	211
36" Dia.	CH31209	36X36 COMP 6"TBF	55.3 / 1403	41 / 1041	118 / 447	15.8	TRIPOD	148
	CH31417	36X57 COMP 6"TF	68 / 1727	59.3 / 1505	205 / 776	27.4	SMC EXT	225
	CH31418	36X57 COMP 6"TF 6"BF	77.3 / 1962	63 / 1600	205 / 776	27.4	TRIPOD	225
	CH33652	36X72 COMP 4"T	80.4 / 2042	71.8 / 1823	264 / 999	35.2	SMC EXT	264
	CH31523	36X72 COMP 4"T 4"B	80.5 / 2045	70.5 / 1791	264 / 999	35.2	SMC EXT	285
	CH31214	36X72 COMP 6"TF	83 / 2108	74.3 / 1886	264 / 999	35.2	SMC EXT	285
	CH31217	36X72 COMP 6"TF 6"BF	90.4 / 2296	76.1 / 1934	264 / 999	35.2	TRIPOD	285
	CH31712	36X72 COMP 6"TF 6"BF 4"TBSF	89.6 / 2275	75.3 / 1913	264 / 999	35.2	TRIPOD	292
42" Dia.	CH31272	42X72 COMP 6"TF	72.5 / 1842	71.1 / 1807	345 / 1306	46.1	SMC	370
	CH31276	42X72 COMP 6"TF 6"BF	90.1 / 2289	73 / 1854	345 / 1306	46.1	TRIPOD	400
	CH34226	42X72 COMP 6"TF 6"BF 4"TBSF	94.6 / 2403	77.5 / 1969	345 / 1306	46.1	TRIPOD	415

Specifications (cont'd.)

	Part No.	Description	Height w/base inches/mm	Height w/o base inches/mm	Capacity Gallons/Liters	Cubic Feet	Base	Ship Weight lbs.
48" Dia	CH31281	48X72 COMP 6"TF	81.5 / 2071	75.2 / 1909	463 / 1753	61.9	SMC	494
	CH31285	48X72 COMP 6"TF 6"BF	92.9 / 2360	76.9 / 1953	463 / 1753	61.9	TRIPOD	494
	CH31283	48X72 COMP 6"TF 6"BF 4"TBSF	96.75 / 2458	80.75 / 2051	463 / 1753	61.9	TRIPOD	504
63" Dia.	CH31390	63X67 COMP 6"TF 6"BF	81.4 / 2068	67.1 / 1704.3	600 / 2271	80.2	TRIPOD	680
	CH31326	63X86 COMP 6"TF 6"BF	98.5 / 2503	84.1 / 2136	900 / 3407	120.3	TRIPOD	950
	CH31327	63X86 COMP 16"TMWY 6"BF	98.9 / 2513	84.5 / 2146	900 / 3407	120.3	TRIPOD	950
	CH31292	63X86 COMP 16"TMWY 6"BF 4"TBSF	99 / 2515	85 / 2159	900 / 3407	120.3	TRIPOD	950
	CH34234	63X116 16"TMWY 6'BF 4"TBSF	130.4 / 3312	115.9 / 2945	1250 / 4732	167	TRIPOD	1190
	CH31607	63X144 16"TMWY 6'BF 4"TBSF	157.9 / 4012	143.9 / 3656	1600 / 6057	214	TRIPOD	1398

*Measurements are subject to change without notice and are for reference only.

NOTE: Flexible connections must be installed between hard piping and tank openings. Failure to install flex connection properly with the vessel will void the warranty.

NOTE: Different base options can be selected on different tank diameters. The bases selected above illustrate most common base selection.

Material of Construction

- Polyethylene inner shell

Operating Parameters

- Maximum operating pressure: 150 psi
- Maximum operating temperature:
  120°F (threaded)
  150°F (flanged)

Pentair Design Parameters

- Safety factor: 4:1
- Minimum burst at 600 psi
- Tested to 250,000 cycles without leakage

NSF Design Parameters

- Safety factor: 4:1
- Minimum burst at 600 psi
- Tested to 100,000 cycles without leakage

ASME Design Parameters

- *Top/Bottom flange:*
  - Safety factor: 5:1
  - Minimum burst at 750 psi
  - Tested to 33,000 cycles without leakage
- *Side flange:*
  - Safety factor: 6:1
  - Minimum burst at 900 psi
  - Tested to 100,000 cycles without leakage

Installation Tips

- Bolt base to floor
- Calculate height for valve and base combined (see photo)

Fleck Valve	Tank Dia. inches/mm	Adder Ht. (X) inches/mm
2750	18/457	6.5/165
2850	21/533	6.5/165
2900	24,30/610,762	12/305
3150	42/1067	10/254
3900	48-63/1219-1600	15/381

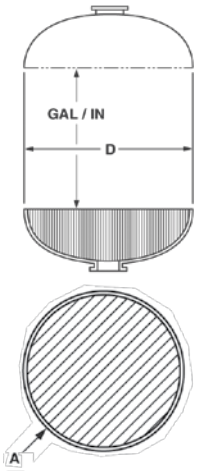
*Measurements are subject to change without notice and are for reference only.

Pentair Water

WATER TREATMENT COMPONENTS

Structural® Composite Vessels

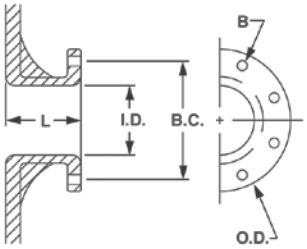
Dome Volume (gallons) and Straight Wall Gallon per Inch



Nominal Diameter

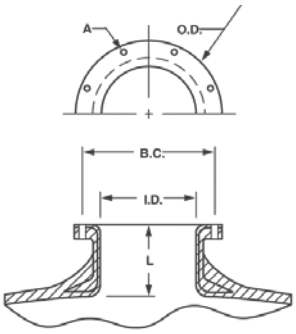
D (inches)	Gallons* (One Dome)	Gallon/Inch (Approx.)	A (Sq. Feet)
12	1.0	0.5	0.7
13	1.4	0.5	0.9
14	1.7	0.6	1.1
16	2.7	0.8	1.3
18	3.7	1.0	1.8
21	6.2	1.4	2.4
24	9.3	1.9	3.0
30	18	2.9	4.6
36	33	4.2	6.7
42	52	5.7	9.0
48	74	7.5	12.0
63	168	13.0	20.0

*Cubic Ft. = 0.1337 x Gallons



Side Flange

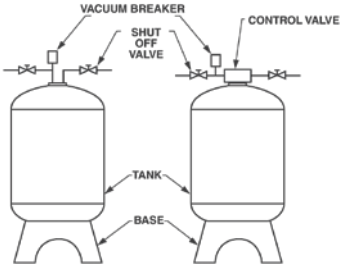
Size	L	I.D.	B.C.	O.D.	A Bolt Dia.	Number of Holes	Weight (lbs.)
4" ANSI	4.1"	4.0"	7.5"	9.0"	0.63"	8	6.4



Top and Bottom Opening Flanges/Manway

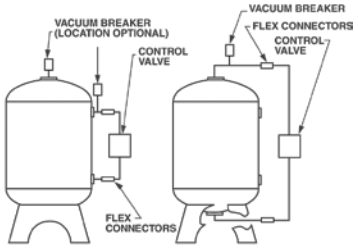
Size	L	I.D.	B.C.	O.D.	A Bolt Dia.	Number of Holes	Weight (lbs.)
6" SNA	3.6"	5.9"	8.5"	9.4"	0.31"	12	5.8
10" ANSI	3.7"	10.0"	14.3"	16.0"	0.88"	12	17.8
16" Manway SNA	4.3"	16.0"	20.4"	21.3"	0.50"	24	34.0

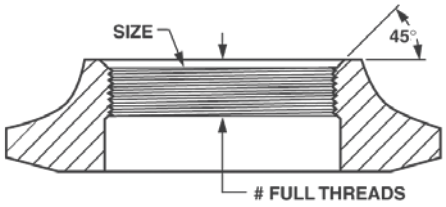
Vacuum Breaker Installation



NOTE: Flexible connectors must be installed between hard piping and tank openings. These pressure vessels are treated for an internal negative pressure of 5y HG (17 Pa) vacuum below atmospheric. If negative pressure could ever exceed 5y Hg (17 Pa), an adequate vacuum breaker must also be properly installed. Failure to install flex connection properly, or improper installation of a vacuum breaker when required, may void the warranty.

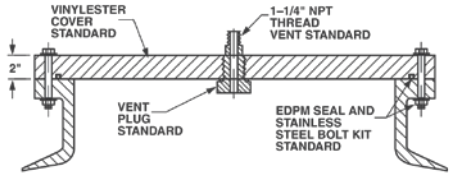
Flex Connectors Installation





Top and Bottom Opening Threads

Size	Composite/ Poly Glass	Number of Full Threads	Composite
2.5" - 8" NPSM	6	3 min	6
4" - 8" UN	7	3 min	7
4.5" - 8" Buttress	7	3 min	7



Manway Cover

Material	Pressure Rating	Tapping
CPVC	100 psi	As requested
VE	150 psi	As shown only

Pentair
Pentair Residential Filtration, LLC

5730 North Glen Park Road
Milwaukee, WI 53209
Tel: 262.238.4400
Fax: 262.238.4402
Customer Care: 800.279.9404
www.pentairaqua.com/pro

40846 Rev B AP11

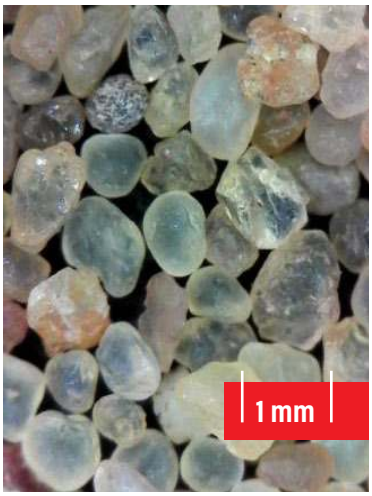
EAU CLAIRE, WISCONSIN

FILTRATION SAND & GRAVEL

Since 1917, Red Flint Sand and Gravel, LLC has produced the highest quality water filtration media and specialty aggregates available worldwide. Red Flint takes pride in our ability to manufacture products with precise effective size ranges and the lowest uniformity coefficients in the industry. Our sand and gravel meets or exceeds the AWWA B100 Standard and is NSF/ANSI Standard 61 & 372 certified for quality and purity.

Red Flint Silica Sand is graded specifically for use in water and waste water filtration processes. Our sand can be used in municipal, industrial, or residential applications. The low acid solubility and high silica content of our filter sand ensures durable and long lasting filter media performance.

Red Flint Gravel is manufactured to be uniform in size which promotes excellent flow and even distribution in support beds. Our gravel is low in soluble impurities and maintains its quality as a support bed for the filter media. We also supply filter pack for water wells, anthracite, garnet, Greensand Plus™, and other granular media.



AWWA MEMBER

Meets or Exceeds AWWA B100

NSF®

Certified to NSF/ANSI Standard 61 & 372

FILTER SAND - EAU CLAIRE, WI

Parameter	Description
Physical Form	Light brown, sub-angular/sub-round
Bulk Density	~ 100 lbs. per cubic foot
Hardness (Mohs Scale)	6.0 - 7.0
Effective Size Range	0.20 - 0.30 mm to 2.00 - 3.00 mm
Uniformity Coefficient	1.3 to less than 1.7
Acid Solubility	< 1.0%
Specific Gravity	> 2.6
Silicon Dioxide Content	> 85%
Loss on Ignition	< 2.0%

SUPPORT GRAVEL - EAU CLAIRE, WI

Parameter	Description
Physical Form	Uncrushed, smooth surface
Bulk Density	~ 100 lbs. per cubic foot
Hardness (Mohs Scale)	7.0 - 8.0
Size Range	1/8" x 1/16" to 2½" x 1½"
Porosity	38% - 45%
Acid Solubility	< 1.0%
Specific Gravity	> 2.6
Deleterious Material	< 1.0%
Thin, Flat & Elongated	< 2.0%

1 AMERICAN BLVD. | EAU CLAIRE, WI 54701 | TEL 800.238.9139 | FAX 715.835.0662 | SALES@REDFLINT.COM | **REDFLINT.COM**

TYPICAL SIEVE ANALYSIS

Filter Sand

Product Effective Size (mm)		2.00-3.00	1.65-2.00	1.20-1.60	0.80-1.20	0.65-0.75	0.60-0.65	0.45-0.55	0.35-0.45	0.20-0.30
US Mesh	mm	Percent Passing (%)								
4	4.75	99								
5	4.00	89	99							
6	3.35	57	94	99						
7	2.80	27	78	96						
8	2.36	10	57	90						
10	2.00	3	29	73	99					
12	1.70	1	6	50	98	99				
14	1.40		1	15	77	97				
16	1.18			3	51	87	99	99		
18	1.00			1	20	64	88	94		
20	0.850				5	41	65	82	98	
25	0.710				1	11	32	58	84	
30	0.600					3	7	33	59	98
35	0.500					1	2	10	28	93
40	0.425						1	2	8	72
45	0.355							1	2	42
50	0.300									24
60	0.250									10
70	0.212									5
80	0.180									2

Support Gravel

Product Size (inches)			2½ x 1½	1½ x 3/4	3/4 x 1/2	5/8 x 3/8	1/2 x 1/4	3/8 x 3/16	1/4 x 1/8	3/16 x 3/32	1/8 x 1/16
US Mesh	Inches	mm	Percent Passing (%)								
2½"	2.500	63.00	98								
2.0"	2.000	50.00	35								
1 ½"	1.500	37.50	5	98							
1.0"	1.000	25.00	1	40							
7/8"	0.875	22.40		18							
3/4"	0.750	19.00		4	97						
5/8"	0.625	16.00			48	99					
1/2"	0.500	12.50			3	77	98				
3/8"	0.375	9.50				3	41	98			
1/4"	0.250	6.30				1	4	30	96		
4	0.187	4.75						4	66	98	
5	0.157	4.00							35	84	
6	0.132	3.35							11	45	97
1/8"	0.125	3.18							5	14	94
7	0.111	2.80							1	3	80
8	0.094	2.36								1	60
10	0.079	2.00									30
12	0.066	1.70									6
14	0.056	1.40									1

APPENDIX F

USGS TOPO MAP

USGS science for a changing world
U.S. DEPARTMENT OF THE INTERIOR
U.S. GEOLOGICAL SURVEY

The National Map
US Topo

RYE QUADRANGLE
COLORADO
7.5-MINUTE SERIES

Produced by the United States Geological Survey
North American Datum of 1983 (NAD83)
World Geodetic System of 1984 (WGS84). Projection and 1 000-meter grid:Universal Transverse Mercator, Zone 13S
This map is not a legal document. Boundaries may be generalized for this map scale. Private lands within government reservations may not be shown. Obtain permission before entering private lands.

Imagery....................NAIP, September 2017 - January 2018
Roads....................U.S. Census Bureau, 2016 - 2016
Roads within US Forest Service Lands..........FSTopo Data with limited Forest Service updates, 2013
Names....................GNIS, 1978 - 2021
Hydrography..........National Hydrography Dataset, 2004 - 2018
Contours..........National Elevation Dataset, 2006
Boundaries..........Multiple sources; see metadata file 2017 - 2021
Public Land Survey System..........BLM, 2021
Wetlands..........FWS National Wetlands Inventory 1975

UTM GRID AND 2019 MAGNETIC NORTH DECLINATION AT CENTER OF SHEET

SCALE 1:24 000

CONTOUR INTERVAL 40 FEET
NORTH AMERICAN VERTICAL DATUM OF 1988

This map was produced to conform with the National Geospatial Program US Topo Product Standard.

QUADRANGLE LOCATION

1 Saint Charles Peak
2 Beulah
3 Muldoon Hill
4 San Isabel
5 Colorado City
6 Badito Cone
7 Hayden Butte
8 Huerfano Butte

ADJOINING QUADRANGLES

ROAD CLASSIFICATION

Expressway — Local Connector
Secondary Hwy — Local Road
Ramp — 4WD
Interstate Route — US Route — State Route
FS Primary Route — FS Passenger Route — FS High Clearance Route

Check with local Forest Service unit for current travel conditions and restrictions.

RYE, CO
2022

NSN. 7643016359699
NGA REF NO. USGSX24K39072

APPENDIX G

NRCS SOIL SURVEY

United States Department of Agriculture

NRCS

Natural Resources Conservation Service

A product of the National Cooperative Soil Survey, a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local participants

Custom Soil Resource Report for Pueblo Area, Colorado, Parts of Pueblo and Custer Counties

April 10, 2023

Preface

Soil surveys contain information that affects land use planning in survey areas. They highlight soil limitations that affect various land uses and provide information about the properties of the soils in the survey areas. Soil surveys are designed for many different users, including farmers, ranchers, foresters, agronomists, urban planners, community officials, engineers, developers, builders, and home buyers. Also, conservationists, teachers, students, and specialists in recreation, waste disposal, and pollution control can use the surveys to help them understand, protect, or enhance the environment.

Various land use regulations of Federal, State, and local governments may impose special restrictions on land use or land treatment. Soil surveys identify soil properties that are used in making various land use or land treatment decisions. The information is intended to help the land users identify and reduce the effects of soil limitations on various land uses. The landowner or user is responsible for identifying and complying with existing laws and regulations.

Although soil survey information can be used for general farm, local, and wider area planning, onsite investigation is needed to supplement this information in some cases. Examples include soil quality assessments (http://www.nrcs.usda.gov/wps/portal/nrcs/main/soils/health/) and certain conservation and engineering applications. For more detailed information, contact your local USDA Service Center (https://offices.sc.egov.usda.gov/locator/app?agency=nrcs) or your NRCS State Soil Scientist (http://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/contactus/?cid=nrcs142p2_053951).

Great differences in soil properties can occur within short distances. Some soils are seasonally wet or subject to flooding. Some are too unstable to be used as a foundation for buildings or roads. Clayey or wet soils are poorly suited to use as septic tank absorption fields. A high water table makes a soil poorly suited to basements or underground installations.

The National Cooperative Soil Survey is a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local agencies. The Natural Resources Conservation Service (NRCS) has leadership for the Federal part of the National Cooperative Soil Survey.

Information about soils is updated periodically. Updated information is available through the NRCS Web Soil Survey, the site for official soil survey information.

The U.S. Department of Agriculture (USDA) prohibits discrimination in all its programs and activities on the basis of race, color, national origin, age, disability, and where applicable, sex, marital status, familial status, parental status, religion, sexual orientation, genetic information, political beliefs, reprisal, or because all or a part of an individual's income is derived from any public assistance program. (Not all prohibited bases apply to all programs.) Persons with disabilities who require

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Contents

How Soil Surveys Are Made

Soil surveys are made to provide information about the soils and miscellaneous areas in a specific area. They include a description of the soils and miscellaneous areas and their location on the landscape and tables that show soil properties and limitations affecting various uses. Soil scientists observed the steepness, length, and shape of the slopes; the general pattern of drainage; the kinds of crops and native plants; and the kinds of bedrock. They observed and described many soil profiles. A soil profile is the sequence of natural layers, or horizons, in a soil. The profile extends from the surface down into the unconsolidated material in which the soil formed or from the surface down to bedrock. The unconsolidated material is devoid of roots and other living organisms and has not been changed by other biological activity.

Currently, soils are mapped according to the boundaries of major land resource areas (MLRAs). MLRAs are geographically associated land resource units that share common characteristics related to physiography, geology, climate, water resources, soils, biological resources, and land uses (USDA, 2006). Soil survey areas typically consist of parts of one or more MLRA.

The soils and miscellaneous areas in a survey area occur in an orderly pattern that is related to the geology, landforms, relief, climate, and natural vegetation of the area. Each kind of soil and miscellaneous area is associated with a particular kind of landform or with a segment of the landform. By observing the soils and miscellaneous areas in the survey area and relating their position to specific segments of the landform, a soil scientist develops a concept, or model, of how they were formed. Thus, during mapping, this model enables the soil scientist to predict with a considerable degree of accuracy the kind of soil or miscellaneous area at a specific location on the landscape.

Commonly, individual soils on the landscape merge into one another as their characteristics gradually change. To construct an accurate soil map, however, soil scientists must determine the boundaries between the soils. They can observe only a limited number of soil profiles. Nevertheless, these observations, supplemented by an understanding of the soil-vegetation-landscape relationship, are sufficient to verify predictions of the kinds of soil in an area and to determine the boundaries.

Soil scientists recorded the characteristics of the soil profiles that they studied. They noted soil color, texture, size and shape of soil aggregates, kind and amount of rock fragments, distribution of plant roots, reaction, and other features that enable them to identify soils. After describing the soils in the survey area and determining their properties, the soil scientists assigned the soils to taxonomic classes (units). Taxonomic classes are concepts. Each taxonomic class has a set of soil characteristics with precisely defined limits. The classes are used as a basis for comparison to classify soils systematically. Soil taxonomy, the system of taxonomic classification used in the United States, is based mainly on the kind and character of soil properties and the arrangement of horizons within the profile. After the soil

scientists classified and named the soils in the survey area, they compared the individual soils with similar soils in the same taxonomic class in other areas so that they could confirm data and assemble additional data based on experience and research.

The objective of soil mapping is not to delineate pure map unit components; the objective is to separate the landscape into landforms or landform segments that have similar use and management requirements. Each map unit is defined by a unique combination of soil components and/or miscellaneous areas in predictable proportions. Some components may be highly contrasting to the other components of the map unit. The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The delineation of such landforms and landform segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, onsite investigation is needed to define and locate the soils and miscellaneous areas.

Soil scientists make many field observations in the process of producing a soil map. The frequency of observation is dependent upon several factors, including scale of mapping, intensity of mapping, design of map units, complexity of the landscape, and experience of the soil scientist. Observations are made to test and refine the soil-landscape model and predictions and to verify the classification of the soils at specific locations. Once the soil-landscape model is refined, a significantly smaller number of measurements of individual soil properties are made and recorded. These measurements may include field measurements, such as those for color, depth to bedrock, and texture, and laboratory measurements, such as those for content of sand, silt, clay, salt, and other components. Properties of each soil typically vary from one point to another across the landscape.

Observations for map unit components are aggregated to develop ranges of characteristics for the components. The aggregated values are presented. Direct measurements do not exist for every property presented for every map unit component. Values for some properties are estimated from combinations of other properties.

While a soil survey is in progress, samples of some of the soils in the area generally are collected for laboratory analyses and for engineering tests. Soil scientists interpret the data from these analyses and tests as well as the field-observed characteristics and the soil properties to determine the expected behavior of the soils under different uses. Interpretations for all of the soils are field tested through observation of the soils in different uses and under different levels of management. Some interpretations are modified to fit local conditions, and some new interpretations are developed to meet local needs. Data are assembled from other sources, such as research information, production records, and field experience of specialists. For example, data on crop yields under defined levels of management are assembled from farm records and from field or plot experiments on the same kinds of soil.

Predictions about soil behavior are based not only on soil properties but also on such variables as climate and biological activity. Soil conditions are predictable over long periods of time, but they are not predictable from year to year. For example, soil scientists can predict with a fairly high degree of accuracy that a given soil will have a high water table within certain depths in most years, but they cannot predict that a high water table will always be at a specific level in the soil on a specific date.

After soil scientists located and identified the significant natural bodies of soil in the survey area, they drew the boundaries of these bodies on aerial photographs and

identified each as a specific map unit. Aerial photographs show trees, buildings, fields, roads, and rivers, all of which help in locating boundaries accurately.

Soil Map

The soil map section includes the soil map for the defined area of interest, a list of soil map units on the map and extent of each map unit, and cartographic symbols displayed on the map. Also presented are various metadata about data used to produce the map, and a description of each soil map unit.

Custom Soil Resource Report
Soil Map

Map Scale: 1:8,730 if printed on A landscape (11" x 8.5") sheet.

N

Meters: 0 100 200 400 600

Feet: 0 400 800 1600 2400

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 13N WGS84

MAP LEGEND

Area of Interest (AOI)
- Area of Interest (AOI)

Soils
- Soil Map Unit Polygons
- Soil Map Unit Lines
- Soil Map Unit Points

Special Point Features
- Blowout
- Borrow Pit
- Clay Spot
- Closed Depression
- Gravel Pit
- Gravelly Spot
- Landfill
- Lava Flow
- Marsh or swamp
- Mine or Quarry
- Miscellaneous Water
- Perennial Water
- Rock Outcrop
- Saline Spot
- Sandy Spot
- Severely Eroded Spot
- Sinkhole
- Slide or Slip
- Sodic Spot
- Spoil Area
- Stony Spot
- Very Stony Spot
- Wet Spot
- Other
- Special Line Features

Water Features
- Streams and Canals

Transportation
- Rails
- Interstate Highways
- US Routes
- Major Roads
- Local Roads

Background
- Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:24,000.

Warning: Soil Map may not be valid at this scale.

Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL:
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Pueblo Area, Colorado, Parts of Pueblo and Custer Counties
Survey Area Data: Version 21, Sep 2, 2022

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Mar 31, 2020—May 18, 2020

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background

MAP LEGEND

MAP INFORMATION

imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Map Unit Legend

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
DeD	Denver clay loam, 3 to 9 percent slopes	80.3	27.5%
EBF	Eutroboralfs, steep	8.1	2.8%
Ho	Holderness silt loam, 3 to 9 percent slopes	10.0	3.4%
LaE	Laporte channery loam, 3 to 25 percent slopes	9.2	3.2%
LbD	Larkson loam, 6 to 12 percent slopes	55.9	19.1%
LcE	Larkson stony loam, 5 to 20 percent slope	55.6	19.1%
NnD	Nunn stony loam, 3 to 9 percent slopes	20.0	6.9%
NuD	Nunn clay loam, 3 to 9 percent slopes	22.0	7.5%
PW	Pinata-Wetmore association	8.2	2.8%
TM	Table Mountain association	22.4	7.7%
Totals for Area of Interest		**291.8**	**100.0%**

Map Unit Descriptions

The map units delineated on the detailed soil maps in a soil survey represent the soils or miscellaneous areas in the survey area. The map unit descriptions, along with the maps, can be used to determine the composition and properties of a unit.

A map unit delineation on a soil map represents an area dominated by one or more major kinds of soil or miscellaneous areas. A map unit is identified and named according to the taxonomic classification of the dominant soils. Within a taxonomic class there are precisely defined limits for the properties of the soils. On the landscape, however, the soils are natural phenomena, and they have the characteristic variability of all natural phenomena. Thus, the range of some observed properties may extend beyond the limits defined for a taxonomic class. Areas of soils of a single taxonomic class rarely, if ever, can be mapped without including areas of other taxonomic classes. Consequently, every map unit is made up of the soils or miscellaneous areas for which it is named and some minor components that belong to taxonomic classes other than those of the major soils.

Most minor soils have properties similar to those of the dominant soil or soils in the map unit, and thus they do not affect use and management. These are called noncontrasting, or similar, components. They may or may not be mentioned in a particular map unit description. Other minor components, however, have properties and behavioral characteristics divergent enough to affect use or to require different management. These are called contrasting, or dissimilar, components. They generally are in small areas and could not be mapped separately because of the

scale used. Some small areas of strongly contrasting soils or miscellaneous areas are identified by a special symbol on the maps. If included in the database for a given area, the contrasting minor components are identified in the map unit descriptions along with some characteristics of each. A few areas of minor components may not have been observed, and consequently they are not mentioned in the descriptions, especially where the pattern was so complex that it was impractical to make enough observations to identify all the soils and miscellaneous areas on the landscape.

The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The objective of mapping is not to delineate pure taxonomic classes but rather to separate the landscape into landforms or landform segments that have similar use and management requirements. The delineation of such segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, however, onsite investigation is needed to define and locate the soils and miscellaneous areas.

An identifying symbol precedes the map unit name in the map unit descriptions. Each description includes general facts about the unit and gives important soil properties and qualities.

Soils that have profiles that are almost alike make up a *soil series*. Except for differences in texture of the surface layer, all the soils of a series have major horizons that are similar in composition, thickness, and arrangement.

Soils of one series can differ in texture of the surface layer, slope, stoniness, salinity, degree of erosion, and other characteristics that affect their use. On the basis of such differences, a soil series is divided into *soil phases*. Most of the areas shown on the detailed soil maps are phases of soil series. The name of a soil phase commonly indicates a feature that affects use or management. For example, Alpha silt loam, 0 to 2 percent slopes, is a phase of the Alpha series.

Some map units are made up of two or more major soils or miscellaneous areas. These map units are complexes, associations, or undifferentiated groups.

A *complex* consists of two or more soils or miscellaneous areas in such an intricate pattern or in such small areas that they cannot be shown separately on the maps. The pattern and proportion of the soils or miscellaneous areas are somewhat similar in all areas. Alpha-Beta complex, 0 to 6 percent slopes, is an example.

An *association* is made up of two or more geographically associated soils or miscellaneous areas that are shown as one unit on the maps. Because of present or anticipated uses of the map units in the survey area, it was not considered practical or necessary to map the soils or miscellaneous areas separately. The pattern and relative proportion of the soils or miscellaneous areas are somewhat similar. Alpha-Beta association, 0 to 2 percent slopes, is an example.

An *undifferentiated group* is made up of two or more soils or miscellaneous areas that could be mapped individually but are mapped as one unit because similar interpretations can be made for use and management. The pattern and proportion of the soils or miscellaneous areas in a mapped area are not uniform. An area can be made up of only one of the major soils or miscellaneous areas, or it can be made up of all of them. Alpha and Beta soils, 0 to 2 percent slopes, is an example.

Some surveys include *miscellaneous areas*. Such areas have little or no soil material and support little or no vegetation. Rock outcrop is an example.

Pueblo Area, Colorado, Parts of Pueblo and Custer Counties

DeD—Denver clay loam, 3 to 9 percent slopes

Map Unit Setting

National map unit symbol: 36c7
Elevation: 6,000 to 7,200 feet
Mean annual precipitation: 16 to 18 inches
Mean annual air temperature: 49 to 52 degrees F
Frost-free period: 115 to 145 days
Farmland classification: Not prime farmland

Map Unit Composition

Denver and similar soils: 80 percent
Minor components: 20 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Denver

Setting

Landform: Fans
Landform position (three-dimensional): Rise
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Clayey alluvium and/or residuum weathered from shale

Typical profile

A - 0 to 12 inches: clay loam
Bt - 12 to 36 inches: clay
Bk - 36 to 50 inches: clay
Cr - 50 to 54 inches: weathered bedrock

Properties and qualities

Slope: 3 to 9 percent
Depth to restrictive feature: 40 to 60 inches to paralithic bedrock
Drainage class: Well drained
Runoff class: Medium
Capacity of the most limiting layer to transmit water (Ksat): Very low to moderately high (0.00 to 0.20 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 15 percent
Gypsum, maximum content: 4 percent
Maximum salinity: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Available water supply, 0 to 60 inches: Moderate (about 8.2 inches)

Interpretive groups

Land capability classification (irrigated): 4e
Land capability classification (nonirrigated): 4c
Hydrologic Soil Group: C
Ecological site: R049XB208CO - Clayey Foothill
Hydric soil rating: No

Minor Components

Nunn

Percent of map unit: 20 percent
Hydric soil rating: No

EBF—Eutroboralfs, steep

Map Unit Setting

National map unit symbol: 36c9
Elevation: 6,900 to 8,500 feet
Mean annual precipitation: 15 to 22 inches
Mean annual air temperature: 42 to 47 degrees F
Frost-free period: 75 to 100 days
Farmland classification: Not prime farmland

Map Unit Composition

Eutroboralfs and similar soils: 70 percent
Rock outcrop: 30 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Eutroboralfs

Setting

Landform: Hills, escarpments
Landform position (three-dimensional): Side slope
Down-slope shape: Linear, concave
Across-slope shape: Linear, concave
Parent material: Colluvium and/or residuum weathered from sandstone

Typical profile

A - 0 to 13 inches: very stony loam
Bt - 13 to 22 inches: very stony loam
C - 22 to 30 inches: clay

Properties and qualities

Slope: 10 to 65 percent
Depth to restrictive feature: 10 to 40 inches to paralithic bedrock
Drainage class: Well drained
Runoff class: High
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to moderately high (0.06 to 0.20 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 5 percent
Available water supply, 0 to 60 inches: Very low (about 2.0 inches)

Interpretive groups

Land capability classification (irrigated): None specified

Land capability classification (nonirrigated): 7e
Hydrologic Soil Group: C
Hydric soil rating: No

Description of Rock Outcrop

Typical profile
R - 0 to 60 inches: unweathered bedrock

Properties and qualities
Slope: 30 to 65 percent
Depth to restrictive feature: 0 inches to lithic bedrock
Available water supply, 0 to 60 inches: Very low (about 0.0 inches)

Interpretive groups
Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 8s
Hydrologic Soil Group: D
Hydric soil rating: No

Ho—Holderness silt loam, 3 to 9 percent slopes

Map Unit Setting
National map unit symbol: 36cj
Elevation: 6,500 to 7,200 feet
Mean annual precipitation: 16 to 20 inches
Mean annual air temperature: 42 to 52 degrees F
Frost-free period: 100 to 130 days
Farmland classification: Not prime farmland

Map Unit Composition
Holderness and similar soils: 85 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Holderness

Setting
Landform: Hills
Landform position (two-dimensional): Footslope
Landform position (three-dimensional): Base slope
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Loess and/or residuum weathered from sandstone

Typical profile
A - 0 to 6 inches: silt loam
Bt - 6 to 30 inches: silty clay loam
Btk - 30 to 42 inches: clay loam
Bk - 42 to 48 inches: loam
R - 48 to 52 inches: unweathered bedrock

Properties and qualities

Slope: 3 to 9 percent
Depth to restrictive feature: 40 to 60 inches to lithic bedrock
Drainage class: Well drained
Runoff class: Medium
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to moderately high (0.06 to 0.20 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 10 percent
Maximum salinity: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Available water supply, 0 to 60 inches: Moderate (about 8.0 inches)

Interpretive groups

Land capability classification (irrigated): 4e
Land capability classification (nonirrigated): 4e
Hydrologic Soil Group: C
Ecological site: R048AY222CO - Loamy Park
Other vegetative classification: Blue grama - needlegrass (BOGR2-STIPA) (G0710)
Hydric soil rating: No

Minor Components

Nunn

Percent of map unit: 10 percent
Landform: Fan remnants
Down-slope shape: Linear
Across-slope shape: Linear
Hydric soil rating: No

Stroupe

Percent of map unit: 5 percent
Landform: Mesas
Down-slope shape: Linear
Across-slope shape: Linear
Hydric soil rating: No

LaE—Laporte channery loam, 3 to 25 percent slopes

Map Unit Setting

National map unit symbol: 36cm
Elevation: 6,200 to 7,000 feet
Mean annual precipitation: 15 to 18 inches
Mean annual air temperature: 49 to 52 degrees F
Frost-free period: 125 to 145 days
Farmland classification: Not prime farmland

Map Unit Composition

Laporte and similar soils: 75 percent
Minor components: 25 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Laporte

Setting

Landform: Hills, ridges
Landform position (three-dimensional): Head slope, side slope
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Calcareous loamy slope alluvium and/or residuum weathered from limestone

Typical profile

A - 0 to 7 inches: channery loam
C - 7 to 17 inches: loam
R - 17 to 21 inches: unweathered bedrock

Properties and qualities

Slope: 3 to 25 percent
Depth to restrictive feature: 10 to 20 inches to lithic bedrock
Drainage class: Well drained
Runoff class: Medium
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to high (0.06 to 2.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 50 percent
Gypsum, maximum content: 2 percent
Maximum salinity: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Available water supply, 0 to 60 inches: Very low (about 2.1 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 6s
Hydrologic Soil Group: D
Ecological site: R049XB204CO - Shallow Foothill
Hydric soil rating: No

Minor Components

Rock outcrop

Percent of map unit: 10 percent
Hydric soil rating: No

Penrose

Percent of map unit: 10 percent
Hydric soil rating: No

Denver

Percent of map unit: 3 percent
Hydric soil rating: No

Table mountain

Percent of map unit: 2 percent
Hydric soil rating: No

LbD—Larkson loam, 6 to 12 percent slopes

Map Unit Setting

National map unit symbol: 36cn
Elevation: 6,500 to 7,800 feet
Mean annual precipitation: 17 to 20 inches
Mean annual air temperature: 42 to 47 degrees F
Frost-free period: 90 to 125 days
Farmland classification: Not prime farmland

Map Unit Composition

Larkson and similar soils: 85 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Larkson

Setting

Landform: Fans, hills, dip slopes
Landform position (three-dimensional): Interfluve, side slope, rise
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Clayey loess and/or alluvium derived from sandstone

Typical profile

A - 0 to 10 inches: loam
Bt - 10 to 41 inches: clay loam
BC - 41 to 60 inches: loam

Properties and qualities

Slope: 6 to 12 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Runoff class: Medium
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to moderately high (0.06 to 0.20 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water supply, 0 to 60 inches: High (about 9.1 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 4e
Hydrologic Soil Group: C
Ecological site: R048AY255CO - Pine Grasslands

Hydric soil rating: No

Minor Components

Nelderness
Percent of map unit: 5 percent
Hydric soil rating: No

Rock outcrop
Percent of map unit: 5 percent
Hydric soil rating: No

Vamer
Percent of map unit: 5 percent
Hydric soil rating: No

LcE—Larkson stony loam, 5 to 20 percent slope

Map Unit Setting
National map unit symbol: 36cp
Elevation: 6,500 to 7,800 feet
Mean annual precipitation: 17 to 20 inches
Mean annual air temperature: 42 to 47 degrees F
Frost-free period: 90 to 125 days
Farmland classification: Not prime farmland

Map Unit Composition
Larkson and similar soils: 80 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Larkson

Setting
Landform: Fans, mountains
Landform position (two-dimensional): Footslope
Landform position (three-dimensional): Mountainbase, rise
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Clayey loess and/or alluvium derived from sandstone

Typical profile
A - 0 to 5 inches: stony loam
Bt - 5 to 41 inches: clay loam
BC - 41 to 60 inches: loam

Properties and qualities
Slope: 5 to 20 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Runoff class: Medium

Capacity of the most limiting layer to transmit water (Ksat): Moderately low to moderately high (0.06 to 0.20 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water supply, 0 to 60 inches: Moderate (about 9.0 inches)

Interpretive groups

Land capability classification (irrigated): 6e
Land capability classification (nonirrigated): 6e
Hydrologic Soil Group: C
Ecological site: R048AY255CO - Pine Grasslands
Hydric soil rating: No

Minor Components

Holderness

Percent of map unit: 5 percent
Hydric soil rating: No

Larkson, extremely stony

Percent of map unit: 5 percent
Hydric soil rating: No

Larkson, gravelly

Percent of map unit: 5 percent
Hydric soil rating: No

NnD—Nunn stony loam, 3 to 9 percent slopes

Map Unit Setting

National map unit symbol: 2tqyl
Elevation: 5,800 to 7,800 feet
Mean annual precipitation: 15 to 18 inches
Mean annual air temperature: 48 to 52 degrees F
Frost-free period: 100 to 130 days
Farmland classification: Prime farmland if irrigated

Map Unit Composition

Nunn and similar soils: 90 percent
Minor components: 10 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Nunn

Setting

Landform: Fan remnants
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Old alluvium

Typical profile

A - 0 to 6 inches: stony loam
Bt1 - 6 to 16 inches: clay loam
Bt2 - 16 to 23 inches: clay loam
Bk1 - 23 to 32 inches: clay loam
Bk2 - 32 to 79 inches: loam

Properties and qualities

Slope: 3 to 9 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Runoff class: Medium
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to moderately high (0.06 to 0.20 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 10 percent
Maximum salinity: Very slightly saline (2.0 to 3.9 mmhos/cm)
Available water supply, 0 to 60 inches: High (about 9.6 inches)

Interpretive groups

Land capability classification (irrigated): 6e
Land capability classification (nonirrigated): 6e
Hydrologic Soil Group: C
Ecological site: R049XB202CO - Loamy Foothill
Hydric soil rating: No

Minor Components

Noden

Percent of map unit: 10 percent
Landform: Fan remnants
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: R049XB202CO - Loamy Foothill
Hydric soil rating: No

NuD—Nunn clay loam, 3 to 9 percent slopes

Map Unit Setting

National map unit symbol: 2tqyk
Elevation: 5,800 to 7,800 feet
Mean annual precipitation: 15 to 18 inches
Mean annual air temperature: 48 to 52 degrees F
Frost-free period: 100 to 130 days
Farmland classification: Not prime farmland

Map Unit Composition

Nunn and similar soils: 90 percent

Minor components: 10 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Nunn

Setting

Landform: Fan remnants
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Old alluvium

Typical profile

A - 0 to 6 inches: clay loam
Bt1 - 6 to 16 inches: clay loam
Bt2 - 16 to 23 inches: clay loam
Bk1 - 23 to 32 inches: clay loam
Bk2 - 32 to 79 inches: loam

Properties and qualities

Slope: 3 to 9 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Runoff class: Medium
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to moderately high (0.06 to 0.20 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 10 percent
Maximum salinity: Very slightly saline (2.0 to 3.9 mmhos/cm)
Available water supply, 0 to 60 inches: High (about 9.9 inches)

Interpretive groups

Land capability classification (irrigated): 6e
Land capability classification (nonirrigated): 6e
Hydrologic Soil Group: C
Ecological site: R049XB202CO - Loamy Foothill
Hydric soil rating: No

Minor Components

Noden

Percent of map unit: 10 percent
Landform: Fan remnants
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: R049XB202CO - Loamy Foothill
Hydric soil rating: No

PW—Pinata-Wetmore association

Map Unit Setting

National map unit symbol: 36dl
Elevation: 6,400 to 7,200 feet
Mean annual precipitation: 18 to 24 inches
Mean annual air temperature: 42 to 47 degrees F
Frost-free period: 90 to 125 days
Farmland classification: Not prime farmland

Map Unit Composition

Pinata and similar soils: 45 percent
Wetmore and similar soils: 30 percent
Minor components: 25 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Pinata

Setting

Landform: Mountainsides
Landform position (three-dimensional): Mountainflank
Down-slope shape: Concave, linear
Across-slope shape: Concave, linear
Parent material: Cobbly and stony clayey colluvium and/or residuum weathered from sandstone

Typical profile

A - 0 to 12 inches: very stony loam
Bt - 12 to 22 inches: cobbly clay
Bk1 - 22 to 39 inches: very cobbly clay
Bk2 - 39 to 60 inches: very stony clay loam

Properties and qualities

Slope: 25 to 40 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Runoff class: High
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to moderately high (0.06 to 0.20 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water supply, 0 to 60 inches: Low (about 5.6 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 7s
Hydrologic Soil Group: C
Ecological site: F048AY925CO - Ponderosa Pine Forest
Hydric soil rating: No

Description of Wetmore

Setting

Landform: Mountainsides
Landform position (three-dimensional): Mountaintop
Down-slope shape: Linear
Across-slope shape: Linear

Typical profile

E - 0 to 6 inches: gravelly sandy loam
E/B - 6 to 12 inches: very gravelly sandy loam
Bt - 12 to 18 inches: very gravelly coarse sandy loam
R - 18 to 22 inches: unweathered bedrock

Properties and qualities

Slope: 30 to 60 percent
Depth to restrictive feature: 8 to 20 inches to lithic bedrock
Drainage class: Well drained
Runoff class: High
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to moderately high (0.06 to 0.20 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water supply, 0 to 60 inches: Very low (about 1.5 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 7s
Hydrologic Soil Group: D
Ecological site: R048AY255CO - Pine Grasslands
Hydric soil rating: No

Minor Components

Larkson

Percent of map unit: 10 percent
Hydric soil rating: No

Moderately deep soils

Percent of map unit: 10 percent
Hydric soil rating: No

Nederland-like

Percent of map unit: 5 percent
Hydric soil rating: No

Loamy soils

Percent of map unit:
Hydric soil rating: No

TM—Table Mountain association

Map Unit Setting

National map unit symbol: 36dx
Elevation: 5,700 to 6,800 feet
Mean annual precipitation: 16 to 18 inches
Mean annual air temperature: 49 to 52 degrees F
Frost-free period: 115 to 145 days
Farmland classification: Prime farmland if irrigated

Map Unit Composition

Table mountain and similar soils: 80 percent
Minor components: 20 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Table Mountain

Setting

Landform: Valley floors, stream terraces
Landform position (three-dimensional): Tread, talf
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Loamy alluvium

Typical profile

A - 0 to 7 inches: loam
Bw - 7 to 17 inches: loam
Bk - 17 to 38 inches: silt loam
C - 38 to 60 inches: loam

Properties and qualities

Slope: 1 to 6 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Runoff class: Low
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.60 to 2.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 15 percent
Maximum salinity: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Sodium adsorption ratio, maximum: 5.0
Available water supply, 0 to 60 inches: High (about 10.0 inches)

Interpretive groups

Land capability classification (irrigated): 3e
Land capability classification (nonirrigated): 3e
Hydrologic Soil Group: B

Ecological site: R049XB202CO - Loamy Foothill
Hydric soil rating: No

Minor Components

Bouldery sandy alluvium
Percent of map unit: 8 percent
Hydric soil rating: No

Stony sandy alluvium
Percent of map unit: 8 percent
Hydric soil rating: No

Briefly flooded areas
Percent of map unit: 2 percent
Hydric soil rating: No

Occasionally flooded areas
Percent of map unit: 2 percent
Hydric soil rating: No

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APPENDIX H

2021 WEATHER OBSERVATIONS

U.S. Department of Commerce
National Oceanic & Atmospheric Administration
National Environmental Satellite, Data, and Information Service

Summary of Monthly Normals 2006-2020

Generated on 09/07/2021

National Centers for Environmental Information
151 Patton Avenue
Asheville, North Carolina 28801

Current Location: Elev: 7141 ft. Lat: 37.9136° N Lon: -104.9483° W
Station: **RYE 1SW, CO US USC00057317**

Precipitation (in.)								
	Totals	**Mean Number of Days**				**Precipitation Probabilities Probability that precipitation will be equal to or less than the indicated amount**		
	Means	**Daily Precipitation**				**Monthly Precipitation vs. Probability Levels**		
Month	**Mean**	**>= 0.01**	**>= 0.10**	**>= 0.50**	**>= 1.00**	**0.25**	**0.50**	**0.75**
01	1.15	6.6	3.5	0.7	0.0	0.64	1.27	1.49
02	1.40	7.9	4.8	0.6	0.0	0.88	0.93	2.13
03	1.99	7.6	4.3	1.4	0.3	1.08	1.31	2.86
04	2.90	9.5	5.7	1.9	0.5	1.82	2.84	3.49
05	2.78	11.7	6.6	1.5	0.4	1.55	1.94	3.31
06	1.38	7.9	3.9	0.7	0.1	0.67	0.94	1.65
07	4.49	14.4	8.3	2.7	1.3	2.29	4.50	5.38
08	2.90	14.3	7.5	1.4	0.5	1.72	2.46	3.56
09	1.57	7.7	4.1	1.0	0.2	0.77	1.45	1.82
10	1.85	6.8	3.9	1.3	0.3	1.38	1.85	2.38
11	1.02	5.3	2.8	0.5	0.1	0.60	0.93	1.34
12	1.44	7.1	4.0	0.8	0.1	0.92	1.22	1.61
Summary	24.87	106.8	59.4	14.5	3.8	14.32	21.64	31.02

Empty or blank cells indicate data is missing or insufficient occurrences to compute value

U.S. Department of Commerce
National Oceanic & Atmospheric Administration
National Environmental Satellite, Data, and Information Service

Summary of Monthly Normals 2006-2020

Generated on 09/07/2021

National Centers for Environmental Information
151 Patton Avenue
Asheville, North Carolina 28801

Current Location: Elev: 7141 ft. Lat: 37.9136° N Lon: -104.9483° W
Station: **RYE 1SW, CO US USC00057317**

Snow (in.)

	Totals	Mean Number of Days									Snow Probabilities Probability that snow will be equal to or less than the indicated amount		
	Means	Snowfall >= Thresholds					Snow Depth >= Thresholds				Monthly Snow vs. Probability Levels Values derived from the incomplete gamma distribution.		
Month	Snowfall Mean	0.01	1.0	3.0	5.00	10.00	1	3	5	10	.25	.50	.75
01	16.6	6.1	3.8	2.2	1.5	0.1	26.1	21.9	16.9	6.7	9.6	15.8	22.7
02	22.7	7.5	5.4	3.1	1.6	0.3	19.6	15.6	11.6	4.2	13.5	16.2	32.7
03	20.6	6.1	4.3	2.5	1.5	0.4	9.9	7.5	5.5	2.5	9.7	14.8	26.1
04	18.6	5.6	3.9	1.8	1.2	0.5	4.4	2.9	1.9	0.8	6.4	16.9	24.0
05	2.9	1.5	0.9	0.3	0.2	0.0	0.9	0.5	0.3	0.0	0.5	1.2	4.9
06	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
07	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
08	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
09	0.8	0.3	0.1	0.1	0.1	0.0	0.2	0.1	0.1	0.0	0.0	0.0	0.0
10	10.5	2.5	1.7	1.1	0.9	0.3	3.3	2.4	1.7	0.7	0.6	8.8	15.3
11	11.3	3.9	2.5	1.1	0.8	0.2	8.2	5.0	2.7	0.7	5.4	9.1	19.4
12	22.5	6.8	4.9	2.5	1.6	0.4	22.1	18.5	14.1	3.5	10.9	21.1	23.3
Summary	126.5	40.3	27.5	14.7	9.4	2.2	94.7	74.4	54.8	19.1	56.6	103.9	168.4

Empty or blank cells indicate data is missing or insufficient occurrences to compute value

U.S. Department of Commerce
National Oceanic & Atmospheric Administration
National Environmental Satellite, Data, and Information Service

Current Location: Elev: 7141 ft. Lat: 37.9137° N Lon: -104.9484° W
Station: **RYE 1 SW, CO US USC00057317**

Record of Climatological Observations

These data are quality controlled and may not be identical to the original observations.

Generated on 09/07/2021

National Centers for Environmental Information
151 Patton Avenue
Asheville, North Carolina 28801

Observation Time Temperature: 2000 Observation Time Precipitation: 2000

Year	Month	Day	Temperature (F)			Precipitation					Evaporation		Soil Temperature (F)					
			24 Hrs. Ending at Observation Time		At Obs.	24 Hour Amounts Ending at Observation Time				At Obs. Time	24 Hour Wind Movement (mi)	Amount of Evap. (in)	4 in. Depth			8 in. Depth		
			Max.	Min.		Rain, Melted Snow, Etc. (in)	Flag	Snow, Ice Pellets, Hail (in)	Flag	Snow, Ice Pellets, Hail, Ice on Ground (in)			Ground Cover (see *)	Max.	Min.	Ground Cover (see *)	Max.	Min.
2021	03	01	40	16	28	0.00		0.0		2.0								
2021	03	02	57	28	42	0.00		0.0		1.0								
2021	03	03	56	32	38	0.00		0.0		T								
2021	03	04	48	32	32	0.19		3.1		3.0								
2021	03	05	49	29	33	0.19		2.9		1.0								
2021	03	06	59	32	45	0.00		0.0		T								
2021	03	07	62	39	42	0.00		0.0		T								
2021	03	08	60	40	46	0.00		0.0		T								
2021	03	09	60	44	46	0.00		0.0		T								
2021	03	10	47	30	30	0.00		0.0		T								
2021	03	11	39	22	33	0.00		0.0		T								
2021	03	12	37	24	30	0.00		0.0		T								
2021	03	13	32	28	28	0.92		5.0		5.0								
2021	03	14	34	24	26	0.32		3.2		6.0								
2021	03	15	47	18	38	0.00		0.0		3.0								
2021	03	16	43	28	28	0.44		3.9		6.0								
2021	03	17	34	24	24	0.03		0.3		5.0								
2021	03	18	47	19	38	0.00		0.0		2.0								
2021	03	19	57	28	41	0.00		0.0		T								
2021	03	20	65	37	56	0.00		0.0		T								
2021	03	21	56	33	33	0.10		0.5		1.0								
2021	03	22	34	28	31	0.46		2.8		3.0								
2021	03	23	37	24	29	0.21		4.2		6.0								
2021	03	24	31	22	22	0.75		9.2		11.0								
2021	03	25	46	18	36	T		T		7.0								
2021	03	26	46	32	34	T		T		6.0								
2021	03	27	47	26	34	0.00		0.0		3.0								
2021	03	28	61	28	49	0.00		0.0		T								
2021	03	29	65	41	51	0.00		0.0		T								
2021	03	30	51	23	25	T		T		T								
2021	03	31	51	21	32	0.00		0.0		T								
Summary			48	28		3.61		35.1										

Empty, or blank, cells indicate that a data observation was not reported.

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"s" This data value failed one of NCDC's quality control tests. "At Obs." = Temperature at time of observation

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U.S. Department of Commerce
National Oceanic & Atmospheric Administration
National Environmental Satellite, Data, and Information Service

Current Location: Elev: 7141 ft. Lat: 37.9137° N Lon: -104.9484° W
Station: **RYE 1 SW, CO US USC00057317**

Record of Climatological Observations

These data are quality controlled and may not be identical to the original observations.

Generated on 09/07/2021

National Centers for Environmental Information
151 Patton Avenue
Asheville, North Carolina 28801

Observation Time Temperature: 2000 Observation Time Precipitation: 2000

Year	Month	Day	Temperature (F)			Precipitation					Evaporation		Soil Temperature (F)					
			24 Hrs. Ending at Observation Time		At Obs.	24 Hour Amounts Ending at Observation Time				At Obs. Time	24 Hour Wind Movement (mi)	Amount of Evap. (in)	4 in. Depth			8 in. Depth		
			Max.	Min.		Rain, Melted Snow, Etc. (in)	Flag	Snow, Ice Pellets, Hail (in)	Flag	Snow, Ice Pellets, Hail, Ice on Ground (in)			Ground Cover (see *)	Max.	Min.	Ground Cover (see *)	Max.	Min.
2021	04	01	65	27	47	0.00		0.0		T								
2021	04	02	69	42	53	0.00		0.0		T								
2021	04	03	71	44	52	0.00		0.0		T								
2021	04	04	73	50	56	0.00		0.0		T								
2021	04	05	75	47	60	0.00		0.0		T								
2021	04	06	64	40	41	0.00		0.0		T								
2021	04	07	60	28	40	0.00		0.0		T								
2021	04	08	67	36	50	0.00		0.0		0.0								
2021	04	09	52	34	34	0.00		0.0		0.0								
2021	04	10	63	27	48	0.00		0.0		0.0								
2021	04	11	67	39	42	0.00		0.0		0.0								
2021	04	12	46	22	36	0.00		0.0		0.0								
2021	04	13	44	28	39	T		T		0.0								
2021	04	14	50	24	40	T		T		0.0								
2021	04	15	46	29	32	T		T		0.0								
2021	04	16	32	25	28	0.10		0.9		T								
2021	04	17	32	24	29	0.40		4.1		3.0								
2021	04	18	49	21	37	0.00		0.0		0.0								
2021	04	19	57	25	25	0.07		0.7		1.0								
2021	04	20	28	16	27	0.34		5.8		1.0								
2021	04	21	39	22	33	0.00		0.0		T								
2021	04	22	58	24	42	0.03		0.2		0.0								
2021	04	23	51	32	35	0.02		T		0.0								
2021	04	24	66	33	59	0.00		0.0		0.0								
2021	04	25	73	49	64	0.00		0.0		0.0								
2021	04	26	71	57	58	0.00		0.0		0.0								
2021	04	27	62	43	44	T		T		0.0								
2021	04	28	50	32	40	0.00		0.0		0.0								
2021	04	29	63	39	47	0.00		0.0		0.0								
2021	04	30	70	43	55	0.00		0.0		0.0								
Summary			57	33		0.96		11.7										

Empty, or blank, cells indicate that a data observation was not reported.

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Record of Climatological Observations

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Generated on 09/07/2021

National Centers for Environmental Information
151 Patton Avenue
Asheville, North Carolina 28801

Observation Time Temperature: 2000 Observation Time Precipitation: 2000

Year	Month	Day	Temperature (F)			Precipitation					Evaporation		Soil Temperature (F)					
			24 Hrs. Ending at Observation Time		At Obs.	24 Hour Amounts Ending at Observation Time				At Obs. Time	24 Hour Wind Movement (mi)	Amount of Evap. (in)	4 in. Depth			8 in. Depth		
			Max.	Min.		Rain, Melted Snow, Etc. (in)	Flag	Snow, Ice Pellets, Hail (in)	Flag	Snow, Ice Pellets, Hail, Ice on Ground (in)			Ground Cover (see *)	Max.	Min.	Ground Cover (see *)	Max.	Min.
2021	05	01	78	50	57	0.00		0.0		0.0								
2021	05	02	69	44	44	0.00		0.0		0.0								
2021	05	03	46	34	35	0.67		T		0.0								
2021	05	04	53	32	45	0.15		T		0.0								
2021	05	05	58	38	48	0.01		0.0		0.0								
2021	05	06	69	36	53	0.00		0.0		0.0								
2021	05	07	77	48	65	0.00		0.0		0.0								
2021	05	08	73	47	47	0.00		0.0		0.0								
2021	05	09	47	33	37	0.19		T		0.0								
2021	05	10	38	32	33	0.02		T		T								
2021	05	11	38	29	33	0.67		5.5		2.0								
2021	05	12	51	30	44	0.00		0.0		0.0								
2021	05	13	68	35	52	0.00		0.0		0.0								
2021	05	14	69	48	53	T		0.0		0.0								
2021	05	15	64	41	49	0.04		0.0		0.0								
2021	05	16	66	44	46	0.08		0.0		0.0								
2021	05	17	59	41	41	1.59		T		0.0								
2021	05	18	54	40	44	2.25		0.0		0.0								
2021	05	19	60	39	48	T		0.0		0.0								
2021	05	20	73	44	57	0.00		0.0		0.0								
2021	05	21	72	53	60	0.00		0.0		0.0								
2021	05	22	68	52	52	0.17		0.0		0.0								
2021	05	23	67	47	59	0.22		0.0		0.0								
2021	05	24	71	44	61	0.00		0.0		0.0								
2021	05	25	66	46	54	0.00		0.0		0.0								
2021	05	26	71	45	59	0.00		0.0		0.0								
2021	05	27	71	46	63	T		0.0		0.0								
2021	05	28	73	43	55	0.00		0.0		0.0								
2021	05	29	73	50	56	T		0.0		0.0								
2021	05	30	59	44	44	0.93		T		0.0								
2021	05	31	47	40	44	0.89		0.0		0.0								
Summary			63	42		7.88		5.5										

Empty, or blank, cells indicate that a data observation was not reported.

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"s" This data value failed one of NCDC's quality control tests. "At Obs." = Temperature at time of observation

"T" values in the Precipitation or Snow category above indicate a "trace" value was recorded.

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U.S. Department of Commerce
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Generated on 09/07/2021

National Centers for Environmental Information
151 Patton Avenue
Asheville, North Carolina 28801

Observation Time Temperature: 2000 Observation Time Precipitation: 2000

Year	Month	Day	Temperature (F)			Precipitation					Evaporation		Soil Temperature (F)					
			24 Hrs. Ending at Observation Time		At Obs.	24 Hour Amounts Ending at Observation Time				At Obs. Time	24 Hour Wind Movement (mi)	Amount of Evap. (in)	4 in. Depth			8 in. Depth		
			Max.	Min.		Rain, Melted Snow, Etc. (in)	Flag	Snow, Ice Pellets, Hail (in)	Flag	Snow, Ice Pellets, Hail, Ice on Ground (in)			Ground Cover (see *)	Max.	Min.	Ground Cover (see *)	Max.	Min.
2021	06	01	66	39	52	0.04		0.0		0.0								
2021	06	02	65	45	51	0.00		0.0		0.0								
2021	06	03	72	47	56	0.00		0.0		0.0								
2021	06	04	77	52	58	0.00		0.0		0.0								
2021	06	05	82	56	63	0.00		0.0		0.0								
2021	06	06	81	54	62	T		0.0		0.0								
2021	06	07	85	54	65	0.00		0.0		0.0								
2021	06	08	85	54	69	0.00		0.0		0.0								
2021	06	09	82	55	64	0.00		0.0		0.0								
2021	06	10	89	55	73	0.00		0.0		0.0								
2021	06	11	75	56	57	0.00		0.0		0.0								
2021	06	12	82	49	68	0.00		0.0		0.0								
2021	06	13	85	57	66	0.00		0.0		0.0								
2021	06	14	87	55	70	0.00		0.0		0.0								
2021	06	15	88	62	71	T		0.0		0.0								
2021	06	16	91	63	70	0.02		0.0		0.0								
2021	06	17	90	63	74	0.00		0.0		0.0								
2021	06	18	87	63	69	0.00		0.0		0.0								
2021	06	19	85	60	66	T		0.0		0.0								
2021	06	20	90	59	68	0.00		0.0		0.0								
2021	06	21	68	47	55	0.51		0.0		0.0								
2021	06	22	91	48	76	T		0.0		0.0								
2021	06	23	91	64	70	T		0.0		0.0								
2021	06	24	85	60	62	0.00		0.0		0.0								
2021	06	25	70	51	59	0.07		0.0		0.0								
2021	06	26	59	49	52	1.06		0.0		0.0								
2021	06	27	62	47	52	0.42		0.0		0.0								
2021	06	28	69	48	50	0.49		0.0		0.0								
2021	06	29	66	48	55	0.01		0.0		0.0								
2021	06	30	71	51	59	T		0.0		0.0								
		Summary	79	54		2.62		0.0										

Empty, or blank, cells indicate that a data observation was not reported.

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National Centers for Environmental Information
151 Patton Avenue
Asheville, North Carolina 28801

Observation Time Temperature: 2000 Observation Time Precipitation: 2000

Year	Month	Day	Temperature (F)			Precipitation					Evaporation		Soil Temperature (F)					
			24 Hrs. Ending at Observation Time		At Obs.	24 Hour Amounts Ending at Observation Time				At Obs. Time	24 Hour Wind Movement (mi)	Amount of Evap. (in)	4 in. Depth			8 in. Depth		
			Max.	Min.		Rain, Melted Snow, Etc. (in)	Flag	Snow, Ice Pellets, Hail (in)	Flag	Snow, Ice Pellets, Hail, Ice on Ground (in)			Ground Cover (see *)	Max.	Min.	Ground Cover (see *)	Max.	Min.
2021	07	01	74	55	56	0.11		0.0		0.0								
2021	07	02	69	51	58	0.09		0.0		0.0								
2021	07	03	80	56	61	0.12		0.0		0.0								
2021	07	04	83	56	64	0.05		0.0		0.0								
2021	07	05	82	55	65	0.00		0.0		0.0								
2021	07	06	77	56	58	0.22		0.0		0.0								
2021	07	07	77	57	65	0.01		0.0		0.0								
2021	07	08	90	58	69	0.00		0.0		0.0								
2021	07	09	91	65	67	0.00		0.0		0.0								
2021	07	10	80	58	68	0.00		0.0		0.0								
2021	07	11	76	52	63	0.00		0.0		0.0								
2021	07	12	81	55	64	0.00		0.0		0.0								
2021	07	13	86	55	55	0.24		0.0		0.0								
2021	07	14	80	55	59	0.14		0.0		0.0								
2021	07	15	81	52	66	0.00		0.0		0.0								
2021	07	16	77	55	59	0.32		0.0		0.0								
2021	07	17	79	55	63	0.00		0.0		0.0								
2021	07	18	82	54	59	0.00		0.0		0.0								
2021	07	19	81	57	64	0.00		0.0		0.0								
2021	07	20	83	58	65	0.00		0.0		0.0								
2021	07	21	85	58	71	0.00		0.0		0.0								
2021	07	22	87	60	74	T		0.0		0.0								
2021	07	23	86	64	71	T		0.0		0.0								
2021	07	24	79	63	66	0.00		0.0		0.0								
2021	07	25	81	54	57	1.26		0.0		0.0								
2021	07	26	82	53	65	0.34		0.0		0.0								
2021	07	27	84	58	67	0.00		0.0		0.0								
2021	07	28	89	62	69	0.00		0.0		0.0								
2021	07	29	86	62	73	0.00		0.0		0.0								
2021	07	30	86	62	73	0.00		0.0		0.0								
2021	07	31	75	54	56	2.50		0.0		0.0								
Summary			82	57		5.40		0.0										

Empty, or blank, cells indicate that a data observation was not reported.

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National Centers for Environmental Information
151 Patton Avenue
Asheville, North Carolina 28801

Observation Time Temperature: 2000 Observation Time Precipitation: 2000

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			24 Hrs. Ending at Observation Time		At Obs.	24 Hour Amounts Ending at Observation Time				At Obs. Time	24 Hour Wind Movement (mi)	Amount of Evap. (in)	4 in. Depth			8 in. Depth		
			Max.	Min.		Rain, Melted Snow, Etc. (in)	Flag	Snow, Ice Pellets, Hail (in)	Flag	Snow, Ice Pellets, Hail, Ice on Ground (in)			Ground Cover (see *)	Max.	Min.	Ground Cover (see *)	Max.	Min.
2021	08	01	65	53	54	1.64		0.0		0.0								
2021	08	02	76	53	64	0.00		0.0		0.0								
2021	08	03	75	57	58	0.07		0.0		0.0								
2021	08	04	70	56	59	0.01		0.0		0.0								
2021	08	05																
2021	08	06	87	62	75	0.00		0.0		0.0								
2021	08	07	82	58	62	0.00		0.0		0.0								
2021	08	08	81	54	66	0.00		0.0		0.0								
2021	08	09	87	62	71	0.00		0.0		0.0								
2021	08	10																
2021	08	11																
2021	08	12																
2021	08	13																
2021	08	14																
2021	08	15																
2021	08	16																
2021	08	17																
2021	08	18																
2021	08	19																
2021	08	20																
2021	08	21																
2021	08	22	85	57	76	0.00		0.0		0.0								
2021	08	23	85	62	78	0.00		0.0		0.0								
2021	08	24	87	64	67	0.00		0.0		0.0								
2021	08	25	83	60	70	0.00		0.0		0.0								
2021	08	26	85	58	65	0.00		0.0		0.0								
2021	08	27	85	57	66	0.00		0.0		0.0								
2021	08	28	86	63	69	0.00		0.0		0.0								
2021	08	29	73	54	65	0.00		0.0		0.0								
2021	08	30																
2021	08	31																
Summary			81	58		1.72		0.0										

Empty, or blank, cells indicate that a data observation was not reported.

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APPENDIX I

TOWN OF RYE RECORD OF APPROVED WATERWORKS

CO0151700 Town of Rye

Record of Approved Waterworks

System Name	Town of Rye
PWSID No.	CO0151700
County	Pueblo
Created Date	May 10, 2018
Previous CDPHE Approvals	
Date	**Details**
2/23/2009	Design approval for construction of Greenhorn Creek Surface Water Treatment Plant 01 (SDWIS ID 001); Joseph C. Talbott, Jr., P.E.
2/20/2014	Approval of Drinking Water Final Plans and Specifications for Construction Raw Water Pipeline Project (GLU Project No. 100080D, ES Project No. ES.12.45288 and ES.14.SRF.00638J); Melanie Criswell, P.E.
2/27/2017	Approval of Drinking Water Final Plans and Specifications for Construction Water Treatment Plant Improvements (Enforcement Order No. DW.11.15.151700, ES Project No. ES.16.DWDR.03118); John S. Nemcik, P.E.
RAW Version Control Log	
Date Modified	**Reason for Modification**
May 10, 2018	Creation of RAW document (Gary Soldano, Project Engineer and Amy Zimmerman, Unit Manager) Note that the 2/27/2017 approved project was nearing completion of construction at the time this RAW document was created, with a projected completion date of June 1, 2018.
November 10, 2021	Record of Approved Waterworks / Approval of Drinking Water Plans and Specifications for Construction; Town of Rye, Corrosion Control Treatment Improvements (Brit Abney, Review Engineer). All updates that will be performed under this project are highlighted in gray. ● ES Project No. ES.21.DWDR.06290 ● Install caustic soda feed system at Greenhorn Creek Surface Water Treatment Plant (001) for optimal corrosion control treatment

Public Water System Facility Summary

Public Water System Classification	Community
Overall Source Classification	Surface Water

Section S: Sources			
ID	**Name**	**Acceptance or Approval Date**	**Last Modified**
Surface Water Sources			
002	**Greenhorn Creek**	**6/1/1974**	

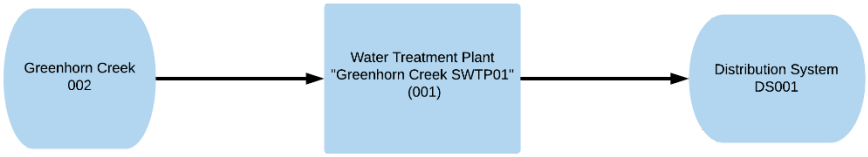
Section T: Treatment			
ID	**Name**	**Acceptance or Approval Date**	**Last Modified**
Surface Water/GWUDI Treatment Plants			
001	**Greenhorn Creek SWTP01**		**11/10/2021**

Section ST: Storage Tanks			
ID	**Name**	**Acceptance or Approval Date**	**Last Modified**
004	**Outside Underground Storage Tank for CT**		**12/15/2010**
005	**Inside Underground Storage Tank for CT**		**12/15/2010**
006	**Above Ground Storage Tank Before EP**		**12/15/2010**

Section D: Distribution			
ID	**Name**	**Acceptance or Approval Date**	**Last Modified**
DS001	**Distribution System**		

System Wide Schematic

CO0151700 - Town of Rye



TP001 clearwell units (common functionality for storage and CT)

004 - "Outside Underground Storage Tank for CT" 50,000 gallons
005 - "Inside Underground Storage Tank for CT" 50, 000 gallons
006 - "Above Ground Storage Tank before EP" 50, 000 gallons

Water Source Details

Source ID/ Name	002 - Greenhorn Creek
Flow Rate	45 gpm limited by water right
Information	
Appurtenances	
Deviations from Design Criteria	
Conditions of Approval	

Water Treatment Plant Details

NOTE: “Design Basis” means either specified equipment or equivalent must be used. If the term “Design Basis” does not appear, then the specified equipment must be used.

<table>
<tr><td>Treatment ID/ Name</td><td>001 – Greenhorn Creek SWTP01</td></tr>
<tr><td>Overall Rated Capacity and Limiting Process</td><td>60 gallons per minute based on Pall Aria microfiltration unit (Note that water right currently limits flow to 45 gpm)</td></tr>
<tr><td>Minimum Water Treatment Facility Classification/Basis</td><td>B – Chemical coagulation</td></tr>
<tr><td>Disinfection Credits (Triggered GW)</td><td>N/A</td></tr>
<tr><td>Disinfection Credits (4-log Certified)</td><td>N/A</td></tr>
<tr><td>Treatment Credits (GWUDI/SW Bin 1)</td><td>
<table>
<tr><th>Required from Regulation 11</th><th>Crypto</th><th>Giardia</th><th>Virus</th></tr>
<tr><td>Minimum Total Treatment Required</td><td>2.0</td><td>3.0</td><td>4.0</td></tr>
<tr><td>Removal Credit</td><td>3.0</td><td>3.0</td><td>0.0</td></tr>
<tr><td>Inactivation Needed</td><td>0</td><td>0</td><td>4.0</td></tr>
</table>
</td></tr>
<tr><td>Optimal Corrosion Control Treatment</td><td>N/A</td></tr>
<tr><td>Overall Treatment Process Description</td><td>Coagulant feed, packaged low-pressure microfiltration unit (Pall Aria AP3 skid with six Microza membrane modules, 60 gpm capacity), sodium hypochlorite disinfection, and contact time provided via three (3) tanks at the treatment plant site</td></tr>
<tr><td colspan="2">Treatment Processes</td></tr>
<tr><td>Chemical Feed – Coagulation (240)

Note: this process and equipment are scheduled to be installed with startup by June 1, 2018</td><td>
● Chemical Feed – Polyaluminum Chloride Coagulant (Design basis: ChemTreat P890L). Treatment goal: coagulation
o Purpose of coagulation process for improved TOC removal and to reduce DBP formation in the distribution system.
o Feed point in raw water piping prior to membrane filtration.
o Polyaluminum Chloride Feed System (O240):
▪ Fed out of 55 gallon shipping drum
▪ One metering pump rated for 0.5 to 2 gph, peristaltic type pump (design basis: Blue-White or Watson Marlow)
▪ Accessories: pressure relief valve, calibration column, foot valve, spill containment deck, pipeline injector
▪ Spare tubing kit
</td></tr>
<tr><td>Microfiltration (895)</td><td>
● Packaged low pressure microfiltration unit, (design basis: Pall Aria AP-3)
▪ Six (6) Microza membrane modules
▪ Maximum flow rate: 60 gpm
o Backwash waste decanted and discharged to Greenhorn Creek under CDPS No. COG641125
o Citric acid, sodium hydroxide, and sodium hypochlorite (common source with disinfection system) used for clean-in-place (CIP) system
o CIP waste discharged to a holding tank and hauled offsite for disposal by a licensed hauler
</td></tr>
<tr><td>Caustic Soda Feed (848)</td><td>● Caustic soda feed system for optimal corrosion control treatment:</td></tr>
</table>

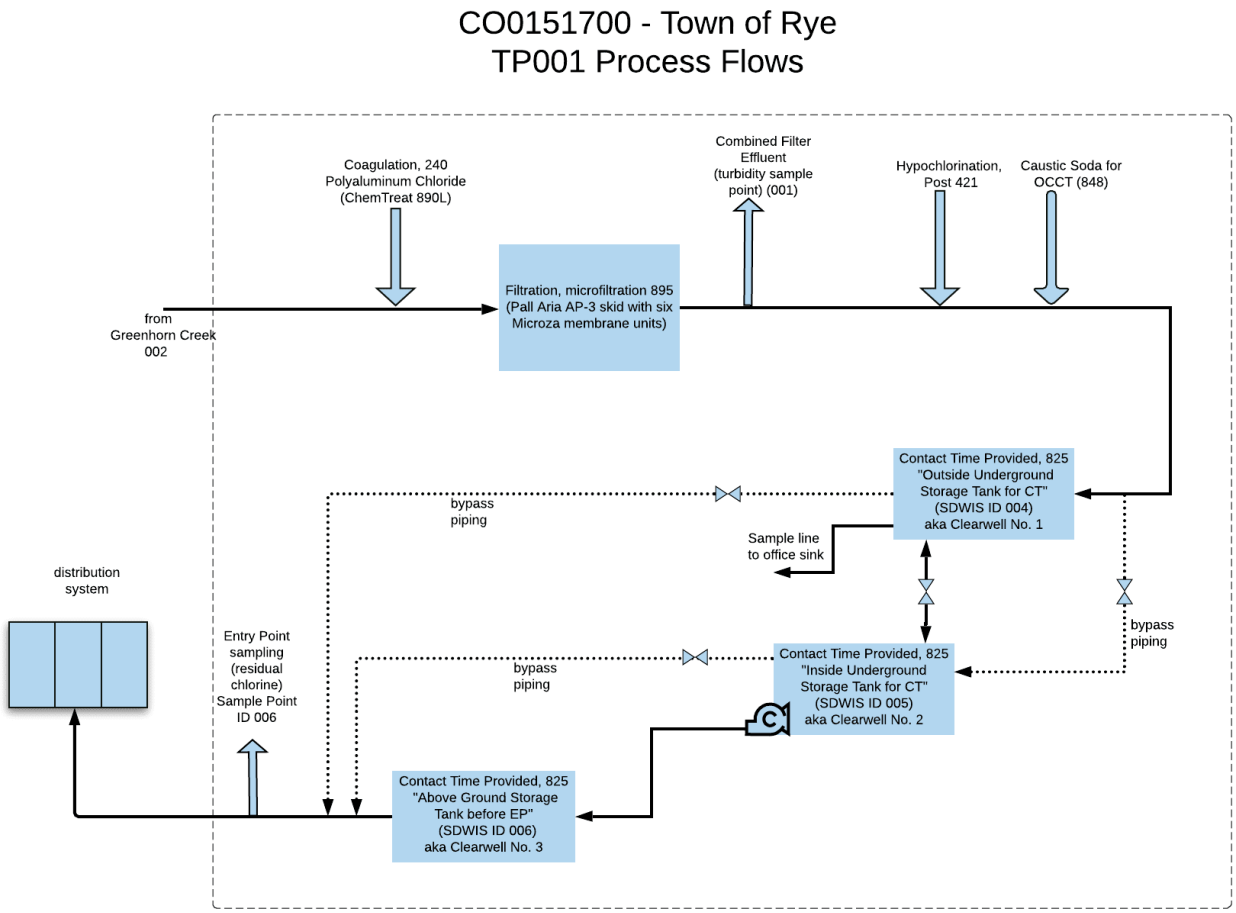
	o Two (2) peristaltic feed pumps, one for treatment and one for redundancy (design basis: Stenner S3002); feed rate of 0.17-17 gpd, 25% solution of NaOH, 100 PSI. Spare pump onsite. Chemical feed rate is flow paced and connected to flow meter. NaOH to be added at rate of 1-24.5 mg/L (seasonally dependent). o Target pH of 8.1. o NaOH is NSF Standard 60 certified to a maximum feed of 100 mg/L. o NaOH fed into static mixer along with chlorine and citric acid. o Feed out of existing 55-gallon NaOH shipping drum (25%). Back up 55-gallon drum provided. Spill containment pad capable of containing entire volume of drum. Chemical held in existing chemical room. Existing room includes deluge shower and eye wash station. o NaOH to be injected into filtered water line through new injection quill. o Manual air release valve on discharge line. Back pressure valve on discharge line. Ball check valve on discharge line prior to injection to prevent siphoning. Calibration column provided. o Associated piping and appurtenances.
Hypochlorination, Post (421) Note: this is replacement equipment and is scheduled to be installed with startup by June 1, 2018	● Sodium hypochlorite disinfection o Fed directly out of 55 gallon shipping drum. o Two metering pumps rated for 0.4 to 2 gph, peristaltic type pump (design basis: Blue-White or Watson Marlow). One pump for disinfection and one pump for clean-in-place (CIP) system. o The CIP metering pump also serves as the backup pump for the disinfection feed pump if needed. o Accessories: pressure relief valve, calibration column, foot valve, spill containment deck, pipeline injector. o Spare tubing kit.
Contact Time Provided (825) Note: the referenced baffle curtain walls and tank mixing equipment are scheduled to be installed by June 1, 2018	● Clearwell configuration consists of three tanks that are normally operated in series configuration o minimum combined tank volume of 32,000 gallons (achieved with a 3.0 feet tank level in each of the first two tanks identified below) to be maintained when operating in this configuration o Clearwell #1 (also designated as “Outside Underground Storage Tank for CT”, SDWIS ID 004) is an in-ground concrete tank. ▪ minimum tank volume when operated in series with Clearwell #2: 16,000 gallons (3.0 feet) ▪ minimum tank volume when operated alone: 32,000 gallons (5.5 feet tank level) and water is fed directly to the distribution system ▪ Baffle configuration in Clearwell #1 (004) is two curtain walls 10’-6” high by 20’-9” long subdividing the tank into three channels. Clearwell #1 is west of treatment plant ▪ Baffle wall material is reinforced polypropylene fabric, ANSI/NSF 61 certified (design basis: Seaman Corporation XR-5) ▪ Concrete surfaces of clearwells are coated with ASNI/NSF 61 certified coating material (design basis: Tnemec Series N140 primer and Series 22 Epoxoline finish coat) ▪ Baffle factor requested in the Basis of Design Report (BDR) and used in CT calculation is 0.1 ▪ Bypass exists - see deviations o Clearwell #2 (also designated as “Inside Underground Storage Tank for CT”, SDWIS ID 005) is an in-ground concrete tank located below the treatment building floor. ▪ minimum tank volume when operated in series with Clearwell #1: 16,000 gallons (3.0 feet)

	▪ minimum tank volume when operated alone: 32,000 gallons (6.0 feet tank level) and water fed directly to the distribution system ▪ Baffle configuration in Clearwell #2 (005) is three curtain walls 10'-6" high by 20'-9" long subdividing the tank into four channels. Inlet pipe modified to extend to head end of baffled channels. Clearwell #2 is under the treatment plant. ▪ Baffle wall material is reinforced polypropylene fabric, ANSI/NSF 61 certified (design basis: Seaman Corporation XR-5) ▪ Concrete surfaces of clearwells are coated with ASNI/NSF 61 certified coating material (design basis: Tnemec Series N140 primer and Series 22 Epoxoline finish coat) ▪ Baffle factor requested in BDR and used in CT calculation is 0.1 ▪ Bypass exists - see deviations o Clearwell #3 (also designated as "Above Ground Storage Tank before EP", SDWIS ID 006) is an above-ground steel tank. ▪ No CT credit is awarded as the inlet and outlet of this tank are directly adjacent to each other ▪ Interior of tank surface is coated with ASNI/NSF 61 certified coating material (design basis: AquataPoxy A-6) ▪ Retrofitted with tank mixing system, ANSI/NSF 61 certified components, to prevent thermal stratification and provide disinfectant uniformity, submersible mixer type, stainless steel construction (design basis: PAX Water Technologies) ▪ Bypass exists - see deviations
Membrane Clean-in-Place Chemical Feed Systems Note: this is replacement equipment and is scheduled to be installed with startup by June 1, 2018	● Clean-in-Place (CIP) chemical feed for membrane modules o Sodium hypochlorite CIP feed: common with disinfection system, see "Hypochlorination, Post (421)" above o Sodium hydroxide CIP feed: ▪ Sodium hydroxide (25%) ▪ Fed out of 55 gallon shipping drum ▪ One metering pump rated for 0.5 to 2 gph, peristaltic type pump (design basis: Blue-White or Watson Marlow) ▪ Accessories: pressure relief valve, calibrating column, foot valve, spill containment deck, pipeline injector ▪ Spare tubing kit o Citric Acid CIP feed: ▪ Citric Acid (50%) ▪ Fed out of 55 gallon shipping drum ▪ One metering pump rated for 0.5 to 2 gph, peristaltic type pump (design basis: Blue-White or Watson Marlow) ▪ Accessories: pressure relief valve, calibration column, foot valve, spill containment deck, pipeline injector ▪ Spare tubing kit
Monitoring Locations	● Turbidity: o Combined filter effluent (CFE): online continuous turbidimeter currently at CFE sampling point (design basis: Hach 1720E) o Sample point is located just downstream of Pall membrane modules, before the point of hypochlorite injection ● Finished water entry point o Chlorine residual monitoring to demonstrate disinfection and entry point requirements: online chlorine sample (design basis: Hach CL17) o Continuous sample drawn via a small diameter pipe downstream of Clearwell No. 3 ▪ Monitored downstream of all bypass return lines

Approach to Achieving Adequate Disinfection	Minimum chlorine residual
Additional Sample Locations	Raw water at entrance to SWTP01
Deviations from Design Criteria	
Deviation No. 1	Item 4.4 of the Design Criteria states that no bypasses around the disinfection process will be approved. A bypass exists to divert water around any of the three clearwell tanks described above. All pertinent valves are confirmed closed. The system is granted a deviation from the bypass prohibition of item 4.4 of the Design Criteria since all valves are confirmed to be closed. Storage tank bypass valve(s) must be confirmed as being closed at least once per year by appropriately actuating the valve to ensure closure. The records of bypass valve maintenance are subject to department review during sanitary surveys.
Conditions of Approval	
Condition No. 1	● Per treatment credits above, the water system is required to continuously provide a minimum of 4-log inactivation by disinfection. Pursuant to Section 11.1(6), to demonstrate adequate disinfection and compliance with Section 11.8(3)(b)(i)(A) of Regulation 11, the System must continuously maintain a chlorine residual of 0.2 mg/L at the entry point sampling location (after the three tanks in series) assuming a peak hour flow rate of 60 gpm (flow through the water treatment system) into the storage tanks, a pH of 8.4, a temperature of 2.0°C, and the specifications outlined in 825 provision above. Monitoring results must be reported on the System's monthly operating report (MOR) to calculate disinfection. o Minimum clearwell tank volumes must be measured and recorded <u>at least as often as each disinfectant residual monitoring event</u> as defined in Section 11.8(3)(c) of Regulation 11. The records of clearwell volumes are subject to Department review during sanitary surveys. o Storage tank bypass valve(s) must be confirmed as being closed at least once per year by appropriately actuating the valve to ensure closure. The records of bypass valve maintenance are subject to department review during sanitary surveys.
Condition No. 2	● The water system must continuously meet the design, performance, and operation and maintenance requirements established in Section 4.3.8 of the Design Criteria (effective September 1, 2013) and in the Department's Acceptance of the Pall Corporation Microza Membrane Modules an Alternative Filtration Technology to meet the Colorado Primary Drinking Water Regulations (CPDWR) requirements for Giardia lamblia and Cryptosporidium Removal dated October 19, 2017, or the most recent version. ● Table 11.8-I of Regulation 11 specifies that the department will approve turbidity limits for Alternative Filtration Technologies – Membranes and all other alternative filtration. Through the *General requirements of membrane filtration technologies as Alternative Filtration Technologies for meeting Colorado Primary Drinking Water Regulations requirements for Giardia lamblia and Cryptosporidium Removal letter* dated July 25, 2012, the department requires that the Supplier of Water demonstrate that the turbidity at the Combined Filter Effluent (CFE) sampling location results in water with a turbidity of less than or equal to 0.1 NTU 95% of the time and that the turbidity at the CFE never exceeds a maximum limit of 0.5 NTU. Turbidity data shall be monitored and reported to the department in accordance with the requirements of Regulation 11.

Condition No. 3	• Whenever either of the contact tanks is going to be bypassed, the Department must be notified of the planned bypass and the Town and the Department shall evaluate the treatment plant's 4-log virus inactivation and entry point before the clearwell or storage tank is bypassed.

Process Schematic
Town of Rye - CO0151700
Greenhorn Creek SWTP01 (001)



Distribution System Details

Distribution System ID	DS001
Overall Distribution System Description	gravity flow from Greenhorn Creek SWTP01 site
Minimum Distribution System Class/ basis	Class 1 Distribution System 1 – population
Distribution System Appurtenances	
No. of Pressure Zones	1
No. of Distribution System Pump Stations	None
No. of Pressure Reducing Valves	
Typical Pressure Range	Pressure is maintained by gravity feed from tank “Above Ground Tank before EP” (006) that is filled by a booster pump that pulls from “Inside Underground Storage Tank for CT” (005). Typical pressures are around 50-75 psi
Flushing Protocol	
Deviations from Design Criteria	
Conditions of Approval	

Storage Tank Details

NOTE: “Design Basis” means either specified equipment or equivalent must be used. If the term “Design Basis” does not appear, then the specified equipment must be used.

Tank ID/ Name	**004, 005, 006 provide CT and are part of Greenhorn Creek SWTP01 (001)**
Tank Volume (gallons)	See “Contact Time Provided, 825” in Greenhorn Creek SWTP01 above
Operating Volume (gallons)	Minimum level must be maintained for disinfection contact time.
Tank Residence Time/ Turnover Info	
Tank Appurtenances	
Deviations from Design Criteria	
Conditions of Approval	

APPENDIX J

DBP SAMPLING TABLES

Town of Rye WTP
TOC Sampling Tables

		TTHM (mcg/L)		80	HAA5 (mcg/L)		60
	Date	Sample Result	LRAA	OEL	Sample Result	LRAA	OEL
Q3	8/28/2013	111.0		--	139.4		--
Q4	12/17/2013	25.7		--	27.8		--
Q1	2/25/2014	20.7	52.5	44.5	24.91	**64.0**	54.3
Q2	6/18/2014	115.8	68.3	69.5	129.34	**80.4**	**77.9**
Q3	8/28/2014	140.0	75.6	**104.1**	140	**80.5**	**108.6**
Q4	10/29/2014	77.9	--	**102.9**	83.01	--	**108.8**
Q4	12/29/2014	22.7	**81.7**	75.3	27.97	**87.4**	**81.3**
Q1	2/25/2015	24.8	**82.7**	60.0	31.37	***89.1***	**64.6**
Q2	4/9/2015	87.0	--	62.3	114.95	--	**79.2**
Q2	5/18/2015	202.0	**89.9**	**119.8**	261.42	***103.8***	**152.4**
Q3	8/24/2015	61.1	70.2	72.9	64.83	***85.0***	**87.3**
Q4	11/23/2015	22.6	--	62.7	33.23	--	**79.9**
Q4	12/21/2015	21.6	63.1	62.2	26.63	***78.6***	**76.6**
Q1	2/24/2016	21.0	62.2	31.3	27.09	***77.5***	37.2
Q2	5/18/2016	193.4	74.4	**107.5**	259.6	***95.4***	**144.1**
Q3	8/25/2016	68.2	76.2	**87.7**	48.2	***91.2***	**95.8**
Q4	12/13/2016	21.7	76.1	76.3	21.6	***89.1***	**87.8**
Q1	2/13/2017	17.0	75.1	31.0	21.6	***87.8***	28.3
Q2	5/18/2017	241.7	**87.2**	**130.5**	322	***103.4***	**171.8**
Q3	8/9/2017	22.6	--	76.0	8.3	--	**90.1**
Q3	8/16/2017	190.4	**96.7**	**159.9**	284.6	***127.9***	**228.2**
Q4	11/14/2017	44.2	**102.4**	**109.2**	53.4	***135.9***	**143.8**
Q1	2/20/2018	17.6	**102.5**	46.5	19.6	***135.4***	59.8
Q2	5/17/2018	52.4	55.2	41.7	41.2	***65.2***	38.9
Q3	8/27/2018	57.6	43.0	46.3	58.8	*43.3*	44.6
Q4	11/19/2018	25.1	38.2	40.1	30.6	*37.6*	40.3
Q1	2/13/2019	19.3	*38.6*	30.3	23.8	*38.6*	34.3
Q2	6/13/2019	196.6	*74.7*	**109.4**	253.5	***91.7***	**140.4**
Q3	8/1/2019	75.6	*79.2*	**91.8**	77.7	***96.4***	**108.2**
Q4	11/24/2019	23.5	*78.8*	79.8	25.9	***95.2***	**95.8**
Q1	2/10/2020	14.2	*77.5*	31.9	20.5	***94.4***	36.2
Q2	5/22/2020	55.7	*42.3*	37.3	79.4	*50.9*	51.3
Q3	7/13/2020	2.3	--	18.6	4.8	--	27.4
Q3	8/6/2020	41.1	*28.8*	38.0	37.5	*36.7*	43.7
Q4	11/12/2020	32.4	*31.0*	35.6	43.6	*41.2*	46.9
Q1	2/17/2021	13.7	30.9	20.4	15.2	*39.8*	23.8
Q2	**5/11/2021**	217.9	--	**120.5**	383.5	--	**206.5**
Q2	**6/28/2021**	109.1	57.8	66.1	133.1	**84.6**	**81.3**
Q3	7/19/2021	210.7	--	**163.3**	241.8	--	**189.3**
Q3	8/18/2021	171.6	**100.2**	**143.7**	145.6	**127.7**	**141.2**

APPENDIX K

GAC DESIGN CRITERIA

Process/Parameter	CDPHE Design Criteria	Proposed GAC Units
Granular Activated Carbon		
Maximum Operating Capacity	• Must include in design submittal	• Maximum operating capacity of 45 gpm
Minimum Empty Bed Contact Time (EBCT)	• Must include in design submittal	• 4.98 minutes
Hydraulic Loading Rate	• Must include in design submittal	• 45 gpm
Acceptable Pressure Drop	• Must include in design submittal	• 4 – 8 PSI
pH Control	• Must include in design submittal, if needed	• N/a
Break-Through Curve	• Must include in design submittal	• Breakthrough is unknown based on high variations of DBP precursors in the raw water. District will replace media when TTHM and/or HAA5 levels reach 0.06 mg/L in the distribution system to ensure compliance.
Flow Rates	• Must not exceed 7 gpm/sq.ft. • Backwash must be 6-8 gpm/sq.ft. of bed area.	• Flow rate of 4.2 gpm/sq. ft. • Backwash flow rate of 10 gpm/sq.ft.
Freeboard	• If open bed, freeboard must be provided.	• N/a
Bypass	• If a portion of the flow is bypassed around the units and blended, maximum blend ratio must be determined.	• No bypass for blend.

Misc. Appurtenances	• System must be designed to include an adequate under drain and support for GAC media.	• Underdrain is included in design
Preconditioning of the Media	• GAC media must be preconditioned in accordance with manufacturer's specifications	• Town will follow GAC manufacturer's guidelines
Waste Disposal	• Suitable disposal must be provided for GAC spent media and any produced wastewater	• Spent media will be landfilled. Backwash water will be conveyed to the district's existing impoundment.
Water quality Test Equipment	• When the purpose of the GAC is to comply with Reg. 11, provision must be provided for water quality monitoring.	• N/a
Cross Connection Control	• Any backwash, bed removal, must be installed in such a manner as to prevent any possibility of back-siphonage	• Cross Connection shall meet CDPHE standards
Type of Media	• Must meet the latest version of AWWA B604 • Must be justified by manufacturer's specifications	• GAC meets these standards
Waste Disposal	• Suitable disposal must be provided for GAC spent media and any produced wastewater	• Spent media will be landfilled.
Number of Units	• At least two units must be provided. • Treatment capacity must be capable of producing the maximum day water demand with one unit out of service.	• Two units are being proposed • One unit has the capacity to treat a maximum water demand day

APPENDIX L

SCHEMATIC PLANS

PLANS FOR PERMITTING

TOWN OF RYE, PUEBLO COUNTY, COLORADO

GAC FILTRATION UNITS INSTALLATION

SECTION 31, TOWNSHIP 24 SOUTH, RANGE 67 WEST OF THE SIXTH P.M.

PREPARED FOR

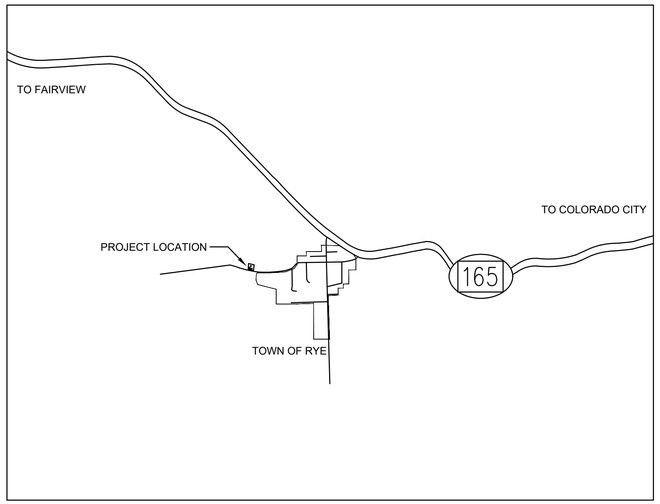
TOWN OF RYE
MICKEY SMITH, MAYOR
719.489.2011
PO BOX 236
RYE, CO 81019

EMERGENCY CONTACT

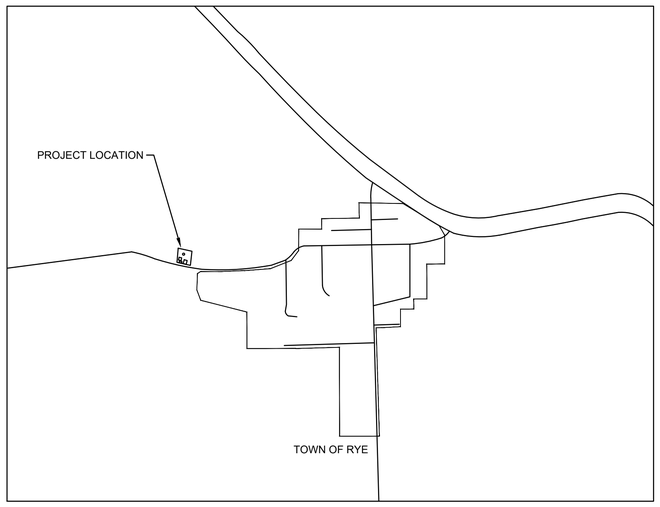
GREG COLTER, ORC
719.890.0700

ENGINEERING

NICHOLAUS P. MARCOTTE, P.E.
NO. 47164
ELEMENT ENGINEERING, LLC
12687 W. CEDAR DR., SUITE 300
LAKEWOOD, CO 80228
303.378.2969



LOCATION MAP
NTS



VICINITY MAP
NTS

SHEET INDEX

Sheet Number	Sheet Title
C1	COVER
C2	NOTES
C3	PFD AND WTP PLAN
C4	DETAILS

ELEMENT ENGINEERING LLC
12687 W. CEDAR DRIVE, SUITE 300
LAKEWOOD, CO 80228
720.749.4165
WWW.ELEMENTENGINEERING.NET

REVISIONS

NO.	DESCRIPTION	DATE	BY

WATER SYSTEM IMPROVEMENTS

COVER

TOWN OF RYE
PO BOX 236
RYE, CO 80169

PREPARED UNDER THE DIRECT SUPERVISION OF

FOR AND ON BEHALF OF
ELEMENT ENGINEERING, LLC

DESIGNED BY	CHECKED BY
MAH	AMA

DATE
JUNE 2023

JOB NUMBER
0101.0003

EDITION
PERMITTING

SHEET
C1 OF C4

S:_PROJECTS\0101 - TOWN OF RYE\0003 - GAC DESIGN AND PERMITTING\CAD\DWG\GAC PLANS - TOWN OF RYE.DWG

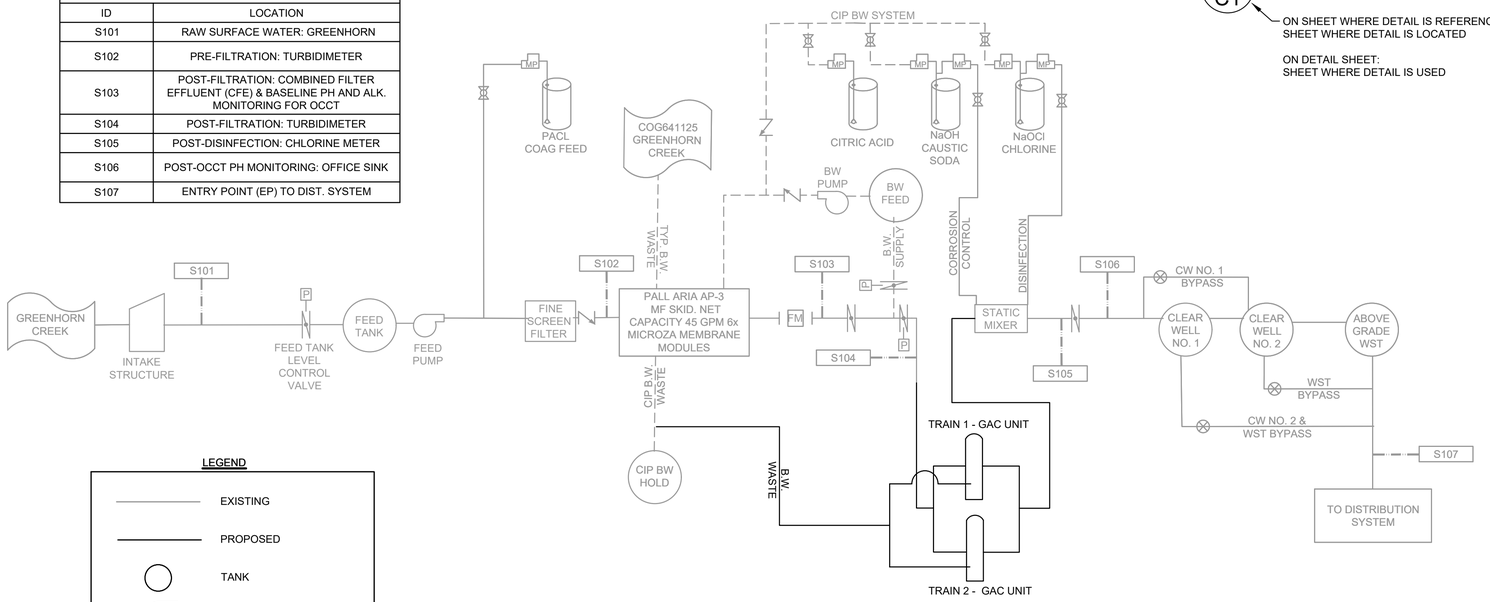
GENERAL NOTES

1. ALL WORK TO BE PERFORMED IN ACCORDANCE WITH THE PROJECT SPECIFICATIONS.
2. THE CONTRACTOR IS TO PROVIDE A DETAILED CONSTRUCTION SCHEDULE DELINEATING CONSTRUCTION MILESTONES AND THE NATURE OF WORK BEING PERFORMED. THE SCHEDULE SHALL DETAIL ACTIVITIES FROM THE START OF CONSTRUCTION THROUGH STARTUP. THIS SCHEDULE SHALL BE PROVIDED TO THE ENGINEER TWO (2) WEEKS PRIOR TO CONSTRUCTION AND UPDATED WEEKLY.
3. THE CONTRACTOR SHALL PERFORM ALL WORK NECESSARY TO COMPLETE THE PROJECT IN ACCORDANCE WITH THE APPROVED CONSTRUCTION DRAWINGS INCLUDING SUCH INCIDENTALS AS MAY BE NECESSARY TO MEET APPLICABLE AGENCY REQUIREMENTS AND PROVIDE A COMPLETED PROJECT.
4. THE CONTRACTOR SHALL FURNISH ALL MATERIALS, LABOR AND EQUIPMENT AND PERFORM WORK SHOWN OR IMPLIED AS NECESSARY FOR THE COMPLETED GAC SYSTEM, READY FOR USE.
5. ALL EXISTING FACILITIES SHALL BE MAINTAINED IN-PLACE BY THE CONTRACTOR UNLESS OTHERWISE SHOWN OR DIRECTED. CONTRACTOR SHALL TAKE ALL PRECAUTIONS NECESSARY TO SUPPORT, MAINTAIN, OR OTHERWISE PROTECT EXISTING UTILITIES AND OTHER FACILITIES AT ALL TIMES DURING CONSTRUCTION. CONTRACTOR TO LEAVE EXISTING FACILITIES IN AN EQUAL OR BETTER-THAN-ORIGINAL CONDITION.
6. IT SHALL BE THE CONTRACTOR'S RESPONSIBILITY TO NOTIFY THE ENGINEER OF ANY PROBLEM IN CONFORMING TO THE APPROVED PLANS FOR ANY ELEMENT OF THE PROPOSED IMPROVEMENTS PRIOR TO ITS CONSTRUCTION.
7. UPON COMPLETION OF CONSTRUCTION AND PRIOR TO INITIAL ACCEPTANCE OF THE WORK, THE CONTRACTOR SHALL SUBMIT A CLEAN SET OF FIELD RECORD DRAWINGS CONTAINING ALL AS-BUILT INFORMATION TO THE ENGINEER. ALL INFORMATION SHOWN ON THE CONTRACTOR'S FIELD RECORD DRAWINGS SHALL BE SUBJECT TO VERIFICATION BY THE ENGINEER. IF SIGNIFICANT ERRORS OR DEVIATIONS ARE NOTED BY THE ENGINEER, AN AS-BUILT SURVEY PREPARED AND STAMPED BY A REGISTERED PROFESSIONAL LAND SURVEYOR SHALL BE COMPLETED AT THE CONTRACTOR'S EXPENSE.
8. ALL BOLTS FOR ABOVE GRADE FITTINGS SHALL BE ASTM 316 STAINLESS STEEL.
9. PIPE, FITTINGS, AND ACCESSORIES SHALL BE HANDLED IN SUCH A MANNER THAT WILL ENSURE INSTALLATION IN SOUND, UNDAMAGED CONDITION. EQUIPMENT, TOOLS, AND METHODS USED IN HANDLING AND INSTALLING PIPE AND FITTINGS SHALL NOT DAMAGE THE PIPE AND FITTINGS.
10. ALL CONTRACTOR INSTALLED PIPE, FITTINGS, VALVES, PIPE JOINTS, AND OTHER MATERIALS WHICH ARE FOUND TO BE DEFECTIVE SHALL BE REMOVED AND REPLACED WITH NEW AND ACCEPTABLE MATERIALS, AND THE AFFECTED PORTION OF THE PIPING RETESTED BY AND AT THE EXPENSE OF THE CONTRACTOR.
11. THE CONTRACTOR WILL IDENTIFY THE HORIZONTAL AND VERTICAL LOCATION OF ALL EXISTING UTILITIES PRIOR TO CONSTRUCTION. THE CONTRACTOR WILL REPORT ANY DISCREPANCIES TO THE ENGINEER IMMEDIATELY AND PRIOR TO CONSTRUCTION.
12. ALL EQUIPMENT AND MATERIAL IS TO BE INSTALLED PER THE MANUFACTURER'S RECOMMENDATIONS AND REQUIREMENTS. ALL EQUIPMENT STARTUP SHALL BE PROVIDED BY A MANUFACTURER APPROVED FIELD REPRESENTATIVE. MANUFACTURER FIELD TRAINING FOR THE OPERATIONS STAFF SHALL ALSO BE PROVIDED AT EITHER THE TIME OF STARTUP OR AT ANOTHER TIME AS APPROVED BY THE OPERATOR.
21. UNLESS OTHERWISE APPROVED BY THE ENGINEER AND OWNER CONSTRUCTION SHALL BE LIMITED TO HOURS BETWEEN 7:00 AM AND 5:00 PM, MONDAY THROUGH FRIDAY. IF THE CONTRACTOR WISHES TO WORK ON SATURDAY OR SUNDAY THE ENGINEER MUST BE NOTIFIED BY WEDNESDAY NOON PRIOR TO THAT WEEKEND FOR APPROVAL.
22. CONTRACTOR SHALL FIELD VERIFY INVERTS PRIOR TO COMPLETING CONNECTIONS TO EXISTING STRUCTURES. IF ANY DISCREPANCIES ARE FOUND THE ENGINEER SHALL BE CONTACTED IMMEDIATELY.
13. THE INTERIOR OF ALL PIPE AND FITTINGS SHALL BE THOROUGHLY CLEANED OF ALL FOREIGN MATTER PRIOR TO INSTALLATION. BEFORE JOINTING, ALL JOINT CONTACT SURFACES SHALL BE WIRE BRUSHED IF NECESSARY, WIPED CLEAN, AND KEPT CLEAN UNTIL JOINTING IS COMPLETED.
14. PRECAUTIONS SHALL BE TAKEN TO PREVENT FOREIGN MATERIAL FROM ENTERING THE PIPE DURING INSTALLATION. DEBRIS, TOOLS, CLOTHING, OR OTHER OBJECTS SHALL NOT BE PLACED IN OR ALLOWED TO ENTER THE PIPE. END OF LINES TO BE PLUGGED TO PREVENT DEBRIS OR ANIMALS FROM ENTERING PIPE.
15. CUTTING SHALL BE DONE IN A NEAT MANNER, WITHOUT DAMAGE TO THE PIPE OR THE LINING. CUTS SHALL BE SMOOTH, STRAIGHT, AND AT RIGHT ANGLES TO THE PIPE AXIS. AFTER CUTTING, THE ENDS OF THE PIPE SHALL BE DRESSED WITH A FILE OR POWER GRINDER TO REMOVE ALL ROUGHNESS AND SHARP EDGES. THE CUT ENDS OF PUSH-ON JOINT PIPE SHALL BE SUITABLY BEVELED.
16. NO DEFLECTION SHALL BE PERMITTED ON INTERIOR PIPE AND FITTINGS.
17. DIAMETRICALLY OPPOSITE NUTS SHALL BE TIGHTENED PROGRESSIVELY AND EVENLY. THE FINAL TIGHTENING SHALL BE DONE WITH A TORQUE LIMITING WRENCH SET FOR THE TORQUE RECOMMENDED BY THE MANUFACTURER FOR ALL FITTINGS AND SERVICE SADDLES.
18. BEFORE THE JOINT IS ASSEMBLED, THE FLANGE FACES SHALL BE THOROUGHLY CLEANED OF ALL FOREIGN MATERIAL WITH A POWER WIRE BRUSH. THE GASKET SHALL BE CENTERED AND THE CONNECTING FLANGES DRAWN UP WATERTIGHT WITHOUT UNNECESSARY STRESSING OF THE FLANGES. ALL BOLTS SHALL BE TIGHTENED IN A PROGRESSIVE DIAMETRICALLY OPPOSITE SEQUENCE USING TORQUE WRENCHES AT SETTINGS RECOMMENDED BY THE MANUFACTURER. WHERE DISSIMILAR FLANGES ARE CONNECTED, AN INSULATING CONNECTION SHALL BE PROVIDED.
19. ALL JOINTS SHALL BE WATERTIGHT AND FREE FROM LEAKS. EACH LEAK WHICH IS DISCOVERED WITHIN THE CORRECTION PERIOD STIPULATED IN THE GENERAL PROVISIONS SHALL BE REPAIRED BY AND AT THE EXPENSE OF THE CONTRACTOR.
20. THE CONTRACTOR SHALL PROVIDE ALL NECESSARY PUMPING EQUIPMENT; PIPING CONNECTIONS BETWEEN THE PIPING AND THE NEAREST AVAILABLE SOURCE OF TEST WATER; PRESSURE GAUGES; AND OTHER EQUIPMENT, MATERIALS, AND FACILITIES NECESSARY FOR THE TESTS.
21. ALL CONTRACTOR INSTALLED PIPE, FITTINGS, VALVES, PIPE JOINTS, AND OTHER MATERIALS WHICH ARE FOUND TO BE DEFECTIVE SHALL BE REMOVED AND REPLACED WITH NEW AND ACCEPTABLE MATERIALS, AND THE AFFECTED PORTION OF THE PIPING RETESTED BY AND AT THE EXPENSE OF THE CONTRACTOR.
22. FLEXIBLE COUPLINGS AND FLANGE ADAPTERS SHALL BE DESIGNED TO RELIEVE STRESS IN PIPELINES DUE TO THERMAL EXPANSION/CONTRACTION, DIFFERENTIAL SETTLEMENT OR MISALIGNMENT AND MECHANICAL VIBRATION. FLEXIBLE COUPLINGS SHALL CONSIST OF A SLEEVE WHICH SHALL FIT OVER THE ENDS OF THE TWO PIPE SECTIONS TO BE JOINED. THE COUPLING SHALL FORM A WATER TIGHT SEAL BY COMPRESSING RESILIENT WEDGE-SHAPED GASKETS BETWEEN THE ENDS OF THE SLEEVE AND THE PIPE SECTIONS. THE GASKETS SHALL BE COMPRESSED BY TWO RETAINER RINGS BOLTED TO ONE ANOTHER ON THE OUTSIDE OF THE COUPLING SLEEVE. FLANGE ADAPTERS SHALL BE EQUIVALENT TO FLEXIBLE COUPLINGS EXCEPT THAT ONE RETAINER RING AND GASKET SHALL BE REPLACED WITH A FLANGED CONNECTION ON THE COUPLING SLEEVE.
23. ALL VALVES SHALL HAVE THE MANUFACTURER AND SIZE OF THE VALVE VISIBLY CAST ON THE BODY OR ON A PLATE ATTACHED TO THE BODY OF THE VALVE. VALVES AND REQUIRED OPERATING APPURTENANCES SHALL BE THE PRODUCT OF THE SAME MANUFACTURER. VALVE SEALS SHALL BE ABLE TO PROVIDE TIGHT CLOSURE AND PREVENT METAL-TO-METAL CONTACT. VALVES SHALL OPEN RIGHT.
24. VALVE COMPONENTS SHALL WITHSTAND THE ENVIRONMENTAL CONDITIONS AND PROVIDE CONTINUOUS TROUBLE-FREE SERVICE.
25. ANY MATERIAL TO BE IN CONTACT WITH POTABLE WATER SHALL BE NSF 61 CERTIFIED.
26. THE CONTRACTOR IS RESPONSIBLE FOR:

26.1. OBTAINING, AT THE CONTRACTORS EXPENSE, APPLICABLE LICENSES, PERMITS, BONDS, ETC.

27. STARTUP AND TRAINING SHALL BE PROVIDED BY THE MANUFACTURER, INCLUDE FIELD TESTING AND SAMPLING.

SAMPLE LOCATIONS	
ID	LOCATION
S101	RAW SURFACE WATER: GREENHORN
S102	PRE-FILTRATION: TURBIDIMETER
S103	POST-FILTRATION: COMBINED FILTER EFFLUENT (CFE) & BASELINE PH AND ALK. MONITORING FOR OCCT
S104	POST-FILTRATION: TURBIDIMETER
S105	POST-DISINFECTION: CHLORINE METER
S106	POST-OCCT PH MONITORING: OFFICE SINK
S107	ENTRY POINT (EP) TO DIST. SYSTEM



1 / C2 TOWN OF RYE PROPOSED PFD
NTS

LEGEND

- EXISTING
- PROPOSED
- TANK
- PUMP SKID
- CHECK VALVE
- BUTTERFLY VALVE
- PNEUMATIC VALVE
- BALL VALVE
- GATE VALVE
- FLOW METER
- SAMPLE LOCATION (S101)

CIVIL SYMBOLS LIBRARY

- SECTION NUMBER / SHOWN ON SHEET (1 / C1)
- SECTION NO. / SECTION or DETAIL SCALE / TAKEN FROM SHEET (A / C2)
- DETAIL NO. / ON SHEET WHERE DETAIL IS REFERENCED: SHEET WHERE DETAIL IS LOCATED / ON DETAIL SHEET: SHEET WHERE DETAIL IS USED (1 / C1)

ELEMENT ENGINEERING LLC
720.749.4165
WWW.ELEMENTENGINEERING.NET
12687 W. CEDAR DRIVE, SUITE 300
LAKEWOOD, CO 80228

REVISIONS

NO.	DESCRIPTION	DATE	BY

WATER SYSTEM IMPROVEMENTS

NOTES

TOWN OF RYE
PO BOX 236
RYE, CO 80169

PREPARED UNDER THE DIRECT SUPERVISION OF

FOR AND ON BEHALF OF ELEMENT ENGINEERING, LLC

DESIGNED BY	CHECKED BY
MAH	AMA

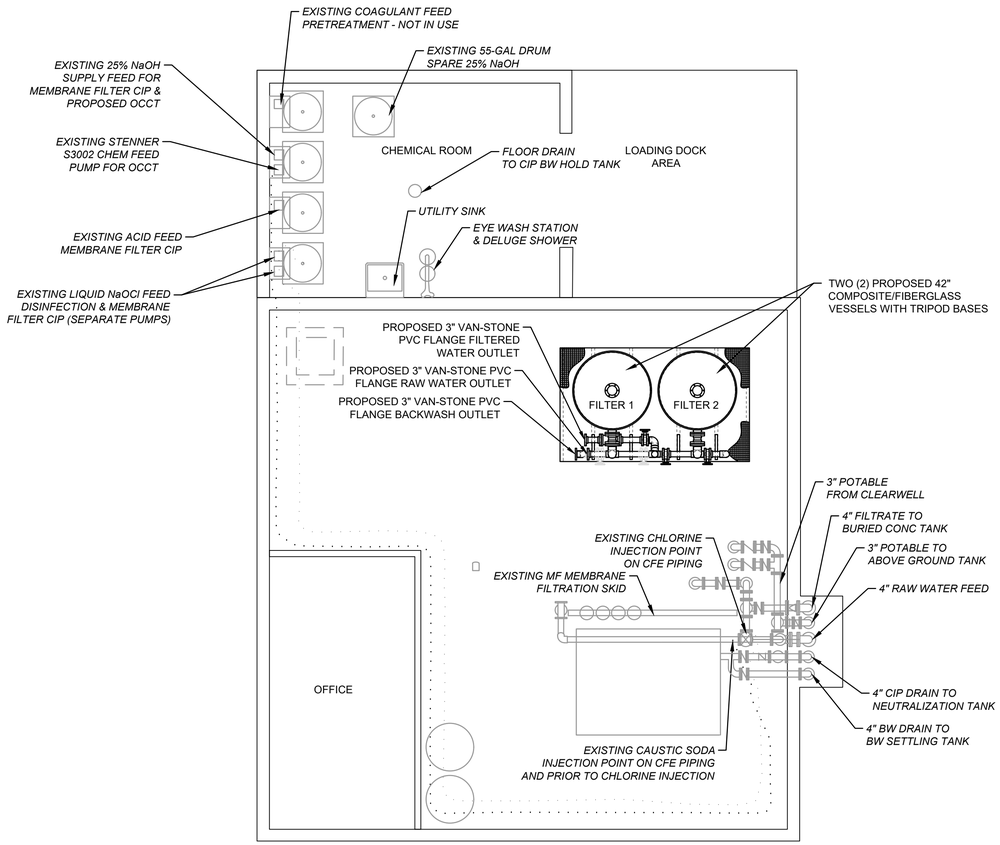
DATE: JUNE 2023

JOB NUMBER: 0101.0003

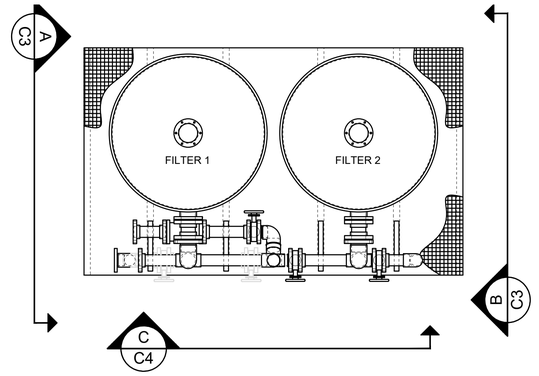
EDITION: PERMITTING

SHEET: C2 OF C4

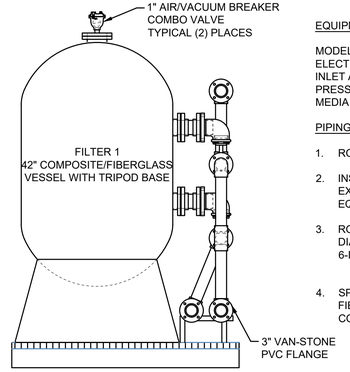
S:_PROJECTS\0101 - TOWN OF RYE\0003 - GAC DESIGN AND PERMITTING\CAD\DWG\GAC PLANS - TOWN OF RYE.DWG



1 / C3 PROPOSED WTP SITE LAYOUT
1/4" = 1'



2 / C3 GAC FILTER INSTALL LOCATION
1/2" = 1'



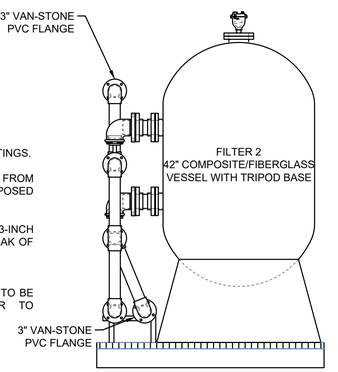
A / C3 GAC FILTER 1 END VIEW
1/2" = 1'

EQUIPMENT SPECIFICATIONS:

MODEL: PENTAIR MODEL ACH31283
ELECTRONIC CONTROL VALVE: PLC-BASED FILTER CONTROL PANEL
INLET AND OUTLET PIPE SIZE: 3" DIA
PRESSURE RATING: 150 PSI
MEDIA VOLUME: 30 CUBIC FT PER FILTER

PIPING NOTES:

1. ROUTE PIPING WITH SCHEDULE 80 PVC OR TYPE L COPPER AND FITTINGS.
2. INSTALL PRESSURE REDUCING VALVE IF EFFLUENT PIPING FROM EXISTING FILTRATION SKIDS EXCEEDS THAT OF THE PROPOSED EQUIPMENT.
3. ROUTE BACKWASH PIPING FROM EACH GAC FILTER SYSTEM (3-INCH DIAMETER) TO EXISTING BACKWASH DRAIN. INSTALL WITH AIR BREAK OF 6-INCHES FOR CROSS CONTAMINATION CONTROL.
4. SPECIFIC ROUTING OF PIPING TO AND LOCATION OF GAC FILTERS TO BE FIELD DETERMINED AND SUBMITTED TO ENGINEER PRIOR TO CONSTRUCTION.



B / C3 GAC FILTER 2 END VIEW
1/2" = 1'

ELEMENT ENGINEERING LLC
12687 W. CEDAR DRIVE, SUITE 300
LAKEWOOD, CO 80228
720.749.4165
WWW.ELEMENTENGINEERING.NET

NO.	DESCRIPTION	DATE	BY
	REVISIONS		

WATER SYSTEM IMPROVEMENTS

PFD AND WTP PLAN

TOWN OF RYE
PO BOX 236
RYE, CO 80169

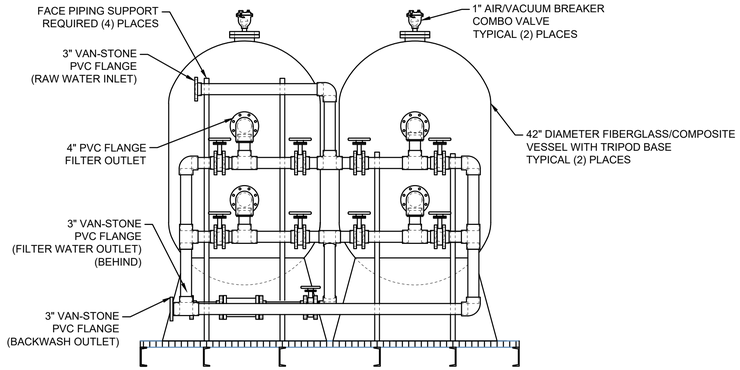
PREPARED UNDER THE DIRECT SUPERVISION OF

FOR AND ON BEHALF OF ELEMENT ENGINEERING, LLC

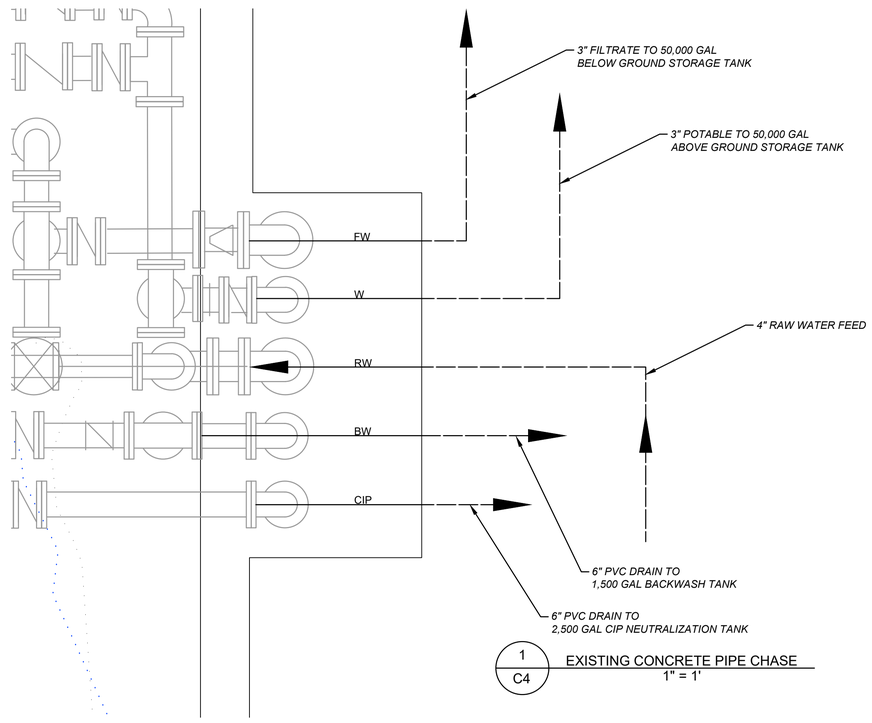
DESIGNED BY	CHECKED BY
MAH	AMA

DATE: JUNE 2023
JOB NUMBER: 0101.0003
EDITION: PERMITTING
SHEET: C3 OF C4

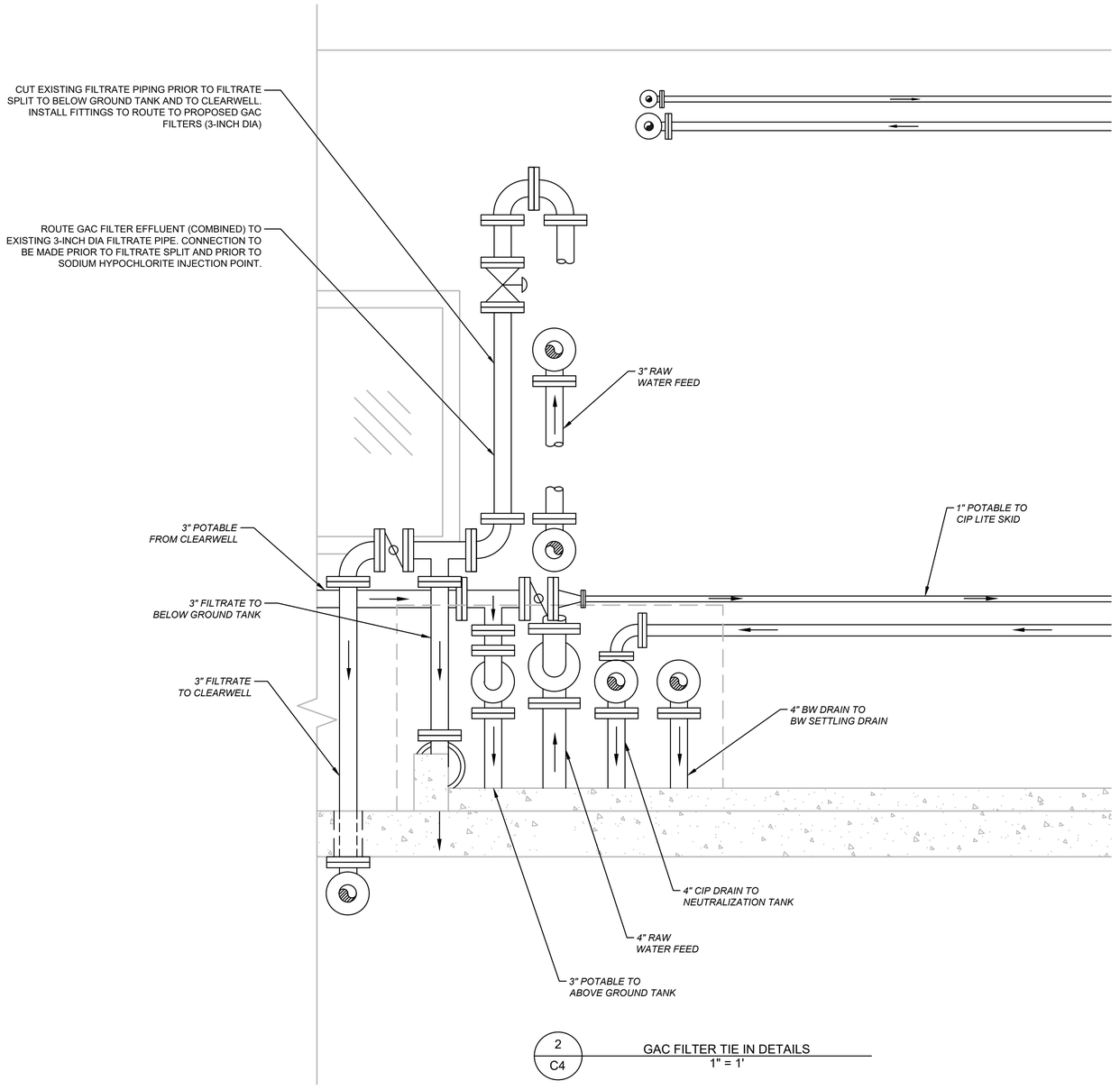
S:_PROJECTS\0101 - TOWN OF RYE\0003 - GAC DESIGN AND PERMITTING\CAD\DWG\GAC PLANS - TOWN OF RYE.DWG



C / C3 GAC FILTER ELEVATION VIEW
1/2" = 1'



1 / C4 EXISTING CONCRETE PIPE CHASE
1" = 1'



2 / C4 GAC FILTER TIE IN DETAILS
1" = 1'

ELEMENT ENGINEERING LLC
12687 W. CEDAR DRIVE, SUITE 300
LAKEWOOD, CO 80228
720.749.4165
WWW.ELEMENTENGINEERING.NET

REVISIONS

NO.	DESCRIPTION	DATE	BY

WATER SYSTEM IMPROVEMENTS

DETAILS

TOWN OF RYE
PO BOX 236
RYE, CO 80169

PREPARED UNDER THE DIRECT SUPERVISION OF

FOR AND ON BEHALF OF ELEMENT ENGINEERING, LLC

DESIGNED BY	CHECKED BY
MAH	AMA

DATE
JUNE 2023

JOB NUMBER
0101.0003

EDITION
PERMITTING

SHEET
C4 OF C4

S:_PROJECTS\0101 - TOWN OF RYE\0003 - GAC DESIGN AND PERMITTING\CAD\DWG\GAC PLANS - TOWN OF RYE.DWG

APPENDIX M

WATER QUALITY DATA

Colorado Analytical LABORATORIES, INC.

Analytical Results

TASK NO: 130322008

Report To: Dennis Baca
Company: Town of Rye
P.O. Box 148
Rye CO 81069

Bill To: Accounts Payable
Company: Town of Rye - AP
P.O. Box 236
Rye CO 81069

Task No.: 130322008
Client PO:
Client Project: Town of Rye CO 0151700

Date Received: 3/22/13
Date Reported: 3/29/13
Matrix: Water - Drinking

Customer Sample ID 006 PH-8.11 Temp 4.9
Sample Date/Time: 3/19/13 9:15 AM
Lab Number: 130322008-01

Test	Result	Method	LQL	Date Analyzed	Analyzed By
Bicarbonate	**43.6 mg/L**	SM 2320-B	0.1	3/25/13	VDB
Carbonate	**< 0.1 mg/L**	SM 2320-B	0.1	3/25/13	VDB
Total Alkalinity	**35.7 mg/L as CaCO3**	SM 2320-B	0.1	3/25/13	VDB
Total					
Calcium	**10.5 mg/L**	SM 3111-B	0.1	3/27/13	TES

Abbreviations/ References:

LQL = Lower Quantification Limit
mg/L = Milligrams Per Liter or PPM
ug/L = Micrograms Per Liter or PPB
mpn/100 mls = Most Probable Number Index/ 100 mls
Date Analyzed = Date Test Completed
SM = "Standard Methods for the Examination of Water and Wastewater"; APHA; 19th Edition; 1995
EPA = "Methods of Chemical Analysis of Water and Wastes"; USEPA; EPA-600/4-79-020 Rev 3/83

DATA APPROVED FOR RELEASE BY

240 South Main Street / Brighton, CO 80601-0507 / 303-659-2313
Mailing Address: P.O. Box 507 / Brighton, CO 80601-0507 / Fax: 303-659-2315

Colorado Analytical LABORATORIES, INC.

Analytical Results

TASK NO: 130322008

Report To: Dennis Baca
Company: Town of Rye
P.O. Box 148
Rye CO 81069

Bill To: Accounts Payable
Company: Town of Rye - AP
P.O. Box 236
Rye CO 81069

Task No.: 130322008
Client PO:
Client Project: Town of Rye CO 0151700

Date Received: 3/22/13
Date Reported: 3/29/13
Matrix: Water - Drinking

Customer Sample ID 006 PH-8.10 Temp 4.9
Sample Date/Time: 3/21/13 7:00 AM
Lab Number: 130322008-02

Test	Result	Method	LQL	Date Analyzed	Analyzed By
Bicarbonate	**45.3 mg/L**	SM 2320-B	0.1	3/25/13	VDB
Carbonate	**< 0.1 mg/L**	SM 2320-B	0.1	3/25/13	VDB
Total Alkalinity	**37.1 mg/L as CaCO3**	SM 2320-B	0.1	3/25/13	VDB
Total					
Calcium	**11.0 mg/L**	SM 3111-B	0.1	3/27/13	TES

Abbreviations/ References:

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DATA APPROVED FOR RELEASE BY

240 South Main Street / Brighton, CO 80601-0507 / 303-659-2313
Mailing Address: P.O. Box 507 / Brighton, CO 80601-0507 / Fax: 303-659-2315

Colorado Analytical LABORATORIES, INC.

Analytical Results

TASK NO: 130125021

Report To: Dennis Bacca
Company: Town of Rye
P.O. Box 148
Rye CO 81069

Bill To: Accounts Payable
Company: Town of Rye - AP
P.O. Box 236
Rye CO 81069

Task No.: 130125021
Client PO:
Client Project: Town of Rye CO 0151700

Date Received: 1/25/13
Date Reported: 2/4/13
Matrix: Water - Drinking

Customer Sample ID 001 PH-7.43 Temp 4.3
Sample Date/Time: 1/23/13 9:40 AM
Lab Number: 130125021-01

Test	Result	Method	LQL	Date Analyzed	Analyzed By
Bicarbonate	**45.3 mg/L**	SM 2320-B	0.1	1/29/13	VDB
Carbonate	**< 0.1 mg/L**	SM 2320-B	0.1	1/29/13	VDB
Specific Conductance	**106 umhos/cm @ 25c**	EPA 120.1	5	1/25/13	TES
Total Alkalinity	**37.1 mg/L as CaCO3**	SM 2320-B	0.1	1/29/13	VDB
Total Dissolved Solids	**92 mg/L**	SM 2540-C	5	1/30/13	ISG
Total					
Calcium	**11.8 mg/L**	SM 3111-B	0.1	1/29/13	TES
Calcium Hardness	**29.6 mg/L as CaCO3**	SM 3111-B	0.1	1/29/13	TES

Abbreviations/ References:

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240 South Main Street / Brighton, CO 80601-0507 / 303-659-2313
Mailing Address: P.O. Box 507 / Brighton, CO 80601-0507 / Fax: 303-659-2315

Colorado Analytical LABORATORIES, INC.

Analytical Results

TASK NO: 130125021

Report To: Dennis Bacca
Company: Town of Rye
P.O. Box 148
Rye CO 81069

Bill To: Accounts Payable
Company: Town of Rye - AP
P.O. Box 236
Rye CO 81069

Task No.: 130125021
Client PO:
Client Project: Town of Rye CO 0151700

Date Received: 1/25/13
Date Reported: 2/4/13
Matrix: Water - Drinking

Customer Sample ID 001 PH-7.81 Temp 5.2
Sample Date/Time: 1/24/13 12:00 PM
Lab Number: 130125021-02

Test	Result	Method	LQL	Date Analyzed	Analyzed By
Bicarbonate	**45.8 mg/L**	SM 2320-B	0.1	1/29/13	VDB
Carbonate	**< 0.1 mg/L**	SM 2320-B	0.1	1/29/13	VDB
Specific Conductance	**102 umhos/cm @ 25c**	EPA 120.1	5	1/25/13	TES
Total Alkalinity	**37.5 mg/L as CaCO3**	SM 2320-B	0.1	1/29/13	VDB
Total Dissolved Solids	**55 mg/L**	SM 2540-C	5	1/30/13	ISG
Total					
Calcium	**17.3 mg/L**	SM 3111-B	0.1	1/29/13	TES
Calcium Hardness	**43.3 mg/L as CaCO3**	SM 3111-B	0.1	1/29/13	TES

Abbreviations/ References:

LQL = Lower Quantification Limit
mg/L = Milligrams Per Liter or PPM
ug/L = Micrograms Per Liter or PPB
mpn/100 mls = Most Probable Number Index/ 100 mls
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